

**State of Maryland  
Department of Health**

**Nelson J. Sabatini  
Chairman**

**Joseph Antos, PhD  
Vice-Chairman**

**Victoria W. Bayless**

**James N. Elliott, M.D.**

**John M. Colmers**

**Adam Kane**

**Jack C. Keane**



**Health Services Cost Review Commission**

4160 Patterson Avenue, Baltimore, Maryland 21215  
Phone: 410-764-2605 · Fax: 410-358-6217  
Toll Free: 1-888-287-3229  
hsrc.maryland.gov

**Katie Wunderlich  
Executive Director**

**Allan Pack, Director  
Population Based  
Methodologies**

**Chris Peterson, Director  
Clinical & Financial  
Information**

**Gerard J. Schmith, Director  
Revenue & Regulation  
Compliance**

**William Henderson, Director  
Medical Economics &  
Data Analytics**

To: Hospital CFOs

Cc: Case Mix Liaisons; Quality Liaisons

From: Alyson Schuster, Deputy Director of Quality Methodologies

Date: April 8, 2019

Re: Rate Year 2021 Maryland Hospital Acquired Conditions (MHAC) Program

---

On March 13, 2019, the Commission approved the staff recommendations to modify the Maryland Hospital Acquired Conditions (MHAC) program for Rate Year (RY) 2021. This memo summarizes the changes to the RY 2021 program, which will be applied to the CY 2019 performance period. The HSCRC staff appreciates all of the effort of the Clinical Adverse Events (CAEM) Subgroup, Performance Measurement Workgroup (PMWG), and other stakeholders to overhaul the MHAC program for RY 2021.

Below are the specific recommendations approved in the RY 2021 MHAC policy:

- I. Continue to use 3M Potentially Preventable Complications (PPCs) to assess hospital-acquired complications.
  - A. Include focused list of PPCs in payment program that are clinically recommended and that generally have higher statewide rates and variation across hospitals.
  - B. Monitor all PPCs and provide reports for hospitals and other stakeholders.
  - C. Explore development of national benchmarks for PPCs in future years.
- II. Assess hospital performance on attainment only using a wider and more continuous performance range to better differentiate hospital performance, rewarding high attainment but also incentivizing improvement.
- III. Weight the PPCs in payment program by 3M cost weights as a proxy for patient harm.
- IV. Convert weighted PPC scores to revenue adjustments using a prospective revenue adjustment scale with a maximum penalty at 2 percent and maximum reward at 2 percent and continuous linear scaling with a hold harmless zone between 60 and 70 percent.

## **RY 2021 Payment Program Potentially Preventable Complication Measures**

During calendar year 2018, staff convened the CAEM Subgroup of experts to consider options and suggest updates to the MHAC program under the new Total Cost of Care model. The Subgroup recommended continuing to use the 3M Potentially Preventable Complications (PPCs), but reducing the number of measures from over forty to the fourteen listed in the table below, based upon the following criteria developed by the Subgroup:

- Applicable to all patients, regardless of payer;
- Clinically significant/important;
- Relatively high incidence/statewide rate;
- Opportunity for improvement, and;
- Hospital variation in performance.

Please note that the HSCRC will provide hospitals with data on all PPCs and will continue to monitor those not included in the MHAC payment program.

<b>Payment Program Potentially Preventable Complications for CY2019</b>	
<b>PPC NUMBER</b>	<b>PPC Description</b>
<b>3</b>	<b>Acute Pulmonary Edema and Respiratory Failure without Ventilation</b>
<b>4</b>	<b>Acute Pulmonary Edema and Respiratory Failure with Ventilation</b>
<b>7</b>	<b>Pulmonary Embolism</b>
<b>9</b>	<b>Shock</b>
<b>16</b>	<b>Venous Thrombosis</b>
<b>28</b>	<b>In-Hospital Trauma and Fractures</b>
<b>35</b>	<b>Septicemia &amp; Severe Infections</b>
<b>37</b>	<b>Post-Operative Infection &amp; Deep Wound Disruption Without Procedure</b>
<b>41</b>	<b>Post-Operative Hemorrhage &amp; Hematoma with Hemorrhage Control Procedure or I&amp;D Proc</b>
<b>42</b>	<b>Accidental Puncture/Laceration During Invasive Procedure</b>
<b>49</b>	<b>Iatrogenic Pneumothrax</b>
<b>60</b>	<b>Major Puerperal Infection and Other Major Obstetric Complications</b>
<b>61</b>	<b>Other Complications of Obstetrical Surgical &amp; Perineal Wounds</b>
<b>67</b>	<b>Pneumonia Combo (PPC 5 Pneumonia &amp; Other Lung Infections &amp; PPC 6 Aspiration Pneumonia)</b>

### **Performance Assessment: Attainment Only**

As proposed by the CAEM Subgroup and PMWG, the Commission approved moving from a methodology that assessed both improvement and attainment, to a methodology that assesses attainment only. The revised attainment only methodology uses the same point-based system for converting PPC results to standardized scores as the old MHAC program, but changed how the performance standards (thresholds and benchmarks) are set, and expands the score range to 0 to 100 (previously it was 0 to 10). These changes were designed to better differentiate hospital performance and ensure that there were still incentives for improvement. For reference, Appendix A provides the details on the revised RY 2021 MHAC methodology.

### **3M PPC Weights**

Previously, the MHAC methodology placed PPCs into two tiers to emphasize the more significant PPCs. Under the revised methodology, the Commission approved weighting the 14 PPCs differentially using 3M cost weights as a proxy for degree of patient harm. Currently, older ICD-9 weights are used for all modeling in the policy and will be used for the initial reports provided to hospitals. We have just received updated 3M cost weights under ICD-10 and are evaluating them with stakeholders for clinical face validity and to assess the impact on the modeling that was presented in the approved policy. HSCRC staff plans to finalize the decision on weighting and will update reporting as needed for the May reporting cycle.

### **Scaling Methodology and Revenue At-Risk**

The preset scale for RY 2021 was modified to account for the higher scores under the new scoring methodology and to increase potential rewards from 1 percent to 2 percent of inpatient revenue. The RY 2021 scale uses a full distribution of potential scores (scale of 0-100%), with a hold harmless zone between 60 and 70 percent. The maximum penalty remains at 2 percent, and the maximum reward is increased to 2 percent. The preset scale is included in Appendix B of this memorandum.

### **Performance Standards and Payment Program Performance Periods**

For RY 2021, two years of data (fiscal year 2017 and 2018) is used to establish the normative values that are used to calculate a hospital's expected PPC rate, and to determine the threshold and benchmark for scoring hospital performance. The change to using two years of data was implemented to reduce the number of diagnosis and severity of illness levels with a statewide expected value of zero. The change increases expected values overall, and gives hospitals credit for historical improvement. The performance period for assessing attainment will be CY 2019.

An excel workbook with program details (i.e., thresholds and benchmarks, normative values, hospital PPC exclusions, 3M cost weights, modeling of hospital scores, and monitoring PPCs) is being distributed by email with this memo and will be provided as part of the monthly summary reports posted on the [CRISP Reporting Services portal](#).

### **Grouper Version and Software Revision**

PPC and APR-DRG software version 36 (CGS: 2018.3.2) will be used for the RY 2021 base period and performance period.

### **MHAC Program Reporting through CRISP Reporting Services (CRS) Portal**

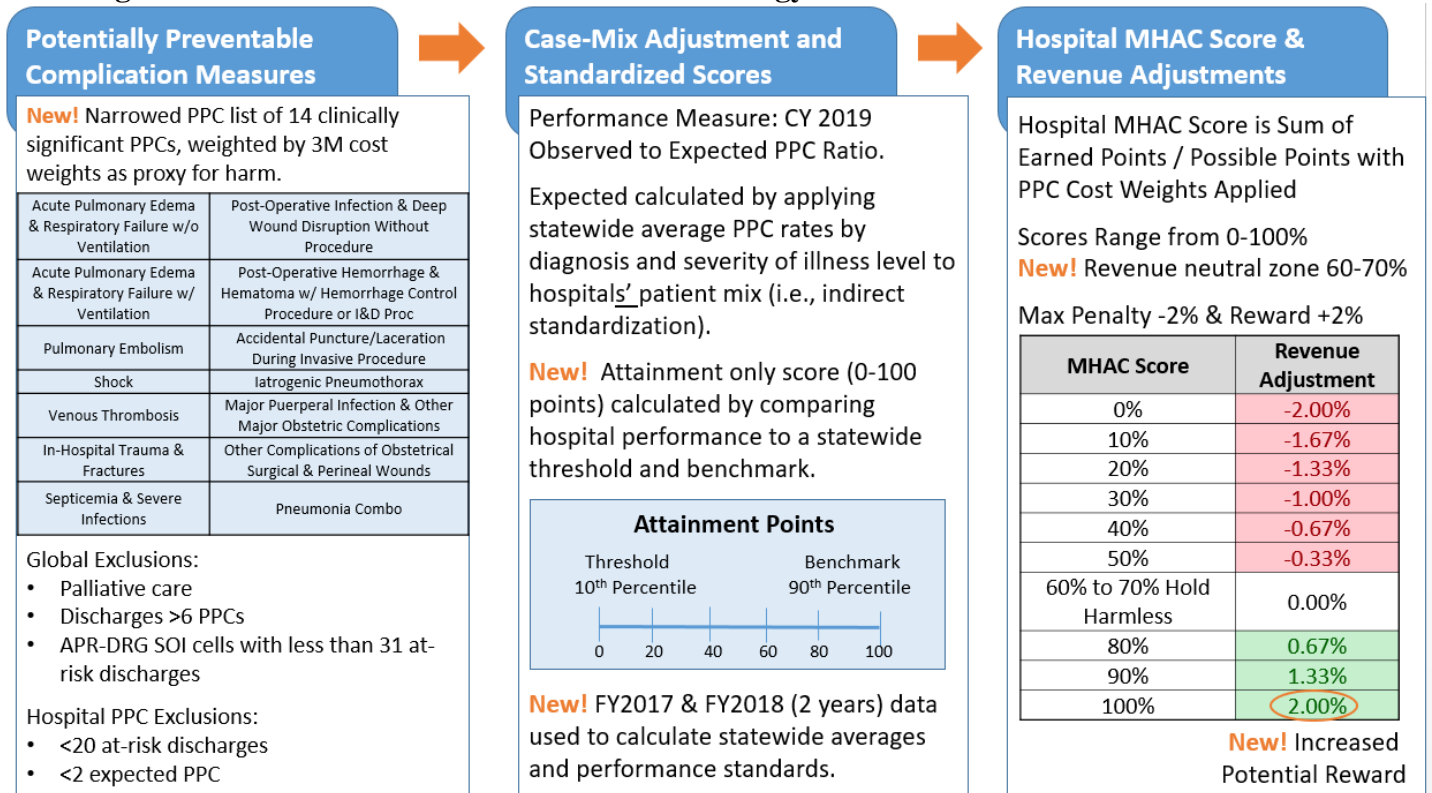
All MHAC summary reports and case-level data will continue to be made available to hospitals/health systems through the CRS portal. Most hospital contacts may access the summary report, and a more limited number of hospital contacts may access the case-level detail that contains PHI. For access to the [CRS portal](#), contact [support@crisphealth.org](mailto:support@crisphealth.org).

If you have any questions, please email [hsrc.quality@maryland.gov](mailto:hsrc.quality@maryland.gov) or call Alyson Schuster at 410-764-2673.

## Appendix A: RY 2021 MHAC Methodology

Figure 1 below provides a summary overview of the RY 2021 MHAC methodology, highlighting the new components.

**Figure 1. Overview of RY 2021 MHAC Methodology**



### Performance Metric

The methodology for the MHAC program measures hospital performance using the Observed (O) /Expected (E) ratio for each PPC. Expected number of PPCs are calculated using historical data on statewide PPC rates by All Patient Refined Diagnosis Related Group and Severity of Illness Level (APR-DRG SOI). See below for details on how expected number of PPCs are calculated for each hospital.

### Observed and Expected PPC Values

The MHAC scores are calculated using the ratio of *Observed* : *Expected* PPC values.

Given a hospital's unique mix of patients, as defined by APR-DRG category and Severity of Illness (SOI) level, the HSCRC calculates the hospital's expected PPC value, which is the number of PPCs the hospital would have experienced if its PPC rate were identical to that experienced by a normative set of hospitals.

The expected number of PPCs is calculated using a technique called indirect standardization. For

illustrative purposes, assume that every hospital discharge is considered “at-risk” for a PPC, meaning that all discharges would meet the criteria for inclusion in the MHAC program. All discharges will either have no PPCs, or will have one or more PPCs. In this example, each discharge either has at least one PPC, or does not have a PPC. The unadjusted PPC rate is the percent of discharges that have at least one PPC.

The rates of PPCs in the normative database are calculated for each diagnosis (APR-DRG) category and severity level by dividing the observed number of PPCs by the total number of admissions. The PPC norm for a single diagnosis and severity level is calculated as follows:

Let:

N = norm

P = Number of discharges with one or more PPCs

D = Number of “at-risk” discharges

i = A diagnosis category and severity level

$$N_i = \frac{P_i}{D_i}$$

In the example, each normative value is presented as PPCs per discharge to facilitate the calculations in the example. Most reports will display this number as a rate per one thousand discharges.

Once the normative expected values have been calculated, they can be applied to each hospital. In this example, the normative expected values are computed for one diagnosis category and its four severity levels.

Consider the following example in Figure 2 for an individual diagnosis category.

**Figure 2. Expected Value Computation Example for one Diagnosis Category**

<b>A</b> Severity of illness Level	<b>B</b> At-risk Discharges	<b>C</b> Observed Discharges with PPCs	<b>D</b> PPCs per discharge (unadjusted PPC Rate)	<b>E</b> Normative PPCs per discharge	<b>F</b> Expected # of PPCs	<b>G</b> Observed: Expected Ratio
			= (C / B)	(Calculated from Normative Population)	= (B x E)	= (C / E) rounded to 4 decimal places
1	200	10	.05	.07	14.0	0.7143
2	150	15	.10	.10	15.0	1.0000
3	100	10	.10	.15	15.0	0.6667
4	50	10	.20	.25	12.5	0.8000
<b>Total</b>	500	45	.09		56.5	0.7965

For the diagnosis category, the number of discharges with PPCs is 45, which is the sum of discharges with PPCs (column C). The overall rate of PPCs per discharge in column D, 0.09, is calculated by dividing the total number of discharges with PPCs (sum of column C) by the total number of discharges at risk for PPCs (sum of column B), i.e.,  $0.09 = 45/500$ . From the normative population, the proportion of discharges with PPCs for each SOI level for that diagnosis category is displayed in column E. The expected number of PPCs for each severity level shown in column F is calculated by multiplying the number of at-risk discharges (column B) by the normative PPCs per discharge rate (column E). The total number of PPCs expected for this diagnosis category is the expected number of PPCs for the severity levels.

In this example, the expected number of PPCs for the APR DRG category is 56.5, which is then compared to the observed number of discharges with PPCs (45). Thus, the hospital had 11.5 fewer observed discharges with PPCs than were expected for 500 at-risk discharges in this APR DRG category. This difference can be expressed as a percentage difference as well.

All APR-DRG categories and their SOI levels are included in the computation of the observed and expected rates, except when the APR-DRG SOI level has less than 30 at-risk discharges statewide.

#### PPC Exclusions

Consistent with prior MHAC policies, the number of at-risk discharges is determined prior to the calculation of the normative values (hospitals with <10 at-risk discharges are excluded for a particular PPC) and the normative values are then re-calculated after removing PPCs with <2 complication expected. The following exclusions will also be applied:

For each hospital, discharges will be removed if:

- Discharge is in an APR-DRG SOI cell has less than 31 statewide discharges.
- Discharge has a diagnosis of palliative care (this exclusion may be removed in the future once POA status is available for palliative care for the data used to determine performance standards); and
- Discharge has more than 6 PPCs (i.e., a catastrophic case, for which complications are probably not preventable).

For each hospital, PPCs will be removed if during FY 2017 and FY 2018:

- The number of cases at-risk is less than 20; and
- The expected number of PPCs is less than 2.

The PPCs for which a hospital will be assessed are determined using the FY 2017 and FY 2018 data and not reassessed during the performance period. This is done so that scores can be reliably calculated during the performance period from a pre-determined set of PPCs. The MHAC summary workbooks provide the excluded PPCs for each hospital.

#### Combination PPCs

Based on clinical input and 3M recommendation, in RY 2021 two pneumonia (PPC 5 Pneumonia & Other Lung Infections & PPC 6 Aspiration Pneumonia) PPCs were combined into single pneumonia PPC and the 3M cost weight is a simple average of the two PPC cost weights.

## Hospital Exclusions

For RY 2021, McCready is removed because they do not have sufficient volume to have at least 20 at-risk and 2 expected for any payment program PPC.

## Benchmarks and Thresholds

For each PPC, a threshold and benchmark value is calculated using the FY 2017 and FY 2018 data. In previous rate years when improvement was also assessed, the threshold was set at the statewide median of 1 and the benchmark was the O/E ratio for the top performing hospitals that accounted for 25% of discharges. For RY 2021 under an attainment only methodology, staff adapted the MHAC points system to allow for greater performance differentiation by moving the threshold to the value of the observed to expected ratio at the 10th percentile of hospital performance, moving the benchmark to the value of the observed to expected ratio at the 90th percentile of hospital performance, and assigning 0 to 100 points for each PPC between these two percentile values. Figure 3 provides the thresholds and benchmarks under this revised methodology based on FY 2017 and FY 2018 data.

**Figure 3: RY 2021 Thresholds and Benchmarks for all 14 Payment Program PPCs**

PPC Number	PPC Description	Threshold	Benchmark
3	Acute Pulmonary Edema and Respiratory Failure without Ventilation	1.8105	0.5751
4	Acute Pulmonary Edema and Respiratory Failure with Ventilation	1.7978	0.4678
7	Pulmonary Embolism	1.7773	0.3836
9	Shock	1.7988	0.4235
16	Venous Thrombosis	1.6437	0.2133
28	In-Hospital Trauma and Fractures	1.7259	0.3859
35	Septicemia & Severe Infections	1.7416	0.3659
37	Post-Operative Infection & Deep Wound Disruption Without Procedure	2.1254	0.402
41	Post-Operative Hemorrhage & Hematoma with Hemorrhage Control Procedure or I&D Proc	1.7871	0.3592
42	Accidental Puncture/Laceration During Invasive Procedure	2.5504	0.4797
49	Iatrogenic Pneumothorax	1.9877	0.1946
60	Major Puerperal Infection and Other Major Obstetric Complications	1.5373	0.2404
61	Other Complications of Obstetrical Surgical & Perineal Wounds	2.0641	0.1078
67	Combined Pneumonia (PPC 5 and 6)	1.5607	0.5899

### Attainment Points (possible points 0-100)

If the PPC ratio for the performance period is greater than the threshold, the hospital scores zero points for that PPC for attainment.

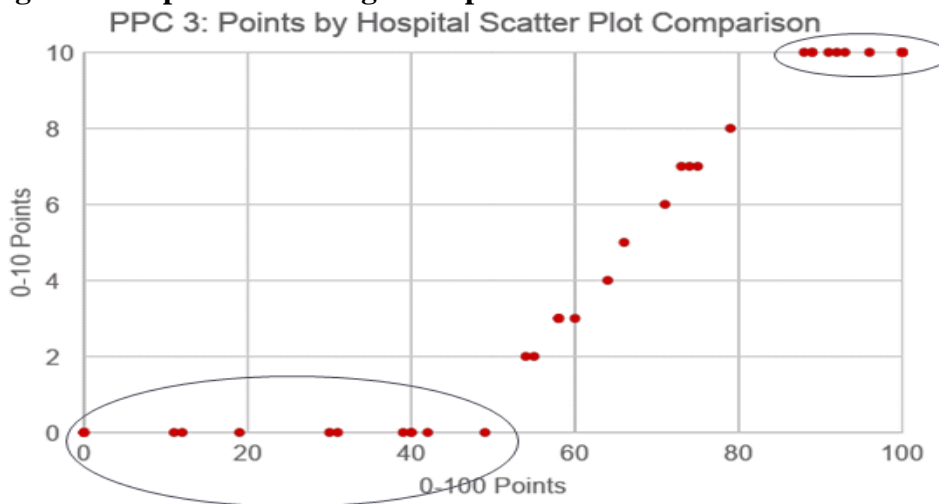
If the PPC ratio for the performance period is less than or equal to the benchmark, the hospital scores a full 100 points for that PPC for attainment.

If the PPC ratio is between the threshold and benchmark, the hospital scores partial points for attainment. The formula to calculate the Attainment points is as follows:

- $\text{Attainment Points} = [99 * ((\text{Hospital's performance period score} - \text{Threshold}) / (\text{Benchmark} - \text{Threshold}))] + 0.5$

Figure 4 below shows how the new method for setting the threshold and benchmark and assigning of 0 to 100 attainment points better differentiates hospital performance at the lower and upper ends, and provides more continuous incentives for improvement. However, because hospitals can begin to earn points for relatively poor performance, i.e. at the value of the 10th percentile, hospital scores are higher under this modified scoring methodology and the preset revenue adjustment scale was adapted so that hospitals do not receive financial rewards for lackluster performance.

**Figure 4. Expanded Scoring Example**



**Calculation of Hospital Overall MHAC Score**

To calculate the final score for each hospital, the attainment points earned by the hospital and the potential points (i.e., 100) for each PPC are multiplied by the 3M cost weights. Hospital scores across PPCs are calculated by summing the total weighted points earned by a hospital, divided by the total possible weighted points (100 per PPC \* 3M cost weight). Figure 5 provides a hypothetical example of the points based scoring approach with the 3M cost weights.



Figure 5: Hypothetical Example of Scoring Methodology

Hospital A								
PPC	Threshold	Benchmark	Hospital O/E Ratio	ATTAINMENT POINTS	POSSIBLE DENOMINATOR	3M Weight	Weighted Points	Weighted Denominators
	A	B	C	D = C relative to A and B	E	F	G = D * F	H = E * F
PPC 1	1.75	0.5	0.2	100	100	0.5	50	50
PPC 2	2	0.3	1.1	53	100	2	106	200
PPC 3	2.5	0.4	0.65	88	100	1	88	100
<b>Total</b>							<b>244</b>	<b>350</b>
<b>TOTAL WEIGHTED SCORE</b> G total /H total								<b>70%</b>

Hospital B								
PPC	Threshold	Benchmark	Hospital O/E Ratio	ATTAINMENT POINTS	POSSIBLE DENOMINATOR	3M Weight	Weighted Points	Weighted Denominators
	A	B	C	D = C relative to A and B	E	F	G = D * F	H = E * F
PPC 1	1.75	0.5	2	0	100	0.5	0	50
PPC 2	2	0.3	1.5	30	100	2	60	200
PPC 3	2.5	0.4	1	71	100	1	71	100
<b>Total</b>							<b>131</b>	<b>350</b>
<b>TOTAL WEIGHTED SCORE</b> G total /H total								<b>37%</b>

**Rounding**

For the purposes of calculating scores, the benchmarks and O: E ratios are rounded to 4 decimal places. The final score for each hospital is rounded to the whole percentage point (e.g., 10%, 20%).

**Financial Impact of MHAC Performance (Scaling)**

The preset scale for RY 2021 was modified to account for the higher scores under the new scoring methodology and increases potential rewards from 1 percent to 2 percent of inpatient revenue. The RY 2021 scale uses a full distribution of potential scores (scale of 0-100%), with a hold harmless zone between 60 and 70 percent. The maximum penalty remains at 2 percent, and the maximum reward is increased to 2 percent. The preset scale is included as Appendix B of this memorandum.

## Appendix B: RY 2021 MHAC Revenue Adjustment Scale with Hold Harmless Zone

Below is a concise version of the RY 2021 MHAC scale, which ranges from 0 to 100 percent and includes a revenue neutral zone between 60 and 70 percent. Note that the Commission approved to keep the maximum potential penalty at 2 percent but increased the maximum potential rewards to 2 percent of inpatient revenue. A full scale with all percentage point revenue adjustments is included in the MHAC Summary workbooks.

<b>Final MHAC Score</b>	<b>Revenue Adjustment</b>
<b>0%</b>	<b>-2.00%</b>
5%	-1.83%
10%	-1.67%
15%	-1.50%
20%	-1.33%
25%	-1.17%
30%	-1.00%
35%	-0.83%
40%	-0.67%
45%	-0.50%
50%	-0.33%
55%	-0.17%
60%	0.00%
65%	0.00%
70%	0.00%
75%	0.33%
80%	0.67%
85%	1.00%
90%	1.33%
95%	1.67%
<b>100%</b>	<b>2.00%</b>
<b>Penalty Cut-point</b>	<b>60%</b>
<b>Reward Cut-point</b>	<b>70%</b>