Quality Payment
PROGRAM

Merit-Based Incentive Payment System (MIPS): Medicare Spending Per Beneficiary

Measure Information Form
2018 Performance Period

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1.0 Background

1.1 Measure Name

Medicare Spending Per Beneficiary (MSPB)

1.2 Measure Description

The Medicare Spending Per Beneficiary (MSPB) clinician measure assesses the cost to Medicare of services performed by an individual clinician during an MSPB episode, which comprises the period immediately prior to, during, and following a patient's hospital stay.[1] An MSPB episode includes all Medicare Part A and Part B claims falling in the episode "window," specifically claims with a start date between 3 days prior to a hospital admission[2] (also known as the "index admission" for the episode) through 30 days after hospital discharge.

The MSPB measure is attributed to individual clinicians, as identified by their unique Medicare Taxpayer Identification Number/National Provider Identifier (TIN-NPI). MSPB measure performance may be reported at either the clinician (TIN-NPI) or the clinician group (TIN) level.

1.3 Rationale

Medicare is transforming from a system that rewards volume of service to one that rewards effective care and reduces delivery system fragmentation. To advance this transformation, the Centers for Medicare & Medicaid Services (CMS) provides financial incentives to clinicians based on their performance on selected quality measures as well as cost measures.

The MSPB clinician measure, a cost measure, was originally developed for use in the Physician Value-Based Modifier program, and was updated (see Section 4.0 for details) for inclusion in the Merit-based Incentive Payment System (MIPS) cost performance category.

2.0 Overview of Measure Calculation

Using Medicare Part A and B claims data, with certain exclusions attached, the MSPB measure compares observed and expected episode costs, as follows.

2.1 Measure Numerator

The numerator for the measure is the sum of the ratio of payment-standardized observed to expected MSPB episode costs for all MSPB episodes for the TIN-NPI or TIN. The sum of the

[1] Claims for inpatient admissions are grouped into "stays" by beneficiary, admission date, and provider.
[2] This only includes admissions to hospitals that are paid under the Inpatient Prospective Payment System (IPPS) and hospitals in Maryland.

ratios is then multiplied by the national average payment-standardized observed episode cost, to convert the ratio to a dollar amount.

2.2 Measure Denominator

The denominator for the MSPB measure is the total number of MSPB episodes for the TIN-NPI or TIN.

2.3 Eligibility and Exclusion Criteria

The MSPB measure assesses costs during episodes of care initiated by acute inpatient hospital stays. Episodes for a beneficiary are excluded from the MSPB measure if they meet any of the following conditions:

- the beneficiary was not continuously enrolled in both Medicare Parts A and B from 93 days prior to the index admission through 30 days after discharge[3]
- the beneficiary's death occurred during the episode
- the beneficiary is enrolled in a Medicare Advantage plan or Medicare is the secondary payer at any time during the episode window or 90-day lookback period[4]
- the index admission for the episode did not occur in a subsection (d) hospital paid under the Inpatient Prospective Payment System (IPPS) or an acute hospital in Maryland[5]
- the discharge of the index admission occurred in the last 30 days of the performance period
- the index admission for the episode is involved in an acute-to-acute hospital transfer (i.e., the admission ends in a hospital transfer or begins because of a hospital transfer)[6]
- the index admission occurs within the 30-day post-discharge period of another MSPB episode[7]
- the index admission inpatient claim indicates a $0 actual payment or a $0 standardized payment

[3] This period includes both the episode window and a 90-day "lookback" period; defining the population in this manner ensures each beneficiary's claims record contains sufficient fee-for-service data for both measuring spending levels and risk adjustment.
[4] Episodes for beneficiaries whose primary insurance becomes Medicaid during an episode because of the exhaustion of Part A benefits are not excluded. Medicaid payments are not counted in the measure; however, all Part A payments made before benefits are exhausted and all Part B payments made during the episode are included.
[5] Subsection (d), which covers hospitals in the 50 states and D.C., does not include psychiatric hospitals, rehabilitation hospitals, hospitals whose inpatients are predominantly under 18 years old, hospitals whose average inpatient length of stay exceeds 25 days, and hospitals involved extensively in treatment for or research on cancer.
[6] If an acute-to-acute hospital transfer or a hospitalization in a Prospective Payment System (PPS)–exempt hospital occurs during the 30 days following discharge from an index admission that is not excluded using the criteria here, these post-discharge costs will still be included in the initial MSPB episode.
[7] The second hospital admission is considered a readmission and its costs are still included in the initial MSPB episode. However, the second hospital admission does not initiate a new MSPB episode.

After applying the exclusions outlined above, all remaining episodes are included in the calculation of the MSPB measure.

2.4 Data Source

The MSPB measure is calculated based on all Medicare Parts A and B final action claims during the performance period, including: inpatient hospital; outpatient; skilled nursing facility; home health; hospice; durable medical equipment, prosthetics, orthotics, and supplies; and Medicare Part B Carrier (non-institutional Physician/Supplier) claims. Beneficiary enrollment data and Part A and B claims are used to determine eligible episodes and to attribute MSPB episodes to clinicians, as described in Section 3.0. Prescription drug costs covered by Part D are not included in calculation of the MSPB measure. MSPB does not require any additional measure submission by clinicians or clinician groups.

3.0 Detailed Measure Calculation Methodology

Calculation of the MSPB measure is divided into seven steps:

1) Define the population of index admissions,
2) Calculate payment-standardized episode costs
3) Calculate expected episode costs
4) Exclude outliers
5) Attribute episodes to a TIN-NPI
6) Calculate the MSPB measure for the TIN-NPI or TIN
7) Report the MSPB measure for the TIN-NPI or TIN

The following sections explain these steps in more detail.

Step 1: Define Population of Index Admissions

An MSPB episode includes all Medicare Part A and Part B claims with a start date between 3 days prior to a hospital admission (“index admission”) and 30 days after hospital discharge. The episode exclusions described in Section 2.3 are applied to arrive at the final population of index admissions.

Step 2: Calculate Payment-Standardized MSPB Episode Costs

Calculate the standardized cost of each MSPB episode by summing all standardized Medicare claims payments made during the episode window. Episodes include the 30 days after discharge in order to emphasize the importance of care transitions and care coordination for improving patient care.

The MSPB measure is payment-standardized to take into account payment factors unrelated to provision of care, such as add-on payments for medical education and geographic variation in Medicare reimbursement rates. More information on the payment standardization algorithm is available in an overview document titled "CMS Price (Payment) Standardization - Basics" and a more detailed document titled "CMS Price (Payment) Standardization - Detailed Methods" at the webpage referenced in Section 4.0.

Step 3: Calculate Risk-Adjusted Expected MSPB Episode Costs

To estimate the expected cost for each episode, the MSPB methodology uses an ordinary least squares regression model to risk adjust for beneficiary age and comorbidities.

Specifically, expected costs for each episode are calculated using a model based on the CMS Hierarchical Condition Category (CMS-HCC) risk adjustment methodology for the Medicare Advantage program.[8] However there are several differences. For example, in the MSPB methodology a separate risk adjustment model was estimated for episodes within each major diagnostic category (MDC). The MDC is determined by the Medicare Severity Diagnosis Related Group (MS-DRG) of the index hospital stay. The Medicare Advantage Program risk adjustment model includes 24 age/sex variables, while the MSPB methodology does not adjust for sex and includes 12 age categorical variables. In addition, the MSPB methodology includes individual indicator variables for history of ESRD, long-term care status, and whether the beneficiary qualifies for Medicare through disability or age, in contrast to the stratification and interaction variables used in the Medicare Advantage model.

As mentioned in Section 2.3, episodes where the beneficiary is not enrolled in both Medicare Part A and Medicare Part B for the 90 days prior to the episode are excluded. The 90-day lookback period is needed to capture beneficiaries' comorbidities for use in risk adjustment. Comorbidities are measured using (i) 79 HCC indicators derived from the beneficiary's claims during the 90 days prior to the start of the episode, (ii) an indicator of whether the beneficiary recently required long-term care, and (iii) the MS-DRG of the index hospitalization. The 79 HCC indicators are specified in Version 22 (V22) of the HCC model.

The MSPB risk adjustment model also accounts for the impact of comorbidities by including interactions between HCCs and/or enrollment status variables included in the Medicare Advantage model. Interaction terms are included because the presence of certain comorbidities increases costs more substantially for particular beneficiaries than predicted by HCC indicators alone.[9] Tables 1 through 6 in Section 5.0 present the final set of risk adjustment variables.

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[8] Centers for Medicare and Medicaid Services, Office of the Actuary. "Announcement of Calendar Year (CY) 2014 Medicare Advantage Capitation Rates and Medicare Advantage and Part D Payment Policies and Final Call Letter." April 2013. https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Announcement2014.pdf

[9] Centers for Medicare and Medicaid Services. Medicare Managed Care Manual, Chapter 7 – Risk Adjustment, Section 70.2.7 – Disease and Disabled Interactions. 2014. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/mc86c07.pdf

Step 4: Exclude Outliers

Statistical outliers are excluded from MSPB measure calculation to mitigate the effect of high- and low-cost episodes on each TIN-NPI or TIN's MSPB measure score. Step 4.1 below describes the winsorization on the lower bound of expected episode costs, and Step 4.2 explains the process for excluding outlier episodes.

Step 4.1: Winsorize Expected Costs

To prevent the creation of extreme expected cost values, the MSPB methodology winsorizes expected values at the 0.5th percentile.[10,11] Expected cost values are also renormalized, by multiplying the winsorized expected values by the ratio of the average standardized cost within each MDC and the average winsorized expected cost within each MDC. Renormalizing the expected values ensures the average expected episode cost for each MDC is the same before and after winsorizing.

Step 4.2: Exclude Outliers

The residual for each episode is calculated as the difference between the standardized episode cost and the winsorized expected episode cost. Outlier episodes are defined as MSPB episodes whose residuals fall above the 99th percentile or below the 1st percentile of the distribution of residuals across all MSPB episodes. Excluding outlier episodes as determined by the distribution of the residuals eliminates episodes that deviate most from their expected values in absolute terms. Next, renormalize expected values by multiplying the expected episode costs (after excluding outliers) by the ratio of the average standardized episode cost and the average winsorized expected episode cost (after excluding outliers). Renormalization ensures that the average expected episode costs are the same as the average standardized episode costs after outlier exclusions.

Step 5: Attribute Episodes to TIN-NPI

Each MSPB episode is attributed to the TIN-NPI responsible for the plurality of Part B Physician/Supplier services during the index admission. Costs of services are measured by Medicare standardized allowed amounts, and services must be performed by MIPS-eligible clinicians during the episode's index admission (the period between admission date and

[10] Winsorization (i.e., "bottom-coding") is a statistical transformation that limits extreme values in data to reduce the effect of possibly spurious outliers. Thus, all predicted values below the 0.5th percentile are assigned the value of the 0.5th percentile.

[11] To ensure that the lowest predicted values within an MDC are adjusted even for MDCs with few episodes, this methodology first sets the lowest predicted value within the MDC to the second lowest predicted value within the MDC before winsorizing at the 0.5th percentile.

discharge date of the hospital stay, inclusive). Part B services are defined as all clinician services billed on non-institutional claims. To determine attribution, Part B services billed by MIPS-eligible clinicians are considered if they are (i) on the admission date and in a hospital setting, with place of service restricted to inpatient, outpatient, or emergency room hospitals, (ii) during the index hospital stay, regardless of place of service, or (iii) on the discharge date with place of service restricted to inpatient hospital.[12] If more than one TIN-NPI has the plurality of Part B services standardized payment, the episode will be attributed to the TIN-NPI with the plurality of Part B services bill lines. If more than one TIN-NPI also have the same count of services during a given episode's index hospitalization, the MSPB episode is randomly attributed to one TIN-NPI.

Step 6: Calculate MSPB Measure for Each TIN-NPI or TIN

The MSPB measure is calculated for each TIN-NPI or TIN by (i) calculating the ratio of standardized observed episode costs to winsorized expected episode costs and (ii) multiplying the average cost ratio across episodes for each TIN-NPI or TIN by the national average episode cost. This method of cost ratio calculation allows for comparison of differences in observed and expected costs at the level of each individual episode before comparison at the provider level. The content of each cost calculation depends on the desired reporting level, as noted in the following steps.

Step 6.1: Calculate risk-adjusted episode cost ratio

For each non-outlier episode, divide the episode's total standardized cost (calculated in Step 2) by the episode's total winsorized and renormalized expected cost (as determined by Step 4).

Step 6.2: Calculate the MSPB measure for each TIN-NPI or TIN

Under MIPS, the MSPB measure is an average of ratios. After calculating each episode's risk-adjusted cost ratio (in Step 6.1), the cost ratios for all episodes are averaged for each TIN-NPI or TIN (depending on reporting choice). Multiplying this average cost ratio by the national average episode cost (all total standardized costs averaged over the universe of attributed, non-outlier episodes) gives the MSPB measure for each TIN-NPI or TIN.

[12] There is no place of service restriction for the time during the index admission because a beneficiary may need to receive specialty services in other locations. This is rare, but occurs when certain services are not available at the admitting hospital (e.g., MRI in a nearby outpatient hospital or dialysis in an ESRD facility).

Step 7: Report MSPB Measure for Each TIN-NPI or TIN

Though MSPB is attributed at the TIN-NPI level, reporting can be at either the TIN or TIN-NPI level. Under MIPS, the case minimum for reporting is 35 episodes, regardless of reporting level.

4.0 Additional References

For more information about the methodology used in payment standardization, please refer to the CMS Price (Payment) Standardization documents on QualityNet.

More details on the MSPB measure as defined by MIPS may be found in the CY 2017 (81 FR 77166–77171) and CY 2018 (82 FR 53643–53647) QPP Final Rules, including updates from previous versions of MSPB.

Final details of MSPB episode construction and original application in the Hospital Value-Based Purchasing (VBP) Program are in the FY 2012 IPPS/LTCH PPS Final Rule (76 FR 51618–51626) and the FY 2013 IPPS/LTCH Final Rule (77 FR 53583–53596).

5.0 Tables

The following tables present the final set of risk adjustment variables used to calculate expected MSPB episode costs, as referenced in Section 3.0.

Table 1. Age Variables

Age Range	Description Label
0–34	Age between 0 and 34 years old
35–44	Age between 35 and 44 years old
45–54	Age between 45 and 54 years old
55–59	Age between 55 and 59 years old
60–64	Age between 60 and 64 years old
65–69	Age between 65 and 69 years old (reference category)[13]
70–74	Age between 70 and 74 years old
75–79	Age between 75 and 79 years old
80–84	Age between 80 and 84 years old
85–89	Age between 85 and 89 years old
90–94	Age between 90 and 94 years old
95+	Age greater than or equal to 95 years old

[13] The 65–69 age indicator variable serves as the reference category and is omitted from the regression.

Table 1. Comorbidity Measures: Hierarchical Condition Categories (HCCs) Included in the CMS-HCC Risk Adjustment Model

Indicator Variable	Description Label
HCC1	HIV/AIDS
HCC2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock
HCC6	Opportunistic Infections
HCC8	Metastatic Cancer and Acute Leukemia
HCC9	Lung and Other Severe Cancers
HCC10	Lymphoma and Other Cancers
HCC11	Colorectal, Bladder, and Other Cancers
HCC12	Breast, Prostate, and Other Cancers and Tumors
HCC17	Diabetes with Acute Complications
HCC18	Diabetes with Chronic Complications
HCC19	Diabetes without Complication
HCC21	Protein-Calorie Malnutrition
HCC22	Morbid Obesity
HCC23	Other Significant Endocrine and Metabolic Disorders
HCC27	End-Stage Liver Disease
HCC28	Cirrhosis of Liver
HCC29	Chronic Hepatitis
HCC33	Intestinal Obstruction/Perforation
HCC34	Chronic Pancreatitis
HCC35	Inflammatory Bowel Disease
HCC39	Bone/Joint/Muscle Infections/Necrosis
HCC40	Rheumatoid Arthritis and Inflammatory Connective Tissue Disease
HCC46	Severe Hematological Disorders
HCC47	Disorders of Immunity
HCC48	Coagulation Defects and Other Specified Hematological Disorders
HCC54	Drug/Alcohol Psychosis
HCC55	Drug/Alcohol Dependence
HCC57	Schizophrenia
HCC58	Major Depressive, Bipolar, and Paranoid Disorders
HCC70	Quadriplegia
HCC71	Paraplegia
HCC72	Spinal Cord Disorders/Injuries
HCC73	Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease
HCC74	Cerebral Palsy
HCC75	Myasthenia Gravis/Myoneural Disorders, Inflammatory and Toxic Neuropathy
HCC76	Muscular Dystrophy
HCC77	Multiple Sclerosis

Indicator Variable	Description Label
HCC78	Parkinson's Disease and Huntington's Disease
HCC79	Seizure Disorders and Convulsions
HCC80	Coma, Brain Compression/Anoxic Damage
HCC82	Respirator Dependence/Tracheostomy Status
HCC83	Respiratory Arrest
HCC84	Cardio-Respiratory Failure and Shock
HCC85	Congestive Heart Failure
HCC86	Acute Myocardial Infarction
HCC87	Unstable Angina and Other Acute Ischemic Heart Disease
HCC88	Angina Pectoris
HCC96	Specified Heart Arrhythmias
HCC99	Cerebral Hemorrhage
HCC100	Ischemic or Unspecified Stroke
HCC103	Hemiplegia/Hemiparesis
HCC104	Monoplegia, Other Paralytic Syndromes
HCC106	Atherosclerosis of the Extremities with Ulceration or Gangrene
HCC107	Vascular Disease with Complications
HCC108	Vascular Disease
HCC110	Cystic Fibrosis
HCC111	Chronic Obstructive Pulmonary Disease
HCC112	Fibrosis of Lung and Other Chronic Lung Disorders
HCC114	Aspiration and Specified Bacterial Pneumonias
HCC115	Pneumococcal Pneumonia, Empyema, Lung Abscess
HCC122	Proliferative Diabetic Retinopathy and Vitreous Hemorrhage
HCC124	Exudative Macular Degeneration
HCC134	Dialysis Status
HCC135	Acute Renal Failure
HCC136	Chronic Kidney Disease, Stage 5
HCC137	Chronic Kidney Disease, Severe (Stage 4)
HCC157	Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone
HCC158	Pressure Ulcer of Skin with Full Thickness Skin Loss
HCC161	Chronic Ulcer of Skin, Except Pressure
HCC162	Severe Skin Burn or Condition
HCC166	Severe Head Injury
HCC167	Major Head Injury
HCC169	Vertebral Fractures without Spinal Cord Injury
HCC170	Hip Fracture/Dislocation
HCC173	Traumatic Amputations and Complications
HCC176	Complications of Specified Implanted Device or Graft

Indicator Variable	Description Label
HCC186	Major Organ Transplant or Replacement Status
HCC188	Artificial Openings for Feeding or Elimination
HCC189	Amputation Status, Lower Limb/Amputation Complications

Table 2. Enrollment Status Variables

Indicator Variable	Description Label
ORIGDS	Originally Disabled
ESRD	End-Stage Renal Disease

Table 3. Long-Term Care Variables

Indicator Variable	Description Label
LTC_Indicator	Long-Term Care

Table 4. Variable Interaction Terms

Indicator Variable	Description Label
DISABLED_HCC6	Disabled, Opportunistic Infections
DISABLED_HCC34	Disabled, Chronic Pancreatitis
DISABLED_HCC46	Disabled, Severe Hematological Disorders
DISABLED_HCC54	Disabled, Drug/Alcohol Psychosis
DISABLED_HCC55	Disabled, Drug/Alcohol Dependence
DISABLED_HCC110	Disabled, Cystic Fibrosis
DISABLED_HCC176	Disabled, Complications of Specified Implanted Device or Graft
SEPSIS_CARD_RESP_FAIL	Sepsis * Cardiorespiratory Failure and Shock
CANCER_IMMUNE	Cancer * Immune Disorders
DIABETES_CHF	Diabetes * Congestive Heart Failure
CHF_COPD	Congestive Heart Failure * Chronic Obstructive Pulmonary Disease
CHF_RENAL	Congestive Heart Failure * Renal Failure
COPD_CARD_RESP_FAIL	Chronic Obstructive Pulmonary Disease * Cardiorespiratory Failure and Shock

Table 5. Indicator Variables

Indicator Variable	Description Label
MS-DRGs	For a complete list of all MS-DRGs, see Table 5 in the download section of the CMS Final Rule and Correction Notice webpage for the appropriate fiscal years.