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National Provider Call

Overall Hospital Quality Star Ratings on *Hospital Compare*

August 13, 2015

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Overall Hospital Quality Star Ratings

CMS Overview

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Agenda

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Background

- The information on *Hospital Compare* can be technical and intimidating to a lay audience
- 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 ratings efforts

Purpose

- To provide patients and consumers with information about multiple dimensions of quality in a single measure
- To develop a methodology for generating a summary five-star rating for each hospital using existing measures on *Hospital Compare*

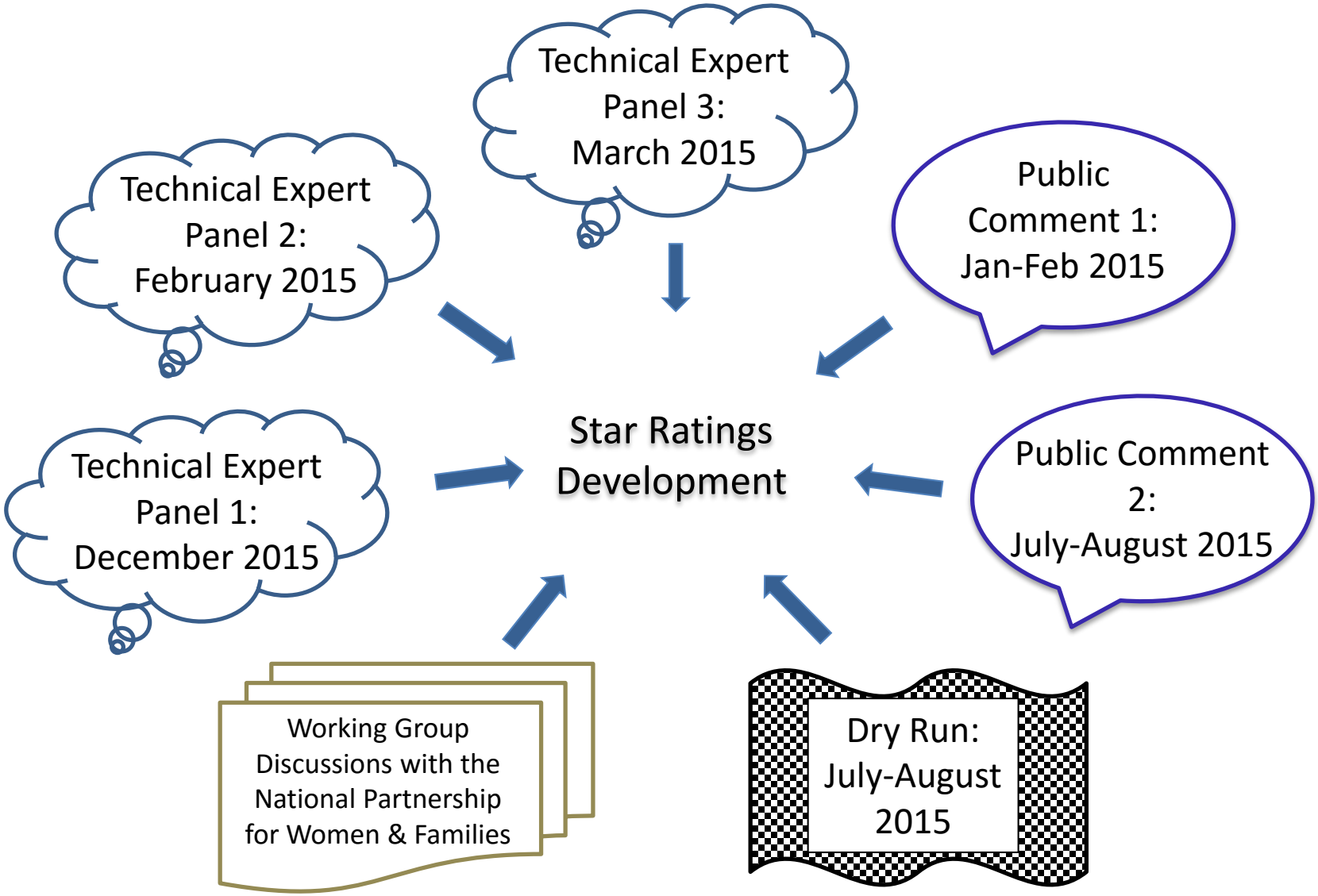
Project Overview

Arjun Venkatesh, MD, MBA, MHS

Guiding Principles for Development

- **Simplicity and accessibility**
  - Summarize overall hospital quality in a single star rating
  - Convey evidence-based 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 that maximize information available in existing data
- **Engage stakeholders**
  - Use multiple channels of engagement from start to finish
- **Consistency**
  - Align as much as possible with other *Compare* sites for star ratings display;
  - Allow for consistency in approach to measure selection with existing CMS programs and *Hospital Compare* over time

Stakeholder Engagement



Key Considerations

- Star ratings will only reflect quality assessed by current measures on *Hospital Compare*
  - Star ratings will evolve as measures are added and removed
  - Existing measures may not capture "all" of hospital quality
- Current public reporting requirements result in heterogeneity in the number and types of measures reported by different hospitals

Star Ratings Development Steps

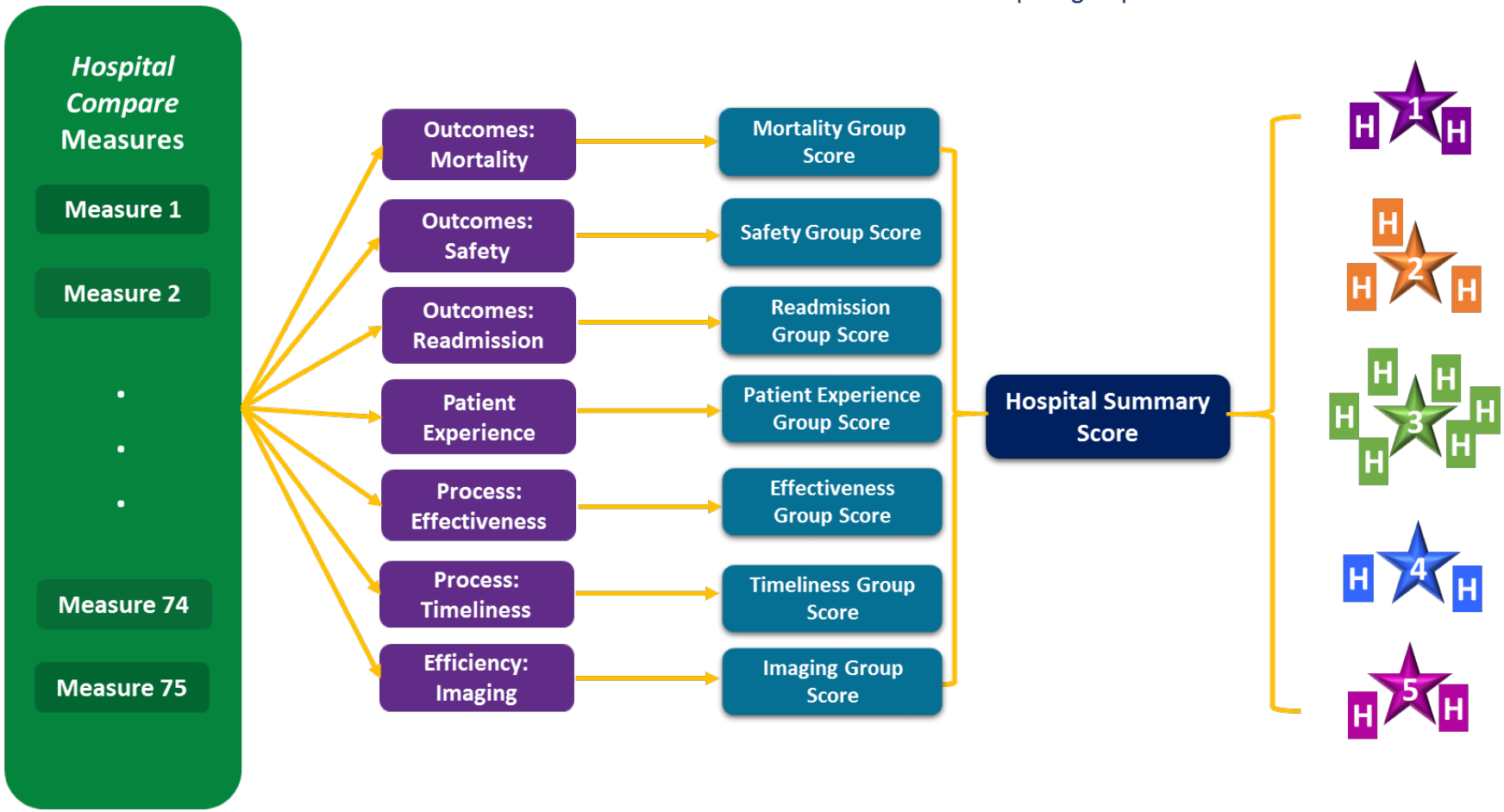
Step 1: Select Measures
Apply measure selection criteria each quarter

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

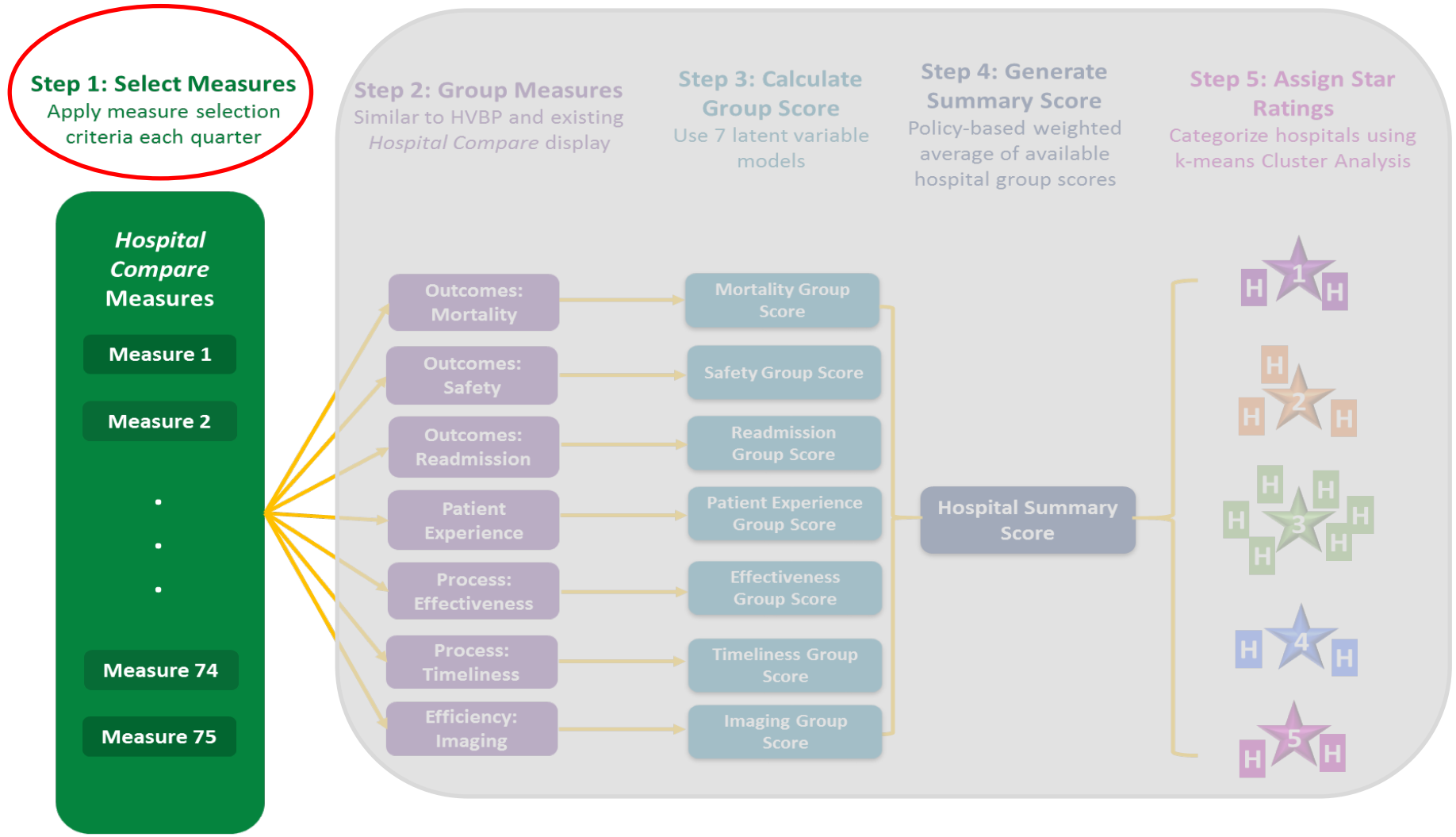
Step 3: Calculate Group Score
Use 7 latent variable models

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

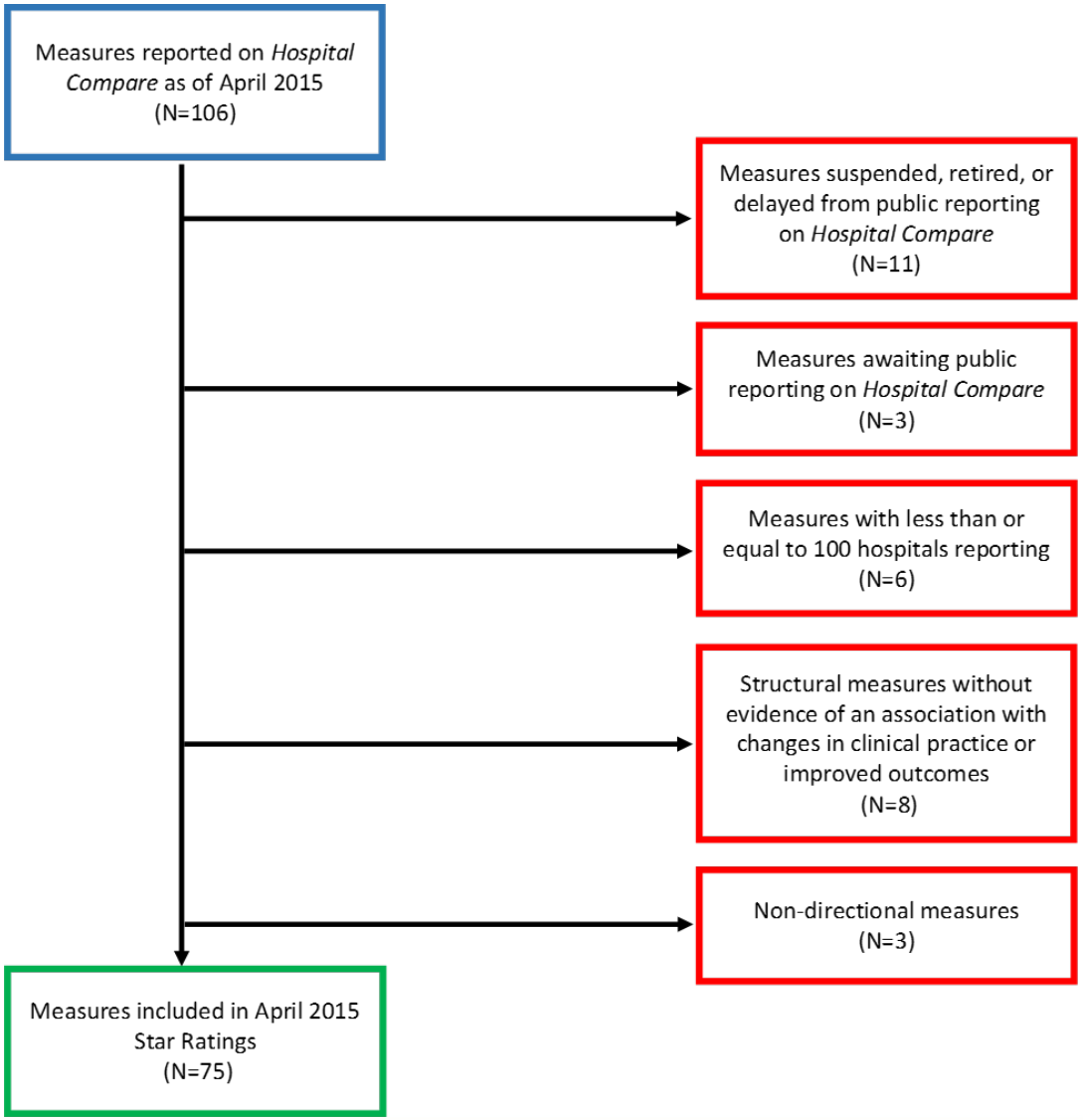
Step 5: Assign Star Ratings
Categorize hospitals using k-means Cluster Analysis



Step 1: Select Measures



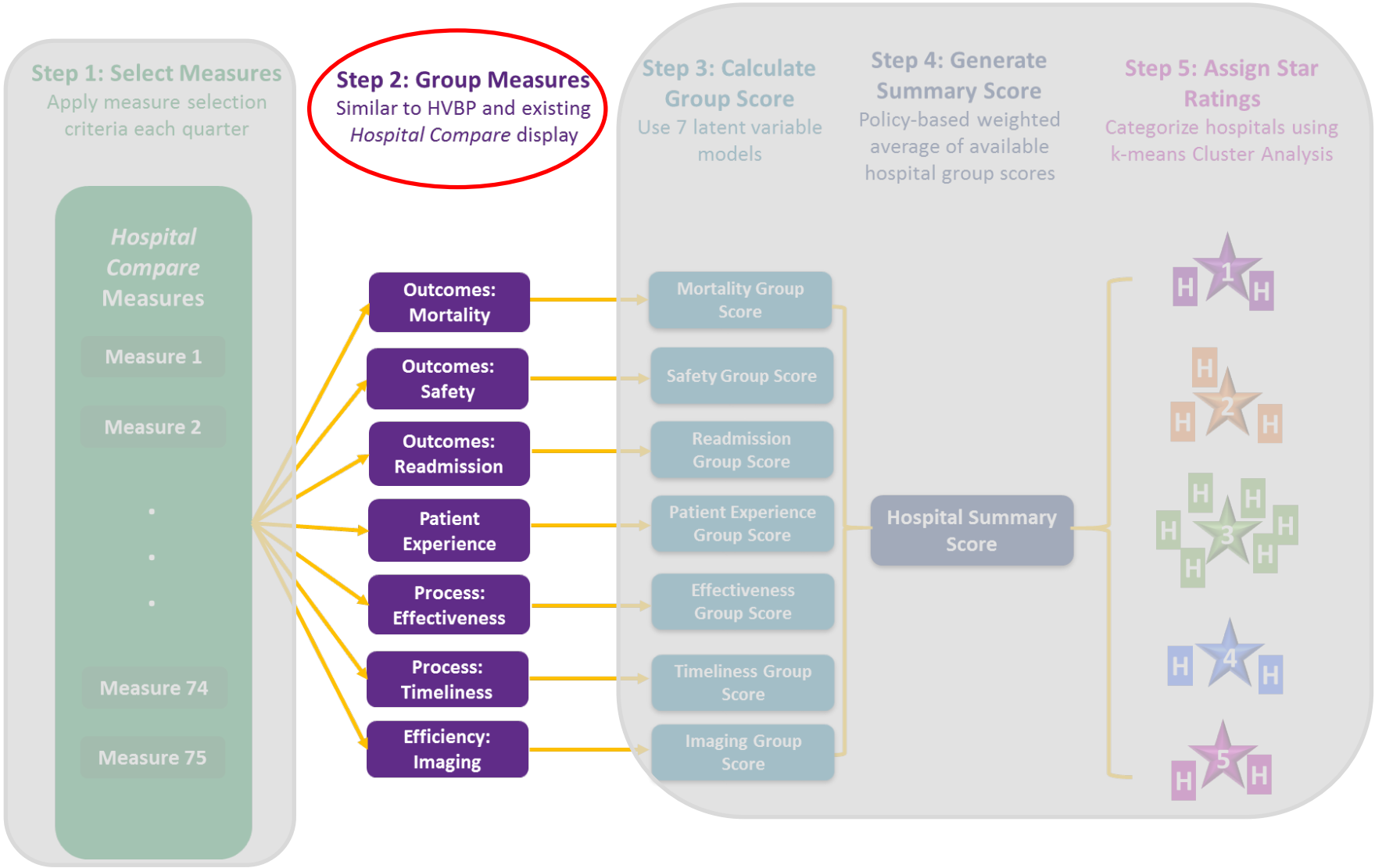
Measure Exclusions for Star Ratings



Step 1: Standardization and Windsorization

- Quality measure results include many different types of scoring information (times, percentages, rates)
- Steps of Standardization and Winsorization:
  1) Calculate Z-score so that all measures are on same scale
  2) Flip measure Z score when necessary, so that all measures are in a common direction
  3) 99.75% Winsorization, so that all the measure scores are between [-3,3]
- All have no material impact on hospital measurement

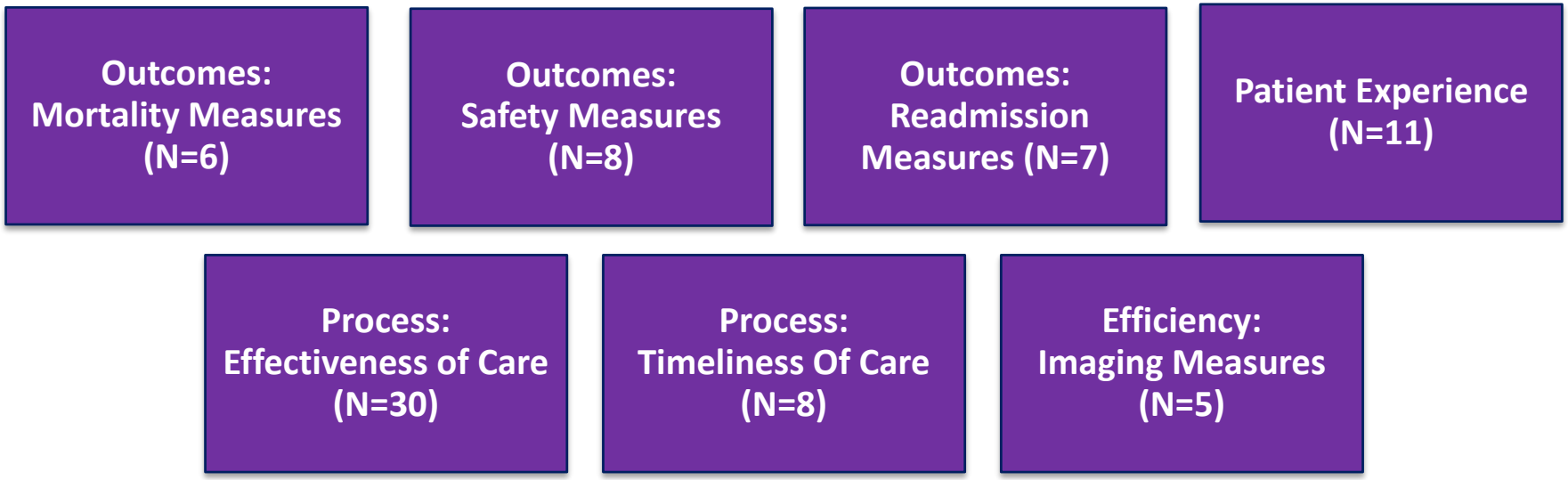
Step 2: Group Measures



Step 2: Measure Grouping

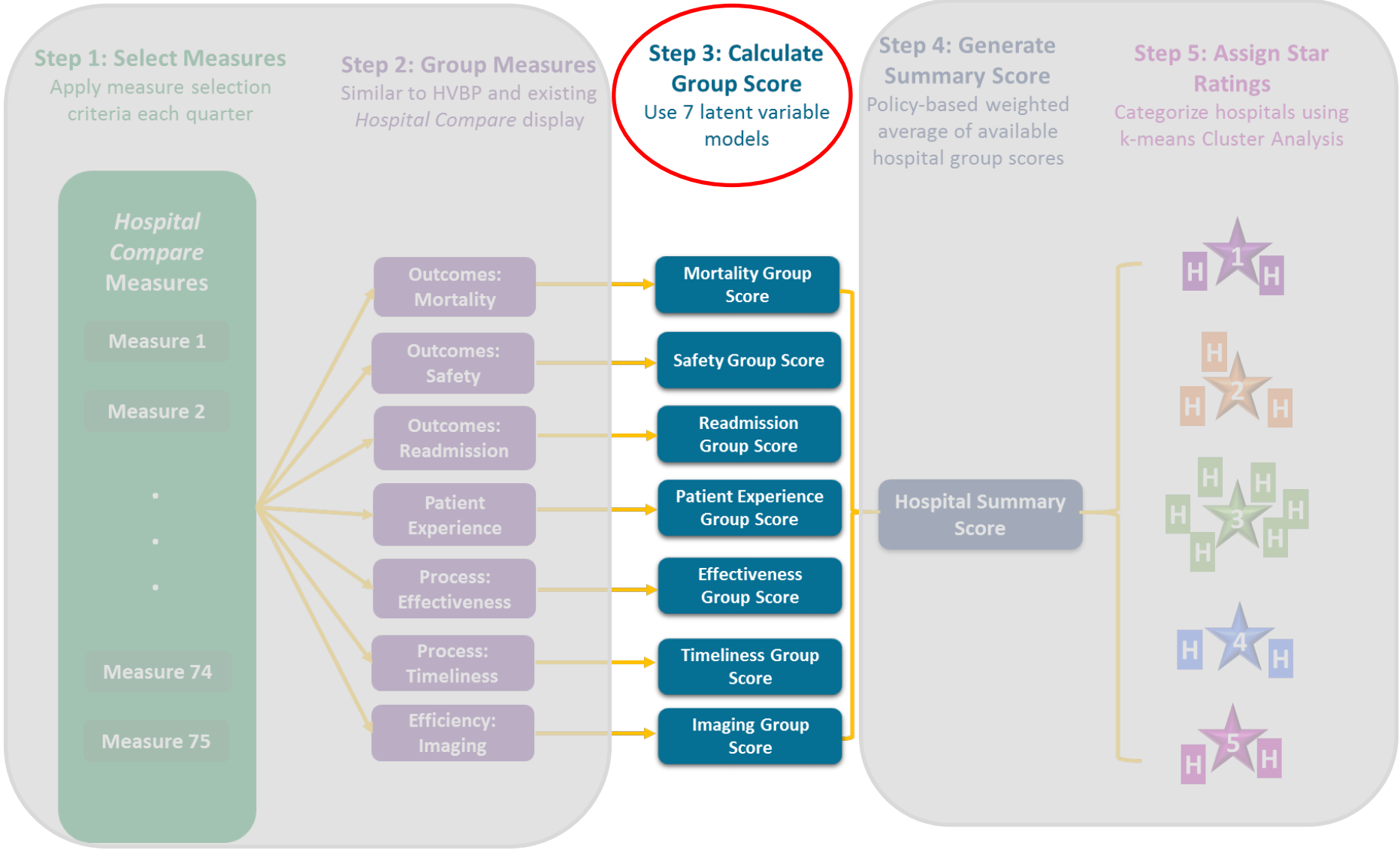
- Hospital quality is represented by several dimensions
- The seven measure groups are aligned with:
  - The Hospital Value-Based Purchasing (HVBP) Program
  - Current categories on *Hospital Compare*
  - Other national quality initiatives
- Measure groups are clinically reasonable
- The proposed groups will allow for future measure to be added and removed from star ratings

Step 2: Measure Grouping



Note: Measure groups based on April 2015 Hospital Compare data

Step 3: Calculate Group Score



Step 3: Latent Variable Models (LVM) for Measure Groups

- LVM is an analytical approach that seeks to measure dimensions of quality (for example, overall hospital safety) that cannot be measured directly, but can be estimated based on existing measures.
- One LVM was used to calculate each measure group score.
- LVMs:
  - Accommodate missing information
  - Accommodate diverse hospital reporting patterns
  - Accommodate addition and removal of measures over time
  - Consider the relationship between measures within a measure group.

Step 3: Latent Variable Models for Measure Groups

Advantages	Challenges
1. Method is used for composite measures in healthcare quality literature 2. Accounts for consistency of performance by giving more importance to measure more highly correlated within measure groups 3. Accounts for missing measures by using only available information 4. Accounts for sampling variance in measures	1. Technique may be challenging for patients and consumers to understand 2. Each LVM assumes that each group reflects a distinct aspect of quality 3. Assumes each included measure is a valid indicator of quality

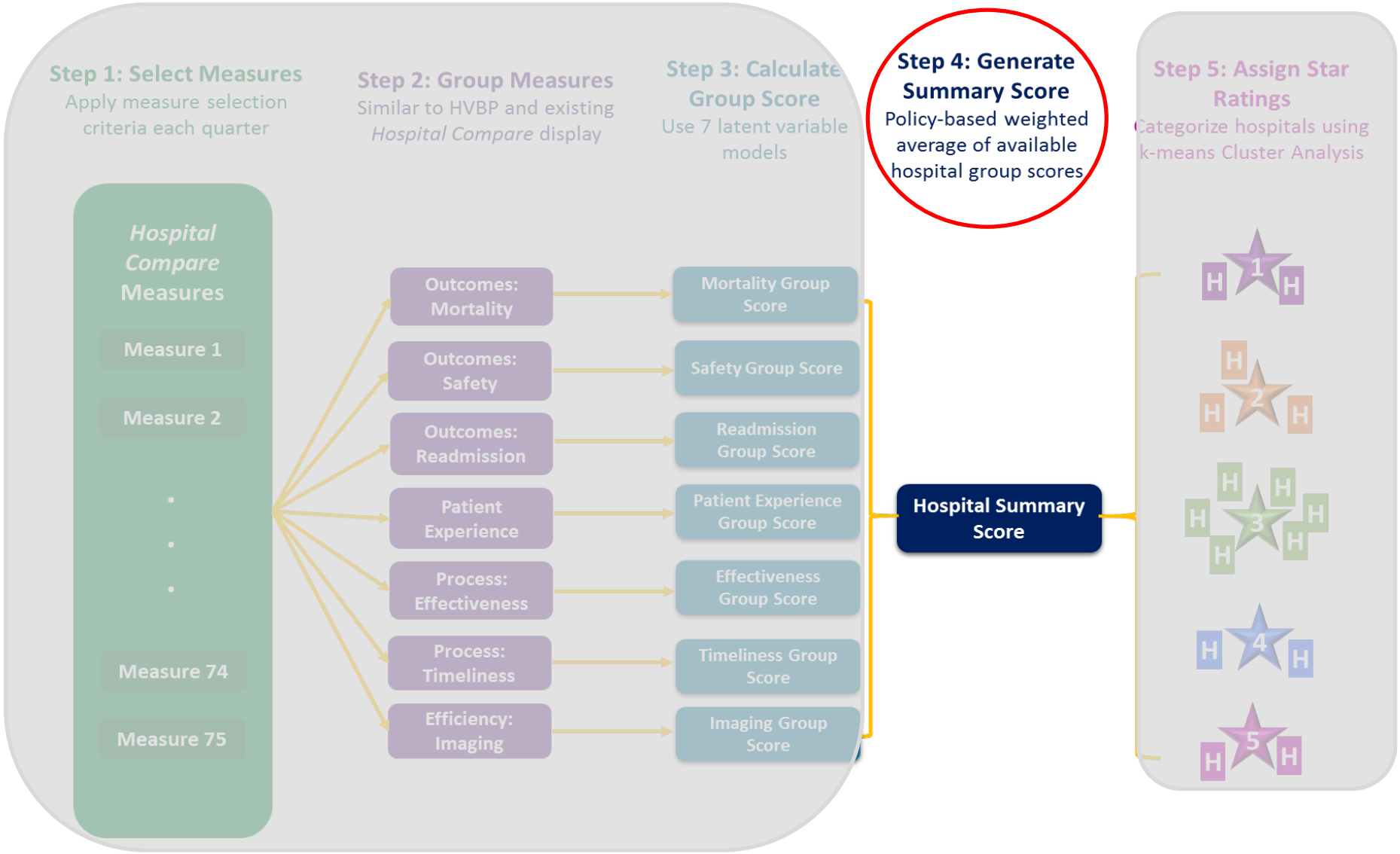
Step 3: Sample Variation

- For each measure, each hospital may report different numbers of cases
- The 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: Measure Loadings

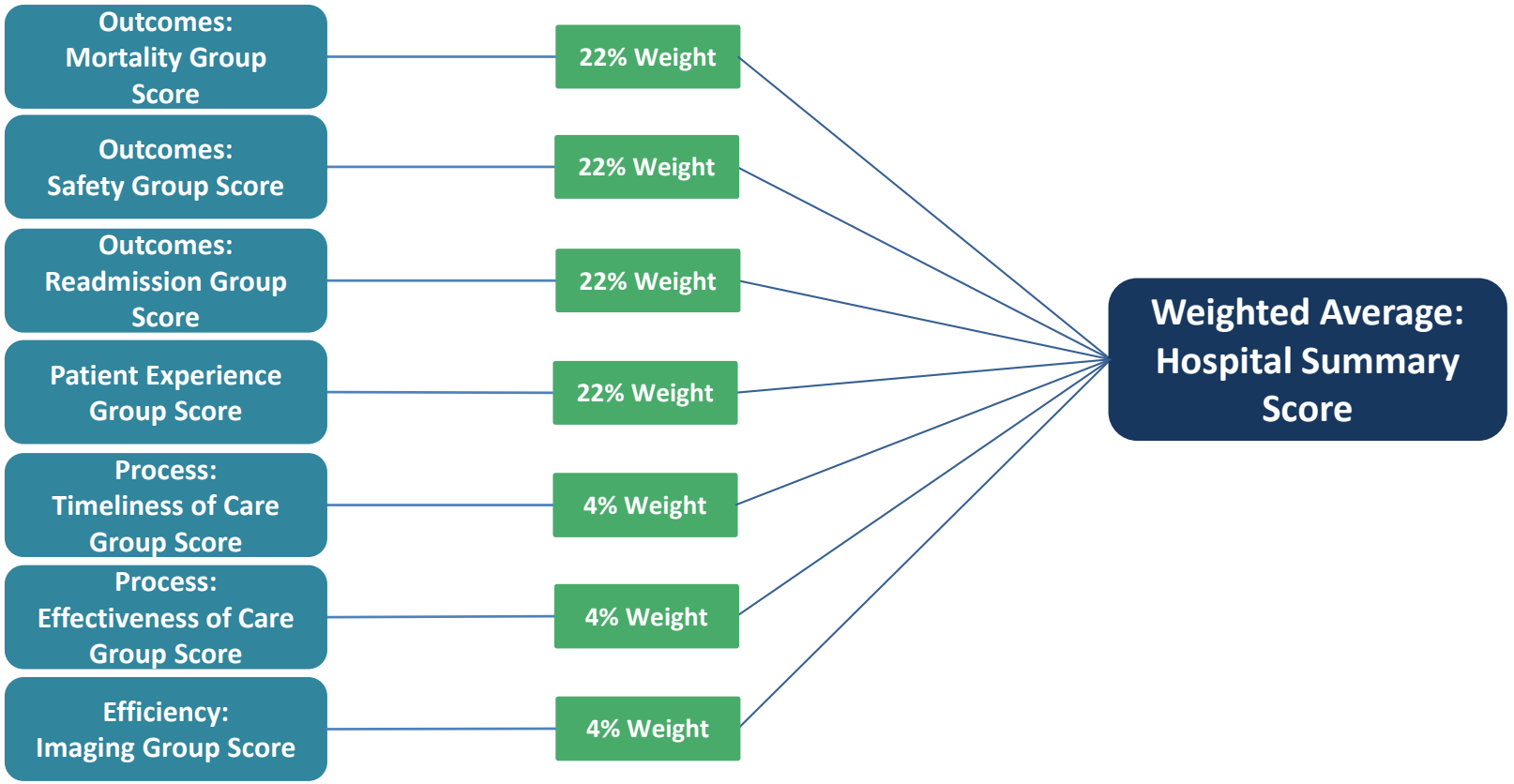
- The LVM estimates a “loading” for each measure in a group that is associated with the hospital-specific group score
  - This is the extent of the measure’s association to the group score (latent aspect of quality) relative to the other measures included in the group.
  - A measure’s loading is the same across all hospitals.
  - Measures with higher loadings are more strongly associated with the group score.
  - Large measure loadings do not directly imply that only a few measures “matter” towards a group score.

Step 4: Generate Summary Score



Step 4: Calculating a Hospital Summary Score

- Hospital Summary Scores are calculated by using a weighted average of the 7 measure group scores
  - Weights based on CMS Hospital Value-Based Purchasing program



Step 4: Policy-Based Weighting for Measure Groups

- The following criteria were used to determine appropriate weighting:
  - Measure Importance
  - Consistency
  - Policy Priorities
  - Stakeholder Input
- The development team conducted a survey of the TEP to inform weighting of the measure type groups

Step 4: Policy-Based Weighting for Measure Groups

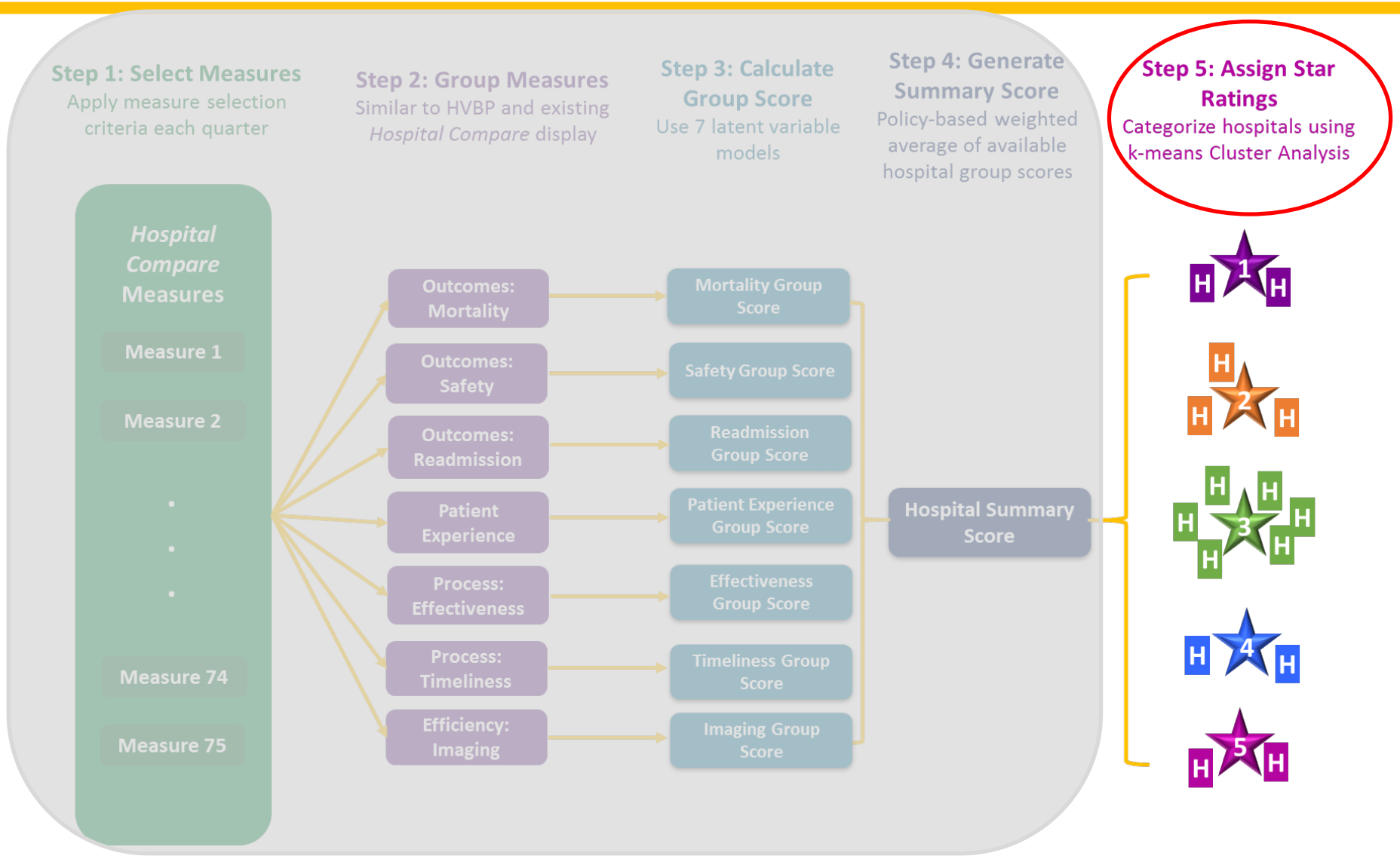
- Methodology requires policy-based weighting to calculate a hospital's summary score from the measure group scores

Measure Group	FY17 HVBP Weight	Dry Run Proposed Weight
Outcomes – Mortality (N=6)	25%	22%
Outcomes – Safety (N=8)	20%	22%
Outcomes – Readmission (N=7)	---	22%
Patient Experience (N=11)	25%	22%
Process – Effectiveness (N=30)	5%	4%
Process – Timeliness (N=8)	---	4%
Efficiency – Imaging (N=5)	---	4%
Efficiency – Cost	25%	---

Step 4: 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”
- The development team recommends using the same approach as the HVBP program for missing groups
  - Redistribute weight to non-missing measure groups

Step 5: Assign Star Ratings



Step 5: Translating into Star Ratings

- The Hospital Summary Scores are then used to calculate a star rating for each hospital using k-Means Clustering
  - This is determined by the sum of the square of distance between hospital's summary score

Star	Description
	**Cluster of hospitals with the highest summary scores**
	**Cluster of hospitals with higher than average summary scores**
	**Cluster of hospitals with average summary scores**
	**Cluster of hospitals with below average summary scores**
	**Cluster of hospitals with lowest summary scores**

Step 5: Translating into Star Ratings

Advantages	Challenges
1. Designates five "means" for five star categories within the distribution of Hospital Summary Scores 2. Hospitals in a cluster will have similar summary scores 3. Approach produces a slightly broader distribution of star ratings 4. Testing showed significant differences for most measure group scores between each star rating category	1. Majority of hospitals will fall into the three-star cluster 2. This approach could be difficult for patients and consumers to understand

Step 5: Translating into Star Ratings

Rating	Frequency (Number of Hospitals)	Percentage of Hospitals
	17	0.1%
	528	14.2%
	2615	70.5%
	544	14.7%
	5	0.1%

Star Ratings Thresholds

- Some hospitals may report fewer individual measures
  - Summary scores calculated with fewer individual measures might have less reliability and face validity
- The development team recommended setting a minimum reporting threshold, similar to HVBP, based on reliability calculations and face validity:
  - At least three of the seven measure groups (at least one being an outcome group)
  - At least three measures in a measure group

Star Ratings Thresholds

- Relationship between measure reporting thresholds and number of hospitals assigned a star rating

	Minimum Measure Groups					
Minimum Measures	**2**	**3**	**4**	**5**	**6**	**7**
1	4,617 (97%)	4,330 (91%)	3,958 (83%)	3,713 (78%)	3,353 (71%)	3,009 (63%)
2	4,329 (91%)	4,020 (85%)	3,639 (77%)	3,319 (70%)	3,061 (64%)	2,789 (59%)
3	3,988 (84%)	3,709 (78%)	3,307 (70%)	3,044 (64%)	2,845 (60%)	2,411 (51%)
4	3,499 (74%)	3,277 (69%)	3,036 (64%)	2,801 (59%)	2,481 (52%)	1,831 (39%)

Dry Run Timeline and Resources

- The star ratings dry run extends from July 17th to August 17th, 2015
- During that time, stakeholders may send questions or comments to cmsstarratings@lantanagroup.com
- Resources for star ratings can be found on www.QualityNet.org

Please do not include any personal health information (PHI) in any comments or questions

Public Comment

- CMS is holding a public comment period concurrent with the dry run from July 17th to August 17th, 2015
- Stakeholders are encouraged to provide feedback by visiting the CMS Quality Measures Public Comment Page at www.cms.gov

Please do not include any personal health information (PHI) in any comments or questions

Question & Answer Session

Resources

- Hospital Compare
- QualityNet

Acronyms in this Presentation

- LVM: Latent Variable Model
- TEP: Technical Expert Panel

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