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Welcome to Today’s Event

Thank you for joining us today! Our event will start shortly.
Overall Hospital Quality Star Ratings on *Hospital Compare*

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Arjun Venkatesh, MD, MBA, MHS  
Assistant Professor and Director of Quality and Safety Research and Strategy in the Department of Emergency Medicine at the Yale University School of Medicine

Kristie Baus, RN  
Technical Advisor, CMS  
Technical Lead, *Hospital Compare* Website

May 12, 2016
<table>
<thead>
<tr>
<th>Acronyms</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPE</td>
<td>Assistant Secretary for Planning and Evaluation</td>
</tr>
<tr>
<td>CABG</td>
<td>Coronary Artery Bypass Graft</td>
</tr>
<tr>
<td>CMS</td>
<td>Centers for Medicare &amp; Medicaid</td>
</tr>
<tr>
<td>HSR</td>
<td>Hospital Specific Report</td>
</tr>
<tr>
<td>IMPACT</td>
<td>Improving Medicare Post-Acute Care Transformation</td>
</tr>
<tr>
<td>LVM</td>
<td>Latent Variable Model</td>
</tr>
<tr>
<td>PHI</td>
<td>Personal Health Information</td>
</tr>
<tr>
<td>SAS</td>
<td>Statistical Analysis Software</td>
</tr>
<tr>
<td>SDS</td>
<td>Sociodemographic Status</td>
</tr>
<tr>
<td>TEP</td>
<td>Technical Expert Panel</td>
</tr>
<tr>
<td>VBP</td>
<td>Value-Based Purchasing</td>
</tr>
<tr>
<td>IQR</td>
<td>Inpatient Quality Reporting</td>
</tr>
<tr>
<td>OQR</td>
<td>Outpatient Quality Reporting</td>
</tr>
</tbody>
</table>
Purpose

This presentation will educate participants about the methodology used to generate the summary Five-Star rating for individual hospitals using existing measures on *Hospital Compare*, as well as changes to the July 2016 Preview Reports and SAS Pack Distribution.
Objectives

Participants will be able to:

• Describe the Overall Star Ratings methodology
• Recognize changes made to the July 2016 Preview Report
• Access the Overall Star Ratings SAS Pack and supporting materials
Agenda

• Star Rating Project Overview
  ▪ Guiding Principles for Development
  ▪ Key Considerations
  ▪ Star Ratings Methodology
• Changes to July 2016 Preview Reports
• SAS Pack Distribution
• Frequently Asked Questions (FAQs)
• Question and Answer Session
Purpose of the Overall Hospital Quality Star Rating System

The Overall Hospital Quality Star Rating System was developed to:

- Provide consumers with information about multiple dimensions of quality in a single score
- Provide a methodology for generating a summary Five-Star rating for each hospital using existing measures on Hospital Compare
Background Behind the Development of the Overall Hospital Quality Star Rating System

- The current information on Hospital Compare can be technical and intimidating to beneficiaries and patients
- Star Ratings are commonly used to convey summary information
  - Five-Star ratings are easily recognizable
- Patients and consumers have reacted favorably to other CMS star rating efforts
- The ACA call provides more user friendly quality information
Stakeholder Engagement

Technical Expert Panel 3: March 2015

Working Group Discussions with the National Partnership for Women & Families - Ongoing

Star Ratings Development

Technical Expert Panel 2: February 2015

Public Comment 1: Jan-Feb 2015

Public Comment 2: July-Sept 2015

Technical Expert Panel 1: December 2014

Q&A Inbox: Jan 2016 to present

Dry Run and Q&A support: July-Sept 2015

30-Day Preview Periods: Prior to each release
Overall Hospital Quality Star Ratings
Arjun Venkatesh, MD, MBA, MHS

PROJECT OVERVIEW
Guiding Principles for Development

- **Simplicity and accessibility**
  - Summarize overall hospital quality in a single star rating
  - Convey available hospital information in a straightforward manner

- **Inclusivity**
  - Reflect quality at as many hospitals as possible by including most Hospital Compare measures

- **Scientific rigor**
  - Utilize established methods for summarizing scores

- **Engage stakeholders**
  - Use multiple channels of engagement from start to finish

- **Consistency**
  - Align as possible with other Compare sites for star ratings display;
  - Allow for consistency in approach to measure selection and weighting with existing CMS programs and Hospital Compare over time
Key Considerations

• Star ratings will only reflect quality assessed by current measures on Hospital Compare
  ▪ Star ratings will evolve as measures are added, removed, and updated
  ▪ Existing measures may not capture “all” of hospital quality
  ▪ Ensures consistency for patients and consumers

• Current public reporting requirements result in diversity in the number and types of measures reported by different hospitals
Star Ratings Calculation Steps

**Step 1: Select Measures**
Apply measure selection criteria each quarter

**Step 2: Group Measures**
Similar to HVBP and existing Hospital Compare display

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

**Step 3: Calculate Group Score**
Use 7 latent variable models

**Step 4: Generate Summary Score**
Policy-based weighted average of available hospital group scores

**Step 5: Calculating Star Ratings**
Categorize hospitals using k-means Cluster Analysis and winsorization

5/12/2016
Changes Since the Dry Run

- Measures Updated
  - Added effective April 2016
    - 30-day Mortality and Readmission Coronary Artery Bypass Graft (CABG) outcomes measures
  - Removed effective April 2016
    - Two retired and 14 voluntary measures in the Effectiveness of Care and Timeliness of Care groups
  - Added effective July 2016
    - OP-29 and OP-30 (colonoscopy measures) to the Effectiveness of Care group
- National improvements in performance on several measures
- Winsorization
  - Employed to limit influence of extreme outliers
  - Applied to hospital summary scores prior to clustering
  - Added based on stakeholder feedback during Public Comment
Step 1: Select Measures

Step 2: Group Measures
Similar to HVBP and existing Hospital Compare display

Step 3: Calculate Group Score
Use 7 latent variable models

Step 4: Generate Summary Score
Policy-based weighted average of available hospital group scores

Step 5: Assign Star Ratings
Categorize hospitals using k-means Cluster Analysis

Hospital Compare Measures

- Measure 1
- Measure 2
- ...
- Measure 74
- Measure 75
Measure Exclusions for Star Ratings

Measures eligible for inclusion as of July 2016 (N=115)

- Measures suspended, retired, or delayed from public reporting on Hospital Compare (N=13)
- Measures with no more than 100 hospitals reporting performance publicly (N=3)
- Structural measures (N=9)
- Non-directional measures (N=6)
- Measures no longer required for IQR or OQR (N=14)
- Duplicative measures (N=6)

Measures included in July 2016 Star Ratings (N=64)
Step 1: Select Measures
Standardization and Winsorization

Quality measure results include many different types of scoring information, e.g., times, percentages, rates

- **Standardization** allows measures to be combined. This is achieved by:
  - Calculating the Z-score
    - Difference between an individual hospital’s score and the overall mean score for hospitals divided by the standard deviation across hospitals
  - Ensuring same direction for better score

- **Winsorization** eliminates extreme outlier performance. This is achieved by:
  - Winsorizing scores to set extreme values to the 99.875% and 0.125% values so that all the measures are between [-3,3]

*These steps have no material impact on hospital measurement.*
Step 2: Group Measures

Step 2: Group Measures
Similar to HVBP and existing Hospital Compare display

Step 1: Select Measures
Apply measure selection criteria each quarter

Step 3: Calculate Group Score
Use 7 latent variable models

Step 4: Generate Summary Score
Policy-based weighted average of available hospital group scores

Step 5: Assign Star Ratings
Categorize hospitals using k-means Cluster Analysis
Step 2: Group Measures

• Hospital quality is represented by several dimensions

• The seven measure groups are aligned (but not exactly alike) with:
  ▪ The Hospital Value-Based Purchasing (VBP) Program
  ▪ Current categories on Hospital Compare
  ▪ Other national quality initiatives

• Measure groups are clinically reasonable

• The proposed groups will allow for measures to be added and removed from star ratings in the future
Step 2: Group Measures
July 2016 Groups

<table>
<thead>
<tr>
<th>Category</th>
<th>Measure Group</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality Measures</td>
<td>(N=7)</td>
<td></td>
</tr>
<tr>
<td>Safety of Care Measures</td>
<td>(N=8)</td>
<td></td>
</tr>
<tr>
<td>Readmission Measures</td>
<td>(N=8)</td>
<td></td>
</tr>
<tr>
<td>Patient Experience</td>
<td>(N=11)</td>
<td></td>
</tr>
<tr>
<td>Effectiveness of Care</td>
<td>(N=18)</td>
<td></td>
</tr>
<tr>
<td>Timeliness Of Care</td>
<td>(N=7)</td>
<td></td>
</tr>
<tr>
<td>Efficient Use of Medical Imaging Measures</td>
<td>(N=5)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Measure groups based on preliminary July 2016 Hospital Compare data.
Step 2: Group Measures
July 2016 Mortality Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORT-30-AMI</td>
<td>Acute Myocardial Infarction (AMI) 30-Day Mortality Rate</td>
</tr>
<tr>
<td>MORT-30-CABG</td>
<td>Coronary Artery Bypass Graft (CABG) 30-Day Mortality Rate</td>
</tr>
<tr>
<td>MORT-30-COPD</td>
<td>Chronic Obstructive Pulmonary Disease (COPD) 30-Day Mortality Rate</td>
</tr>
<tr>
<td>MORT-30-HF</td>
<td>Heart Failure (HF) 30-Day Mortality Rate</td>
</tr>
<tr>
<td>MORT-30-PN</td>
<td>Pneumonia (PN) 30-Day Mortality Rate</td>
</tr>
<tr>
<td>MORT-30-STK</td>
<td>Acute Ischemic Stroke (STK) 30-Day Mortality Rate</td>
</tr>
<tr>
<td>PSI-4-SURG-COMP</td>
<td>Death Among Surgical Patients with Serious Treatable Complications</td>
</tr>
</tbody>
</table>
Step 2: Group Measures
July 2016 Safety of Care Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAI-1</td>
<td>Central-Line Associated Bloodstream Infection (CLABSI)</td>
</tr>
<tr>
<td>HAI-2</td>
<td>Catheter-Associated Urinary Tract Infection (CAUTI)</td>
</tr>
<tr>
<td>HAI-3</td>
<td>Surgical Site Infection from colon surgery (SSI-colon)</td>
</tr>
<tr>
<td>HAI-4</td>
<td>Surgical Site Infection from abdominal hysterectomy (SSI-abdominal hysterectomy)</td>
</tr>
<tr>
<td>HAI-5</td>
<td>MRSA Bacteremia</td>
</tr>
<tr>
<td>HAI-6</td>
<td>Clostridium Difficile (C.difficile)</td>
</tr>
<tr>
<td>COMP-HIP-KNEE</td>
<td>Hospital-Level Risk-Standardized Complication Rate (RSCR) Following Elective Primary Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA)</td>
</tr>
<tr>
<td>PSI-90-Safety</td>
<td>Complication/Patient Safety for Selected Indicators (PSI)</td>
</tr>
</tbody>
</table>
Step 2: Group Measures
July 2016 Readmission Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>READM-30-AMI</td>
<td>Acute Myocardial Infarction (AMI) 30-Day Readmission Rate</td>
</tr>
<tr>
<td>READM-30-CABG</td>
<td>Coronary Artery Bypass Graft (CABG) 30-Day Readmission Rate</td>
</tr>
<tr>
<td>READM-30-COPD</td>
<td>Chronic Obstructive Pulmonary Disease (COPD) 30-Day Readmission Rate</td>
</tr>
<tr>
<td>READM-30-HF</td>
<td>Heart Failure (HF) 30-Day Readmission Rate</td>
</tr>
<tr>
<td>READM-30-Hip-Knee</td>
<td>Hospital-Level 30-Day All-Cause Risk-Standardized Readmission Rate Following Elective Total Hip Arthroplasty (THA)/Total Knee Arthroplasty (TKA)</td>
</tr>
<tr>
<td>READM-30-PN</td>
<td>Pneumonia (PN) 30-Day Readmission Rate</td>
</tr>
<tr>
<td>READM-30-STK</td>
<td>Stroke (STK) 30-Day Readmission Rate</td>
</tr>
<tr>
<td>READM-30-HOSP-WIDE</td>
<td>HWR Hospital-Wide All-Cause Unplanned Readmission</td>
</tr>
</tbody>
</table>
### Step 2: Group Measures
#### July 2016 Patient Experience Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-CLEAN-HSP</td>
<td>Cleanliness of Hospital Environment (Q8)</td>
</tr>
<tr>
<td>H-COMP-1</td>
<td>Nurse Communication (Q1, Q2, Q3)</td>
</tr>
<tr>
<td>H-COMP-2</td>
<td>Doctor Communication (Q5, Q6, Q7)</td>
</tr>
<tr>
<td>H-COMP-3</td>
<td>Responsiveness of Hospital Staff (Q4, Q11)</td>
</tr>
<tr>
<td>H-COMP-4</td>
<td>Pain Management (Q13, Q14)</td>
</tr>
<tr>
<td>H-COMP-5</td>
<td>Communication About Medicines (Q16, Q17)</td>
</tr>
<tr>
<td>H-COMP-6</td>
<td>Discharge Information (Q19, Q20)</td>
</tr>
<tr>
<td>H-COMP-7</td>
<td>HCAHPS 3 Item Care Transition Measure (CTM-3)</td>
</tr>
<tr>
<td>H-HSP-RATING</td>
<td>Overall Rating of Hospital (Q21)</td>
</tr>
<tr>
<td>H-QUIET-HSP</td>
<td>Quietness of Hospital Environment (Q9)</td>
</tr>
<tr>
<td>H-RECMND</td>
<td>Willingness to Recommend Hospital (Q22)</td>
</tr>
</tbody>
</table>
## Step 2: Group Measures
### July 2016 Effectiveness of Care Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAC-3</td>
<td>Home Management Plan of Care (HMPC) Document Given to Patient/Caregiver</td>
</tr>
<tr>
<td>IMM-2</td>
<td>Influenza Immunization</td>
</tr>
<tr>
<td>IMM-3/OP-27</td>
<td>Healthcare Personnel Influenza Vaccination</td>
</tr>
<tr>
<td>OP-4</td>
<td>Aspirin at Arrival</td>
</tr>
<tr>
<td>OP-22</td>
<td>ED-Patient Left Without Being Seen</td>
</tr>
<tr>
<td>OP-23</td>
<td>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</td>
</tr>
<tr>
<td>OP-29</td>
<td>Endoscopy/Polyp Surveillance: Appropriate Follow-up Interval for Normal Colonoscopy in Average Risk Patients</td>
</tr>
<tr>
<td>OP-30</td>
<td>Endoscopy/Polyp Surveillance: Colonoscopy Interval for Patients with a History of Adenomatous Polyps – Avoidance of Inappropriate Use</td>
</tr>
</tbody>
</table>
### Step 2: Group Measures
#### July 2016 Effectiveness of Care Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC-01</td>
<td>Elective Delivery Prior to 39 Completed Weeks Gestation: Percentage of Babies Electively Delivered Prior to 39 Completed Weeks Gestation</td>
</tr>
<tr>
<td>STK-1</td>
<td>Venous Thromboembolism (VTE) Prophylaxis</td>
</tr>
<tr>
<td>STK-4</td>
<td>Thrombolytic Therapy</td>
</tr>
<tr>
<td>STK-6</td>
<td>Discharged on Statin Medication</td>
</tr>
<tr>
<td>STK-8</td>
<td>Stroke Education</td>
</tr>
<tr>
<td>VTE-1</td>
<td>Venous Thromboembolism Prophylaxis</td>
</tr>
<tr>
<td>VTE-2</td>
<td>Intensive Care Unit Venous Thromboembolism Prophylaxis</td>
</tr>
<tr>
<td>VTE-3</td>
<td>Venous Thromboembolism Patients with Anticoagulation Overlap Therapy</td>
</tr>
<tr>
<td>VTE-5</td>
<td>Venous Thromboembolism Warfarin Therapy Discharge Instructions</td>
</tr>
<tr>
<td>VTE-6</td>
<td>Hospital Acquired Potentially-Preventable Venous Thromboembolism</td>
</tr>
</tbody>
</table>
## Step 2: Group Measures

### July 2016 Timeliness of Care Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED-1b</td>
<td>Median Time from ED Arrival to ED Departure for Admitted ED Patients</td>
</tr>
<tr>
<td>ED-2b</td>
<td>Admit Decision Time to ED Departure Time for Admitted Patients</td>
</tr>
<tr>
<td>OP-3</td>
<td>Median Time to Transfer to Another Facility for Acute Coronary Intervention</td>
</tr>
<tr>
<td>OP-5</td>
<td>Median Time to ECG</td>
</tr>
<tr>
<td>OP-18b/ED-3</td>
<td>Median Time from ED Arrival to ED Departure for Discharged ED Patients</td>
</tr>
<tr>
<td>OP-20</td>
<td>Door to Diagnostic Evaluation by a Qualified Medical Professional</td>
</tr>
<tr>
<td>OP-21</td>
<td>ED-Median Time to Pain Management for Long Bone Fracture</td>
</tr>
</tbody>
</table>
Step 2: Group Measures
July 2016 Efficient Use of Medical Imagery Measures

<table>
<thead>
<tr>
<th>Measure ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP-8</td>
<td>MRI Lumbar Spine for Low Back Pain</td>
</tr>
<tr>
<td>OP-10</td>
<td>Abdomen CT Use of Contrast Material</td>
</tr>
<tr>
<td>OP-11</td>
<td>Thorax CT Use of Contrast Material</td>
</tr>
<tr>
<td>OP-13</td>
<td>Cardiac Imaging for Preoperative Risk Assessment for Non-Cardiac Low-Risk Surgery</td>
</tr>
<tr>
<td>OP-14</td>
<td>Simultaneous Use of Brain Computed Tomography (CT) and Sinus CT</td>
</tr>
</tbody>
</table>
Step 3: Calculate Group Score

Step 1: Select Measures
Apply measure selection criteria each quarter

Hospital Compare Measures
- Measure 1
- Measure 2
- ...
- Measure 74
- Measure 75

Step 2: Group Measures
Similar to HVB and existing Hospital Compare display

Outcomes:
- Mortality
- Safety
- Readmission
- Experience
- Effectiveness
- Process
- Timeliness
- Efficiency
- Imaging

Step 3: Calculate Group Score
Use 7 latent variable models

Mortality Group Score
Safety Group Score
Readmission Group Score
Patient Experience Group Score
Effectiveness Group Score
Timeliness Group Score
Imaging Group Score

Step 4: Generate Summary Score
Policy-based weighted average of available hospital group scores

Step 5: Assign Star Ratings
Categorize hospitals using k-means Cluster Analysis

5/12/2016
Step 3: Calculate Group Score
LVMs for Measure Groups

Latent Variable Models (LVMs) is an analytical approach that seeks to measure dimensions of quality that cannot be measured directly, but can be estimated based on existing measures. LVMs:

- Are used to calculate each measure group score
- Accommodate:
  - Missing information
  - Diverse hospital reporting patterns
  - Addition and removal of measures over time
- Also consider the relationship between measures within a measure group
Step 3: Calculate Group Score
Sample Variation

• For each measure, each hospital may report different numbers of cases
• The Star Ratings methodology accounts for this variation
• A large denominator, or a more precise measure score, would be weighted more in the model by using “weighted likelihood”
Step 3: Calculate Group Score
Measure Loadings

The LVM estimates a “loading” for each measure in a group associated with the hospital-specific group score.

- “Loading” is the extent of the measure’s association with the group score (quality dimension) relative to other measures in the group.
- A measure’s “loading” is the same across all hospitals.
- Measures with higher “loadings” are more strongly associated with the group score.
  - “Loadings” are not “weights” that imply proportional importance.
Step 4: Generate Summary Score

Step 1: Select Measures
Apply measure selection criteria each quarter

Step 2: Group Measures
Similar to HVBP and existing Hospital Compare display

Step 3: Calculate Group Score
Use 7 latent variable models

Step 4: Generate Summary Score
Policy-based weighted average of available hospital group scores

Step 5: Assign Star Ratings
Categorize hospitals using k-means Cluster Analysis

Hospital Compare Measures

- Measure 1
- Measure 2
- Measure 74
- Measure 75

Outcomes:
- Mortality
- Safety
- Readmission
- Patient Experience
- Process: Effectiveness
- Process: Timeliness
- Efficiency: Imaging

Group Measures

- Mortality Group Score
- Safety Group Score
- Readmission Group Score
- Patient Experience Group Score
- Effectiveness Group Score
- Timeliness Group Score
- Imaging Group Score

Hospital Summary Score
Step 4: Generate Summary Score
Calculating a Hospital Summary Score

Hospital Summary Scores are calculated by using a weighted average of the seven measure group scores.

Weights are consistent with the CMS Hospital Value-Based Purchasing program and CMS Quality Strategy.

- Mortality Group Score: 22% Weight
- Safety of Care Group Score: 22% Weight
- Readmission Group Score: 22% Weight
- Patient Experience Group Score: 22% Weight
- Timeliness of Care Group Score: 4% Weight
- Effectiveness of Care Group Score: 4% Weight
- Efficient Use of Medical Imaging Group Score: 4% Weight

Weighted Average: Hospital Summary Score
Step 4: Generate Summary Score
Policy-Based Weighting for Measure Groups

• The following criteria are used to determine weighting:
  ▪ Measure Importance
  ▪ Consistency
  ▪ Policy Priorities
  ▪ Stakeholder Input

• Measure groups weights were vetted with the TEP, Patient Workgroup, and through Public Comment

• Same weights are being used as during the hospital dry run
Step 4: Generate Summary Score
Policy-Based Weighting for Measure Groups

The Star Ratings methodology requires policy-based weighting to calculate a hospital’s summary score from the measure group scores.

<table>
<thead>
<tr>
<th>Measure Group</th>
<th>FY17 HVBP Weight</th>
<th>Overall Star Rating Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes – Mortality (N=6)</td>
<td>25%</td>
<td>22%</td>
</tr>
<tr>
<td>Outcomes – Safety (N=8)</td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>Outcomes – Readmission (N=7)</td>
<td>---</td>
<td>22%</td>
</tr>
<tr>
<td>Patient Experience (N=11)</td>
<td>25%</td>
<td>22%</td>
</tr>
<tr>
<td>Process – Effectiveness (N=30)</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Process – Timeliness (N=8)</td>
<td>---</td>
<td>4%</td>
</tr>
<tr>
<td>Efficiency – Imaging (N=5)</td>
<td>---</td>
<td>4%</td>
</tr>
<tr>
<td>Efficiency – Cost</td>
<td>25%</td>
<td>---</td>
</tr>
</tbody>
</table>
Step 4: Generate Summary Score

Redistributing Measure Group Weights

- A hospital may not have measures reported in all measure groups.
- If a hospital has no measures in a group, the group is considered “missing.”
  - Groups with one or two measures have a group score.
- Star Ratings methodology uses the same approach as the Hospital VBP program for missing groups.
  - Weight is redistributed to non-missing measure groups.
Method for Re-weighting When Missing Group(s)

Example Re-weighting Scheme for Hospital Missing Efficient Use of Medical Imaging Group

<table>
<thead>
<tr>
<th>Measure Group</th>
<th>Standard Weight</th>
<th>Re-proportioned Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>22%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Safety of Care</td>
<td>22%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Readmission</td>
<td>22%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Patient Experience</td>
<td>22%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Effectiveness of Care</td>
<td>4%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Timeliness of Care</td>
<td>4%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Efficient Use of Medical Imaging (N=0)</td>
<td>4%</td>
<td>---</td>
</tr>
</tbody>
</table>

Example Calculation for Re-proportioning Group Weights

Reassign 4% from Efficiency by calculating weights for remaining groups out of 96 (100-4 =96)
Step 5: Assign Star Ratings

Step 1: Select Measures
Apply measure selection criteria each quarter

Step 2: Group Measures
Similar to HVBP and existing Hospital Compare display

Step 3: Calculate Group Score
Use 7 latent variable models

Step 4: Generate Summary Score
Policy-based weighted average of available hospital group scores

Step 5: Assign Star Ratings
Categorize hospitals using k-means Cluster Analysis
Step 5: Assign Star Ratings
Categorizing Using Winsorization and k-Means Clustering

The Hospital Summary Scores are then used to calculate a Star Rating for each hospital using k-Means Clustering.

- k-Means clustering minimizes the sum of the square of distance between a hospital’s summary score and each cluster mean score.
- CMS analyzes the distribution of hospital summary scores and performs Winsorization to 0.5th and 99.5th percentile.
  - This resulted in modification of only 46 hospital summary scores.

<table>
<thead>
<tr>
<th>Star</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>★★★★★</td>
<td>Cluster of hospitals with the highest summary scores</td>
</tr>
<tr>
<td>★★★★</td>
<td>Cluster of hospitals with higher than average summary scores</td>
</tr>
<tr>
<td>★★★</td>
<td>Cluster of hospitals with average summary scores</td>
</tr>
<tr>
<td>★★</td>
<td>Cluster of hospitals with below average summary scores</td>
</tr>
<tr>
<td>★</td>
<td>Cluster of hospitals with lowest summary scores</td>
</tr>
</tbody>
</table>
Step 5: Assign Star Ratings
Categorizing Using Winsorization and k-Means Clustering

Frequency of Hospitals by Star Category using $k$-Means in July 2016

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency (Number of Hospitals)</th>
<th>Percentage of Hospitals</th>
<th>Summary Score Range in Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>100</td>
<td>2.73%</td>
<td>(0.85, 2.06)</td>
</tr>
<tr>
<td>4</td>
<td>918</td>
<td>25.10%</td>
<td>(0.23, 0.85)</td>
</tr>
<tr>
<td>3</td>
<td>1,777</td>
<td>48.58%</td>
<td>(-0.35, 0.23)</td>
</tr>
<tr>
<td>2</td>
<td>728</td>
<td>19.90%</td>
<td>(-1.00, -0.35)</td>
</tr>
<tr>
<td>1</td>
<td>135</td>
<td>3.69%</td>
<td>(-1.97, -1.01)</td>
</tr>
</tbody>
</table>

Note: Data based on preliminary July 2016 Hospital Compare results. Subject to change.
Star Ratings Thresholds

• Some hospitals may report fewer individual measures.
  ▪ Summary scores calculated with fewer individual measures might have less reliability and face validity.

• Star methodology uses a minimum reporting threshold similar to Hospital VBP, which is based on reliability calculations and face validity.
  ▪ At least three of the seven measure groups (at least one being an outcome group) must be included.
  ▪ At least three measures in at least three measure groups must be represented.
## Star Ratings Thresholds

### Relationship Between Measure Reporting Thresholds and Number of Hospitals Assigned a Star Rating

Data as of April 2015

<table>
<thead>
<tr>
<th>Minimum Measures</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4,617 (97%)</td>
<td>4,330 (91%)</td>
<td>3,958 (83%)</td>
<td>3,713 (78%)</td>
<td>3,353 (71%)</td>
<td>3,009 (63%)</td>
</tr>
<tr>
<td>2</td>
<td>4,329 (91%)</td>
<td>4,020 (85%)</td>
<td>3,639 (77%)</td>
<td>3,319 (70%)</td>
<td>3,061 (64%)</td>
<td>2,789 (59%)</td>
</tr>
<tr>
<td>3</td>
<td>3,988 (84%)</td>
<td>3,709 (78%)</td>
<td>3,307 (70%)</td>
<td>3,044 (64%)</td>
<td>2,845 (60%)</td>
<td>2,411 (51%)</td>
</tr>
<tr>
<td>4</td>
<td>3,499 (74%)</td>
<td>3,277 (69%)</td>
<td>3,036 (64%)</td>
<td>2,801 (59%)</td>
<td>2,481 (52%)</td>
<td>1,831 (39%)</td>
</tr>
</tbody>
</table>
Group Categories

- In response to stakeholder feedback, CMS reports categorical group performance for each measure group available (meeting a minimum of three measure thresholds).
- This is calculated by comparing a hospital’s group score and 95% confidence interval to the national average group score.
  - Above the national average: a group score with a confidence interval that falls entirely above the national average
    - Above the national average indicates better performance
  - Same as the national average: a group score with a confidence interval that includes the national average
  - Below the national average: a group score with a confidence interval that falls entirely below the national average
# Group Categories

## Frequency of Hospitals by Categorical Group Score Performance in July 2016

<table>
<thead>
<tr>
<th>Measure Group</th>
<th>Above the national average</th>
<th>Same as the national average</th>
<th>Below the national average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality (N=3,533)</td>
<td>415 (11.75%)</td>
<td>2,767 (78.32%)</td>
<td>351 (9.93%)</td>
</tr>
<tr>
<td>Safety of Care (N=2,917)</td>
<td>825 (28.28%)</td>
<td>1,402 (48.06%)</td>
<td>690 (23.65%)</td>
</tr>
<tr>
<td>Readmission (N=3,871)</td>
<td>827 (21.36%)</td>
<td>2,156 (55.70%)</td>
<td>888 (22.94%)</td>
</tr>
<tr>
<td>Patient Experience (N=3,528)</td>
<td>1,208 (34.24%)</td>
<td>1,201 (34.04%)</td>
<td>1,119 (31.72%)</td>
</tr>
<tr>
<td>Effectiveness of Care (N=3,662)</td>
<td>1,070 (29.22%)</td>
<td>2,091 (57.10%)</td>
<td>501 (13.68%)</td>
</tr>
<tr>
<td>Timeliness of Care (N=3,428)</td>
<td>1,140 (33.26%)</td>
<td>1,375 (40.11%)</td>
<td>913 (26.63%)</td>
</tr>
<tr>
<td>Efficient Use of Medical Imaging (N=2,840)</td>
<td>377 (13.27%)</td>
<td>2,088 (73.52%)</td>
<td>375 (13.20%)</td>
</tr>
</tbody>
</table>

Note: Data based on preliminary July 2016 Hospital Compare results. Subject to change.
Implementation

Star Ratings:

- Refresh
  - Quarterly in 2016
  - Semi-annually (July and December) in 2017 and onwards
- Are located on the following pages on Hospital Compare:
  - Results page
  - Hospitals’ Compare pages
  - Hospitals’ Profile pages

Note: Group categories are located on a “View Details” page on the General Information tabs.
Questions and Resources

• During implementation, stakeholders may send questions and comments to cmsstarratings@lantanagroup.com.

• Resources for Star Ratings can be found on the QualityNet Star Ratings page, Hospitals–Inpatient>Hospital Star Ratings.

Please do not include any PHI in any comments or questions.
Overall Hospital Quality Star Ratings
Kristie Baus, RN

CHANGES TO JULY 2016
PREVIEW REPORTS
Changes in July 2016 Preview Report

• Weights and group scores will be shown for any measure group included in the calculation of the summary score.
  ▪ In May, data will only be shown for measure groups who met the minimum reporting threshold (three measures).

• This will allow hospitals to re-calculate the summary score with the group scores and weights.
# April 2016 Preview Report vs. July 2016 Preview Report

## April 2016 Preview Report

<table>
<thead>
<tr>
<th>Overall Hospital Star Rating</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Hospital's Overall Star Rating</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your Overall Summary Score</td>
<td>-0.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Overall Hospital Star Rating Group Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Measures</th>
<th>Weight</th>
<th>Group Score</th>
<th>National Group Scores</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome: Mortality</td>
<td>5</td>
<td>22.9</td>
<td>-1.23</td>
<td>0.00</td>
<td>Below the National average</td>
</tr>
<tr>
<td>Outcome: Safety</td>
<td>4</td>
<td>22.9</td>
<td>-0.52</td>
<td>-0.03</td>
<td>Below the National average</td>
</tr>
<tr>
<td>Outcome: Readmission</td>
<td>5</td>
<td>22.9</td>
<td>0.14</td>
<td>0.00</td>
<td>Same as the National average</td>
</tr>
<tr>
<td>Patient Experience</td>
<td>11</td>
<td>22.9</td>
<td>-0.98</td>
<td>-0.14</td>
<td>Below the National average</td>
</tr>
<tr>
<td>Process: Effectiveness of Care</td>
<td>2</td>
<td>N/A</td>
<td><strong>N/A(16)</strong></td>
<td>0.06</td>
<td>N/A</td>
</tr>
<tr>
<td>Process: Timeliness of Care</td>
<td>5</td>
<td>4.2</td>
<td>-1.51</td>
<td>0.04</td>
<td>Below the National average</td>
</tr>
<tr>
<td>Efficiency: Imaging</td>
<td>0</td>
<td>N/A</td>
<td>N/A(16)</td>
<td>0.00</td>
<td>N/A</td>
</tr>
</tbody>
</table>

## July 2016 Preview Report

<table>
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<td>2</td>
<td>4.2</td>
<td><strong>-0.12</strong></td>
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</tr>
<tr>
<td>Efficiency: Imaging</td>
<td>0</td>
<td>N/A</td>
<td>N/A(16)</td>
<td>0.00</td>
<td>N/A</td>
</tr>
</tbody>
</table>
HSRs

• HSRs will be provided starting with the July 2016 Hospital Compare release.
• HSRs have been designed to complement the data in the Preview Report and provide additional information for hospitals, including:
  ▪ Confidence intervals for summary scores and group scores to allow validation of group category
  ▪ Individual standardized measure scores
• Release date of the HSRs is to be determined.
Overall Hospital Quality Star Ratings
Kristie Baus

SAS PACK DISTRIBUTION
SAS Pack and Input File

• In response to stakeholder feedback and to ensure transparency, CMS is considering the feasibility of providing the Overall Star Rating SAS Pack and applicable input file on a CMS website.

• The package may include:
  ▪ SAS Pack code and documentation
  ▪ Input File
    • Includes all hospital data publicly reported and the denominators for all measures
  ▪ Instruction Guide for using the SAS Pack

• The SAS Pack requires release of all hospitals’ individual data.
SAS Pack and Input File: Caveats

• It is possible for a hospital to get slightly different results than CMS if they do not use the system requirements provided in the SAS Pack instructions.

• Manipulation of the SAS coding or input file can result in errors or varying results.

• Help Desk support would not be available to answer technical questions.
  ▪ Please refer to the Instruction Guide for system requirements and a step-by-step guide on running the SAS Pack with the provided input file.
  ▪ FAQs will be provided on the Hospital Star Ratings QualityNet page to provide SAS Pack guidance.
Overall Hospital Quality Star Ratings
Kristie Baus

FREQUENTLY ASKED QUESTIONS
FAQs

CMS began responding to stakeholder questions from the CMS Hospital Compare Overall Star Ratings inbox beginning January 2016.

1. Can the release of the Star Ratings be delayed until the full impact is analyzed?
2. Why is my measure group score for Mortality and/or Readmissions “Below the national average” when my individual measures are “Same as the national average?”
3. Why is my production star rating different (lower) than my “dry run” star rating?
4. How can a hospital re-create their star rating?
5. Can individual quality measures be removed (i.e., PSI-90)?
6. Are Star Ratings adjusted for sociodemographic factors?
7. Can the Overall Star Ratings be misleading to patients and consumers?
FAQ and Answer – 1

Can the release of the Star Ratings be delayed until the full impact is analyzed?

In order to give more time for hospitals and other stakeholders to become more familiar with the methodology, CMS will postpone the public reporting of the Overall Hospital Star Rating until a future release to be determined.

Over the next 60 days, CMS will:

• Continue to listen to stakeholders
• Educate and work with hospitals about their data to analyze questions raised
• Hear how we can evolve Hospital Compare in the future
Why is my measure group score for Mortality and/or Readmissions “Below the national average” when my individual measures are “Same as the national average” or “Above the national average?”

The methodology ensures all included measures are in the same direction (i.e., a higher score indicates better quality). It combines these measure values into a group score. A hospital’s score may be substantially lower than the national average but not statistically lower on several measures. When combined this shows consistently lower performance resulting in a lower category score.
For each measure group, the 95% confidence interval of a hospital’s group score is compared to the national average to assign a national comparison category according to the following guidelines:

- **Above the National Average**: If the hospital’s interval falls above the national average
- **Same as the National Average**: If the hospital’s interval includes the national average
- **Below the National Average**: If the hospital’s interval falls entirely below the national average

The measure group score does not directly translate into a national performance category since the 95% confidence interval is required to compare the measure group score to the national average.
Why is my production star rating different (lower) than my “dry run” star rating?

The change in the overall summary score and star rating can be attributed to a number of factors.

- The measures used in the calculation for the overall summary score and star ratings have changed.
- The methodology has been updated since the dry run to include Winsorization.
- The hospital’s performance may have worsened or the national performance may have improved beyond the hospital’s performance.

In addition, the minimum and maximum hospital summary scores for each star category will change with each reporting period based on the underlying distribution of hospital summary scores.
Can individual quality measures be removed (i.e., PSI-90)?

CMS believes that the PSI-90 composite is an important measure. Several indicators within the composite are not included in other measures. It addresses issues that are harmful to patients with limited burden on hospitals for data collection.

CMS developed the Star Ratings to be as inclusive of as many measures as possible on Hospital Compare. Methodology includes systematic process for the inclusion of measures. All measures in the methodology pass the selection criteria.
By studying outlying hospitals, CMS concluded that it is unlikely that any one measure precludes a hospital of a given type from performing well on the Star Ratings. CMS will continue to consider your feedback in evaluating future measures, including PSI measures.
Are Star Ratings adjusted for sociodemographic factors?

The Overall Hospital Quality Star Ratings represent a performance summary based on individual measures already reported on Hospital Compare.

CMS is committed to addressing concerns about the role of SDS factors for individual measures, improving outcomes, and working with stakeholders to improve individual quality measures.
The Office of the Assistant Secretary for Planning and Evaluation (ASPE) is conducting research on risk adjustment for SDS, as directed by the IMPACT Act.

- The ASPE will issue a report to Congress by October 2016.
- CMS will examine the recommendations issued by ASPE and consider how they apply to publicly reported measures.

Risk adjustment for individual measures is beyond the scope of Star Ratings.
Can the Overall Star Ratings be misleading to patients and consumers?

The Overall Star Rating represents a performance summary designed to facilitate patient and consumer use of Hospital Compare. It responds to sections of the Affordable Care Act, which call for public reporting that is transparent, efficient, easily understood, and widely available.

The data used in the Overall Star Rating is the data available on Hospital Compare.

CMS consulted both the TEP and patient advocate working group, which include diverse patient and patient advocate representation. The patient advocate group supports CMS’ decision to provide a hospital quality star rating system.
Feedback and Engagement

CMS welcomes stakeholder feedback and appreciates your continued and thoughtful engagement in CMS’ quality measurement work.
Overall Hospital Quality Star Ratings

QUESTION AND ANSWER SESSION
Resources

• Hospital Compare
  www.medicare.gov/hospitalcompare

• QualityNet
  www.qualitynet.org
Continuing Education Approval

This program has been approved for 1.5 continuing education (CE) unit for the following professional boards:

- Florida Board of Clinical Social Work, Marriage and Family Therapy and Mental Health Counseling
- Florida Board of Nursing Home Administrators
- Florida Council of Dietetics
- Florida Board of Pharmacy
- Board of Registered Nursing (Provider #16578)
  - It is your responsibility to submit this form to your accrediting body for credit.
CE Credit Process

• Complete the ReadyTalk® survey that will pop up after the webinar, or wait for the survey that will be sent to all registrants within the next 48 hours.

• After completion of the survey, click “Done” at the bottom of the screen.

• Another page will open that asks you to register in HSAG’s Learning Management Center.
  ▪ This is a separate registration from ReadyTalk®.
  ▪ Please use your PERSONAL email so you can receive your certificate.
  ▪ Healthcare facilities have firewalls up that block our certificates.
CE Certificate Problems?

• If you do not immediately receive a response to the email that you signed up with in the Learning Management Center, you have a firewall up that is blocking the link that is sent out.

• Please go back to the New User link and register your personal email account.
  ▪ Personal emails do not have firewalls.
CE Credit Process

Thank you for completing our survey!

Please click on one of the links below to obtain your certificate for your state licensure.

You must be registered with the learning management site.

**New User Link:**
https://ifmc.hshapps.com/register/default.aspx?ID=da0a12bc-db39-408f-b429-d6f6b9ccb1ae

**Existing User Link:**
https://ifmc.hshapps.com/test/adduser.aspx?ID=da0a12bc-db39-408f-b429-d6f6b9ccb1ae

**Note:** If you click the 'Done' button below, you will not have the opportunity to receive your certificate without participating in a longer survey.
CE Credit Process: New User
CE Credit Process: Existing User