PINC AI

100 Top Hospitals® Program
Methodology Guide
April 2024

100 Top Hospitals® Study
15 Top Health Systems™ Study
50 Top Cardiovascular Hospitals™ Study

Solution Center

877.777.1552

PINC AI™ 100 Top Hospitals® Program

Printed and bound in the United States of America.

PINC AI

Contents

100 Top Hospitals® Program

Overview

The purpose of this document is to discuss the methodology behind the studies within the 100 Top Hospitals® program. These studies include:

100 Top Hospitals®, Everest Award and Community Champion Award
Research that annually recognizes the 100 top rated hospitals in the nation based on a balanced scorecard of overall organizational performance; and separately identifies those hospitals that excel at long-term rates of improvement (Everest); and hospitals serving a higher proportion of patients with social drivers of health (Community Champion Award).

15 Top Health Systems™
An annual study that aims provides an objective measure of overall health system performance and offers insight into the ability of a system's hospitals to deliver consistent top performance across the communities they serve, all based on our national health system scorecard.

50 Top Cardiovascular Hospitals™
An annual study that aims to identify hospitals demonstrating the highest performance in hospital cardiovascular services for four important patient groups: acute myocardial infarction, heart failure, coronary artery bypass graft and percutaneous coronary intervention.

Data Sources

All studies within the 100 Top Hospitals® program are designed to be balanced, objective, representative and transparent. In pursuit of this, all data used to develop the respective studies comes from publicly available data sources. In this process, a database of short-term, acute care, nonfederal U.S. hospitals that treat a broad spectrum of patients is developed with the primary data sources being the Medicare Provider Analysis and Review (MEDPAR) patient claims data set, the Centers for Medicare & Medicaid Services (CMS) Care Compare hospital performance data set, and the Hospital Cost Report Information System Medicare Cost Report (HCRIS) file. Residency program information, used in classifying teaching hospitals, is from the Accreditation Council for Graduate Medical Education (ACGME) for American Medical Association (AMA) and American Osteopathic Association (AOA) accredited programs. Additional details on each of these data sources is provided below:

Medicare Provider Analysis and Review (MEDPAR)

MEDPAR data is a complete dataset of Medicare hospitalizations, containing information for U.S. acute care facilities. The MEDPAR dataset is primarily used to support the development of various risk standardized outcome measures related to quality and efficiency. The measures include risk- and severity-adjustment models for inpatient mortality, complications, cost and length of stay (LOS), which are recalibrated annually to estimate the most current expectations of care.

Medicare Cost Report

The Medicare Cost Report promotes comparability of costs and efficiency among hospitals and contains hospital-specific demographic information and all-payer revenue and expense data filed annually by every U.S. hospital that participates in the Medicare program. The Medicare Cost Report includes hospital costs across payers, not just costs associated with Medicare beneficiaries. Hospitals' most current cost reports published in the federal Healthcare Cost Report Information System (HCRIS) are used for relevant studies.

CMS Care Compare

The CMS Care Compare[1] database is comprised of calculated measures sourced from a diverse set of quality improvement agencies. Various measures are sourced from the Care Compare database for each of the 100 Top Hospitals® studies, including healthcare-associated infection (HAI) measures, Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), 30-day mortality rates, 30-day readmission rates, 30-day hospital-wide readmission rates and Medicare spend per beneficiary (MSPB).

Accreditation Council for Graduate Medical Education (ACGME)

Residency program information is used to stratify hospitals. This data comes from the Accreditation Council for Graduate Medical Education (ACGME). AMA and AOA graduate medical education program data is directly sourced from the ACGME. In addition, online information about graduate medical education programs from the Fellowship and Residency Electronic Interactive Database Access (FREIDA) and hospital websites is utilized to confirm program participation.

Award Revocation Policy

To preserve the integrity of the study, it is the policy of the 100 Top Hospitals® program to revoke awards across the 100 Top Hospitals® studies if a hospital or health system is found to have submitted inaccurate or misleading data to any data source used in the study.

At the discretion of the 100 Top Hospitals® program, the circumstances under which an award could be revoked include, but are not limited to, the following:

- Discovery by 100 Top program staff, through statistical analysis or other means, that a hospital or health system has submitted inaccurate data.
- Discovery of media or internet reports of governmental or accrediting agency investigations, or sanctions for actions by a hospital or health system that could have an adverse impact on the integrity of the studies or award winner selection.
- Exclusions from government programs.
- Violations of healthcare laws and/or sanctions.

100 Top Hospitals® – National Study

Introduction

The 100 Top Hospitals® is an annual study that aims to identify 100 U.S. hospitals with the highest performance on a balanced scorecard.

The 100 Top Hospitals® scorecard, based on Norton and Kaplan's concept[2], consists of 10 measures distributed across five domains (inpatient outcomes, extended outcomes, operational efficiency, financial health and patient experience) and uses publicly available data. The highest-achieving hospitals in the study are determined by the hospitals with the highest ranking on a composite score across the 10 measures.

This 100 Top Hospitals® study includes only short-term, nonfederal, acute care U.S. hospitals that treat a broad spectrum of patients.

The main steps taken in selecting the 100 Top Hospitals® are:

1. Building the database of hospitals using annual updates to the publicly available data sets and including special selection and exclusion criteria.
2. Classifying hospitals into comparison groups by size and teaching status (strata).
3. Scoring hospitals on a balanced scorecard of 10 weighted performance measures across five domains.
4. Determining the 100 Top Hospitals® with the best performance by ranking hospitals relative to their comparison groups.

The following section provides an overview of these steps.

Hospital Inclusion Criteria

The 100 Top Hospitals® study evaluates short-term, general, acute care U.S. hospitals having available data in the current MEDPAR data set. Hospitals are excluded from the study under the following conditions:

- Specialty hospitals (critical access, children's, women's, psychiatric, substance abuse, rehabilitation, cardiac, orthopedic, 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 fewer than 25 acute care beds.
- Hospitals with fewer than 100 Medicare patient discharges in the current data year.
- Hospitals with Medicare average LOS longer than 30 days in the current data year.
- Hospitals with no reported Medicare patient deaths in the current data year.
- Hospitals for which a current year Medicare Cost Report was not available.
- Hospitals with a current year Medicare Cost Report that was not for a 12-month reporting period.
- Hospitals that did not have Medicare claims for the two most current years of data
- Hospitals that had fewer than 60 percent of patient records with valid POA codes.
- Hospitals missing data required to calculate performance measures.

The remaining hospitals included in the study are referred to as "in-study" hospitals.

Patient Inclusion Criteria

Patients are excluded from the study under the following conditions:

- 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.

Measures and Data Time Periods

As part of the balanced scorecard approach, distinct measure domains are used within the 100 Top Hospital® study to assess unique facets of care. The rationale for the selection of the domains, and the measures within those domains, is described in the following paragraphs.

Measure Domains

- **Clinical Outcomes**: This domain includes risk-adjusted mortality, complications, and healthcare-associated infections (HAI) metrics. These measures indicate how the hospital is performing on fundamental care standards (survival, error-free care, avoidance of infections) while patients are being treated in the hospital.
- **Extended Outcomes**: The extended outcomes measures (30-day mortality rates for acute myocardial infarction (AMI), heart failure (HF), pneumonia, chronic obstructive pulmonary disease (COPD) and stroke patients; and 30-day all-cause hospital-wide readmission rates) help us understand the well-being of the hospital's patients over an extended period (or episode). Hospitals with lower values appear to provide or coordinate care across the continuum with better medium-term outcomes for these conditions.
- **Operational Efficiency**: The operational efficiency domain includes severity-adjusted average length of stay (ALOS), Medicare spend per beneficiary (MSPB) and inpatient expense per discharge. Average LOS serves as a proxy for clinical efficiency in an inpatient setting. It is severity adjusted to increase validity of comparisons across hospitals. A lower severity-adjusted ALOS generally indicates a more efficient consumption of hospital resources and reduced risk to patients.

  Inpatient expense is also adjusted for patient severity (Medicare case-mix index) and area wage levels (CMS area wage index applied to labor cost) to improve fairness when comparing performance across hospitals with different case-mix and in varying cost-of-living environments.

  The MSPB index serves as a proxy for continuum-of-care performance, measuring the ratio of MSPB treated in a specific hospital to the median MSPB nationally. It includes Medicare Part A and Part B payments three days prior to hospital admission, during the hospital stay and 30 days post-discharge.

- **Financial Health**: Adjusted operating profit margin is used to evaluate a hospital's financial health. The profit margin measure is adjusted for net related organization expense, as reported on the hospital cost report.
- **Patient Experience**: Patient perception of care, or the patient "experience," is integral to the balanced scorecard concept. Understanding patients' perceptions of care compared to those of patients in peer hospitals is vital for hospitals pursuing performance excellence. For this, the HCAHPS top-box answer in CMS Care Compare dataset, defined as the percent of patients rating their hospital as 9 or 10 on a scale of 0 to 10, is utilized.

Through these combined measures, hospitals are assessed on a balanced set of performance measures, designed to evaluate leadership's ability to consistently improve and sustain high performance over time.

Measures, Data Sources, Stewardship and Time Periods**Error! Reference source not found.**

lists measures included in the100 Top Hospitals® study by measure domain along with the respective data sources, measure steward and time periods of data used to compute the measure results. Data time periods vary by data source. 100 Top Hospitals® benchmark hospitals are determined using the current year performance only.

Table 1: Measures included in the 100 Top Hospitals® Study

Domain	Performance Measure	Data Source	Measure Steward	Current Performance Data Period	Trend Performance Data Period
Clinical Outcome	Risk-adjusted inpatient mortality index	MEDPAR	Premier	Two most current federal fiscal years (FFY)	Current + 5 previous FFY
	Risk-adjusted complications index	MEDPAR	Premier	Two most current FFY	Current + 5 previous FFY
	Mean healthcare-associated infection index	CMS Care Compare	NHSN	Current calendar year (CY)	Current + 4 previous CY
Extended Outcomes	30-day risk-standardized mortality rate (includes AMI, HF, pneumonia, COPD and stroke)	CMS Care Compare	Yale CORE	Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	30-day risk-adjusted hospital-wide readmission rate	CMS Care Compare	Yale CORE	Current dataset of one year, July-June	Current + 4 previous years
Operational Efficiency	Severity-adjusted average length of stay	MEDPAR	Premier	Current FFY	Current + 4 previous FFY
	Case mix- and wage-adjusted inpatient expense per discharge	CMS Cost Report	Premier	Current year	Current + 4 previous years
	Medicare spend per beneficiary	CMS Care Compare	CMS	Current CY	Current + 4 previous CY
Financial Health	Adjusted operating profit margin	CMS Cost Report	Premier	Current year	Current + 4 previous years
Patient Experience	HCAHPS top-box percent (overall hospital performance)	CMS Care Compare	HCAHPS	Current CY	Current + 4 previous CY

Stratification

Bed size, teaching status, and extent of residency/fellowship program involvement can influence the types of patients treated and services provided by a hospital. To evaluate performance accurately, it important to compare hospitals within a peer comprised of similar facilities. Thus, each hospital is assigned to one of five comparison groups based on size and teaching status.

The classification methodology distinguishes between major teaching hospitals and teaching hospitals by considering the number and type of teaching programs and the level of involvement in physician education and research. This approach de-emphasizes bed size and focuses more on teaching program involvement to measure the depth and breadth of teaching activity accurately.

The criteria for defining the teaching comparison groups incorporates factors such as hospital bed size, residents-to-acute-care-beds ratio and the number and type (sponsorship or participation) of graduate medical education (GME) programs that the hospital is affiliated with.

The five comparison groups and their parameters are provided Table 2.

Table 2: 100 Top Hospitals® Stratum Definitions

Hospital Stratum	Stratum Definition
Major teaching hospitals	Three ways to qualify: 1. 400 or more acute care beds in service, plus a resident-per-bed ratio of at least 0.25 AND one of the following: • Sponsorship of at least 10 GME programs • Involvement in at least 15 programs overall 2. Involvement in at least 30 GME programs overall (regardless of bed size or resident- per-bed ratio). 3. A resident-per-bed ratio of at least 0.55 (regardless of number of GME program involvement) and bed size of 250 or greater.
Teaching hospitals	A hospital must meet two of the three criteria: • 200 or more acute care beds in service. • Resident-per-bed ratio of at least 0.03 and total GME programs not null or 0. • Total GME programs are 3 or greater and a resident-to-bed ratio not null or 0. *If criteria for bullets two and three are met, bed size must be between 99 and 199.*
Large community hospitals	• 250 or more acute care beds in service. • Not classified as a teaching hospital per definitions above.
Medium community hospitals	• 100 to 249 acute care beds in service. • Not classified as a teaching hospital per definitions above.
Small community hospitals	• 25 to 99 acute care beds in service. • Not classified as a teaching hospital per definitions above.

Outliers and Benchmark Exclusions

Outliers

Prior to ranking, hospitals identified as outliers are deemed ineligible to be named benchmark hospitals. This process aims to prevent hospitals with a high likelihood of erroneous cost report data from being declared top performers.

The interquartile range methodology is employed to identify hospitals with extreme outlier values for specific measures within each of the five hospital comparison groups. These measures include:

- Case mix- and wage-adjusted inpatient expense per discharge (high or low outliers).
- Adjusted operating profit margin (high and low outliers).

The procedure for calculating the IQR and outlier points is as follows:

- The first quartile (Q1) is determined, representing the 25th percentile value of all records in the population.
- The third quartile (Q3) is determined, representing the 75th percentile value of all records in the population.
- The IQR is calculated by subtracting Q1 from Q3 (IQR = Q3 – Q1).
- The upper- and lower-limit trim points are then calculated:
    - Upper-limit = Q3 + (3.0 × IQR)
    - Lower-limit = Q1 – (3.0 × IQR)

Data points outside the IQR upper- and lower-limits are considered extreme outliers and are therefore excluded.

Benchmark Exclusions

Hospitals with statistically unfavorable inpatient mortality or complication performance are excluded during the winner selection process. An approximate binomial confidence interval (or exact mid-p binomial confidence interval for less than 30 observations) is calculated for observed events by measure. The upper and lower limits produced from the confidence interval are divided by the expected value. The confidence interval upper and lower index values are used to determine whether a measure result is statistically better than, worse than, or as expected, with 99 percent confidence.

By measure, the 75th percentile index value is calculated from the range of measure values that are worse than expected. This value becomes the measure high trim point. A hospital is excluded if both of the following conditions apply for one or more inpatient mortality or complications measures:

- The measure is statistically worse than expected with 99 percent confidence.
- The measure value is above the high trim point.

In addition to these outlier conditions, hospitals will not be eligible for benchmark status if the following reason exists:

- Hospitals without a MSPB measure value (this effects all Maryland hospitals as they have a different IPPS reimbursement policy with CMS).

Normalization and Scoring

Normalization

The inpatient mortality, complications, HAI and ALOS measures are normalized for hospitals in-study population, by comparison group, to provide a more easily interpreted comparison among hospitals.

For the mortality and complications measures, the ranking is based on the difference between observed and stratum-adjusted expected events and further standardized into standard deviation units (z-scores). The individual hospital expected values are normalized by multiplying them by the ratio of the observed to expected values for their comparison group. The normalized z-score is then calculated based on the observed and normalized expected values and the patient count.

For the HAI measures, the ranking is based on the equally-weighted mean of the normalized z-scores for the included HAIs, which vary by comparison group. The individual hospital expected values for each HAI are normalized by multiplying them by the ratio of the observed to expected values for their comparison group for that HAI. A normalized z-score is calculated for each HAI, for each hospital, using the observed, normalized expected and count.

For the ALOS measure, the ranking is based 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 hospital. The individual hospital's expected values are normalized by multiplying them by the ratio of the observed to expected values for its comparison group. The hospital's normalized index is then calculated by dividing the hospital's observed value by its normalized expected value. This normalized index is converted into days by multiplying by the average LOS of all in-study hospitals (grand mean ALOS).

Scoring

To select the 100 Top Hospitals® award winners, hospitals are ranked on current study year performance on each of the study measures relative to other hospitals in their comparison group. Each performance measure is assigned a weight for use in overall ranking (see Table 3). The weighted performance measure ranks for each hospital are summed to arrive at a total score for the hospital. Each hospital's performance measure rankings are summed, and hospitals are re-ranked overall to arrive at a final rank for the hospital. The hospitals with the best final ranks in each comparison group are selected as the 100 Top Hospitals® award winners.

Table 3: Measure weights in current and trend profiles

Measure	Current Profile Weight	Trend Profile Weight	Small Community Hospital Weight
Risk-Adjusted Inpatient Mortality Index	1	1	1.25
Risk-Adjusted Complications Index	1	1	1.25
Mean Healthcare-Associated Infection Index*	1	1	NA
Mean 30-Day Mortality Rate (AMI, HF, pneumonia, COPD, stroke)	1	1	1.25
30-Day Hospital-Wide Readmission Rate	1	1	1.25
Severity-Adjusted Average Length of Stay	1	1	1
Inpatient Expense per Discharge (Case Mix- and Wage-Adjusted)	1	1	1
MSPB Index	1	1	1
Adjusted Operating Profit Margin	1	1	1
HCAHPS Top-Box Percent (Overall Hospital Rating)	1	1	1

*HAI metrics are not ranked for small community hospitals. For this comparison group only, weights for inpatient mortality, complications, 30-day mortality and 30-day readmission weights were increased to 1.25 to balance quality and operational groups for ranking purposes.

The number of hospitals selected to receive the 100 Top Hospitals® award in each hospital comparison group is shown in Table 4:

Table 4: Count of benchmark hospitals by stratum

Hospital Stratum	Number of Benchmark Hospitals
Major teaching hospitals	15
Teaching hospitals	25
Large community hospitals	20
Medium community hospitals	20
Small community hospitals	20
Total	**100**

Community Health Survey Measure

The 100 Top Hospitals® program incorporated a community health measure into its ranking process for those hospitals identified as top performers. The community health measure is weighted equally with other ranked outcome measures assessing inpatient outcomes, extended outcomes, processes of care, operational efficiency, financial health and patient experience.

This measure utilizes the final recommendations from Measuring Hospital Contributions to Community Health with a Focus on Equity created by the Bloomberg American Health Initiative and the Center for Health Equity at the Johns Hopkins Bloomberg School of Public Health. Survey details can be found in Appendix E.

Key principles of this measure include:

- Components of the measure should be based on evidence, existing standards and best practices.
- The underlying data should be publicly available or easily and transparently collected from hospitals and health systems.
- Hospitals and health systems, community organizations, and the general public should have the opportunity to suggest and comment on all elements of the proposed measures.

The proposal recommended a four-component approach to measuring hospital contributions to community health. However, since data for the first proposed component is only available by county, it was not incorporated to evaluate individual hospitals. Data for the other three proposed components would be derived from a straightforward survey to be completed by hospitals.

The three components derived from a hospital survey focus on the role that a hospital can play, including: (1) acting as a healthcare provider to provide critical services for community health and offering preventive services; (2) acting as a partner and collaborating with local organizations to implement critical programs; and (3) acting as an anchor institution and supporting local economic and social progress.
For hospitals that did not submit a survey this year but had submitted one in the two previous years, their previous survey results were included in the calculation of the current year's results.

The community health measure is measured as a percentage, with 100 percent being the highest score possible. Submitting a survey and sharing data accounts for 25 percent (data transparency). Each of the other components of the survey – hospital as a provider, hospital as a partner, and hospital as an anchor institution – is worth an additional 25 percent. To receive the full 25 percent for each component, hospitals needed to attest to at least half of the best practice standards within the component.

For top performers, the performance values of the Community Health Measures are independently ranked relative to other hospitals in their comparison group. The rank of the Community Health measure is then added to the final sum, which is based on the ten outcome measures. Subsequently, hospitals are re-ranked within each comparison group. The final rankings are published on the Fortune website.

Trend

For every hospital in the study, a t-statistic is calculated separately to measure five-year performance improvement (i.e. slope) for each of the included performance measures. This statistic assesses the direction and magnitude of change in performance, as well as the statistical significance of that change.

Hospitals are ranked based on their performance improvement t-statistic on each of the study measures relative to other hospitals in their comparison group. Each hospital's performance-measure rankings are then summed, and they are re-ranked overall to determine a final trend rank for the hospital.

The hospitals with the best final trend rank in each comparison group are selected as the performance improvement benchmark hospitals.

The current and trend graphs in the hospital reports do not match for inpatient mortality, complications, or average LOS. This is due to different norm factors used to normalize the expected values.

- Current profile: In-study hospitals' data for only the most current study year is combined to calculate each comparison group norm factor (observed/expected).
- Trend profile: In-study hospitals' data for all five study years is combined to calculate each comparison group norm factor.

There are fewer in-study hospitals in the trend profile than the current profile because some hospitals lack sufficient data points for one or more measures, leading to their exclusion.

The observed/normalized expected LOS index for each hospital is converted into an average LOS in days by multiplying it by the mean average LOS for all in-study hospitals (sum observed LOS/in-study hospital count). The grand mean average LOS differs between current and trend profiles when there are different numbers of in-study hospitals.
Both the current and trend profiles maintain internal consistency, providing relevant comparisons of a profiled hospital's performance versus peers and national benchmarks.

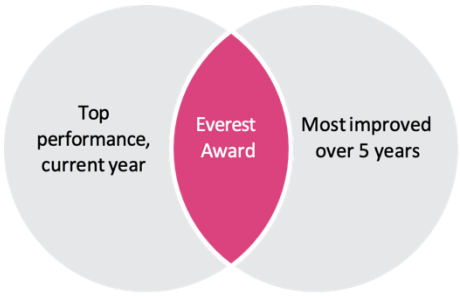
Everest Award

The recipients of the 100 Top Hospitals® Everest Award set national benchmarks for both the fastest rate of improvement (trend performance) and the highest current year performance on the study's balanced scorecard. Everest Award recipients are selected from among the 100 Top Hospitals® awardees. The national award and the Everest Award are based on a set of measures that reflect performance across the whole organization.

The methodology for determining the Everest Award recipients can be summarized in three main steps:

1. Identify the annual 100 Top Hospitals® award benchmark hospitals using a balanced scorecard of performance measures from the most current data period available.
2. Identify hospitals that have shown the fastest, most consistent improvement rates on the same balanced scorecard of performance measures across a five-year period.
3. Hospitals that ranked in the top 100 on both lists are recognized with the Everest Award.

Combining these two methodologies yields a select group of Everest Award recipients. The number of Everest Award recipients can vary each year based solely on performance in the two categories.



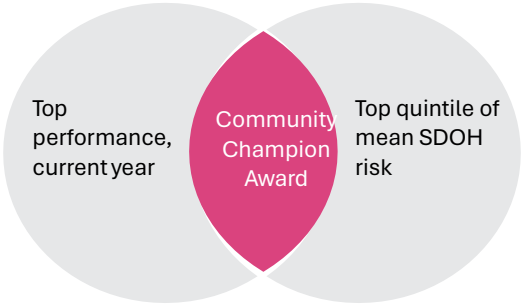
Community Champion Award

This award is designed to recognize hospitals providing exceptional care despite serving a higher proportion of patients with social drivers of health (SDOH) related risk factors.

The methodology for these designations can be summarized in three main steps:

1. Identify the annual 100 Top Hospitals® Benchmark Awardees using a balanced scorecard of performance measures from the most current data period available.
2. Calculate a hospital-level SDOH index based on a wide range of social factors generally associated with adverse outcomes and higher cost of care. This index is comprised of dual eligibility, low-income subsidy, disability and end-stage renal failure status with Medicare and Medicaid, urban rural status, and ICD-10 coding indicating the presence of behavioral health and SDOH factors. Mean SDOH indices are calculated for each in-study facility.
3. 100 Top Hospitals® Benchmark Awardees with a mean SDOH index in the top quintile of highest risk patients are presented recognized for providing exceptional care among a largely disadvantaged patient population.

Combining these two methodologies yields a select group of Community Champion Award recipients. The number of Community Champion Award recipients can vary each year based solely on performance in the two categories.



Leading Measures

Every year, the 100 Top Hospitals® study is evaluated, and consideration is given to whether new measures would enhance the value of the analysis provided. Several performance measures are being tested that update basic standards of inpatient care and expand the balanced scorecard across the continuum of care. These measures are listed in Table 5.

Table 5: Leading Measures Reported in the 100 Top Hospitals® National Study

Domain	Measure	Domain Justification
Patient Safety	Patient Safety Indicators	Patient safety is considered an important measure of hospital quality. The measures reflect both clinical quality and the effectiveness of systems within the hospital setting. Ten individual PSI measures and one overall score representing potentially avoidable serious complications are published in the Care Compare data set.
Patient Safety	Unplanned Hospital Revisits	The percentage of unplanned visits to the hospital following outpatient surgery is assessed by this measure. It is defined by CMS as 'unplanned hospital visits within seven days of same-day surgery at a hospital outpatient department.' These visits can include inpatient admission directly after surgery, emergency department visits, observation stays, or inpatient admissions within seven days of the surgical procedure. The population included in this measure comprises Medicare-fee-for-service patients aged 65 years and older.
Financial Health	30-day Episode-of-care Payment	Risk-standardized payments associated with 30-day episode-of-care measures for three patient groups, now also being published by CMS in the Care Compare data set, are continued to be published. These measures capture differences in services and supplies provided to patients diagnosed with AMI, HF or pneumonia. According to CMS, these measures represent the sum of payments made for care and supplies starting from the day the patient enters the hospital and for the subsequent 30 days.
Operational Efficiency	Excess Days in Acute Care	The EDAC measures for AMI, HF and pneumonia are among the more recent set of measures available from CMS in the Care Compare data set. "Excess days" are defined by CMS as the difference between a hospital's average days in acute care and expected days, based on an average hospital nationally. Days in acute care include those spent in an ED, a hospital observation unit, or a hospital inpatient unit for 30 days following a hospitalization.
Financial Health	90-day Episode-of-care Payment	Another measure available in the Care Compare data set is the 90-day episode-of-care payment metric for primary, elective THA/TKA. Similar to the other 30-day episode-of-care payment measures, CMS calculates risk-standardized payments associated with a 90-day episode of care, comparing them to an "average" hospital nationally. The measure summarizes payments for patients across multiple care settings, services and supplies during the 90-day period, starting on the day of admission.
Patient Safety	90-day Complication Measure	Along with the THA/TKA 90-day payment, CMS is publishing a THA/TKA 90-day complication measure. This measure calculates a risk-standardized complication rate for elective, primary THA/TKA procedures using the occurrence of one or more specified complications within the specified timeframes.

15 Top Health Systems™ Study

Introduction

PINC AI™ 15 Top Health Systems™ is an annual quantitative study in which 15 U.S. health systems with the highest overall achievement on a balanced scorecard are identified.

The health system scorecard is based on the 100 Top Hospitals® national balanced scorecard methodologies and focuses on four performance domains: inpatient outcomes, extended outcomes, operational efficiency and patient experience.

This health systems study includes eight measures that provide an objective 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 based on these eight measures.

To analyze health system performance, data for short-term, acute care, nonfederal U.S. hospitals, as well as cardiac, orthopedic, women's and critical access hospitals (CAHs) that are part of the health systems are included.

The following criteria identifies the four specialty hospital types included in the health system study:

- CAH hospitals are identified as having a facility-block within the CCN ranging between 1300 and 1399.[3]
- Cardiac specialty hospitals are identified when the major diagnostic category (MDC) of disease and disorders of the circulatory system (MDC = 05) represents 45 percent or more of the Medicare patient population with the top two MDCs comprising greater than 66.67 percent of those cases.
- Orthopedic specialty hospitals are identified when the MDC of diseases and disorders of the musculoskeletal system and connective tissue (MDC = 08) represents 45 percent or more of the Medicare patient population with the top two MDCs comprising greater than 66.67 percent of those cases. Additionally, at least 25 percent of the cases must fall into an operative MS-DRG.
- Women's hospitals are identified when the MDCs of diseases and disorders of the female reproductive systems and pregnancy, childbirth and the puerperium (MDCs 13, 14) represents 66.9 percent or greater of the cases. Additionally, at least 90 percent of the patient population is female.

The main steps taken in selecting the 15 Top Health Systems™ are:

1. Building the database of health systems using annual updates to the publicly available data sets including special selection and exclusion criteria.
2. Identifying which hospitals are part of health systems.
3. Aggregating the patient-level and hospital-level data from system hospitals and calculating a set of performance measures at the system level.

4. Classifying health systems into comparison groups based on total operating expense, number of system hospitals and geographic spread across the U.S.
5. Ranking systems on each of the performance measures by comparison group.
6. Determining the 15 top performers (five in each comparison group) from the health systems' overall rankings, based on their aggregate performance relative to their comparison group.

The 15 Top Health Systems™ scorecard results are divided into two separate sections that graphically illustrate:

- A health system's performance and improvement versus peer health systems.
- Cross-system performance alignment of system hospitals.

This study is designed to provide a view of health system performance across multiple dimensions: how they stand compared to peers and high performers (whole-system performance), where they stand in the evolution of their own cultures of performance improvement (relative long-term improvement and rate of improvement), and the achievement of cross-system performance alignment (system hospital performance).

Hospital Inclusion Criteria

A hospital will be excluded from the system study if any of the following exist:

- Identified as a specialty hospital not included in the study (Children's, Cancer, LTAC, Psych/Substance Abuse, or SNF).
- Identified as a Federally-owned hospital.
- Identified as a non-U.S. hospital (Guam, Puerto Rico, U.S. Virgin Islands).
- Medicare average length of stay longer than 30 days.
- No reported deaths.
    - This exclusion only applies to short-term acute care hospitals and NOT the included specialty hospitals (CAH, Women's, Cardio, Ortho).

Hospitals that are missing data for one or more measures are not excluded from the system study, as they are in the 100 Top Hospitals® National study. Data for all available measures are included in the system aggregation for the health system analysis.

Patient Inclusion Criteria

Patients are excluded from the study under the following conditions:

- Patients who were discharged to another short-term facility (this is done to avoid double-counting).
- Patients who were not at least 65 years old.
- Rehabilitation, psychiatric, and substance abuse patients.
- Patients with stays shorter than one day.

Health System Inclusion Criteria

Health systems are excluded from the study if:

- Fewer than two short-term, acute care, nonfederal U.S. hospitals.
- One or more required measures are missing.
- Fewer than 50 percent of system hospitals have valid POA coding.
- Fewer than 50 percent of system hospitals have valid data for any one or more required measures.

NOTE: MSPB measures are not published for Maryland hospitals by CMS due to a separate payment agreement. For this reason, the comparison group median is substituted, and Maryland health systems without reported MSPB measures are excluded from winning to allow Maryland health systems to remain in the study. If a Maryland health system included hospitals in other states, they were winner-excluded when more than 50 percent of their hospitals had no reported MSPB measure.

Identifying Health Systems

To be included in the study, a health system must have at least two short-term, general, acute care hospitals with separate Medicare provider identification numbers. The minimum of two hospitals must be met after hospital exclusions have been applied. In addition, any cardiac, orthopedic, women's hospitals and CAHs that passed the hospital exclusion rules cited on the previous page are also included. Multiple data sources, including the Medicare cost report, Agency for Healthcare Research and Quality (AHRQ), Definitive Healthcare, American Hospital Association, and American Hospital Directory, are used to identify health systems and their hospitals. The systems' websites and hospitals' websites are also referred to for verification and validation of inclusion in the 15 Top Health Systems™ study. Hospitals must be a part of the health system as of the current data year or earlier to be included in the system measure aggregation for this study year.

Health systems that have subsystems with their own reported home offices or related organization relationships or are clearly identified as a subsystem on their websites are identified. Both the parent system and any identified subsystems are treated as "health systems" for purposes of this study and are independently profiled. Hospitals belonging to a parent health system and a subsystem are included in both for analysis of system performance.
To analyze health system performance, data are aggregated from all of a system's included hospitals. Specific details about the calculations used for each performance measure and how these measures are aggregated to determine system performance are provided in the methodology summary tables in this section.

Measures and Data Time Periods

The same measure domains as in the 100 Top Hospitals® study are included in the 15 Top Health Systems™ study, except for the financial health domain. Additionally, the financial measure, inpatient expense per discharge, in the operational efficiency domain, is not included. The eight measures included in this study with data source, measure steward and data time periods for the current and trend profiles are provided in Table 6.

Table 6 : Measures included in the 15 Top Health Systems™ Study

Domain	Performance Measure	Data Source	Measure Steward	Current Performance Data Period	Trend Performance Data Period
Clinical Outcome	Risk-adjusted inpatient mortality index	MEDPAR	Premier	Two most current federal fiscal years (FFY)	Current + 5 previous FFY
	Risk-adjusted complications index	MEDPAR	Premier	Two most current FFY	Current + 5 previous FFY
	Mean healthcare-associated infection index	CMS Care Compare	NHSN	Current calendar year (CY)	Current + 4 previous CY
Extended Outcomes	30-day risk-standardized mortality rate (includes AMI, HF, pneumonia, COPD and stroke)	CMS Care Compare	Yale CORE	Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	30-day risk-adjusted hospital-wide readmission rate	CMS Care Compare	Yale CORE	Current dataset of one year, July-June	Current + 4 previous years
Operational Efficiency	Severity-adjusted average length of stay	MEDPAR	Premier	Current FFY	Current + 4 previous FFY
	Medicare spend per beneficiary	CMS Care Compare	CMS	Current CY	Current + 4 previous CY
Patient Experience	HCAHPS top-box percent (overall hospital performance)	CMS Care Compare	HCAHPS	Current CY	Current + 4 previous CY

Stratification

The analysis of health systems is refined by dividing them into three comparison groups based on a number of elements: total operating expense of system hospitals, number of states system hospitals reside and number of short-term, general, acute care hospitals that make up the system. This is done to develop more action-driving benchmarks for like systems. For this study, the three comparison groups used are listed in Table 7.

Table 7: 15 Top Health Systems™ Stratum Definitions

Health System Stratum	Stratum Definition
Large Health System	>= $2.5 billion total operating expense **OR** >= $1.5 billion & >= 3 states **OR** $1.5B & >= 5 STGAC
Medium Health System	>= $800 million tot exp & >= 5 STGAC **OR** >= $1 billion total operating expense
Small Health System	Does not meet large or medium system criteria

Benchmark Exclusions

Benchmark exclusions are determined based on mortality and complications, which involve observed and expected values. Systems with performance that is statistically worse than expected are identified and excluded from consideration when selecting the as benchmarks. This is done to prevent systems with poor clinical outcomes from being declared high performers.

A system is benchmark-excluded if both of the following conditions apply:

- The observed value is higher than expected, and the difference is statistically significant, with 99 percent confidence.
- The 75th percentile index value for mortality and complications is calculated, including data only for systems that meet condition number 1 above. These values serve as the high trim points for those health systems. Systems with mortality or complications index values above the respective trim points are winner-excluded.

Further, if MSPB performance is missing, the system is excluded from being considered a benchmark system.

Normalization and Scoring

Normalization

All measure data used in the 15 Top Health Systems™ study comes directly from the 100 Top Hospitals® national study of those hospitals included in an ins-study system. To analyze health system performance, we aggregate data from all of a system's included hospitals. The methodology below provides specific details about the calculations used for each performance measure and how these measures are aggregated to determine system performance.

The inpatient mortality, complications, HAI and LOS measures are normalized for the in-study health system population, by comparison group, to provide a more easily interpreted comparison among systems.

For the mortality and complications measures, the ranking is based on the difference between the health system hospitals' aggregated observed and expected values and further standardized into standard deviation units (z-scores). The system's expected values are normalized by multiplying them by the ratio of the observed to expected values for their comparison group. The normalized z-score is then calculated based on the observed and normalized expected values and the aggregate patient count.

For the HAI measures, the ranking is based on the equally-weighted mean of the normalized z-scores for the included HAIs, which vary by comparison group. The system expected values for each HAI are normalized by multiplying them by the ratio of the observed to expected values for their comparison group for that HAI. A normalized z-score is calculated for each HAI, for each system, using the observed, normalized expected and count. The mean HAI normalized z-score for each system is calculated using the sum of the individual HAI normalized z-scores divided by the number of HAIs available for each system.

For the ALOS measure, the ranking is based on the normalized, severity-adjusted ALOS index expressed in days. This index is the ratio of the aggregated observed and expected values for each system. The system's expected values are normalized by multiplying them by the ratio of the observed to expected values for its comparison group. The system's normalized index is then calculated by dividing the hospital's observed value by its normalized expected value. This normalized index is converted into days by multiplying by the average LOS of all in-study systems (grand mean LOS).

The health system measures from the CMS Care Compare dataset (30-day mortality and 30-day hospital-wide readmission rates, MSPB index and HCAHPS top-box percent) are calculated by aggregating the data for each hospital to the system level. The ranked metrics are the same values as reported in CMS Care Compare.

Scoring

To select the 15 Top Health Systems™ benchmarks, systems are ranked on current study year performance on each of the included measures relative to the other systems in their comparison group. The ranks are summed, giving all measures equal weight, 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 are selected as the benchmark systems, as shown in Table 8 .

Table 8: Count of benchmark systems by stratum:

System Stratum	Number of Benchmark Systems
Large Health Systems	5
Medium Health Systems	5
Small Health Systems	5
Total	**15**

Consistency

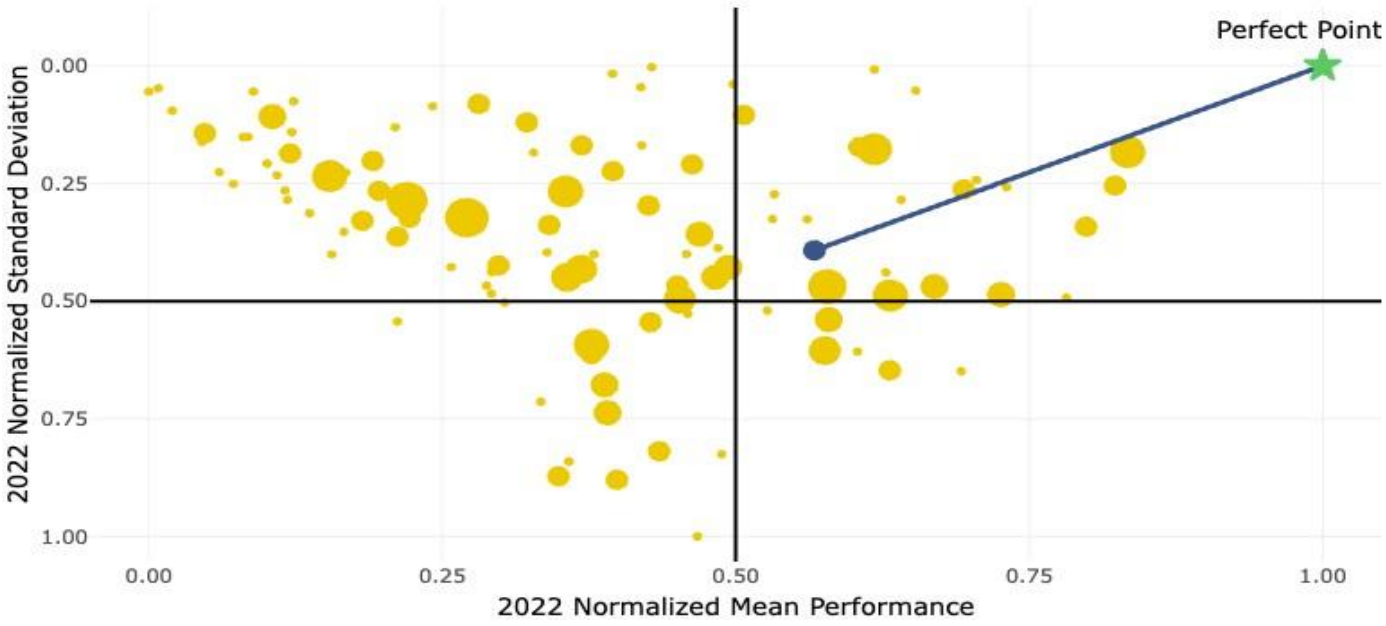
Introduced in 2023 is the Health System Consistency metric. Within this study, the consistency measure is defined as the intersection of system-level performance and within-system variation.

This metric is designed to identify systems that not only perform well overall, but also exhibit consistent performance across facilities within their health system. The consistency metric is designed to measure coordination of care across facilities, and further surfaces potential imbalance of performance for hospitals within a health system.

Methodology:

Overall system performance and variation are standardized using z-scores and plotted as x and y axes on a coordinate plane. The consistency score is calculated as the Euclidean distance between the profiled system point and the theoretical perfect point, whereby a system has a perfect overall score and zero variation across facilities.

Figure 1: Consistency scoring methodology comparing normalized system performance and within system variation



The system consistency scores are based on the standardized variation and performance of the profiled system compared to their peer group in the current data year only. Higher consistency scores identify systems with favorable overall measure performance, illustrated by the normalized mean performance (x-axis), while the y-axis represents the variation between the facilities, with lower variation identifying systems with the best consistency between their hospitals.

The size of the point on the graph represents the size of the system (number of facilities) within that comparison group. Benchmark and peer systems in the comparison group are identified by green and yellow points, respectively, while the profiled system is blue.

Trend

For every health system in the study, a t-statistic is calculated separately to measure five-year performance improvement (i.e. slope) for each of the included performance measures. This statistic assesses the direction and magnitude of change in performance, as well as the statistical significance of that change.

Health systems are ranked based on their performance improvement t-statistic on each of the study measures relative to other systems in their comparison group. Each health system's performance-measure rankings are then summed, and they are re-ranked overall to determine a final trend rank for the system.

The health systems with the best final trend rank in each comparison group are selected as the performance improvement benchmark hospitals.

The current and trend graphs in the health system reports do not match for inpatient mortality, complications, or average LOS. This is due to different norm factors used to normalize the expected values.

- Current profile: In-study health systems' data for only the most current study year is combined to calculate each comparison group norm factor (observed/expected).
- Trend profile: In-study health systems' data for all five study years is combined to calculate each comparison group norm factor.

There are fewer in-study health systems in the trend profile than the current profile because some systems lack sufficient data points for one or more measures, leading to their exclusion.

The observed/normalized expected LOS index for each health system is converted into an average LOS in days by multiplying it by the mean average LOS for all in-study systems (sum observed LOS/in-study system count). The grand mean average LOS differs between current and trend profiles when there are different numbers of in-study hospitals.

Both the current and trend profiles maintain internal consistency, providing relevant comparisons of a profiled health system's performance versus peers and national benchmarks.

Leading Measures

The leading measures provided in the 100 Top Hospitals® study are the same as those offered in the 15 Top Health Systems™ study. Refer to Table 5 for the list of those measures that are being evaluated for future inclusion in the studies as ranked metrics.

50 Top Cardiovascular Hospitals™ Study

Introduction

The PINC AI™ 50 Top Cardiovascular Hospitals™ study is designed to identify top-performing cardiovascular providers in the United States. The study is based on quantitative research that uses a balanced scorecard approach, based on publicly available data, to identify these top performing facilities. This study focuses on short-term, acute care, nonfederal U.S. hospitals that treat a broad spectrum of cardiology patients. It includes patients requiring medical management, as well as those who receive invasive or surgical procedures. Because multiple measures are used in the assessment, a hospital must provide all forms of cardiovascular care, including open heart surgery, to be included in the study.

The primary steps in the selection of the 50 Top Cardiovascular Hospitals™ study winners are:

1. Building the database of hospitals using annual updates to the publicly available data sets and including special selection and exclusion criteria.
2. Classifying hospitals into comparison groups (i.e., strata).
3. Scoring hospitals on a set of weighted performance measures.
4. Determining the 50 hospitals with the best overall performance by ranking relative to like comparison groups.

The following section provides an overview of these steps.

Hospital Inclusion Criteria

The 50 Top Cardiovascular Hospitals™ study evaluates short-term, general, acute care U.S. hospitals having available data in the current MEDPAR data file. Hospitals are excluded from the study under the following conditions:

- Specialty hospitals (that is, critical access, children's, women's, psychiatric, substance abuse, rehabilitation, orthopedic, 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 fewer than 100 Medicare patient discharges in the current data year.
- Hospitals with Medicare average length of stays longer than 30 days in the current data year.
- Hospitals with no reported Medicare patient deaths in the current data year.
- Hospitals for which a current year Medicare Cost Report was not available.
- Hospitals with a current year Medicare Cost Report that was not for a 12-month reporting period.
- Hospitals that did not have Medicare claims for the two most current years of data.
- Hospitals that had fewer than 60 percent of patient records with valid POA codes.
- Hospitals missing data required to calculate performance measures.
- Hospitals with fewer than 30 unique patient records in each patient group (AMI, HF, CABG and PCI) for the two most current MEDPAR years combined.

The remaining hospitals included in the study are referred to as “in-study” hospitals.

Patient Inclusion Criteria

Patients are excluded from the study under the following conditions:

- 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.

Additionally, in order to be included in the 50 Top Cardiovascular Hospitals™ study, patients must be classified into one of the four cardiovascular cohorts below, with at least 30 unique cases in each of the cohorts in the two most current data years combined:

- Acute Myocardial Infarction (AMI) patients – restricted to nonsurgical patients.
- Heart Failure (HF) patients – restricted to nonsurgical patients.
- Coronary Artery Bypass Graft (CABG) patients – includes all ICD-10 procedure codes in MS-DRGs 231 – 236.
- Percutaneous Coronary Intervention (PCI) patients – excludes patients with open chest coronary artery angioplasty.

Each patient group is defined based on ICD-10 coding definitions designed to be mutually exclusive. The AMI and HF groups explicitly exclude patients who also had a PCI or CABG procedure. See Appendices A-D for patient group definitions and the code-level detail.

Measures and Data Periods

Within the 50 Top Cardiovascular Hospitals™ study, hospital performance is evaluated based on overall performance of 23 distinct measures across five measure domains: clinical outcomes, extended outcomes, efficiency, extended efficiency, and patient experience. The rationale for the selection of the domains, and the measures within those domains, is described in the following paragraphs.

Measure Domains

- **Clinical Outcomes**: This domain includes risk-adjusted inpatient mortality measures for the acute myocardial infarction (AMI), heart failure (HF), coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) patient groups. The risk-adjusted complications measure includes the two surgical patient groups, CABG and PCI. These measures indicate how the hospital is performing on fundamental care standards (survival and error-free care) while patients are being treated in the hospital.

- **Extended Outcomes**: The extended outcomes measures (30-day mortality rates for AMI, HF and CABG patients and 30-day readmission rates for AMI, HF and CABG patients) help us understand the well-being of the hospital's patients over an extended period (or episode). Hospitals with lower values appear to provide or coordinate care across the continuum with better medium-term outcomes for these conditions.
- **Efficiency**: The operational efficiency domain includes severity-adjusted average length of stay (ALOS) and wage- and severity-adjusted average cost per case, for all four patient groups. Average LOS serves as a proxy for clinical efficiency in an inpatient setting. It is severity adjusted to increase validity of comparisons across hospitals. A lower severity-adjusted ALOS generally indicates a more efficient consumption of hospital resources and reduced risk to patients.

  The cost per case measure is also adjusted for patient severity (Medicare case-mix index) and area wage levels (CMS area wage index applied to labor cost) to improve fairness when comparing performance across hospitals with different case-mix and in varying cost-of-living environments. This measure helps to determine how cost-effectively a hospital is caring for its patients. Ideally, best value is achieved when patients receive high-quality care, with good outcomes, at the lowest cost.
- **Extended Efficiency**: This domain includes a measure that reports risk-standardized payments associated with a 30-day episode of care for AMI and HF patients. The values represent the payments made for the care and supplies, beginning with the hospital admission, through the next 30 days. This extended efficiency measure helps us better understand differences in services and supplies provided to similar patients, as well as differences in post-discharge care and associated payments made for Medicare patients across the entire continuum of care.
- **Patient Experience**: Patient perception of care, or the patient "experience," is integral to the balanced scorecard concept. Understanding patients' perceptions of care compared to those of patients in peer hospitals is vital for hospitals pursuing performance excellence. For this, the HCAHPS top-box answer in CMS Care Compare dataset, defined as the percent of patients rating their hospital as 9 or 10 on a scale of 0 to 10, is utilized.

Through these combined measures, hospitals are assessed on a balanced set of performance measures, designed to evaluate leadership's ability to consistently improve and sustain high performance over time.

Measures, Data Sources, Stewardship and Time Periods

Table 9: Measures included in the 50 Top Cardiovascular Hospitals™ Study

Domain	Performance measure		Data Source	Measure Steward	Current Performance Data Period	Trend Performance Data Period
Clinical outcomes	Risk-adjusted inpatient mortality index	AMI mortality	MEDPAR	Premier	Two most current federal fiscal years (FFY)	Current + 5 previous FFY
		HF mortality			Two most current FFY	Current + 5 previous FFY
		CABG mortality			Two most current FFY	Current + 5 previous FFY
		PCI mortality			Two most current FFY	Current + 5 previous FFY
	Risk-adjusted complications index	CABG complications	MEDPAR	Premier	Two most current FFY	Current + 5 previous FFY
		PCI complications			Two most current FFY	Current + 5 previous FFY
Extended outcomes	AMI 30-day mortality		CMS Care Compare	Yale CORE	Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	HF 30-day mortality				Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	CABG 30-day mortality				Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	AMI 30-day readmission				Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	HF 30-day readmission				Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	CABG 30-day readmission				Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
Efficiency	AMI severity-adjusted average length of stay (ALOS)		MEDPAR	Premier	Current FFY	Current + 4 previous FFY
	HF severity-adjusted ALOS				Current FFY	Current + 4 previous FFY
	CABG severity-adjusted ALOS				Current FFY	Current + 4 previous FFY
	PCI severity-adjusted ALOS				Current FFY	Current + 4 previous FFY
	AMI wage- and severity-adjusted average cost per case		CMS Cost Report	Premier	Current year	Current + 4 previous years
	HF wage- and severity-adjusted average cost per case				Current year	Current + 4 previous years
	CABG wage- and severity adjusted average cost per case				Current year	Current + 4 previous years
	PCI wage- and severity-adjusted average cost per case				Current year	Current + 4 previous years
Extended efficiency	AMI 30-day episode of payment		CMS Care Compare	Yale CORE	Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
	HF 30-day episode of payment				Current dataset of rolling 3-years, July-June	Current + 4 previous datasets
Patient Experience	HCAHPS top-box (overall hospital rating)		CMS Care Compare	HCAHPS	Current CY	Current + 4 previous CY

Stratification

Bed size, teaching status and residency/fellowship program involvement have a significant effect on the types of patients a hospital treats and the scope of services it provides. When analyzing the performance of an individual hospital, it is important to compare against similar hospitals. Each hospital is therefore assigned to one of three comparison strata according to its teaching and residency program status. The formula for defining the cardiovascular hospital comparison groups includes each hospital's bed size, residents-to-beds ratio and involvement in graduate medical education (GME) programs accredited by the ACGME. Definitions for the hospital strata within the 50 Top Cardiovascular Hospitals™ study are provided in Table 10.

Table 10: 50 Top Cardiovascular Hospitals™ Stratum Definitions

Hospital Stratum	Stratum Definition
Teaching hospitals with cardiovascular residency programs	Hospitals in this category must meet the definition of teaching (see teaching hospitals without cardiovascular residency programs definition) and be involved in a cardiovascular residency program accredited by the ACGME (for AMA or AOA programs). Cardiovascular residency programs include any of the following: • Adult congenital heart disease. • Advanced heart failure and transplant cardiology. • Cardiology. • Cardiothoracic surgery. • Cardiovascular disease. • Cardiovascular medicine. • Clinical cardiac electrophysiology. • Interventional cardiology. • Thoracic surgery. • Thoracic surgery – integrated. Note: Cardiovascular radiology residency programs are not included. Participation in a fellowship program was identified and confirmed using the following sources: • AMA and AOA participation from ACGME files. • FREIDA database.
Teaching hospitals without cardiovascular residency programs	Hospitals in this category have no involvement in a cardiovascular residency program. There are two ways to qualify as a teaching hospital: 1) Hospital must meet two of the following three criteria: • 200 or more acute care beds in service. • An intern/resident-per-bed ratio of at least 0.03. • Involvement in at least three accredited GME programs overall. **OR** 2) Have an intern/resident-per-bed ratio of 0.25 or greater, regardless of bed size.
Community hospitals	Hospital must meet the following criteria: • Not classified as a teaching hospital per definitions above

Bed size and number of interns/residents (full-time equivalents) are taken from hospitals' most current Medicare Cost Report.

Outliers and Benchmark Exclusions

Outliers

Hospitals with costs per case for any patient group that qualify as high or low statistical outliers (using an interquartile range [IQR]-trimming methodology) are ineligible to be considered for benchmark status. For each individual cost-per-case measure, an interquartile range (IQR) is calculated for all in-study hospitals. Two outlier points (trim points) are determined for each measure: one upper limit and one lower limit.

The procedure for calculating the IQR and outlier points is as follows:

- The first quartile (Q1) is determined, representing the 25th percentile value of all records in the population.
- The third quartile (Q3) is determined, representing the 75th percentile value of all records in the population.
- The IQR is calculated by subtracting Q1 from Q3 (IQR = Q3 – Q1).
- The upper- and lower-limit trim points are then calculated:
    - Upper-limit = Q3 + (3.0 × IQR)
    - Lower-limit = Q1 – (3.0 × IQR)

Data points outside the IQR upper- and lower-limits are considered extreme outliers and are therefore excluded.

Benchmark Exclusions

Hospitals with statistically unfavorable inpatient mortality or complication performance are excluded during the winner selection process. An approximate binomial confidence interval (or exact mid-p binomial confidence interval for less than 30 observations) is calculated for observed events by measure. The upper and lower limits produced from the confidence interval are divided by the expected value. The confidence interval upper and lower index values are used to determine whether a measure result is statistically better than, worse than, or as expected, with 99 percent confidence.

By measure, the 75th percentile index value is calculated from the range of measure values that are worse than expected. This value becomes the measure high trim point. A hospital is excluded if both of the following conditions apply for one or more inpatient mortality or complications measures:

- The measure is statistically worse than expected with 99 percent confidence.
- The measure value is above the high trim point.

In addition to these two outlier conditions, hospitals will not be eligible for benchmark status if the following reasons exist:

- Hospital had fewer than 11 cases in any one of the four patient groups (AMI, HF, CABG and PCI) in the most current data year.
- Hospital missing one of the six 30-day mortality or readmission measures.

Normalization and Scoring

Normalization

The inpatient mortality, complications, LOS and cost measures are measured as a ratio of observed to expected events and are further normalized by hospital comparison group (i.e. stratum) to provide a more interpretable comparison between hospitals.

To do this, hospital-level expected values are first multiplied by the overall stratum-specific ratio of the observed-to-expected events to produce a stratum-adjusted hospital-level expected value. The adjusted expected value is used as the denominator to form the ratio of observed to (adjusted) expected events for each measure.

After the stratum-specific adjustments, the resulting observed-to-expected values are normalized into z-scores, or standard deviation units to mitigate effects of magnitude differences between measure results.

Within each of the three hospital comparison groups, hospitals are ranked based on their performance on each of the measures independently, relative to other hospitals in their group. Each performance measure is assigned a weight for use in overall ranking (see Table 11).

Scoring

Each hospital's measure ranks are summed to arrive at a total score for the hospital. The summed ranks are ranked and the hospitals with the best overall rank in each comparison group are selected as the benchmark hospitals (winning hospitals).

Only current profile performance is used for the selection of benchmark award-winning hospitals. Trend performance is ranked for information only.

Table 11: Measure weights incurrent and trend profiles

Ranked performance measure	Patient group	Current profile weight	Trend profile weight
Risk-adjusted inpatient mortality index	AMI	½	½
	HF	½	½
	CABG	½	½
	PCI	½	½
Risk-adjusted complications index	CABG	¼	¼
	PCI	¼	¼
30-day mortality rates (%)	AMI	⅙	⅙
	HF	⅙	⅙
	CABG	⅙	⅙
30-day readmission rates (%)	AMI	⅙	⅙
	HF	⅙	⅙
	CABG	⅙	⅙
Severity-adjusted average length of stay (days)	AMI	¼	¼
	HF	¼	¼
	CABG	¼	¼
	PCI	¼	¼
Wage- and severity-adjusted cost per case	AMI	¼	¼
	HF	¼	¼
	CABG	¼	¼
	PCI	¼	¼
30-day episode payment	AMI	½	½
	HF	½	½
HCAHPS top-box score (%)		½	n/a

The number of hospitals selected to receive the 50 Top Cardiovascular Hospitals™ award in each hospital comparison group is shown in Table 12.

Table 12: Count of benchmark hospitals by stratum

Hospital Stratum	Number of Benchmark Hospitals
Teaching hospitals with cardiovascular residency programs	20
Teaching hospitals without cardiovascular residency programs	20
Community hospitals	10
Total	**50**

Trend

For every hospital in the study, a t-statistic is calculated separately to measure five-year performance improvement (i.e., slope) for each of the included performance measures. This statistic assesses the direction and magnitude of change in performance, as well as the statistical significance of that change.

Hospitals are ranked based on their performance improvement t-statistic on each of the study measures relative to other hospitals in their comparison group. Each hospital's performance-measure rankings are then summed, and they are re-ranked overall to determine a final trend rank for the hospital.

The hospitals with the best final trend rank in each comparison group are selected as the performance improvement benchmark hospitals. Refer to the Methodology section for details on trending, including measure weighting.

The current and trend graphs in the hospital reports do not match for inpatient mortality, complications, or average LOS. This is due to different norm factors used to normalize the expected values.

- Current profile: In-study hospitals' data for only the most current study year is combined to calculate each comparison group norm factor (observed/expected).
- Trend profile: In-study hospitals' data for all five study years is combined to calculate each comparison group norm factor.

There are fewer in-study hospitals in the trend profile than the current profile because some hospitals lack sufficient data points for one or more measures, leading to their exclusion.

The observed/normalized expected LOS index for each hospital is converted into an average LOS in days by multiplying it by the mean average LOS for all in-study hospitals (sum observed LOS/in-study hospital count). The grand mean average LOS differs between current and trend profiles when there are different numbers of in-study hospitals.

Both the current and trend profiles maintain internal consistency, providing relevant comparisons of a profiled hospital's performance versus peers and national benchmarks.

Leading Measures

As with the 100 Top Hospitals® study, additional measures are evaluated, and consideration is given to whether these measures would enhance the value of the analysis provided. For the 50 Top Cardiovascular Hospitals™ study one measure has been included, 30-day excess days in acute care (EDAC), for the AMI and HF patient groups.

Table 13: Leading Measures Reported in the 100 Top Hospitals® National Study

Domain	Measure	Domain Justification
Operational Efficiency	Excess Days in Acute Care	The EDAC measures for AMI and HF capture excess days that hospitals' patients spent in acute care within 30 days after discharge, including emergency departments (ED), hospital observation units, or hospital inpatient units following a hospitalization for AMI or HF. The measures report the difference ("excess") between each hospital's average days in acute care ("predicted days") and the number of days in acute care that each hospital's patients would have been expected to spend if discharged from an average-performing hospital ("expected days").

Critical Access Hospitals (CAH) 100 Top Hospitals® Study

Introduction

As an extension to the 100 Top Hospitals® study, a separate sub-study that includes only critical access hospitals (CAH) is conducted annually. This study aims to identify CAH U.S. hospitals with the highest performance on a balanced scorecard.

The CAH scorecard is a subset of the measures included in the 100 Top Hospitals® study. Six of the 10 measures in the 100 Top Hospitals® study, distributed across five domains (inpatient outcomes, extended outcomes, operational efficiency, financial health and patient experience), are ranked with the 20 highest performing hospitals designated as the benchmark group.

Standard 100 Top Hospitals® methodologies are applied in developing the metrics and in analyzing CAH performance. CAH are evaluated based on the following measures:

- Risk-adjusted Inpatient mortality
- Risk-adjusted complications
- 30-day hospital-wide readmission
- Severity-adjusted average LOS
- Adjusted operating profit margin
- HCAHPS top-box

Measure Details

Risk-adjusted Inpatient Mortality Index

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™, 50 Top Cardiovascular Hospitals™

Overview

Mortality is often used as an inpatient measure of quality as it is a direct and objective indicator of a hospital's ability to provide effective medical care. Inpatient mortality refers to the number of patients who die while hospitalized, and it is a commonly used metric to assess the quality of care provided by hospitals. A risk-adjusted measure of mortality is necessary as it considers the severity of illness and other patient characteristics that may affect the likelihood of death, allowing for a more robust comparison of mortality rates across hospitals.

Calculation

A proprietary risk-adjusted mortality index model is used to determine expected deaths, predicting the likelihood of a patient's death based on patient-level characteristics such as age, sex and complicating diagnoses. The inpatient mortality risk model can be applied to coded patient claims data to estimate the expected probability of death occurring, given various patient-related factors. The mortality risk model used in this study is calibrated for patients aged 65 and older.

The risk-adjusted mortality model is calculated from MEDPAR patient claims data to estimate the variation between total observed and expected mortality by facility. Patient level expected mortality values are produced through regression modeling, which controls various patient-related factors, which are subsequently aggregated to the facility level to form the ratio of observed to expected length of stay. Exclusions are made for long-term care, psychiatric, substance abuse, rehabilitation, and federally owned or controlled facilities. Additionally, certain patient records are excluded from the dataset, including psychiatric, substance abuse, and unclassified cases (MS-DRGs 945, 946 and 999), as well as cases involving patients under 65 years of age or patients transferred to another short-term, acute care hospital.

Inpatients coded as palliative care (Z515) are included in the study. Over the past few years, the number of patients coded as palliative care has increased significantly, and the risk models have been calibrated to produce expected values for these patients. Separately licensed hospice unit patient records are not included in MEDPAR data. They have a separate billing type and separate provider numbers. In addition, patients receiving hospice treatment in acute care beds are billed under hospice, not the hospital, and would not be in the MEDPAR data file.

Do not resuscitate (DNR) patients are also included, with the risk model controlling for DNR status as a confounding variable. Post-discharge deaths are excluded from consideration. POA coding is utilized to identify pre-existing conditions that serve as risk factors in the risk adjustment model.

Risk-adjusted Complications Index

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™, 50 Top Cardiovascular Hospitals™

Overview

The complication measure provides a method to identify potentially avoidable complications during an inpatient hospital stay. A complication is an adverse health event, that may be associated with a substandard care process. While it is often difficult to determine if a complication was a result of care decisions (provider or patient), resource limitations, conflicting policies, or a one-time random event, identifying complications and adjusting for patient risk can help surface variation in quality and efficiency for performance improvement efforts. 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.

Calculation

An index value is calculated based on the number of cases with complications in the two most current years of data, divided by the number expected given the risk of complications for each patient. Expected complications are determined using proprietary expected complications risk index models, which consider patient-level characteristics such as age, sex, principal diagnosis, and comorbid conditions. Complication rates are calculated separately for medical and surgical patient risk groups, using normative data.

A complications risk model is employed to estimate the expected probability of a complication occurring, given various patient-related factors. Long-term care, psychiatric, substance abuse, rehabilitation, and federally owned or controlled facilities are excluded. Additionally, certain patient records are excluded from the data set: psychiatric; substance abuse; unclassified cases (MS-DRGs 945, 946, and 999); cases in which patient age was less than 65 years; and cases in which a patient transferred to another short-term, acute care hospital.

Palliative care patients (Z515) are included in the complications risk model, which is calibrated to estimate the probability of complications for these patients. The complications model uses clinical qualifiers to identify complications that have occurred in the inpatient setting. POA coding is utilized in the risk model to accurately identify pre-existing conditions and distinguish them from complications occurring during hospitalization.

Healthcare-associated Infections (HAI) Index

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™

Overview

Healthcare-associated infections (HAIs), developed by the National Healthcare Safety Network (NHSN)[4] and reported in the public Care Compare dataset by CMS, are utilized to capture new information about the quality of inpatient care. The tracking and intervention to reduce infection rates for methicillin-resistant Staphylococcus aureus (MRSA), central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infection (CAUTI), Clostridium difficile colitis (C. diff), and other problematic infections are required to be reported to CMS. The new public data will enable the development of national benchmarks for use by hospital leadership to affect change.

Healthcare-Associated Infection Measures	
HAI-1	Central line-associated bloodstream infections (CLABSI) in ICUs and select wards
HAI-2	Catheter-associated urinary tract infections (CAUTI) in ICUs and select wards
HAI-3	Surgical Site Infection from colon surgery (SSI: Colon)
HAI-4	Surgical Site Infection from abdominal hysterectomy (SSI: Hysterectomy)
HAI-5	Methicillin-resistant Staphylococcus Aureus (MRSA) Blood Laboratory-identified
HAI-6	Clostridium difficile (C. diff) Laboratory-identified Events (Intestinal infections)

Calculation

The HAI measures are reported as risk-adjusted standardized infection ratios (SIRs) using probability models and normative datasets maintained by a branch of the Centers for Disease Control and Prevention (CDC), the NHSN. Its underlying methodology details for building the SIR are documented and updated annually in a reference guide posted on the CDC website.[4]

To enable reporting of a hospital's general performance level on the HAI measures overall, a composite HAI measure is calculated for each hospital. Each facility's composite HAI measure considers only the HAIs included for its designated 100 Top Hospitals® comparison group, as indicated in the table below. Since not all hospitals report data for all six HAIs, the number of included HAI measures varies based on data availability in each comparison group.

Compare Group	Included HAIs	Minimum Required
Major Teaching	HAI-1, HAI-2, HAI-3, HAI-4, HAI-5, HAI-6	4
Teaching	HAI-1, HAI-2, HAI-3, HAI-5, HAI-6	4
Large Community	HAI-1, HAI-2, HAI-3, HAI-5, HAI-6	4
Medium Community	HAI-1, HAI-2, HAI-6	1
Small Community	NOT RANKED	NA

In addition to the SIR values for each HAI, CMS publishes the observed and expected values. The individual hospital expected values for each HAI are normalized by multiplying them by the ratio of the observed to expected values for their comparison group for that HAI. A normalized z-score is calculated for each HAI, for each hospital, using the observed, normalized expected and count. A z-score for an individual HAI is not calculated if CMS did not report an SIR value for that measure in the Care Compare dataset.

To develop a composite HAI measure, it is not appropriate to simply aggregate observed and expected values across the different HAIs because the overall observed to expected ratio would be weighted by the rates for each HAI, which could be quite different, and the HAIs are also likely to be distributed differently from hospital to hospital. For these reasons, an unweighted mean of the normalized z-scores is calculated as the composite HAI measure used for ranking hospitals.

For reporting purposes, an unweighted mean of the CMS SIRs for each hospital is calculated. If no value was available for a measure, the composite measure represents the mean of available measures, providing the hospital had the minimum required number of predicted HAIs for its comparison group. For each HAI, the SIR can be viewed as a unitless measure that is essentially a percent difference; that is, observed to expected ratio minus 1 x 100 = percent difference, which is unbiased by differences in the rates by HAI or distributions of HAIs by hospital.

30-Day Risk-Standardized Mortality Rate

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™, 50 Top Cardiovascular Hospitals™

Overview

Mortality rates serve as widely accepted indicators of hospital care effectiveness, allowing for an evaluation beyond immediate inpatient outcomes to understand the hospital's impact on longer-term patient survival. The CMS mortality models estimate hospital-specific, risk-standardized, all-cause 30-day cohort-specific mortality rates.[5] All-cause mortality, defined as death from any cause within 30 days after admission, is assessed regardless of whether the patient passes away during the hospital stay or after discharge.

30-day mortality rates for acute myocardial infarction (AMI), heart failure (HF), pneumonia (PN), chronic obstructive pulmonary disease (COPD), coronary artery bypass graft (CABG) and stroke (STK) patients are calculated by CMS from Medicare enrollment and claims records.

CMS derives its data from the CMS Care Compare dataset and calculates 30-day mortality rates using three years of MEDPAR data combined. Rates are not calculated for hospitals with fewer than 25 cases, in which case the comparison group-specific median rate is substituted for the affected measure.

Calculation

The CMS mortality model, developed by Yale CORE, evaluates deviations in 30-day cohort-specific mortality through regression modeling that produces hospitals-specific predicted to expected event ratio that is further transformed into a mortality rate (through multiplication of the national crude rate).

The predicted to expected ratio is analogous to an observed to expected ratio; however, it is designed to control for patient clustering within hospitals, in addition to patient-level risk factors themselves. Only Medicare fee-for-service records are utilized in the measure calculation.

Within the 100 Top Hospitals® national study, the arithmetic mean of the mortality rates for the AMI, HF, pneumonia, COPD and stroke cohorts is used to form a mortality composite value. For the 50 Top Cardiovascular™ study, the AMI, HF and CABG mortality measures are evaluated independently.

30-Day Risk-Standardized All-Cause Hospital-Wide Readmission Rate

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™

Overview

The CMS hospital-wide readmission model estimates hospital-specific, risk-standardized, unplanned, all-cause 30-day readmission rates for patients discharged alive to a non-acute care setting.[6] Patients may have been readmitted back to the same hospital, to a different hospital, or to another acute care facility. They may have been readmitted for the same condition as their recent hospital stay or for a different reason (CMS has indicated this is to discourage hospitals from coding similar readmissions as different readmissions). All readmissions that occur 30 days after discharge to a non-acute care setting are included, with a few exceptions. Planned admissions (obstetrical delivery, transplant surgery, maintenance chemotherapy, rehabilitation and non-acute admissions for a procedure) are not counted as readmissions by CMS.

Calculation

The CMS readmission model, developed by Yale CORE, evaluates deviations in 30-day readmissions through regression modeling that produces hospitals-specific predicted to expected event ratio that is further transformed into a readmission rate (through multiplication of the national crude rate).

The predicted to expected ratio is analogous to an observed to expected ratio; however, it is designed to control for patient clustering within hospitals, in addition to patient-level risk factors themselves. Only Medicare fee-for-service records are utilized in the measure calculation.

30-Day Risk-Standardized Readmission Rate

Study Inclusion: 50 Top Cardiovascular Hospitals™

Overview

Readmission rates are an accepted measure of the effectiveness of overall hospital care, allowing for an evaluation of how the care the hospital provides to inpatients with these particular conditions (AMI, HF, CABG) have contributed to issues with their post-discharge medical stability and recovery, with a focus on discharge appropriateness, effectiveness of follow-up care coordination and availability of appropriate post-acute care. The CMS readmission models estimate hospital-specific, risk-standardized, all-cause 30-day cohort-specific readmission rates, post discharge with a diagnosis of acute myocardial infarction (AMI), heart failure (HF) or coronary artery bypass graft (CABG).[7] This measure is defined as readmission to a hospital, for any cause within 30 days after discharge for a principal diagnosis of AMI, HF or CABG.

30-day readmission rates for AMI, HF or CABG patients are calculated by CMS from Medicare enrollment and claims records.

CMS derives its data from the CMS Care Compare dataset and calculates 30-day readmission rates using three years of MEDPAR data combined. Rates are not calculated for hospitals with fewer than 25 cases, in which case the comparison group-specific median rate is substituted for the affected measure.

Calculation

The CMS readmission model, developed by Yale CORE, evaluates deviations in 30-day cohort-specific readmission through regression modeling that produces hospitals-specific predicted to expected event ratio that is further transformed into a readmission rate (through multiplication of the national crude rate).

The predicted to expected ratio is analogous to an observed to expected ratio; however, it is designed to control for patient clustering within hospitals, in addition to patient-level risk factors themselves. Only Medicare fee-for-service records are utilized in the measure calculation.

30-Day Episode of Care Payments

Study Inclusion: 50 Top Cardiovascular Hospitals™

Overview

The 30-day episode-of-care payment for AMI and HF patients is an important metric included for evaluation. Hospital risk-standardized payments associated with a 30-day episode of care for AMI and HF are publicly reported by CMS. These values represent the payments made for the care and supplies for AMI and HF patients from hospital admission through the next 30 days. They aim to reflect differences in services and supplies provided to similar patients.

The creation of these measures by CMS aims to better understand differences in post-discharge care patterns and associated payments made for Medicare patients across the continuum of care. These measures are intended to be used alongside other 30-day measures (mortality and readmission) to fully assess a hospital's financial and quality of care performance.

Calculation

The 30-day payment is calculated by CMS using the ratio of predicted 30-day payment to expected 30-day payment, which is then multiplied by the national mean payment to obtain the risk-standardized payment for each hospital for AMI and HF patients. These payment measures include Medicare claims data for each patient condition using three years of MEDPAR data combined.

Average Length-of-stay (ALOS)

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™, 50 Top Cardiovascular Hospitals™

Overview

Efficient hospitals are those that can provide high-quality care in a timely manner, resulting in a shorter length of stay. Risk-adjusted length of stay measures help identify variation in efficiency, while controlling for patient mix.

Calculation

The severity-adjusted length-of-stay (LOS) model is calculated from MEDPAR patient claims data to estimate the variation between total observed and expected LOS by facility. Patient level expected LOS values are produced through regression modeling, which controls various patient-related factors, which are subsequently aggregated to the facility level to form the ratio of observed to expected length of stay. Exclusions are made for long-term care, psychiatric, substance abuse, rehabilitation, and federally owned or controlled facilities. Additionally, certain patient records are excluded from the dataset, including psychiatric, substance abuse, and unclassified cases (MS-DRGs 945, 946 and 999), as well as cases involving patients under 65 years of age or patients transferred to another short-term, acute care hospital. Palliative care patients (Z515) are included in the LOS model, which is calibrated to control for these important factors. POA coding is utilized to identify pre-existing conditions that serve as risk factors in the risk adjustment model. Full details on the 100 Top Hospitals® risk methodology can be found in the risk adjustment methodology guide.

Case-Mix and Wage-Adjusted Inpatient Expense Per Discharge

Study Inclusion: 100 Top Hospitals®

Overview

The measure of adjusted inpatient expense per discharge helps determine how efficiently a hospital cares for its patients. Low values indicate lower costs and better efficiency. This measure utilizes hospital Medicare Cost Report data from the current cost report year. It calculates the inpatient expense per discharge measure by aggregating the cost center-level inpatient expense from the hospital cost report and dividing by the total acute inpatient discharges, adjusted for case mix and area wage indexes.

Inpatient expense for each department is calculated from fully allocated cost using the ratio of inpatient charges to total charges. Non-reimbursable and special purpose cost centers are omitted, as they have no charges for patient care. Adjusted inpatient expense per discharge measures the hospital's average cost of delivering inpatient care on a per-unit basis. The hospital's CMS-assigned case mix index adjusts inpatient expense to account for differences in patient complexity, while the CMS area wage index accounts for geographic differences in the cost of living.

Calculation

The inpatient expense per discharge and operating profit margin measures are calculated using hospital-reported data from the current data year of Medicare cost reports available in the Hospital Cost Report Information System (HCRIS) data files. The calculations and the locations of data elements for these measures are detailed below.

The inpatient expense per discharge formula is:

[((0.62 x acute inpatient expense ÷ CMS wage index) + 0.38 x acute inpatient expense) ÷ acute inpatient discharges] ÷ Medicare case mix index

Where:

- Acute inpatient expense = inpatient expense − subprovider expense − nursery expense − skilled nursing facility expense − intermediate-care facility expense − other long-term care facility expense − cost centers without revenue (e.g., organ procurement, outpatient therapy, and other capital-related costs)
- Inpatient expense = sum over all departments [(inpatient department charges ÷ department charges) x department cost]

Individual element locations in the Medicare Cost Report are specified as follows:

- Acute inpatient discharges: worksheet S-3, line 14, column 15
- Inpatient department (cost center) elements:
- Fully allocated cost — worksheet B, part 1, column 26
- Total charges — worksheet C, part 1, column 8
- Inpatient charges — worksheet C, part 1, column 6
- Medicare case mix index — Federal Register: CMS IPPS Final Rule table 2 (cost report end dates in Q1, Q2, Q3) or IPPS, table 2 (cost report end dates in Q4)
- CMS wage index — CMS Federal Register: CMS IPPS FFY 2021 Final Rule/CN (cost report end dates in Q1, Q2, Q3) or IPPS Final Rule/CN (cost report end dates in Q4)

Wage- and Severity-adjusted Cost per Case

Study Inclusion: 50 Top Cardiovascular Hospitals™

Overview

The Wage- and Severity-Adjusted Cost per Case metric is included for evaluation. This measure helps determine how cost-effectively patients are cared for in a hospital setting. Ideally, achieving the best value involves providing high-quality care with positive outcomes at the lowest possible cost. Hospitals that perform well on this measure may be better prepared for risk-based population health payment systems.

Calculation

The Cost per Case is calculated by deriving a cost index value for each patient group (AMI, HF, CABG, PCI). This value is based on the sum of observed costs at the patient level divided by the sum of normalized expected costs. Observed costs are estimated by applying hospital cost-to-charge ratios for each cost center, as reported in the hospital cost report (most current available), to the MEDPAR patient-level charges by revenue code. Expected costs adjust for differences in illness severity using a linear regression model and are Area Wage Index-adjusted. Conditions present on admission (POA) are considered when determining expected costs.

Charge data for this measure is from the most current MEDPAR year, while cost-to-charge ratios are from the most current year of the hospital's Medicare Cost report available (if the current year's report is not available, the previous year's report is used).

Medicare Spending per Beneficiary (MSPB)

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™

Overview

The Medicare spend per beneficiary (MSPB) index helps determine how efficiently a hospital coordinates care for its patients across continuum-of-care sites.[8] This risk-adjusted index is developed and published by CMS in the public Care Compare data. The inclusion of this measure in the program aims to reward hospitals that can provide efficient care at a lower cost to Medicare.

Calculation

The MSPB index evaluates hospitals' efficiency relative to the efficiency of the median hospital nationally. It assesses the cost to Medicare of services performed during an MSPB episode, which comprises the period three days prior to, during, and 30 days following a patient's hospital stay.

The MSPB index is calculated by dividing the profiled hospital's risk-adjusted average episode cost by the national hospital median. The profiled hospital's MSPB amount is the sum of standardized, risk-adjusted spending across all eligible episodes divided by the number of episodes for that hospital, further divided by the median MSPB amount across all episodes nationally. CMS adjusts spending amounts for area price variation and various risk factors, including case mix, age, and hierarchical condition category (HCC) indicators. Lower values indicate lower costs relative to national medians and greater efficiency.

The hospital index published in the CMS Care Compare public data set, aggregating costs associated with the index admission from three days pre-admission through 30 days post-discharge, and rank hospitals accordingly. CMS calculates the cost of care for each admitted patient, including both Medicare Part A and Part B costs.

Adjusted Operating Profit Margin

Study Inclusion: 100 Top Hospitals®

Overview

The Adjusted Operating Profit Margin provides a true picture of a hospital's operating costs by adjusting for net related organization expense. This includes costs covered by the hospital on behalf of another organization and costs covered by another organization on behalf of the hospital.

The adjusted operating profit margin is calculated using hospital Medicare Cost Report data from the current cost report year. This measure helps to assess the financial performance of hospitals by determining the difference between total operating revenue and total operating expense, expressed as a percentage of total operating revenue, adjusted for net related organization expense.

Calculation

The Adjusted Operating Profit Margin is calculated as follows: [(net patient revenue + other operating revenue − (total operating expense + net related organization expense)) ÷ (net patient revenue + other operating revenue)] x 100. The other operating revenue is determined as [total other income − other income: (for example, contributions and donations) − other income from investments].

In the Medicare Cost Report, the individual elements are located as follows:

- Net patient revenue: worksheet G-3, line 3, column 1
- Total other income: worksheet G-3, line 25, column 1
- Other income: contributions, donations, etc.: worksheet G-3, line 6, column 1
- Other income from investments: worksheet G-3, line 7, column 1
- Total operating expense: worksheet G-3, line 4, column 1
- Related organization expense: worksheet A- 8, line 12, column 2

When a hospital has already reported the net related organization expense in its total operating expense, it is subtracted back out to avoid double-counting. This correction is made when the reported value is less than 80 percent of the reported related organization expense or when the G-2 expense additions are any other value.

Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Overall Hospital Rating

Study Inclusion: 100 Top Hospitals®, 15 Top Health Systems™, 50 Top Cardiovascular Hospitals™

Overview

The HCAHPS score for the overall hospital rating is a crucial element in this study, as it reflects patient assessment/perception of care, which directly impacts a hospital's competitiveness.[9] The data used in this study is sourced from the CMS Care Compare dataset, including HCAHPS results for the current calendar year. Hospital ranking is based on the "top-box" answer percent value in the CMS Care Compare dataset for the current calendar year. HCAHPS data is survey data based on either a sample of hospital inpatients or all inpatients.

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Overall Hospital Ratings are used to measure patient perception of care in this study. The HCAHPS patient survey, a standardized survey instrument and data collection methodology, is utilized for this purpose. Developed through a partnership between CMS and AHRQ, the HCAHPS survey aims to achieve three broad goals:

1. Produce comparable data on patients' perspectives of care to enable objective and meaningful comparisons among hospitals.
2. Encourage public reporting of survey results to create incentives for hospitals to enhance the quality of care.
3. Enhance public accountability in healthcare by increasing transparency regarding the quality of hospital care provided.

Calculation

While hospital performance on all HCAHPS questions is reported, only performance on the overall hospital rating question, "How do patients rate the hospital, overall?" is utilized for ranking hospital performance. Patient responses are categorized into three groups based on their ratings:

- 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).

Normative Database Development

A normative database of case-level data has been constructed from the MEDPAR database, containing more than 15 million Medicare discharges annually. This data is obtained from approximately 6,400 U.S. hospitals. Demographic and clinical data are also included: age, sex and LOS; clinical groupings (Medicare Severity Diagnosis Related Groups, or MS-DRGs), ICD-10-CM principal and secondary diagnoses and procedures; present-on-admission (POA) coding; admission source and type; and discharge status. For this study, risk models are recalibrated using the three most current federal fiscal years.

The risk models used by 100 Top Hospitals® make normative comparisons of cost, length of stay, mortality and complication rates by using patient-level data to control for case mix and severity differences. This is done by evaluating ICD-10-CM diagnosis and procedure codes to adjust for severity within clinical case mix groupings. Conceptually, patients with similar characteristics (i.e., age, sex, principal diagnosis, procedures performed, admission type and comorbid conditions) are grouped to produce expected or normative comparisons. Through testing, it has been found that this methodology produces normative comparisons using readily available administrative data, eliminating the need for additional data collection.

The proprietary risk- and severity-adjustment models for inpatient mortality, complications, and ALOS use POA data reported in the all-payer data to identify conditions that were present on admission and distinguish them from complications that occurred while the patient was in the hospital. The models develop expected values based only on conditions that were present on admission.

In addition to considering the POA indicator codes in the calibration of the risk- and severity-adjustment models, adjustments are made for missing/invalid POA coding found in the Medicare Provider Analysis and Review (MEDPAR) data files.

To correct for this bias, MEDPAR record processing through the mortality, complications, and LOS models is adjusted as follows:

- Original, valid (Y, N, U, W, or 1) POA codes assigned to diagnoses are retained.
- Where a POA code of “0” appears, the following steps are taken:
    - All diagnosis codes on the CMS exempt list are treated as “exempt,” regardless of POA coding.
    - All principal diagnoses are treated as “present on admission.”
    - Secondary diagnoses where the POA code “Y” or “W” appears more than 50 of the time in the all-payer database are treated as “present on admission.”
    - All others are treated as “not present.”

Without adjusting for differences in patient severity, comparing outcomes among hospitals does not present an accurate picture of performance. To make normative comparisons of hospital outcomes, raw data must be adjusted to accommodate differences resulting from the variety and severity of admitted cases.

An outcome index is a ratio of an observed number of outcomes to an expected number of outcomes in a 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 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 of 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 (for example, hospital or service line).

Patient Privacy Protection

Individual hospital data based on 11 or fewer patients is not reported, as required by CMS guidelines. This policy impacts the following measures:

- Risk-adjusted inpatient mortality index.
- Risk-adjusted complications index.
- 30-day mortality rates for AMI, HF, pneumonia, COPD and stroke (CMS does not report rates when the count is less than 25).
- 30-day hospital-wide readmission rates (CMS does not report rates when the count is less than 25).
- Average length of stay (ALOS).

Appendix A: Acute Myocardial Infarction (AMI) ICD-10-CM Definition

Acute myocardial infarction (AMI) patient group Defined as patients in MS-DRGs 280-285 and with the following ICD-10-CM codes as primary diagnosis:	
ICD-10 Code	**Code Description**
I21.01	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING LEFT MAIN CORONARY ARTERY
I21.02	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING LEFT ANTERIOR DESCENDING CORONARY ARTERY
I21.09	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING OTHER CORONARY ARTERY OF ANTERIOR WALL
I21.11	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING RIGHT CORONARY ARTERY
I21.19	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING OTHER CORONARY ARTERY OF INFERIOR WALL
I21.21	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING LEFT CIRCUMFLEX CORONARY ARTERY
I21.29	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION INVOLVING OTHER SITES
I21.3	ST ELEVATION (STEMI) MYOCARDIAL INFARCTION OF UNSPECIFIED SITE
I21.4	NON-ST ELEVATION (NSTEMI) MYOCARDIAL INFARCTION
I21.A1	MYOCARDIAL INFARCTION TYPE 2
I21.A9	OTHER MYOCARDIAL INFARCTION TYPE
I22.0	SUBSEQUENT ST ELEVATION (STEMI) MYOCARDIAL INFARCTION OF ANTERIOR WALL
I22.1	SUBSEQUENT ST ELEVATION (STEMI) MYOCARDIAL INFARCTION OF INFERIOR WALL
I22.2	SUBSEQUENT NON-ST ELEVATION (NSTEMI) MYOCARDIAL INFARCTION
I22.8	SUBSEQUENT ST ELEVATION (STEMI) MYOCARDIAL INFARCTION OF OTHER SITES
I22.9	SUBSEQUENT ST ELEVATION (STEMI) MYOCARDIAL INFARCTION OF UNSPECIFIED SITE
I219	ACUTE MYOCARDIAL INFARCTION, UNSPECIFIED

Appendix B: Heart Failure (HF) ICD-10-CM Definition

Heart failure (HF) patient group - restricted to nonsurgical patients Defined as HF patients in MS-DRGs 291-293 with the following ICD-10- CM code as primary diagnosis only:	
ICD-10 Code	**Code Description**
I09.81	RHEUMATIC HEART FAILURE
I11.0	HYPERTENSIVE HEART DISEASE WITH HEART FAILURE
I13.0	HYPERTENSIVE HEART AND CHRONIC KIDNEY DISEASE WITH HEART FAILURE AND STAGE 1 THROUGH STAGE 4 CHRONIC KIDNEY DISEASE, OR UNSPECIFIED CHRONIC KIDNEY DISEASE
I13.2	HYPERTENSIVE HEART AND CHRONIC KIDNEY DISEASE WITH HEART FAILURE AND WITH STAGE 5 CHRONIC KIDNEY DISEASE, OR END STAGE RENAL DISEASE
I50.1	LEFT VENTRICULAR FAILURE
I50.20	UNSPECIFIED SYSTOLIC (CONGESTIVE) HEART FAILURE
I50.21	ACUTE SYSTOLIC (CONGESTIVE) HEART FAILURE
I50.22	CHRONIC SYSTOLIC (CONGESTIVE) HEART FAILURE
I50.23	ACUTE ON CHRONIC SYSTOLIC (CONGESTIVE) HEART FAILURE
I50.30	UNSPECIFIED DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.31	ACUTE DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.32	CHRONIC DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.33	ACUTE ON CHRONIC DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.40	UNSPECIFIED COMBINED SYSTOLIC (CONGESTIVE) AND DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.41	ACUTE COMBINED SYSTOLIC (CONGESTIVE) AND DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.42	CHRONIC COMBINED SYSTOLIC (CONGESTIVE) AND DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.43	ACUTE ON CHRONIC COMBINED SYSTOLIC (CONGESTIVE) AND DIASTOLIC (CONGESTIVE) HEART FAILURE
I50.810	RIGHT HEART FAILURE, UNSPECIFIED
I50.811	ACUTE RIGHT HEART FAILURE
I50.812	CHRONIC RIGHT HEART FAILURE
I50.813	ACUTE ON CHRONIC RIGHT HEART FAILURE
I50.814	RIGHT HEART FAILURE DUE TO LEFT HEART FAILURE
I50.82	BIVENTRICULAR HEART FAILURE
I50.83	HIGH OUTPUT HEART FAILURE
I50.84	END STAGE HEART FAILURE
I50.89	OTHER HEART FAILURE
I50.9	HEART FAILURE, UNSPECIFIED

Appendix C: Coronary Artery Bypass Graft (CABG) ICD-CM-10 Definition

Coronary artery bypass graft (CABG) patient group Defined as CABG patients in MS-DRGs 231 – 236
Includes all ICD-10-CM procedure codes, principal or secondary, in these MS-DRGs

Appendix D: Percutaneous Coronary Intervention (PCI) ICD-10-CM Definition

Percutaneous coronary intervention (PCI) patient group

Defined as PCI patients in MS-DRGs 246-251 with any of the following ICD-10-CM procedure codes:

ICD-10 Code	Code Description
0270346	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
027034Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
0270356	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
027035Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0270366	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROAC
027036Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0270376	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS
027037Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703D6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02703DZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02703E6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703EZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703F6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703FZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703G6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703GZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02703T6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH

ICD-10 Code	Code Description
02703TZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02703Z6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, PERCUTANEOUS APPROACH
02703ZZ	DILATION OF CORONARY ARTERY, ONE ARTERY, PERCUTANEOUS APPROACH
0270446	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APP
027044Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
0270456	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPI
027045Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
0270466	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCO
027046Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
0270476	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS
027047Z	DILATION OF CORONARY ARTERY, ONE ARTERY WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APP
02704D6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02704DZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02704E6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02704EZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02704F6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02704FZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02704G6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC AP
02704GZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02704T6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPR
02704TZ	DILATION OF CORONARY ARTERY, ONE ARTERY WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH

ICD-10 Code	Code Description
02704Z6	DILATION OF CORONARY ARTERY, ONE ARTERY, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02704ZZ	DILATION OF CORONARY ARTERY, ONE ARTERY, PERCUTANEOUS ENDOSCOPIC APPROACH
0271346	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
027134Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
0271356	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROAC
027135Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0271366	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPRO
027136Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0271376	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOU
027137Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713D6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02713DZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02713E6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713EZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713F6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713FZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713G6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713GZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02713T6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02713TZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02713Z6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, PERCUTANEOUS APPROACH
02713ZZ	DILATION OF CORONARY ARTERY, TWO ARTERIES, PERCUTANEOUS APPROACH

ICD-10 Code	Code Description
0271446	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC A
027144Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
0271456	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCO
027145Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
0271466	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOS
027146Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
0271476	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOU
027147Z	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC A
02714D6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02714DZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02714E6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02714EZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02714F6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROAC
02714FZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02714G6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC
02714GZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02714T6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC AP
02714TZ	DILATION OF CORONARY ARTERY, TWO ARTERIES WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02714Z6	DILATION OF CORONARY ARTERY, TWO ARTERIES, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02714ZZ	DILATION OF CORONARY ARTERY, TWO ARTERIES, PERCUTANEOUS ENDOSCOPIC APPROACH

ICD-10 Code	Code Description
0272346	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
027234Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
0272356	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPRO
027235Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0272366	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APP
027236Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0272376	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANE
027237Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723D6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02723DZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02723E6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723EZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723F6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723FZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723G6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723GZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02723T6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02723TZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02723Z6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, PERCUTANEOUS APPROACH
02723ZZ	DILATION OF CORONARY ARTERY, THREE ARTERIES, PERCUTANEOUS APPROACH
0272446	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC

ICD-10 Code	Code Description
027244Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
0272456	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOS
027245Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
0272466	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS END
027246Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROA
0272476	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANE
027247Z	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC
02724D6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02724DZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02724E6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROAC
02724EZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02724F6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPRO
02724FZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02724G6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPI
02724GZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02724T6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC
02724TZ	DILATION OF CORONARY ARTERY, THREE ARTERIES WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02724Z6	DILATION OF CORONARY ARTERY, THREE ARTERIES, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02724ZZ	DILATION OF CORONARY ARTERY, THREE ARTERIES, PERCUTANEOUS ENDOSCOPIC APPROACH
0273346	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APP

ICD-10 Code	Code Description
027334Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
0273356	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOU
027335Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0273366	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANE
027336Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
0273376	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PE
027337Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS APP
02733D6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02733DZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02733E6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02733EZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02733F6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02733FZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02733G6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS AP
02733GZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS APPROACH
02733T6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPR
02733TZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS APPROACH
02733Z6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, PERCUTANEOUS APPROACH
02733ZZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, PERCUTANEOUS APPROACH
0273446	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS END
027344Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH DRUG-ELUTING INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROA

ICD-10 Code	Code Description
0273456	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOU
027345Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH TWO DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC A
0273466	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANE
027346Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH THREE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC
0273476	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PE
027347Z	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH FOUR OR MORE DRUG-ELUTING INTRALUMINAL DEVICES, PERCUTANEOUS END
02734D6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPRO
02734DZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROACH
02734E6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC
02734EZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH TWO INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02734F6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPI
02734FZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH THREE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPROACH
02734G6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS EN
02734GZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH FOUR OR MORE INTRALUMINAL DEVICES, PERCUTANEOUS ENDOSCOPIC APPRO
02734T6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDO
02734TZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES WITH RADIOACTIVE INTRALUMINAL DEVICE, PERCUTANEOUS ENDOSCOPIC APPROAC
02734Z6	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02734ZZ	DILATION OF CORONARY ARTERY, FOUR OR MORE ARTERIES, PERCUTANEOUS ENDOSCOPIC APPROACH
02C03Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, ONE ARTERY, BIFURCATION, PERCUTANEOUS APPROACH
02C03Z7	EXTIRPATION OF MATTER FROM CORONARY ARTERY, ONE ARTERY, ORBITAL ATHERECTOMY TECHNIQUE, PERCUTANEOUS APPROACH
02C03ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, ONE ARTERY, PERCUTANEOUS APPROACH

ICD-10 Code	Code Description
02C04Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, ONE ARTERY, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02C04ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, ONE ARTERY, PERCUTANEOUS ENDOSCOPIC APPROACH
02C13Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, TWO ARTERIES, BIFURCATION, PERCUTANEOUS APPROACH
02C13Z7	EXTIRPATION OF MATTER FROM CORONARY ARTERY, TWO ARTERIES, ORBITAL ATHERECTOMY TECHNIQUE, PERCUTANEOUS APPROACH
02C13ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, TWO ARTERIES, PERCUTANEOUS APPROACH
02C14Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, TWO ARTERIES, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02C14ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, TWO ARTERIES, PERCUTANEOUS ENDOSCOPIC APPROACH
02C23Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, THREE ARTERIES, BIFURCATION, PERCUTANEOUS APPROACH
02C23Z7	EXTIRPATION OF MATTER FROM CORONARY ARTERY, THREE ARTERIES, ORBITAL ATHERECTOMY TECHNIQUE, PERCUTANEOUS APPROACH
02C23ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, THREE ARTERIES, PERCUTANEOUS APPROACH
02C24Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, THREE ARTERIES, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02C24ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, THREE ARTERIES, PERCUTANEOUS ENDOSCOPIC APPROACH
02C33Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, PERCUTANEOUS APPROACH
02C33Z7	EXTIRPATION OF MATTER FROM CORONARY ARTERY, FOUR OR MORE ARTERIES, ORBITAL ATHERECTOMY TECHNIQUE, PERCUTANEOUS APPROACH
02C33ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, FOUR OR MORE ARTERIES, PERCUTANEOUS APPROACH
02C34Z6	EXTIRPATION OF MATTER FROM CORONARY ARTERY, FOUR OR MORE ARTERIES, BIFURCATION, PERCUTANEOUS ENDOSCOPIC APPROACH
02C34ZZ	EXTIRPATION OF MATTER FROM CORONARY ARTERY, FOUR OR MORE ARTERIES, PERCUTANEOUS ENDOSCOPIC APPROACH
02H03DZ	INSERTION OF INTRALUMINAL DEVICE INTO CORONARY ARTERY, ONE ARTERY, PERCUTANEOUS APPROACH
02H03YZ	INSERTION OF OTHER DEVICE INTO CORONARY ARTERY, ONE ARTERY, PERCUTANEOUS APPROACH
02H13DZ	INSERTION OF INTRALUMINAL DEVICE INTO CORONARY ARTERY, TWO ARTERIES, PERCUTANEOUS APPROACH
02H13YZ	INSERTION OF OTHER DEVICE INTO CORONARY ARTERY, TWO ARTERIES, PERCUTANEOUS APPROACH
02H23DZ	INSERTION OF INTRALUMINAL DEVICE INTO CORONARY ARTERY, THREE ARTERIES, PERCUTANEOUS APPROACH
02H23YZ	INSERTION OF OTHER DEVICE INTO CORONARY ARTERY, THREE ARTERIES, PERCUTANEOUS APPROACH

ICD-10 Code	Code Description
02H33DZ	INSERTION OF INTRALUMINAL DEVICE INTO CORONARY ARTERY, FOUR OR MORE ARTERIES, PERCUTANEOUS APPROACH
02H33YZ	INSERTION OF OTHER DEVICE INTO CORONARY ARTERY, FOUR OR MORE ARTERIES, PERCUTANEOUS APPROACH
X2C0361	EXTIRPATION OF MATTER FROM CORONARY ARTERY, ONE ARTERY USING ORBITAL ATHERECTOMY TECHNOLOGY, PERCUTANEOUS APPROACH, NEW
X2C1361	EXTIRPATION OF MATTER FROM CORONARY ARTERY, TWO ARTERIES USING ORBITAL ATHERECTOMY TECHNOLOGY, PERCUTANEOUS APPROACH, NE
X2C2361	EXTIRPATION OF MATTER FROM CORONARY ARTERY, THREE ARTERIES USING ORBITAL ATHERECTOMY TECHNOLOGY, PERCUTANEOUS APPROACH,
X2C3361	EXTIRPATION OF MATTER FROM CORONARY ARTERY, FOUR OR MORE ARTERIES USING ORBITAL ATHERECTOMY TECHNOLOGY, PERCUTANEOUS APP

PCI group definition

While most patients undergoing an inpatient PCI are grouped into one of the PCI-related MS-DRGs, a few are grouped into other MS-DRGs. Patients may be grouped into another MS-DRG if they have a cardiac procedure considered to be higher in the DRG surgical hierarchy than PCI, or if they have a principal diagnosis that is not cardiac in nature.

The approximately 15 percent of Medicare PCI patients grouped to other MS-DRGs in the most current year of data tend to have longer LOS, higher costs and more complications than those in PCI MS-DRGs, likely because many of them have more complex surgeries during the same hospitalization. We have confined PCI patients to those patients in a PCI-related MS-DRG for this study.

Appendix E: Community Health Survey Community Health with a Focus on Equity

A full description of best practice standards is available at https://americanhealth.jhu.edu/news/measuring-hospital-contributions-community-health-focus-equity

BEST PRACTICE STANDARD	**ATTESTATION**	**ADD LINK FOR MORE DETAILS (OPTIONAL)**
Hospital as a Provider		
1. Our hospital is a comprehensive tobacco-free campus. Details	[ ] We attest to this standard	
2. Our hospital has an inpatient tobacco use cessation program. Details	[ ] We attest to this standard	
3. Our hospital provides buprenorphine treatment for opioid use disorder in the ED. Details	[ ] We attest to this standard	
4. Our hospital provides screening, brief intervention, and referral to treatment for alcohol use in the ED and hospital. Details	[ ] We attest to this standard	
5. Our hospital runs a hospital-based violence prevention program. Details	[ ] We attest to this standard	
6. Our hospital screens for intimate partner violence and refers to services and supports as needed. Details	[ ] We attest to this standard	
7. Our hospital offers healthy food options. Details	[ ] We attest to this standard	
8. Our hospital has a social needs screening and referral program. Details	[ ] We attest to this standard	
9. Our hospital offers an infant safe sleep education program. Details	[ ] We attest to this standard [NA]	
10. Our hospital adopts 10 practices to support breastfeeding. Details	[ ] We attest to this standard [NA]	
11. Our hospital offers contraception treatment and counseling to patients immediately postpartum. Details	[ ] We attest to this standard [NA]	
12. Our hospital implements practices to reduce falls and optimize mobility for elderly patients per the Age Friendly Hospital Program. Details	[ ] We attest to this standard	

BEST PRACTICE STANDARD	ATTESTATION	ADD LINK FOR MORE DETAILS (OPTIONAL)
Hospital as Community Partner		
1. Our hospital does a community needs assessment with the department of health. Details	[ ] We attest to this standard	
2. Our hospital provides meaningful support for a community-based hypertension control program. Details	[ ] We attest to this standard	
3. Our hospital provides meaningful support for a community-based diabetes control program. Details	[ ] We attest to this standard	
4. Our hospital provides meaningful support for an evidence-based home visiting program. Details	[ ] We attest to this standard	
5. Our hospital provides meaningful support for training and work of community health workers. Details	[ ] We attest to this standard	
6. Our hospital makes meaningful contributions to supporting school success. Details	[ ] We attest to this standard	
7. Our hospital meaningfully supports expanding access to fresh, healthy foods in the community. Details	[ ] We attest to this standard	
8. Our hospital invests in expanding or improving healthy, affordable housing in the community. Details	[ ] We attest to this standard	
Hospital as Anchor Institution		
1. Our hospital has a five-year plan for achieving diversity in board and top management. Details	[ ] We attest to this standard	
2. Our hospital pays all employees a minimum hourly rate based on the local living wage. Details	[ ] We attest to this standard	
3. Our hospital has a minority owned business purchasing and procurement goal and measures progress towards this goal. Details	[ ] We attest to this standard	
4. Our hospital supports access to affordable high-quality childcare for children of all full and part-time employees. Details	[ ] We attest to this standard	
5. Our hospital provides paid sick leave to all employees. Details	[ ] We attest to this standard	
6. Our hospital adopts a “do no harm” collections policy. Details	[ ] We attest to this standard	
7. Our hospital has a returning citizen work program. Details	[ ] We attest to this standard	
8. Our hospital supports community sustainability. Details	[ ] We attest to this standard	

Appendix F: Potential Inpatient Complication (PIC) List

PIC Description
Accidental Laceration or Puncture
Acute Myocardial Infarction
Acute Pancreatitis
Acute Pulmonary Edema
Acute Renal Failure
Adverse Drug Event (ADE)
Air Embolism (CMS)
Amputation Stump Complications
Anaphylactic Reaction/Serum Reaction
Anoxic Brain Damage
Aspiration Pneumonia
C. Diff. Enteritis
Cardiac Arrest
Cardiogenic Shock
Catheter-Associated UTI (CMS)
Cellulitis/Skin Infection
Cerebral Infarction
Coma
Complication CNS
Complication of Nervous System Device
Complication of Other Unspecified Device
Complication of Vascular Device
Complication or Infection of Colostomy/Enterostomy
Complications due to Orthopedic Prosthesis or Device
Complications due to Peritoneal Dialysis Catheter
Complications of Acute Myocardial Infarction (AMI)
Complications of Anesthesia
Complications of Cardiac Device/Graft
Complications of Cystostomy
Complications of Transplanted Organ
Deep Vein Thrombosis
Dural Tear
DVT/PE with Total Knee or Hip Replacement (CMS)
Embolism/Thrombus (non-pulmonary)
Encephalopathy

PIC Description
Enteritis
Falls and Trauma (CMS)
Fat Embolism
Foreign Object Retained After Surgery (CMS)
Gastrointestinal (GI) Ulceration & Hemorrhage
Hemorrhage/Hematoma Complicating a Procedure
Iatrogenic Cerebrovascular Infarction
Iatrogenic Hypotension
Iatrogenic Pituitary Disorder/Diabetes Insipidus
Iatrogenic Pneumothorax
Iatrogenic Pneumothorax with Venous Catheterization (CMS)
Infection due to Device / Graft
Infection due to Infusion
Infection following GI Procedure
Injury to Nerve
Intestinal Perforation
Intracranial Hemorrhage
Manifestations of Poor Glycemic Control (CMS)
Mechanical Complication of Genitourinary (GU) Device or Graft
Methicillin-Resistant Staphylococcus Aureus (MRSA)
Other Complications of Medical / Surgical Care
Other Respiratory Complications
Other Shock
Performance of Inappropriate Operation
Perioperative Infection
Perioperative Shock
Pneumonia
Post-Surgical Respiratory Failure
Pulmonary Embolism
Pyelonephritis
Sepsis
Sepsis with Septic Shock
Septic Arterial Embolism
Stage III or IV Pressure Ulcer (CMS)
Status Asthmaticus
Subdural / Extradural Hemorrhage
Surgical Complication-Digestive System
Surgical Complication-Heart

PIC Description
Surgical Complication-Peripheral Vascular System
Surgical Complication-Urinary Tract
Surgical Site Infection - Certain Orthopedic Procedures of Spine, Shoulder and Elbow (CMS)
Surgical Site Infection - Mediastinitis after CABG (CMS)
Surgical Site Infection Following Cardiac Implantable Electronic Device (CIED) (CMS)
Tracheostomy Complication
Transfusion Reaction (non-ABO)
Vascular Catheter-Associated Infection (CMS)
Vascular Complications
Ventilator Associated Pneumonia
Ventricular Fibrillation

Appendix G: Methodology Updates

Recalibration:

- The risk-adjustment models for inpatient mortality, complications and the severity-adjustment models for LOS and cost per case are recalibrated for each annual release using the latest federal fiscal years of data.

Inpatient Mortality Risk Model

- Accounting for patients admitted to hospitals at the end of a terminal disease process is key to signaling care quality and identifying opportunities for improvement. Research has shown that do not resuscitate (DNR) has value in estimating mortality risk, especially when the DNR order comes early in the hospital stay. Therefore, DNR patients (Z66) coded as POA are included in the model and are controlled for using DNR status as a confounding variable.

Complication Risk Model

- The inclusion of a broader set of potential inpatient complications (PIC). Research has shown that the complications identified in the PIC measure set are associated with higher costs, length of stay, and odds of mortality. The expanded set of measures provides a more holistic evaluation of complications that can occur as a result of care decisions.
- The use of a Poisson regression for the length of stay than a log-transformed linear regression. The Poisson regression improves model fit and results in a more robust estimate of patient risk.

References

1. Hospital Quality Initiative Public Reporting | CMS. Accessed January 9, 2024. https://www.cms.gov/medicare/quality/initiatives/hospital-quality-initiative/hospital-compare

2. Kaplan RS, Norton DP. The Balanced Scorecard: Measures that Drive Performance. *Harvard Business Review*. 1992;70(1):71-79. Accessed March 13, 2024. https://pubmed.ncbi.nlm.nih.gov/10119714/

3. CMS Manual System: Pub 100-07 State Operations Provider Certification. Published online October 12, 2007. https://www.cms.gov/regulations-and-guidance/guidance/transmittals/downloads/r29soma.pdf

4. National Healthcare Safety Network. The NHSN Standardized Infection Ratio (SIR). Published online March 2024. https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf

5. *2022 Condition-Specific Mortality Measures Updates and Specifications Report: Acute Myocardial Infarction (Version 16.0), Chronic Obstructive Pulmonary Disease (Version 11.0), Heart Failure (Version 16.0), Pneumonia (Version 16.0)*. Yale New Haven Health Services Corporation — Center for Outcomes Research and Evaluation (YNHHSC/CORE); 2022. https://qualitynet.cms.gov/files/64273c66a484cd0017883bbd?filename=2022ArchiveMethodologyMort.zip

6. ale New Haven Health Services Corporation/Center for, Outcomes Research & Evaluation (YNHHSC/CORE). Hospital-Wide All-Cause Unplanned Readmission Measure. Published online July 2012. https://www.cms.gov/medicare/quality/initiatives/hospital-quality-initiative/measure-methodology

7. *2022 Condition-Specific Readmission Measures Updates and Specifications Report: Acute Myocardial Infarction (Version 15.0), Chronic Obstructive Pulmonary Disease (Version 11.0), Heart Failure (Version 15.0), Pneumonia (Version 15.0)*. Yale New Haven Health Services Corporation — Center for Outcomes Research and Evaluation (YNHHSC/CORE); 2022. https://qualitynet.cms.gov/files/64511ae4a484cd00178841d0?filename=2022_Readmission_MeasMeth.zip

8. Measure Specifications:Medicare Spending Per Beneficiary – Post-Acute Care Skilled Nursing Facility, Inpatient Rehabilitation Facility, and Long-Term Care Hospital Resource Use Measures. Published online July 2016. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/2016_07_20_mspb_pac_ltch_irf_snf_measure_specs.pdf

9. Hospital Consumer Assessment (HCAHPS) Overview. Published January 9, 2024. Accessed January 9, 2024. https://qualitynet.cms.gov/inpatient/measures/hcahps