Hospital-Acquired Condition (HAC) Reduction Program: Scoring Methodology

CMS CENTERS FOR MEDICARE & MEDICAID SERVICES

STEP 1

CALCULATION OF MEASURE RESULTS:

a **CMS PSI 90 measure:**

CMS evaluates hospital performance using the CMS Patient Safety and Adverse Events Composite (CMS PSI 90) composite value, which is a weighted average of the smoothed rates (as in, the risk- and reliability- adjusted rates) of the 10 component PSI measures.

b **HAI measures:**

For each measure, the Centers for Disease Control and Prevention (CDC) evaluates hospital performance using a standardized infection ratio (SIR), calculated as the ratio of a hospital's observed healthcare-associated infections (HAIs) to its predicted HAIs. CDC determines predicted HAIs for each measure using a risk-adjustment process, based on hospital information submitted to the National Healthcare Safety Network (NHSN).

STEP 2

WINSORIZATION:[a]

**Limit the distribution of measure results at the 5th and 95th percentiles to reduce outliers.**

a Hospitals with a measure result between the minimum and the 5th percentile will receive the 5th percentile value for the measure.

b Hospitals with a measure result between the 95th percentile and the maximum will receive the 95th percentile value for the measure.

c Hospitals with a measure result between the 5th and 95th percentile will receive the hospital's measure result.

[a] CMS includes all subsection (d) hospitals (that is, general acute care hospitals paid under the Inpatient Prospective Payment System), including Maryland hospitals, that have measure results when determining the 5th and 95th percentiles.

> "Measure results" are the composite value for the CMS PSI 90 measure and the standardized infection ratio for CLABSI, CAUTI, SSI, MRSA, and CDI.

Examples of Winsorized measure calculations:

Hospital A's SSI measure result of 2.795 is greater than the 95th percentile SSI measure value of 2.353; therefore, Hospital A's Winsorized SSI measure result will equal the 95th percentile value of 2.353.

Hospital A's SSI measure result = 2.795

| 5th (0) | 95th (2.353) |

Hospital A's Winsorized SSI measure result = 2.353
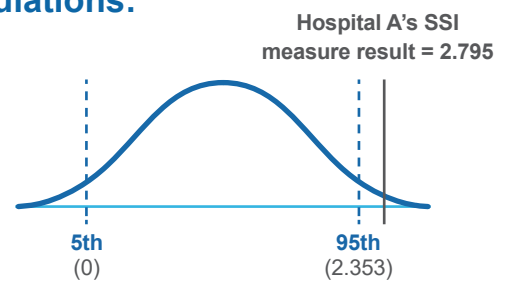
Hospital A's CDI measure result is between the 5th and 95th percentile values for this measure; therefore, Hospital A's Winsorized measure result will equal the hospital's measure result for the CDI measure.[b]

Hospital A's CDI measure result = 0.919

| 5th (0) | 95th (1.639) |

Hospital A's Winsorized CDI measure result = 0.919
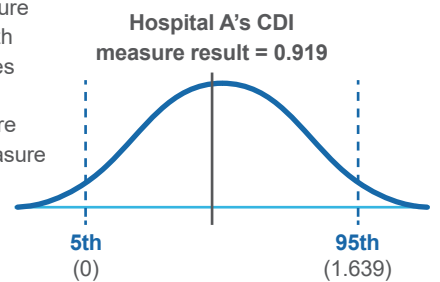
[b] Hospital A's CMS PSI 90, CLABSI, CAUTI, and MRSA measure results are also between the 5th and 95th percentile values.

STEP 3

MEASURE SCORES:

Calculate Winsorized z-scores based on Winsorized measure results.[c]

a **Mean of Winsorized measure results $\overline{x}$, calculated across subsection (d) hospitals with a measure result:**

$$\overline{x} = \left(\frac{1}{n}\right)\sum_{i=1}^{n} x_i$$

where n includes all eligible hospitals with a measure result, and x_i is the Winsorized measure result of a specific eligible hospital, and Σ is the summation of Winsorized measure results (x_i) across all eligible hospitals (n).

b **Standard deviation of Winsorized measure results, s, calculated across subsection (d) hospitals with a measure result:**

$$s = \sqrt{\left(\frac{1}{n-1}\right)\sum_{i=1}^{n}(x_i - \overline{x})^2}$$

where n includes all eligible hospitals with a measure result, x_i is the hospital's Winsorized measure result, and $\overline{x}$ is the mean of Winsorized measure results across all eligible hospitals with a measure result.

c **Winsorized z-score for each hospital**

$$Z = \frac{x_i - \overline{x}}{s}$$

where x_i is hospital's Winsorized measure result, $\overline{x}$ is the mean Winsorized measure result calculated across all eligible hospitals with a measure result, and s is the standard deviation of Winsorized measure results calculated across all eligible hospitals with a measure result.

> Negative Winsorized z-scores indicate better performance. Positive Winsorized z-scores indicate worse performance.

Examples of Winsorized z-score calculations:

Hospital A's Winsorized CMS PSI 90 z-score:

$$\frac{0.8485 - 0.8885}{0.1178} = -0.3396$$

Hospital A's Winsorized CLABSI z-score:

$$\frac{0.922 - 1.048}{0.1637} = -0.7697$$

Hospital A's Winsorized CAUTI z-score:

$$\frac{0.112 - 0.998}{0.4801} = -1.8454$$

Hospital A's Winsorized SSI z-score:

$$\frac{2.353 - 0.965}{0.7127} = 1.9475$$

Hospital A's Winsorized MRSA z-score:

$$\frac{1.366 - 1.001}{0.5138} = 0.7104$$

Hospital A's Winsorized CDI z-score:

$$\frac{0.919 - 0.979}{0.3484} = -0.1722$$

[c] When calculating the measure means and standard deviations, CMS includes all subsection (d) hospitals that have measure results, including Maryland hospitals.

Hypothetical calculations for Hospital A using Winsorized *z*-score approach*

Table 1: Hospital A's measure results, Winsorized measure results, and Winsorized *z*-scores

Measure **	Measure result	5th percentile **	95th percentile **	Winsorized measure result	Mean **	Standard deviation **	Winsorized *z*-score
CMS PSI 90	0.8485	0.6537	1.2977	0.8485	0.8885	0.1178	-0.3396
CLABSI	0.922	0	1.375	0.922	1.048	0.1637	-0.7697
CAUTI	0.112	0	1.808	0.112	0.998	0.4801	-1.8454
SSI	2.795	0	2.353	2.353 ***	0.965	0.7127	1.9475
MRSA	1.366	0	2.142	1.366	1.001	0.5138	0.7104
CDI	0.919	0	1.639	0.919	0.979	0.3484	-0.1722

*Hypothetical values for illustrative purposes; not based on real data.
** Calculated across all subsection (d) hospitals, including Maryland hospitals, that have a measure result for the given measure.
*** This number is the Winsorized measure result that differs from the measure result (that is, a measure result that is below the 5th percentile or above the 95th percentile).

STEP 4

EQUAL MEASURE WEIGHTS:

The Equal Measure Weights approach applies an equal weight to each measure for which a hospital has a measure score.

CMS finalized the adoption of the Equal Measure Weights approach starting in fiscal year 2020.

a Hospital A has measure scores for all six measures. CMS would apply a weight of 16.7 percent to each measure for Hospital A.[d]

Number of measures with a Winsorized *z*-score	Weight applied to each Winsorized *z*-score
0	n. a.
1	100.0%
2	50.0%
3	33.3%
4	25.0%
5	20.0%
6	16.7%

b For each measure, CMS calculates the measure's contribution to the Total HAC Score as the measure score multiplied by the measure weight.

Examples of calculating contributions to Total HAC Score

Hospital A's **CMS PSI 90** contribution:

-0.3396 x 0.167 = **-0.0566**

Hospital A's **CLABSI** contribution:

-0.7697 x 0.167 = **-0.1283**

Hospital A's **CAUTI** contribution:

-1.8454 x 0.167 = **-0.3076**

Hospital A's **SSI** contribution:

1.9475 x 0.167 = **0.3246**

Hospital A's **MRSA** contribution:

0.7104 x 0.167 = **0.1184**

Hospital A's **CDI** contribution:

-0.1722 x 0.167 = **-0.0287**

[d] CMS uses unrounded measure weights (for example, 1/6) when calculating each measure's contribution to the Total HAC Score. Measure weights are rounded to three decimal places, as shown in the graphic.

STEP 5

TOTAL HAC SCORE:

CMS calculates each hospital's Total HAC Score as the sum of the hospital's contribution to Total HAC Score value for each measure (see Step 4b).

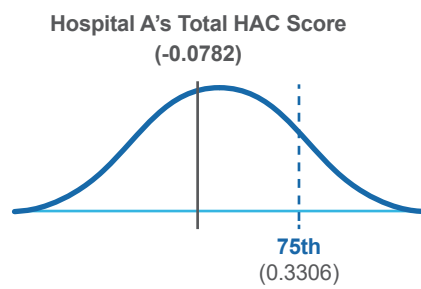### Example of Total HAC Score calculation:

Hospital A's Total HAC Score equals

(-0.0566 + -0.1283 + -0.3076 + 0.3246 + 0.1184 + -0.0287) = **-0.0782**
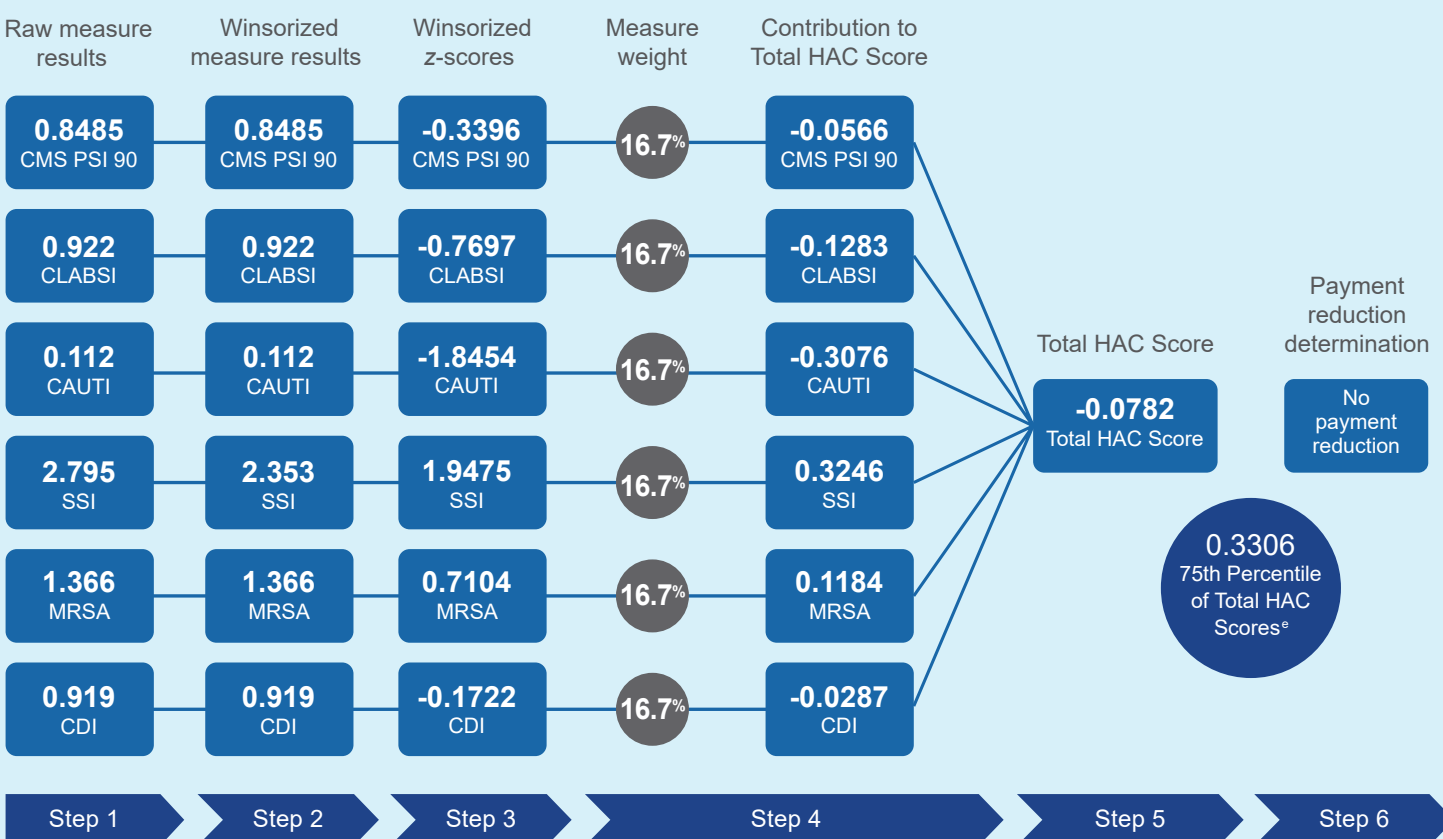
STEP 6

DETERMINE WORST-PERFORMING QUARTILE STATUS:

Hospitals with a Total HAC Score greater than the 75th percentile will be in the worst-performing quartile and will receive a 1-percent payment reduction.[e]

Hospital A's Total HAC Score (-0.0782)

75th (0.3306)

Hospital A's Total HAC Score is less than the 75th percentile, and thus it is not in the worst-performing quartile.

Example of calculating Hospital A's results using Equal Measure Weights and Winsorized *z*-scores:

Raw measure results	Winsorized measure results	Winsorized *z*-scores	Measure weight	Contribution to Total HAC Score
0.8485 CMS PSI 90	0.8485 CMS PSI 90	-0.3396 CMS PSI 90	16.7%	-0.0566 CMS PSI 90
0.922 CLABSI	0.922 CLABSI	-0.7697 CLABSI	16.7%	-0.1283 CLABSI
0.112 CAUTI	0.112 CAUTI	-1.8454 CAUTI	16.7%	-0.3076 CAUTI
2.795 SSI	2.353 SSI	1.9475 SSI	16.7%	0.3246 SSI
1.366 MRSA	1.366 MRSA	0.7104 MRSA	16.7%	0.1184 MRSA
0.919 CDI	0.919 CDI	-0.1722 CDI	16.7%	-0.0287 CDI

Total HAC Score

-0.0782 Total HAC Score

0.3306 75th Percentile of Total HAC Scores[e]

Payment reduction determination

No payment reduction

Step 1 → Step 2 → Step 3 → Step 4 → Step 5 → Step 6

[e] CMS includes all non-Maryland subsection (d) hospitals with a Total HAC Score in its calculation of the 75th percentile.

The HAC Reduction Program includes the following measures: CMS Patient Safety and Adverse Events Composite (CMS PSI 90), Central Line-Associated Bloodstream Infection (CLABSI), Catheter-Associated Urinary Tract Infection (CAUTI), Colon and Abdominal Hysterectomy Surgical Site Infection (SSI), Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia, and *Clostridium difficile* Infection (CDI).

Note: The numbers used in this infographic are hypothetical values that are not based on real data. Replication of some results might not be possible because of rounding.

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