

**Overall Hospital Quality Star Rating on *Hospital Compare*
December 2016 Updates and Specifications Report**

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1. How to Use This Report

Under contract with the Centers for Medicare & Medicaid Services (CMS), Yale New Haven Health Services Corporation – Center for Outcomes Research & Evaluation (CORE) has developed the methodology for the Overall Hospital Quality Star Rating, summarizing the quality information conveyed by many of the measures publicly reported on *Hospital Compare*. The purpose of this report is to provide an overview of the methodology for calculating the Star Rating (v2.0) and provide updated national results for the December 2016 *Hospital Compare* release. A more detailed version of the methodology and process for developing the Star Rating (“Overall Hospital Quality Star Rating v2.0”) can be found on *QualityNet* at www.qualitynet.org > [Hospitals-Inpatient](#) > [Hospital Star Ratings](#).

This Overall Hospital Quality Star Rating Updates and Specifications Report (December 2016) is organized into the following sections:

- Section 2: Objective of Overall Hospital Quality Star Rating
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2. Objective of Overall Hospital Quality Star Rating

The primary objective of the Overall Hospital Quality Star Rating project is to summarize information from the existing measures on *Hospital Compare* in a way that is useful and easy to interpret for patients and consumers through the development of a statistically sound methodology. Consistent with other CMS Star Rating programs, this methodology assigns each hospital between one and five stars, reflecting the hospital's overall performance on selected quality measures.

The Overall Hospital Quality Star Rating is designed to provide summary information for consumers about existing publicly-reported quality data. In the case of *Hospital Compare*, the Overall Hospital Quality Star Rating will be complimentary to existing efforts, such as the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) star ratings (implemented in April 2015), and will not replace the reporting of any individual quality measures. In what follows, "Star Rating(s)" refers to the Overall Hospital Quality Star Rating unless otherwise noted.

3. Overall Hospital Quality Star Rating Methodology

3.1. Overview of Five Steps of the Star Rating Methodology

The methodology to calculate the Overall Star Rating is comprised of a five-step process. These steps are listed below and are described in greater detail in subsequent sections (see [Appendix A](#)).

- Step 1: Selection and standardization of measures for inclusion in the Overall Star Rating
- Step 2: Assignment of measures to groups
- Step 3: Calculation of latent variable model group scores
- Step 4: Calculation of hospital summary scores as a weighted average of group scores
- Step 5: Application of clustering algorithm to translate a summary score into a Star Rating

The measures were first selected based on their relevance and importance as determined through stakeholder and expert feedback. The selected measures were standardized to be consistent in terms of direction and magnitude, with outlying values trimmed (Step 1). In Step 2, the measures were organized into seven groups by measure type. In Step 3, the standardized measures for each group were used to construct a latent variable statistical model that reflected the dimension of quality represented by the measures within the given group. Each of the seven statistical models generated a hospital-specific group score, which is obtained as a prediction of the latent variable. The term prediction is used to represent the realized value of the latent variable. In Step 4, a weight was applied to each group score, and all available groups were averaged to calculate a hospital summary score. Finally, in Step 5, to assign a Star Rating, hospital summary scores were organized into five categories using a clustering algorithm.

Of note, CMS reports hospital performance at the group level, separately categorizing each of a hospital's available group scores into one of three group performance categories (above, same as, and below the national average). These performance categories provide additional detail to patients and consumers for comparing across the seven groups (see [Section 4.2](#)).

3.2. Step 1: Selection and Standardization of Measures for Inclusion in the Overall Star Rating

Criteria for Selecting Measures

CMS determined and vetted measure selection criteria with stakeholders through the Technical Expert Panel (TEP) and opportunities for public input to ensure that the Star Rating captured the diverse aspects of quality represented by the measures on *Hospital Compare*.

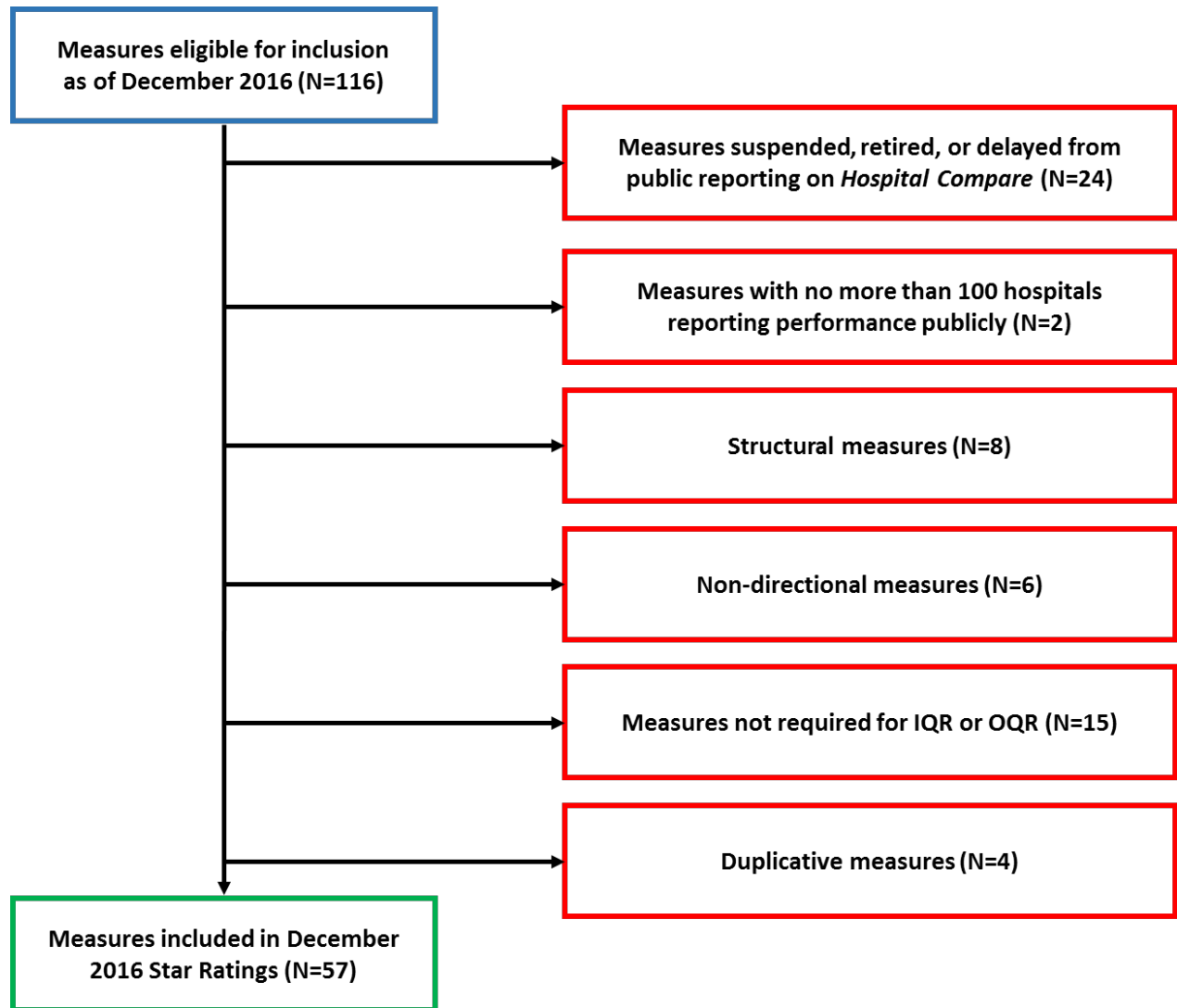
Because the Star Rating is intended for acute care hospitals, CMS first omitted all measures on *Hospital Compare* that were specific to specialty hospitals (such as cancer hospitals or inpatient psychiatric facilities), or ambulatory surgical centers prior to applying any measure selection criteria. With these measures omitted, the total number of measures eligible for inclusion in the Star Rating for December 2016 is 116 measures. The Star Rating methodology further limited the number of measures for inclusion in order to maintain a sound methodology through measure selection criteria, which are presented in the subsequent text and in [Figure 1](#).

Measure Selection Criteria

CMS uses the following criteria to exclude measures from the Star Rating calculation:

1. Measures suspended, retired, or delayed from public reporting on *Hospital Compare*;
2. Measures with no more than 100 hospitals reporting performance publicly;
3. Structural measures;
4. Measures for which it is unclear whether a higher or lower score is better (non-directional);
5. Measures not required for Inpatient Quality Reporting (IQR) Program or Outpatient Quality Reporting (OQR) Program; and
6. Duplicative measures (for example, individual measures that make up a composite measure that is also reported or measures that are identical to another measure).

Figure 1. Measure Selection Flowchart (December 2016)



For a complete list of the measures excluded in December 2016, please refer to [Appendix B](#).

Standardization of Measure Scores

For all selected measures, CMS transforms the measures into a single, common scale to account for differences in measure score format, differences in score direction, and the occurrence of extreme outliers. A measure is standardized by subtracting the national mean of measure scores from a hospital's measure score and dividing it by the standard deviation across hospitals. Measure direction is standardized by reversing the direction of the standardized scores for all measures for which "lower score is better," and converting them into "higher score is better" measures. Finally, CMS utilizes Winsorization to limit the influence of measures with extreme outlier values at the 0.125th percentile (Z=-3) and the 99.875th percentile (Z=3). Winsorization is a common strategy used

to set extreme outliers to a specified percentile of the data. All standardized measure scores above 3 are set to be 3, and all standardized below -3 are set to be -3.

3.3. Step 2: Assignment of Measures to Groups

Approach to Grouping Measures

CMS organizes measures into groups by measure type. Group names were finalized with input from a Patient & Patient Advocate Work Group, convened in collaboration with the National Partnership for Women and Families (NPWF), and previous CMS consumer testing. The Overall Hospital Quality Star Rating groups are:

- Mortality
- Safety of Care
- Readmission
- Patient Experience
- Effectiveness of Care
- Timeliness of Care
- Efficient Use of Medical Imaging

Measures by Group for December 2016

We assigned each measure included in the Star Rating to one of seven mutually exclusive groups: Mortality (N=7), Safety of Care (N=8), Readmission (N=8), Patient Experience (N=11), Effectiveness of Care (N=11), Timeliness of Care (N=7), and Efficient Use of Medical Imaging (N=5). For a complete list of the measures in each group, please refer to [Appendix C](#).

3.4. Step 3: Calculation of Latent Variable Model Group Scores

Overview of Latent Variable Model (LVM)

CMS employs latent variable modeling (LVM) to estimate a group score for the dimension of quality represented by the measures in each group. LVM is a statistical modeling approach that has been used to summarize information in a variety of settings ranging from education to healthcare. For the Star Rating, LVM assumes each measure reflects information about an underlying, unobserved dimension of quality. A separate LVM is constructed for each group so that a total of seven latent variable models are used to calculate the Star Ratings. The LVM accounts for the relationship, or correlation, between measures for a single hospital. Measures that are more consistent with each other, as well as measures with larger denominators, have a greater influence on the derived latent variable. Each model estimates, for each hospital, the value of a single latent variable representing the underlying, unobserved dimension of quality; this estimate is the hospital's group score.

Loadings of Measures within Each Group

As noted above, measures that are more consistent, or more correlated, with other measures within the group have a greater influence on the hospital's group score. The influence of an individual measure on the group score is represented by the measure's "loading."

A loading is empirically derived for each measure in a group when applying the LVM; these statistically estimated measure loadings are regression coefficients based on maximum likelihood methods using observed data and are not subjectively assigned. A loading reflects the degree of the measure's influence on the group score relative to the other measures included in the same group. A measure's loading is the same across all hospitals. Measures with higher loadings are more strongly associated with the group score and the other measures within that group. All measures included in the Star Rating have an effect on the group score; however, measures with higher loadings have a greater association (or impact) on the group score than measures with substantially lower loadings. The loadings for the December 2016 Star Rating are reported in [Appendix D](#).

Please note, the loadings for an individual measure are re-estimated each time the Star Rating is updated and can dynamically change as the distribution of hospitals' performance on the measure and its correlation with other measures evolve over time.

Accounting for Measure Sampling Variation

Hospitals' reported measure scores may include different numbers of patients, depending on the measure. For each measure, some hospitals may report a score based on data from fewer cases while other hospitals report scores based on more cases, resulting in differing precision for each hospital's individual measure score. This variability in precision is usually known as "sampling variation."

CMS gives more weight to measure scores that are more precise by using a weighted likelihood method. This method uses the hospital's measure denominator (hospital case count or sample size) to weight the observed value. A weighted likelihood ensures that a hospital with a larger denominator, or a more precise measure score, contributes more in calculating the loadings used to estimate the group score.

3.5. Step 4: Calculation of the Hospital Summary Score as a Weighted Average of Group Scores

Weighting Scheme

The seven group scores are combined to create a hospital summary score. To calculate this hospital summary scores, CMS takes a weighted average of that hospital's available group scores, assigning each group a policy-based weight ([Table 1](#)). This weighting scheme was modified from that used for the Hospital Value-based Purchasing (VBP) program. Additionally, these weights were thoroughly

vetted through the TEP, opportunities for public input, hospital dry run, and the Patient & Patient Advocate Work Group.

Table 1. Measure Group Weight for the Overall Star Rating

Measure Group	Star Ratings Weight
Mortality (N=7)	22%
Safety of Care (N=8)	22%
Readmission (N=8)	22%
Patient Experience (N=11)	22%
Effectiveness of Care (N=11)	4%
Timeliness of Care (N=7)	4%
Efficient Use of Medical Imaging (N=5)	4%

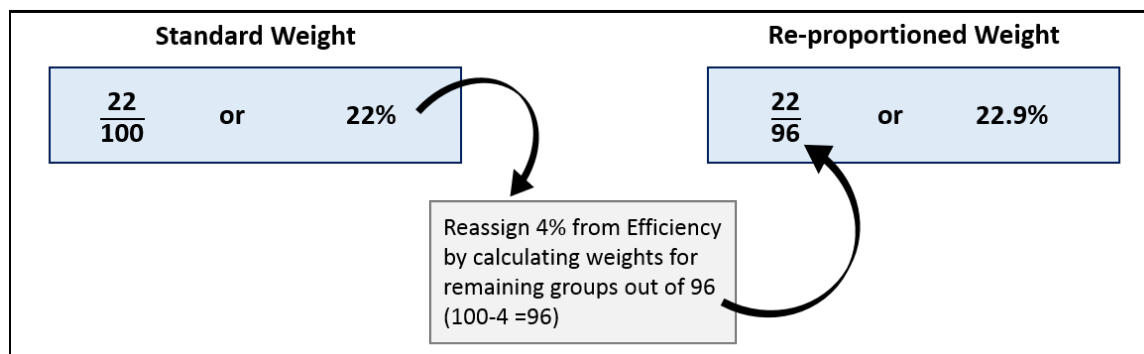
Method for Re-Weighting When Missing Group(s)

If a hospital reports no measures for a given measure group, that group is considered to be “missing.” When a hospital is missing one or more groups, CMS applies the same approach as the Hospital VBP program, re-proportioning the weight of the missing group(s) across the groups for which the hospital does report measures. [Table 2](#) and [Figure 2](#) provide examples of how CMS adjusts the weighting scheme for a hospital that is missing the Efficient Use of Medical Imaging group.

Table 2. Example Re-Weighting Scheme when Missing Efficient Use of Medical Imaging Group

Measure Group	Standard Weight	Re-proportioned Weight
Mortality	22%	22.9%
Safety of Care	22%	22.9%
Readmission	22%	22.9%
Patient Experience	22%	22.9%
Effectiveness of Care	4%	4.2%
Timeliness of Care	4%	4.2%
Efficient Use of Medical Imaging (N=0)	4%	---

Figure 2. Example Calculation for Re-Proportioning Group Weights



Winsorization of Summary Scores

CMS analyzes the distribution of hospital summary scores and performs a second Winsorization. Winsorization is a common strategy used to set extreme outliers to a specified percentile of the data; in this case, any extreme outlier values lower than the 0.5th percentile and higher than the 99.5th percentile is reset to have the 0.5th percentile or 99.5th percentile value, respectively. For the December 2016 update, Winsorization only resulted in modification of 44 individual hospital summary scores out of a total 4,598 hospital summary scores in the dataset.

3.6. Step 5: Application of Clustering Algorithm to Obtain a Star Rating

Approach for Translating a Summary Score to a Star Rating

To translate each hospital’s summary score to a rating between one and five stars, CMS applies *k*-means clustering.

Overview of k-Means Clustering

The *k*-means clustering analysis is a standard method for creating categories (or clusters) so that observations in each category are closer to their category mean than to any other category mean. The number of categories is pre-specified; CMS specifies five categories, so that the *k*-means clustering analysis generates five categories (clusters) based on hospital summary scores in a way that minimizes the distance between summary scores (observations) and the middle value of their assigned cluster (category mean). It organizes hospitals into one of five categories such that a hospital’s summary score is “more like” that of the other hospitals in the same category and “less like” the summary scores of hospitals in the other categories. The Star Rating categories are structured such that the lowest group is one star and the highest group is five stars.

4. Reporting Thresholds and Results for December 2016 Implementation

4.1. Minimum Thresholds for Receiving a Star Rating

CMS evaluated and developed standards regarding the minimum number of measures and groups a hospital must report in order to receive a publicly reported Star Rating on *Hospital Compare*. CMS set these thresholds to allow for as many hospitals as possible to receive a Star Rating without sacrificing the validity and reliability of the Star Rating methodology.

On average, hospitals reported 5 groups and 35 measures for December 2016. A total of 3,629 (78.93%) hospitals on *Hospital Compare* met the public reporting threshold for receiving a Star Rating for December 2016.

Please note results included in this report may differ from the results posted on *Hospital Compare* due to data suppressed by CMS for one or more quarters. CMS may suppress data for various reasons, like data inaccuracies.

Minimum Threshold of Measures per Group

The minimum measure threshold for December 2016 is three measures per group.

Minimum Threshold of Groups in Summary Score

The minimum group threshold for December 2016 is three groups with at least one outcome group (that is, Mortality, Safety of Care, or Readmission).

If a hospital met the minimum threshold of having three groups (one of which must be an Outcome group) with at least three measures, any other measures reported by the hospital were also included in the hospital's Star Rating. That is, any additional measures were included even if the hospital did not meet the minimum three measure threshold for a given group. This decision ensured that the Star Rating was inclusive of publicly reported measures and was vetted with the public through the second Star Rating opportunity for public input.

4.2. Group Performance Category

In addition to a hospital's Star Rating, CMS reports a group performance category for each of a hospital's available (in other words, meeting the minimum threshold) measure groups. To calculate a performance category, a hospital's group score is compared to the national average group score. The LVM for each group produces a point estimate and standard error that can be used to construct a 95% confidence interval for each hospital's group score for comparison to the national mean group score. The group performance categories are:

- “Above the national average,” defined as a group score with a confidence interval that falls entirely *above* the national average;
- “Same as the national average,” defined as a group score with a confidence interval that *includes* the national average; and
- “Below the national average,” defined as a group score with a confidence interval that falls entirely *below* the national average.

4.3. Distribution of the Overall Star Rating and Group Performance Categories

The Star Rating for December 2016 public reporting is calculated using December 2016 *Hospital Compare* data. The frequency of hospitals by each Star Rating category is shown in [Table 3](#). Of note, the minimum and maximum score for each category will change with each reporting period based on the underlying distribution of hospital summary scores.

Table 3. Frequency of Hospitals by Star Category using k-Means

Rating	Frequency (Number of Hospitals)	Summary Score Range in Cluster	Mean (sd)
1 Star	112 (3.09%)	-2.02, -1.06	-1.36 (0.23)
2 Star	694 (19.12%)	-1.06, -0.39	-0.63 (0.18)
3 Star	1,794 (49.44%)	-0.38, 0.21	-0.05 (0.16)
4 Star	946 (26.07%)	0.21, 0.81	0.42 (0.15)
5 Star	83 (2.29%)	0.81, 1.97	1.05 (0.26)

Note: The total number of hospitals in the *Hospital Compare* dataset as of December 2016 is 4,598 hospitals. Results shown are for all hospitals meeting the reporting criteria (N=3,629). Please note results included in this report may differ from the results posted on *Hospital Compare* due to data suppressed by CMS for one or more quarters. CMS may suppress data for various reasons, like data inaccuracies.

[Table 4](#) displays the frequency of hospitals in each performance category by group.

Table 4. Frequency of Hospitals by Group Performance Category

Group	Above the National Average	Same as the National Average	Below the National Average
Mortality (N=3,521)	411 (11.67%)	2,762 (78.44%)	348 (9.88%)
Safety of Care (N=2,710)	803 (29.63%)	1,224 (45.17%)	683 (25.20%)
Readmission (N=3,858)	827 (21.44%)	2,147 (55.65%)	884 (22.91%)
Patient Experience (N=3,498)	1,222 (34.93%)	1,165 (33.30%)	1,111 (31.76%)
Effectiveness of Care (N=3,672)	131 (3.57%)	3,294 (89.71%)	247 (6.73%)
Timeliness of Care (N=3,610)	1,098 (30.42%)	1,567 (43.41%)	945 (26.18%)

Group	Above the National Average	Same as the National Average	Below the National Average
Efficient Use of Medical Imaging (N=2,834)	375 (13.23%)	2,085 (73.57%)	374 (13.20%)

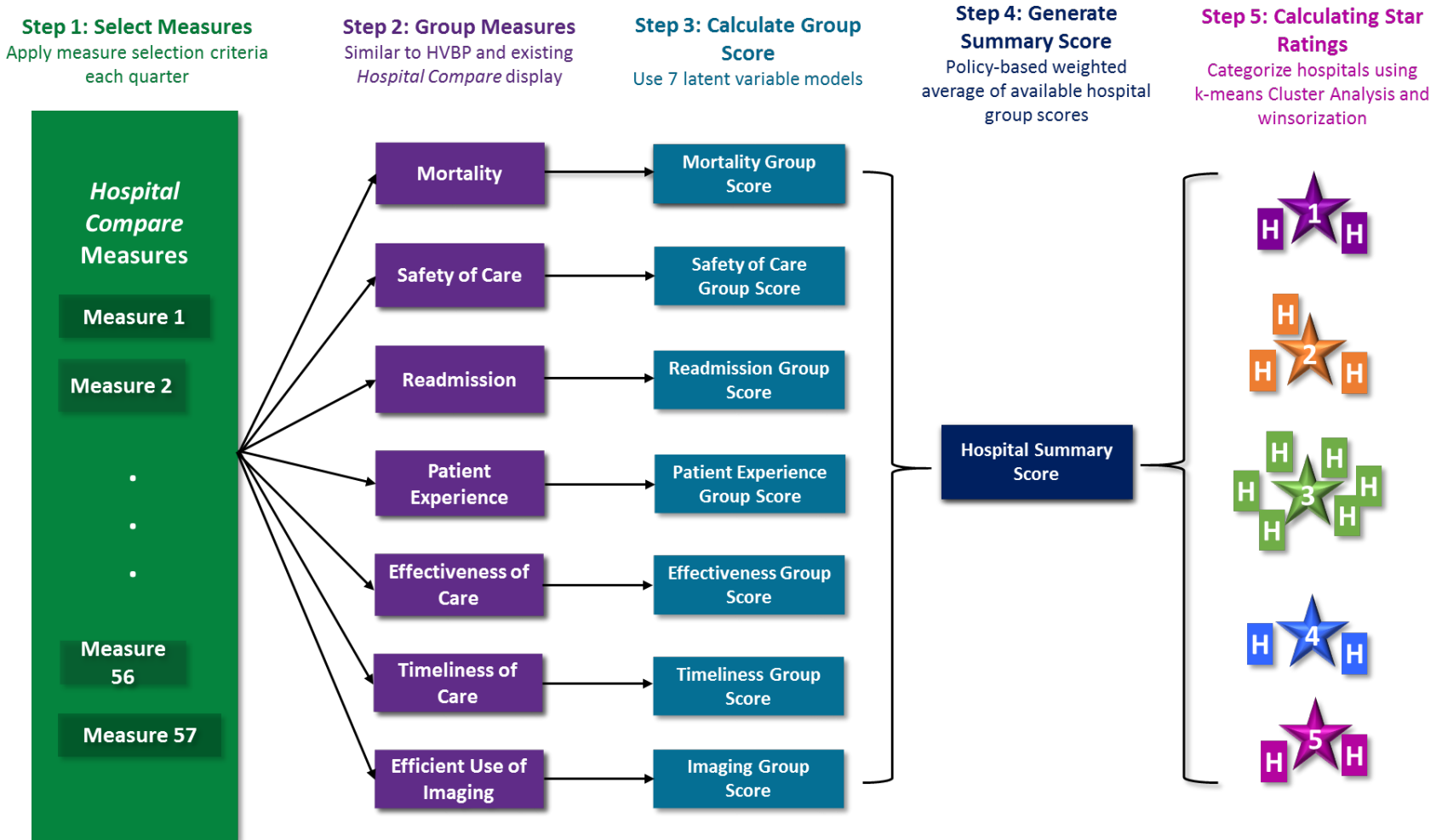
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4.3.1 Overall Star Rating Quarter to Quarter Analysis

CMS calculated the Overall Star Rating using October and December 2016 *Hospital Compare* data for comparison across quarters. The Kappa coefficient is 0.92 (a value of 1 indicates complete agreement), which indicates high agreement of the Overall Star Rating between these two quarters. The Concordance Correlation is 0.99, which indicates substantial correlation of summary scores between these two quarters.

Appendix A: Flowchart of the Five-Step Overall Star Rating Methodology

Figure A.1. The Five Steps of the Overall Star Rating Methodology



Appendix B: Measures Excluded from December 2016 Star Rating (N=59) by Exclusion Criterion

Measures suspended, retired, or delayed from public reporting

1. AMI-2 Aspirin Prescribed at Discharge
2. AMI-10 Statin Prescribed at Discharge
3. CAC-1 Relievers for Inpatient Asthma
4. CAC-2 Systemic Corticosteroids for Inpatient Asthma
5. HF- 1 Discharge Instructions
6. HF-3 ACEI or ARB for LVSD
7. OP-6 Timing of Antibiotic Prophylaxis
8. OP-7 Prophylactic Antibiotic Selection for Surgical Patients
9. PN-3b Blood Cultures Performed in the ED prior to Initial Antibiotic Received in Hospital
10. SCIP-Inf-4 Cardiac Surgery Patients with Controlled Postoperative Blood Glucose
11. SCIP-Inf-10 Surgery Patients with Perioperative Temperature Management
12. SM-PART-STROKE Participation in a Systematic Clinical Database Registry for Stroke Care
13. MV Number of Medicare Patient Discharges for Selected MS-DRGs
14. AMI-7a Fibrinolytic Therapy Received Within 30 Minutes of Hospital Arrival
15. SM-PART-CARD Participation in a Systematic Clinical Database Registry for Cardiac Surgery
16. VTE-1 Venous Thromboembolism Prophylaxis
17. VTE-2 Intensive Care Unit Venous Thromboembolism Prophylaxis
18. VTE-3 Venous Thromboembolism Patients with Anticoagulation Overlap Therapy
19. CAC-3 Home Management Plan of Care (HMPC) Document Given to Patient/Caregiver
20. STK-1 Venous Thromboembolism (VTE) Prophylaxis
21. STK-6 Discharged on Statin Medication
22. STK-8 Stroke Education
23. HAI-1a Central Line-Associated Bloodstream Infection (CLABSI) – ICU Only
24. HAI-2a Catheter-Associated Urinary Tract Infection (CAUTI) – ICU Only

Measures with less than or equal to 100 hospitals reporting

1. OP-1 Median Time to Fibrinolysis
2. OP-2 Fibrinolytic Therapy Received Within 30 Minutes of Emergency Department Arrival

Structural measures without evidence of an association with changes in clinical practice or improved outcomes

1. ACS-REGISTRY Participation in a Multispecialty Surgical Registry
2. SM-PART-GEN-SURG Participation in a Systematic Clinical Database Registry for General Surgery

3. SM-PART-NURSE Participation in a Systematic Clinical Database Registry for Nursing Sensitive Care
4. OP-12 The Ability for Providers with HIT to Receive Laboratory Data Electronically Directly into their ONC-Certified EHR System as Discrete Searchable Data
5. OP-17 Tracking Clinical Results between Visits
6. OP-25 Safe Surgery Checklist Use
7. OP-26 Hospital Outpatient Volume Data on Selected Outpatient Surgical Procedures
8. EDV-1 Emergency Department (ED) Volume

Non-directional measures

1. MSPB-1/SPP-1 Medicare Spending per Beneficiary (MSPB)
2. OP-9 Mammography Follow-up Rates
3. PAYM-30-AMI Acute Myocardial Infarction (AMI) Payment per Episode of Care
4. PAYM-30-HF Heart Failure (HF) Payment per Episode of Care
5. PAYM-30-PN Pneumonia (PN) Payment per Episode of Care
6. Medicare Hospital Spending by Claim Spending Breakdowns by Claim Type

Measures not required for IQR or OQR

1. AMI-8a Timing of Receipt of Primary Percutaneous Coronary Intervention (PCI)
2. HF-2 Evaluation of LVS Function
3. PN-6 Initial Antibiotic Selection for Community-Acquired Pneumonia (CAP) in Immunocompetent Patient
4. SCIP-Card-2 Surgery Patients on Beta-Blocker Therapy Prior to Arrival Who received a Beta-Blocker During the Perioperative Period
5. SCIP-Inf-1 Prophylactic Antibiotic Received Within One Hour Prior to Surgical Incision
6. SCIP-Inf-2 Prophylactic Antibiotic Selection for Surgical Patients
7. SCIP-Inf-3 Prophylactic Antibiotics Discontinued Within 24 Hours After Surgery End Time
8. SCIP-Inf-9 Urinary Catheter Removed on Postoperative Day 1 (POD 1) or Postoperative Day 2 (POD 2) with day of surgery being day zero
9. SCIP-VTE-2 Surgery Patients Who Received Appropriate Venous Thromboembolism Prophylaxis Within 24 Hours Prior to Surgery to 24 Hours After Surgery
10. STK-2 Discharged on Antithrombotic Therapy
11. STK-3 Anticoagulation Therapy for Atrial Fibrillation/Flutter
12. STK-5 Antithrombotic Therapy by End of Hospital Day 2
13. STK-10 Assessed for Rehabilitation
14. VTE-4 Venous Thromboembolism Patients Receiving Unfractionated Heparin with Dosages/Platelet Count Monitoring by Protocol or Nomogram
15. OP-31 Cataracts- Improvement in Patient's Visual Function within 90 days Following Cataract Surgery

Duplicative measures already captured in a composite measure

1. PSI-6 Iatrogenic Pneumothorax
2. PSI-12 Postoperative Pulmonary Embolism or Deep Vein Thrombosis
3. PSI-14 Postoperative Wound Dehiscence
4. PSI-15 Accidental Puncture or Laceration

Appendix C: Measures Included in December 2016 Star Rating (N=57) by group

Mortality

1. MORT-30-AMI Acute Myocardial Infarction (AMI) 30-Day Mortality Rate
2. MORT-30-CABG Coronary Artery Bypass Graft (CABG) 30-Day Mortality Rate
3. MORT-30-COPD Chronic Obstructive Pulmonary Disease (COPD) 30-Day Mortality Rate
4. MORT-30-HF Heart Failure (HF) 30-Day Mortality Rate
5. MORT-30-PN Pneumonia (PN) 30-Day Mortality Rate
6. MORT-30-STK Acute Ischemic Stroke (STK) 30-Day Mortality Rate
7. PSI-4-SURG-COMP Death Among Surgical Patients with Serious Treatable Complications

Safety of Care

1. HAI-1 Central-Line Associated Bloodstream Infection (CLABSI)
2. HAI-2 Catheter-Associated Urinary Tract Infection (CAUTI)
3. HAI-3 Surgical Site Infection from colon surgery (SSI-colon)
4. HAI-4 Surgical Site Infection from abdominal hysterectomy (SSI-abdominal hysterectomy)
5. HAI-5 MRSA Bacteremia
6. HAI-6 Clostridium Difficile (C. difficile)
7. COMP-HIP-KNEE Hospital-Level Risk-Standardized Complication Rate (RSCR) Following Elective Primary Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA)
8. PSI-90-Safety Complication/Patient Safety for Selected Indicators (PSI)

Readmission

1. READM-30-AMI Acute Myocardial Infarction (AMI) 30-Day Readmission Rate
2. READM-30-CABG Coronary Artery Bypass Graft (CABG) 30-Day Readmission Rate
3. READM-30-COPD Chronic Obstructive Pulmonary Disease (COPD) 30-Day Readmission Rate
4. READM-30-HF Heart Failure (HF) 30-Day Readmission Rate
5. READM-30-Hip-Knee Hospital-Level 30-Day All-Cause Risk-Standardized Readmission Rate (RSRR) Following Elective Total Hip Arthroplasty (THA)/Total Knee Arthroplasty (TKA)
6. READM-30-PN Pneumonia (PN) 30-Day Readmission Rate
7. READM-30-STK Stroke (STK) 30-Day Readmission Rate
8. READM-30-HOSP-WIDE HWR Hospital-Wide All-Cause Unplanned Readmission

Patient Experience

1. H-CLEAN-HSP Cleanliness of Hospital Environment (Q8)
2. H-COMP-1 Nurse Communication (Q1, Q2, Q3)
3. H-COMP-2 Doctor Communication (Q5, Q6, Q7)

4. H-COMP-3 Responsiveness of Hospital Staff (Q4, Q11)
5. H-COMP-4 Pain management (Q13, Q14)
6. H-COMP-5 Communication About Medicines (Q16, Q17)
7. H-COMP-6 Discharge Information (Q19, Q20)
8. H-HSP-RATING Overall Rating of Hospital (Q21)
9. H-QUIET-HSP Quietness of Hospital Environment (Q9)
10. H-RECMND Willingness to Recommend Hospital (Q22)
11. H-COMP-7 HCAHPS 3 Item Care Transition Measure (CTM-3)

Effectiveness of Care

1. IMM-2 Influenza Immunization
2. IMM-3/OP-27 Healthcare Personnel Influenza Vaccination
3. OP-4 Aspirin at Arrival
4. OP-22 ED-Patient Left Without Being Seen
5. OP-23 ED-Head CT or MRI Scan Results for Acute Ischemic Stroke or Hemorrhagic Stroke who Received Head CT or MRI Scan Interpretation Within 45 Minutes of Arrival
6. PC-01 Elective Delivery Prior to 39 Completed Weeks Gestation: Percentage of Babies Electively Delivered Prior to 39 Completed Weeks Gestation
7. STK-4 Thrombolytic Therapy
8. VTE-5 Venous Thromboembolism Warfarin Therapy Discharge Instructions
9. VTE-6 Hospital Acquired Potentially-Preventable Venous Thromboembolism
10. OP-29 Endoscopy/Poly Surveillance- Appropriate Follow-up Interval for Normal Colonoscopy in Average Risk Patients
11. OP-30 Endoscopy/Poly Surveillance- OP-30: Endoscopy/Poly Surveillance – Colonoscopy Interval for Patients with a History of Adenomatous Polyps – Avoidance of Inappropriate Use

Timeliness of Care

1. ED-1b Median Time from ED Arrival to ED Departure for Admitted ED Patients
2. ED-2b Admit Decision Time to ED Departure Time for Admitted Patients
3. OP-3b Median Time to Transfer to Another Facility for Acute Coronary Intervention
4. OP-5 Median Time to ECG
5. OP-18b Median Time from ED Arrival to ED Departure for Discharged ED Patients
6. OP-20 Door to Diagnostic Evaluation by a Qualified Medical Professional
7. OP-21 ED-Median Time to Pain Management for Long Bone Fracture

Efficient Use of Medical Imaging

1. OP-8 MRI Lumbar Spine for Low Back Pain
2. OP-10 Abdomen CT Use of Contrast Material

3. OP-11 Thorax CT Use of Contrast Material
4. OP-13 Cardiac Imaging for Preoperative Risk Assessment for Non-Cardiac Low-Risk Surgery
5. OP-14 Simultaneous Use of Brain Computed Tomography (CT) and Sinus CT

Appendix D: Measure loadings by group for December 2016

Table D.1. Mortality measures and loading coefficients

Measure Name	Loading Coefficient
MORT-30-AMI Acute Myocardial Infarction (AMI) 30-Day Mortality Rate	0.48
MORT-30-CABG Coronary Artery Bypass Graft (CABG) 30-Day Mortality Rate	0.35
MORT-30-COPD Chronic Obstructive Pulmonary Disease (COPD) 30-Day Mortality Rate	0.62
MORT-30-HF Heart Failure (HF) 30-Day Mortality Rate	0.74
MORT-30-PN Pneumonia (PN) 30-Day Mortality Rate	0.66
MORT-30-STK Acute Ischemic Stroke (STK) 30-Day Mortality Rate	0.52
PSI-4-SURG-COMP Death Among Surgical Patients with Serious Treatable Complications	0.29

Table D.2. Safety of Care measures and loading coefficients

Measure Name	Loading Coefficient
COMP-HIP-KNEE Hospital-Level Risk-Standardized Complication Rate (RSCR) Following Elective Primary Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA)	0.17
HAI-1 Central-Line Associated Bloodstream Infection (CLABSI)	0.05
HAI-2 Catheter-Associated Urinary Tract Infection (CAUTI)	0.05
HAI-3 Surgical Site Infection from colon surgery (SSI-colon)	0.12
HAI-4 Surgical Site Infection from abdominal hysterectomy (SSI-abdominal hysterectomy)	0.06
HAI-5 MRSA Bacteremia	0.02
HAI-6 Clostridium Difficile (C. difficile)	0.03
PSI-90-Safety Complication/Patient Safety for Selected Indicators (PSI)	0.93

Table D.3. Readmission measures and loading coefficients

Measure Name	Loading Coefficient
READM-30-AMI Acute Myocardial Infarction (AMI) 30-Day Readmission Rate	0.54
READM-30-CABG Coronary Artery Bypass Graft (CABG) 30-Day Readmission Rate	0.27

Measure Name	Loading Coefficient
READM-30-COPD Chronic Obstructive Pulmonary Disease (COPD) 30-Day Readmission Rate	0.56
READM-30-HF Heart Failure (HF) 30-Day Readmission Rate	0.63
READM-30-Hip-Knee Hospital-Level 30-Day All-Cause Risk-Standardized Readmission Rate (RSRR) Following Elective Total Hip Arthroplasty (THA)/Total Knee Arthroplasty (TKA)	0.42
READM-30-HOSP-WIDE HWR Hospital-Wide All-Cause Unplanned Readmission	0.94
READM-30-PN Pneumonia (PN) 30-Day Readmission Rate	0.61
READM-30-STK Stroke (STK) 30-Day Readmission Rate	0.53

Table D.4. Patient Experience measures and loading coefficients

Measure Name	Loading Coefficient
H-CLEAN-HSP Cleanliness of Hospital Environment (Q8)	0.65
H-COMP-1 Nurse Communication (Q1, Q2, Q3)	0.74
H-COMP-2 Doctor Communication (Q5, Q6, Q7)	0.61
H-COMP-3 Responsiveness of Hospital Staff (Q4, Q11)	0.71
H-COMP-4 Pain management (Q13, Q14)	0.68
H-COMP-5 Communication About Medicines (Q16, Q17)	0.69
H-COMP-6 Discharge Information (Q19, Q20)	0.58
H-COMP-7 HCAHPS 3 Item Care Transition Measure (CTM-3)	0.77
H-HSP-RATING Overall Rating of Hospital (Q21)	0.78
H-QUIET-HSP Quietness of Hospital Environment (Q9)	0.57
H-RECMND Willingness to Recommend Hospital (Q22)	0.74

Table D.5. Effectiveness of Care measures and loading coefficients

Measure Name	Loading Coefficient
IMM-2 Influenza Immunization	0.33
IMM-3/OP-27 Healthcare Personnel Influenza Vaccination	0.28
OP-4 Aspirin at Arrival	0.36
OP-22 Emergency Department (ED)-Patient Left Without Being Seen	0.27
OP-23 Emergency Department (ED)-Head Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) Scan Results for Acute Ischemic Stroke or Hemorrhagic Stroke who Received Head CT or MRI Scan Interpretation Within 45 Minutes of Arrival	0.34

Measure Name	Loading Coefficient
OP-29 Endoscopy/Poly Surveillance- Appropriate Follow-up Interval for Normal Colonoscopy in Average Risk Patients	0.65
OP-30 Endoscopy/Poly Surveillance- OP-30: Endoscopy/Poly Surveillance – Colonoscopy Interval for Patients with a History of Adenomatous Polyps – Avoidance of Inappropriate Use	0.57
PC-01 Elective Delivery Prior to 39 Completed Weeks Gestation: Percentage of Babies Electively Delivered Prior to 39 Completed Weeks Gestation	0.28
STK-4 Thrombolytic Therapy	0.37
VTE-5 Venous Thromboembolism Warfarin Therapy Discharge Instructions	0.36
VTE-6 Hospital Acquired Potentially-Preventable Venous Thromboembolism	0.22

Table D.6. Timeliness of Care measures and loading coefficients

Measure Name	Loading Coefficient
ED-1b Median Time from Emergency Department (ED) Arrival to ED Departure for Admitted ED Patients	0.82
ED-2b Admit Decision Time to Emergency Department (ED) Departure Time for Admitted Patients	0.77
OP-3b Median Time to Transfer to Another Facility for Acute Coronary Intervention	0.22
OP-5 Median Time to Electrocardiography (ECG)	0.22
OP-18b Median Time from Emergency Department (ED) Arrival to ED Departure for Discharged ED Patients	0.73
OP-20 Door to Diagnostic Evaluation by a Qualified Medical Professional	0.46
OP-21 Emergency Department (ED)-Median Time to Pain Management for Long Bone Fracture	0.41

Table D.7. Efficient Use of Medical Imaging measures and loading coefficients

Measure Name	Loading Coefficient
OP-8 Magnetic Resonance Imaging (MRI) Lumbar Spine for Low Back Pain	0.08
OP-10 Abdomen Computed Tomography (CT) Use of Contrast Material	0.69
OP-11 Thorax Computed Tomography (CT) Use of Contrast Material	0.30

Measure Name	Loading Coefficient
OP-13 Cardiac Imaging for Preoperative Risk Assessment for Non-Cardiac Low-Risk Surgery	-0.01
OP-14 Simultaneous Use of Brain Computed Tomography (CT) and Sinus CT	-0.02