



ACUMEN

**Inpatient Rehabilitation Facility
Quality Reporting Program
Claims-Based Measures
Specifications Manual**

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1 INTRODUCTION

This document presents technical specifications for the production of Medicare fee-for-service (FFS) claims-based measures (CBMs) for the Inpatient Rehabilitation Facility (IRF) Quality Reporting Program (QRP) maintained by the Centers for Medicare & Medicaid Services (CMS). These measures are intended to promote informed decisions among Medicare beneficiaries and their caregivers when deciding on an IRF at which to receive rehabilitative care.

The measures included in this manual individually assess Discharge to Community (DTC), Potentially Preventable 30-Day Post-Discharge Readmission (PPR-PD), Potentially Preventable Within-Stay Hospital Readmission (PPR-WS), and Medicare Spending per Beneficiary – Post-Acute Care (MSPB-PAC). Maintenance and reporting of these measures are mandated by the Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014.¹

All claims-based measures included in this manual are refreshed annually, using Medicare FFS claims data from two consecutive fiscal years. Measure scores are published on the Care Compare website (<https://www.medicare.gov/care-compare/>), where consumers can compare IRFs using CMS’s measures. Additionally, publicly reported measure data are published online in the CMS Provider Data Catalog (PDC) (<https://data.cms.gov/provider-data/>) for use by researchers in further study regarding healthcare utilization and outcomes. Measure scores are also reported confidentially to providers via confidential feedback reports.

The following sections detail the technical specifications for each of the above measures, as well as supplemental information required for calculating the measures. Section 2 outlines the data sources and supplemental files used in measure calculations, Section 3 contains the specifications for the DTC measure, Section 4 contains the specifications for the PPR-PD measure, Section 5 contains the specifications for the PPR-WS measure, and Section 6 contains the specifications for the MSPB-PAC measure.

Additional information on the measures in this manual and other IRF QRP measures can be found on the CMS IRF QRP Measures Information page: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/IRF-Quality-Reporting/IRF-Quality-Reporting-Program-Measures-Information>.

¹ <https://www.govinfo.gov/content/pkg/BILLS-113hr4994enr/pdf/BILLS-113hr4994enr.pdf>.

2 DATA, MAPPINGS, AND SUPPLEMENTAL MATERIALS

The measures specified in this document are calculated exclusively from administrative data filed by providers as required for payment. As such, all variables used for measure calculation are primarily sourced from both Medicare Parts A and B FFS claims files and the Master Beneficiary Summary File (MBSF). The DTC and MSPB measures also use Nursing Home (NH) Minimum Data Set (MDS) assessments for certain exclusions and covariates.

2.1 Publicly Available Materials

A variety of publicly available mappings are used to identify exclusion criteria, numerator events, and risk-adjustment covariates:

- **Clinical Classification Software (CCS):** CCS mappings are used to categorize International Classification of Diseases, Tenth Revision (ICD-10) codes into discrete categories. ICD-10-Clinical Modification (CM) codes are used to inform CCS diagnosis categories, and ICD-10-Procedure Coding System (PCS) codes are used to determine CCS procedure and surgical categories. The CCS categories were originally developed by the Agency for Healthcare Research and Quality (AHRQ)² Healthcare Cost and Utilization Project (HCUP). ICD-10 codes used in these mappings are updated annually using the CMS conversion table files.³
- **Hierarchical Condition Categories (HCCs):** HCCs, developed and maintained by CMS, categorize ICD-10-CM codes for purposes of risk adjustment.⁴
- **Planned Readmission Algorithm (PRA):** The PRA is used to identify whether a readmission should be considered planned or unplanned for the purposes of measure calculation. The PRA algorithm and accompanying documentation can be found in the Hospital-Wide Readmission (HWR) Measure Code Specifications Supplemental File.⁵
- **State Operations Manual (SOM):** The SOM is referenced to identify the U.S. state associated with a provider, based on the provider's CMS Certification Number (CCN).⁶

² The most recent versions of the AHRQ-produced CCS mappings (2019.1 for diagnoses, published in October 2018, and 2020.1 for procedures, updated in October 2019), are available on the AHRQ CCS-Refined Tools Archive page: https://hcup-us.ahrq.gov/toolssoftware/ccsr/ccsr_archive.jsp#ccsr.

³ The conversion table files are available on the CMS ICD-10 webpage: <https://www.cms.gov/medicare/coding/icd10> (conversion tables are available for each year).

⁴ CMS HCC risk adjustment mappings can be downloaded at: <https://www.cms.gov/medicare/health-plans/medicareadvtspeccratestats/risk-adjustors>.

⁵ This file is available for download at: <https://qualitynet.cms.gov/inpatient/measure/readmission/methodology>.

⁶ Publication #100-07 from the CMS Internet-Only Manuals (IOMs) page: <https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Internet-Only-Manuals-IOMs>.

2.2 IRF QRP-Specific Supplementary Materials

Calculation of these measures may require the use of supplemental materials, contained in the IRF QRP CBMs Supplemental Files (2023-irf-qrp-cbm-supplemental-files.zip), available for download from the IRF QRP Measures Information page.⁷ Table 1 describes these materials.

Table 1. IRF QRP Claims-Based Measures Supplemental Files Overview

Measure(s)	Workbook(s)	Description
DTC, PPR-PD, PPR-WS	2023-irf-dtc-pprpd-pprws-supplemental-codes.xlsx	Contains the potentially preventable diagnoses list, the PAC-specific PRA codes, pregnancy- and cancer-related CCS codes, and measure-specific covariates lists
MSPB-PAC	2023-irf-mspb-pac-clinically-unrelated-services-exclusions.xlsx	Contains the clinically unrelated services that are excluded from measure calculation
	2023-irf-mspb-pac-first-day-service-exclusions.xlsx	Contains the first-day services that are excluded from measure calculation
	2023-irf-mspb-pac-covariates.xlsx	Contains the list of covariates used for risk adjustment

⁷ <https://www.cms.gov/medicare/quality/inpatient-rehabilitation-facility/irf-quality-reporting-measures-information>.

3 SPECIFICATIONS FOR IRF DISCHARGE TO COMMUNITY (DTC) MEASURE

The IRF DTC measure assesses the rate at which beneficiaries are successfully discharged to the community from the IRF. Specifically, this measure reports an IRF's risk-standardized rate of Medicare FFS beneficiaries who are discharged to the community after an IRF stay, do not have an unplanned readmission to an acute care hospital (ACH) or Long-Term Care Hospital (LTCH), and remain alive during the 31 days following that discharge. Community, for this measure, is defined as home/self-care, with or without home health services.

The IRF DTC measure is calculated using the following steps:

- 1. Select IRF and hospital stays for the measure period.** Stays are constructed using final action Medicare FFS Part A claims. Stay construction begins by linking claims that share the same beneficiary identifier, facility CCN, and admission date. To implement restrictions and apply risk adjustment, stays created from claims are linked to other Medicare claims and enrollment data using the beneficiary identifier. IRF stays indexed for the denominator prior to exclusion criteria are those that end within the measure period.
- 2. Identify eligible IRF stays.** Indexed IRF stays are excluded from measure calculation if any of the following exclusion criteria are met. All remaining indexed stays are eligible for measure calculations.
 - The beneficiary was under 18 years of age at the start of the stay.
 - The beneficiary was not discharged from an acute care facility within 30 days prior to IRF admission.
 - The beneficiary was discharged from the IRF against medical advice.
 - The beneficiary was discharged from the IRF to a psychiatric hospital or to the same level of care (another IRF).
 - The beneficiary was discharged from the IRF to a federal hospital, disaster alternative care site, or court/law enforcement.
 - The beneficiary was either discharged from the IRF to hospice, or has a hospice benefit period that overlaps with the 31-day post-IRF discharge window (identified via the presence of a hospice benefit start or end date within 31 days of IRF discharge).
 - The beneficiary was not continuously enrolled in Medicare Part A for at least 365 days prior to IRF admission and for at least 31 days after IRF discharge.

- The beneficiary was discharged from an acute care facility within 30 days prior to IRF admission, but the stay was for non-surgical treatment of cancer.
- The IRF stay is associated with problematic or incomplete data. This includes anomalous records for stays that overlap wholly or in part, or are otherwise erroneous or contradictory; stays where the beneficiary cannot be matched with Medicare enrollment data; claims with zero utilization days; or if the beneficiary exhausted their Medicare Part A benefits during the stay.
- The IRF stay ended in planned discharge from the IRF to an ACH, psychiatric hospital, or an LTCH, identified by the presence of a claim from that facility type with a "claim from" date within one day of IRF discharge, and flagged as a planned admission by the PRA (note that all psychiatric hospital stays are considered planned).
- The beneficiary received care outside the 50 states, District of Columbia, Puerto Rico, and U.S. Territories (determined via the CCN of the provider rendering care, using the SOM CCN-to-U.S. state mappings).
- The beneficiary had a long-term nursing home stay in the 180 days preceding their prior proximal hospitalization (identified via NH MDS Omnibus Budget Reconciliation Act [OBRA] assessments) and was not discharged to the community from that stay prior to the inpatient (IP) hospitalization.

3. Identify numerator events. A non-excluded IRF stay is included in the numerator if the stay resulted in a successful discharge to community.

- 3.1. Identify IRF stays ending in discharge to either home/self-care, home under care of an organized home health agency (HHA), home with a planned ACH readmission, or discharged home under care of an HHA with a planned ACH readmission, as indicated by the patient discharge status code on the last claim of the stay.
- 3.2. Remove stays where the beneficiary died within 31 days of IRF discharge, identified by the beneficiary's date of death from the Medicare enrollment database.
- 3.3. Remove stays where the beneficiary has an unplanned readmission to an ACH or an LTCH within 31 days of IRF discharge, as determined using the PRA.

4. Determine the National Observed Rate. Divide the number of eligible stays resulting in a successful DTC (Step 3) by the total number of all eligible stays (Step 2).

5. Identify covariates. Identify the following covariates associated with each IRF stay⁸:

- Beneficiary age and sex categories.
- Beneficiary is at least 65 years old and Original Reason for Entitlement Code (OREC) is either (1) end-stage renal disease (ESRD), (2) disability, or (3) both ESRD and disability.
- CCS category of the principal diagnosis from the prior proximal acute stay.
- Comorbidities based on the prior acute care stay and/or a 365-day lookback, depending on the specific comorbidity, mapped to HCCs using principal and secondary ICD-10 diagnoses codes from all IP claims. HCCs are constructed using secondary diagnoses from the prior proximal stay and all diagnoses from other stays in the 365-day lookback period.
- IRF Case-Mix Groups (CMGs) (identified via the Healthcare Common Procedure Coding System [HCPCS] code corresponding to Revenue Center Code “0024” on the IRF claim).
- Surgical procedure categories (if present) from the procedure codes from the prior proximal acute care stay.
- Dialysis during the prior proximal acute care stay where ESRD not indicated.
- Length of prior proximal acute care stay (if stay was in non-psychiatric hospital), or indicator if prior proximal acute care stay was in a psychiatric hospital.
- Number of ACH stays in the 365 days prior to IRF admission (excluding the prior proximal acute care admission).

6. Calculate risk-adjustment coefficients. Once covariates have been identified for each eligible stay included in measure calculation, calculate coefficient estimates for use in risk adjustment using the following hierarchical model:

6.1. Let Y_{ij} denote the outcome (equal to 1 if beneficiary i is discharged to community, 0 otherwise) for a beneficiary i at facility j . Let $Z_{ij} = (Z_1, Z_2, \dots, Z_k)$ denote a set of k risk adjustment variables. Let α_j represent the facility-specific intercept, μ the adjusted average intercept across all facilities, and τ^2 the between-facility variance component.

6.2. The probability of the outcome occurring is assumed to relate to the covariates via a logit function:

⁸ A detailed list of individual covariates used in the model is available in the supplemental workbook (Section 2.2).

$$\text{logit}\left(P(Y_{ij} = 1|Z_{ij}, \alpha_j)\right) = \log\left(\frac{P(Y_{ij} = 1|Z_{ij}, \alpha_j)}{1 - P(Y_{ij} = 1|Z_{ij}, \alpha_j)}\right) = \alpha_j + \beta * Z_{ij}$$

$$\alpha_j = \mu + \omega_j ; \omega_j \sim N(0, \tau^2)$$

7. Calculate provider-level final scores. Using the estimated coefficients

$$\hat{\beta}, \hat{\mu}, \text{ and } \hat{\alpha}_j = \hat{\mu} + \hat{\omega}_j$$

determined in Step 6, calculate the following values for each provider:

7.1. Facility-level expected DTC number: the number of DTCs that would be expected if that facility's beneficiaries were treated at the average provider. This is defined as:

$$\text{Expected Value}_j = \sum \frac{\exp(\hat{\mu} + \hat{\beta} * Z_{ij})}{\exp(\hat{\mu} + \hat{\beta} * Z_{ij}) + 1}$$

7.2. Facility-level predicted DTC number: the predicted number of DTCs that would occur from that facility assuming the estimated provider-specific effect in the model. This is defined as:

$$\text{Predicted Value}_j = \sum \frac{\exp(\hat{\alpha}_j + \hat{\beta} * Z_{ij})}{\exp(\hat{\alpha}_j + \hat{\beta} * Z_{ij}) + 1}$$

7.3. Risk-Standardized DTC Rate (RSDTCR): the final risk-adjusted facility-level DTC rate, used as the final publicly reported score. Let \bar{Y} denote the national observed rate calculated in Step 4. The RSDTCR is then defined as:

$$\text{RSDTCR} = \left(\frac{\text{Predicted Value}_j}{\text{Expected Value}_j}\right) * \bar{Y}$$

4 SPECIFICATIONS FOR IRF POTENTIALLY PREVENTABLE 30-DAY POST-DISCHARGE READMISSION (PPR-PD) MEASURE

The IRF PPR-PD measure assesses the rate at which beneficiaries experience a potentially preventable hospital readmission following discharge from the IRF. Specifically, this measure reports an IRF's risk-standardized rate of Medicare FFS beneficiaries who are discharged following an IRF stay, but experience a potentially preventable readmission to either an ACH or an LTCH in the 31 days following discharge.

The IRF PPR-PD measure is calculated using the following steps:

- 1. Select IRF and hospital stays for the measure period.** Stays are constructed using final action Medicare FFS Part A claims. Stay construction begins by linking claims that share the same beneficiary identifier, facility CCN, and admission date. To implement restrictions and apply risk adjustment, stays created from claims are linked to other Medicare claims and enrollment data using the beneficiary identifier. IRF stays indexed for the denominator prior to exclusion criteria are those that end within the measure period.
- 2. Identify eligible IRF stays.** Indexed IRF stays are excluded from measure calculation if any of the following exclusion criteria are met. All remaining indexed stays are eligible for measure calculation.
 - The beneficiary was under 18 years of age at the start of the stay.
 - The beneficiary was not discharged from an acute care facility within 30 days prior to IRF admission.
 - The beneficiary was discharged from the IRF against medical advice.
 - The beneficiary was discharged from the IRF to an IP psychiatric hospital, short term ACH, or LTCH.
 - The beneficiary was discharged from the IRF to a federal hospital.
 - The beneficiary was not continuously enrolled in Medicare Part A for at least 365 days prior to IRF admission and for at least 31 days after IRF discharge.
 - The beneficiary was discharged from an acute care facility within 30 days prior to IRF admission, but the stay was for non-surgical treatment of cancer.
 - The IRF stay is associated with problematic or incomplete data. This includes anomalous records for stays that overlap wholly or in part, or are otherwise erroneous or contradictory; stays where the beneficiary cannot be matched in the Medicare enrollment

data; claims with zero utilization days; or if the beneficiary exhausted their Medicare Part A benefits during the stay.

- The beneficiary received care outside the 50 states, District of Columbia, Puerto Rico, and U.S. Territories (determined via the CCN of the provider rendering care, using the SOM CCN-to-U.S. state mappings).
- The beneficiary died during the stay.

3. Identify numerator events. A non-excluded IRF stay is included in the numerator if a PPR event is identified following discharge from the IRF.

3.1. Determine the IRF stays where at least one ACH or LTCH admission occurred during the period spanning the day of discharge (day 0) through the 31st day following discharge (day 31).

3.2. Remove stays where all of the above ACH or LTCH admissions are identified as planned as determined via the PRA (note: for the purposes of measure calculation, all admissions to a psychiatric hospital are considered planned).

3.3. Keep stays where at least one of the unplanned ACH or LTCH admissions is determined to be potentially preventable using the potentially preventable diagnoses and procedures list.⁹

4. Determine the National Observed Rate. Divide the number of eligible stays resulting in a post-discharge PPR (Step 3) by the total number of all eligible stays (Step 2).

5. Identify covariates. Identify the following covariates associated with each IRF stay¹⁰:

- Beneficiary age and sex categories.
- Beneficiary is at least 65 years old and OREC is either (1) ESRD, (2) disability, or (3) both ESRD and disability.
- CCS category of principal diagnosis from the prior proximal acute stay.
- Comorbidities based on prior acute care stay and/or 365-day lookback, depending on specific comorbidity, clustered into HCCs using principal and secondary ICD-10 diagnoses codes from all IP claims. HCCs are constructed using secondary diagnoses from the prior proximal stay and all diagnoses from other stays in the 365-day lookback period.

⁹ This list is available in the supplemental workbook (see Section 2.2).

¹⁰ A detailed list of individual covariates used in the model is available in the supplemental workbook (see Section 2.2).

- IRF CMGs (identified via the HCPCS code corresponding to Revenue Center Code “0024” on the IRF claim).
- Surgical procedure categories (if present) from the procedure codes from the prior proximal acute care stay.
- Number of ACH stays in the 365 days prior to IRF admission (excluding the prior proximal acute care admission).

6. Calculate risk-adjustment coefficients. Calculate coefficient estimates for use in risk adjustment using the following hierarchical model:

6.1. Let Y_{ij} denote the outcome (equal to 1 if beneficiary i experiences a post-discharge PPR, 0 otherwise) for a beneficiary i at facility j . Let $Z_{ij} = (Z_1, Z_2, \dots, Z_k)$ denote a set of k risk adjustment variables. Let α_j represent the facility-specific intercept, μ the adjusted average intercept across all facilities, and τ^2 the between-facility variance component.

6.2. The probability of the outcome occurring is assumed to relate to the covariates via a logit function:

$$\text{logit} \left(P(Y_{ij} = 1 | Z_{ij}, \alpha_j) \right) = \log \left(\frac{P(Y_{ij} = 1 | Z_{ij}, \alpha_j)}{1 - P(Y_{ij} = 1 | Z_{ij}, \alpha_j)} \right) = \alpha_j + \beta * Z_{ij}$$

$$\alpha_j = \mu + \omega_j ; \omega_j \sim N(0, \tau^2)$$

7. Calculate provider-level final scores. Using the coefficients

$$\hat{\beta}, \hat{\mu}, \text{ and } \hat{\alpha}_j = \hat{\mu} + \hat{\omega}_j$$

determined in Step 6, calculate the following values for each provider:

7.1. Facility-level expected PPR number: the number of PPRs that would be expected if that facility’s beneficiaries were treated at the average provider. This is defined as:

$$\text{Expected Value}_j = \sum \frac{\exp(\hat{\mu} + \hat{\beta} * Z_{ij})}{\exp(\hat{\mu} + \hat{\beta} * Z_{ij}) + 1}$$

7.2. Facility-level predicted PPR number: the predicted number of PPRs that would occur from that facility assuming the estimated provider-specific effect in the model. This is defined as:

$$\text{Predicted Value}_j = \sum \frac{\exp(\widehat{\alpha}_j + \widehat{\beta} * Z_{ij})}{\exp(\widehat{\alpha}_j + \widehat{\beta} * Z_{ij}) + 1}$$

7.3. Risk-Standardized Readmission Rate (RSRR): the final risk-adjusted facility-level PPR rate, used as the final publicly reported score. Let \bar{Y} denote the national observed rate calculated in Step 4. The RSRR is then defined as:

$$\text{RSRR} = \left(\frac{\text{Predicted Value}_j}{\text{Expected Value}_j} \right) * \bar{Y}$$

5 SPECIFICATIONS FOR IRF POTENTIALLY PREVENTABLE WITHIN-STAY READMISSION (PPR-WS) MEASURE

The IRF PPR-WS measure assesses the rate at which beneficiaries experience a potentially preventable hospital readmission while actively receiving care at the IRF. Specifically, this measure reports an IRF's risk-standardized rate of Medicare FFS beneficiaries who experience a potentially preventable readmission to either an ACH or an LTCH in the period following IRF admission, before the beneficiary is discharged to a non-acute-care setting.

The IRF PPR-WS measure is calculated using the following steps:

- 1. Select IRF and hospital stays for the measure period.** Stays are constructed using final action Medicare FFS Part A claims. Stay construction begins by linking claims that share the same beneficiary identifier, facility CCN, and admission date. To implement restrictions and apply risk adjustment, stays created from claims are linked to other Medicare claims and enrollment data using the beneficiary identifier. IRF stays indexed for the denominator prior to exclusion criteria are those that end within the measure period.
- 2. Identify eligible IRF stays.** Indexed IRF stays are excluded from measure calculation if any of the following exclusion criteria are met. All remaining indexed stays are eligible for measure calculations.
 - The beneficiary was under 18 years of age at the start of the stay.
 - The beneficiary was not discharged from an acute care facility within 30 days prior to IRF admission.
 - The beneficiary was discharged from the IRF against medical advice.
 - The beneficiary was discharged from the IRF to a federal hospital.
 - The beneficiary was not continuously enrolled in Medicare Part A for at least 365 days prior to IRF admission and through the end of the IRF stay.
 - The beneficiary was discharged from an acute care facility within 30 days prior to IRF admission, but the stay was for non-surgical treatment of cancer.
 - The IRF stay is associated with problematic or incomplete data. This includes anomalous records for stays that overlap wholly or in part, or are otherwise erroneous or contradictory; stays where the beneficiary cannot be matched with Medicare enrollment data; claims with zero utilization days; or if the beneficiary exhausted their Medicare Part A benefits during the stay.

- The beneficiary received care outside the 50 states, District of Columbia, Puerto Rico, and U.S. Territories (determined via the CCN of the provider rendering care, using the SOM CCN-to-U.S. state mappings).
3. **Identify numerator events.** A non-excluded IRF stay is included in the numerator if the stay resulted in a within-stay PPR event.
 - 3.1. Determine the IRF stays where at least one ACH or LTCH admission occurred during the period spanning the day of admission through the day of discharge.
 - 3.2. Remove stays where all of the above ACH or LTCH admissions are identified as planned as determined via the PRA.
 - 3.3. Keep stays where at least one of the unplanned ACH or LTCH admissions is determined to be potentially preventable through the potentially preventable diagnoses and procedures list.¹¹
 4. **Determine the National Observed Rate.** Divide the number of eligible stays resulting in a within-stay PPR (Step 3) by the total number of all eligible stays (Step 2).
 5. **Identify covariates.** Identify the following covariates associated with each IRF stay¹²:
 - Beneficiary age and sex categories.
 - Beneficiary is at least 65 years old and OREC is either (1) ESRD, (2) disability, or (3) both ESRD and disability.
 - CCS category of principal diagnosis from the prior proximal acute stay.
 - IRF CMGs (identified via the HCPCS code corresponding to Revenue Center Code “0024” on the IRF claim).
 - Surgical procedure categories (if present) from the principal procedure code from the prior proximal acute care stay.
 - Dialysis during the prior proximal acute stay where ESRD not indicated.
 - Length of prior proximal acute stay.
 - Indicator if prior proximal acute stay was in psychiatric hospital.
 - Number of intensive care unit (ICU) or cardiac care unit (CCU) days associated with prior proximal acute stay.

¹¹ This list is available in the supplemental workbook (see Section 2.2).

¹² A detailed list of individual covariates used in the model is available in the supplemental workbook (see Section 2.2).

- Comorbidities based on prior acute stay or based on 365-day lookback, depending on specific comorbidity, clustered into HCCs using principal and secondary ICD-10 diagnoses codes from all IP claims. HCCs are constructed using secondary diagnoses from the prior proximal stay and all diagnoses from other stays in the 365-day lookback period.
- Number of ACH stays in the 365 days prior to IRF admission (excluding the prior proximal acute care admission).

6. Calculate risk-adjustment coefficients. Once covariates have been identified for each eligible stay included in measure calculation, calculate coefficient estimates for use in risk-adjustment using the following hierarchical model:

6.1. Let Y_{ij} denote the outcome (equal to 1 if beneficiary i experiences a within-stay PPR, 0 otherwise) for a beneficiary i at facility j . Let $Z_{ij} = (Z_1, Z_2, \dots, Z_k)$ denote a set of k risk adjustment variables. Let α_j represent the facility-specific intercept, μ the adjusted average intercept across all facilities, and τ^2 the between-facility variance component.

6.2. The probability of the outcome occurring is assumed to relate to the covariates via a logit function:

$$\text{logit}\left(P(Y_{ij} = 1|Z_{ij}, \alpha_j)\right) = \log\left(\frac{P(Y_{ij} = 1|Z_{ij}, \alpha_j)}{1 - P(Y_{ij} = 1|Z_{ij}, \alpha_j)}\right) = \alpha_j + \beta * Z_{ij}$$

$$\alpha_j = \mu + \omega_j ; \omega_j \sim N(0, \tau^2)$$

7. Calculate provider-level final scores. Using the coefficients

$$\hat{\beta}, \hat{\mu}, \text{ and } \hat{\alpha}_j = \hat{\mu} + \hat{\omega}_j$$

determined in Step 6, calculate the following values for each provider:

7.1. Facility-level expected PPR number: the number of PPRs that would be expected if that facility's beneficiaries were treated at the average provider. This is defined as:

$$\text{Expected Value}_j = \sum \frac{\exp(\hat{\mu} + \hat{\beta} * Z_{ij})}{\exp(\hat{\mu} + \hat{\beta} * Z_{ij}) + 1}$$

7.2. Facility-level predicted PPR number: the predicted number of PPRs that would occur from that facility assuming the estimated provider-specific effect in our model. This is defined as:

$$\text{Predicted Value}_j = \sum \frac{\exp(\widehat{\alpha}_j + \widehat{\beta} * Z_{ij})}{\exp(\widehat{\alpha}_j + \widehat{\beta} * Z_{ij}) + 1}$$

7.3. Risk-Standardized Readmission Rate (RSRR): the final risk-adjusted facility-level PPR rate, used as the final publicly-reported score. Let \bar{Y} denote the national observed rate calculated in Step 4. The RSRR is then defined as:

$$\text{RSRR} = \left(\frac{\text{Predicted Value}_j}{\text{Expected Value}_j} \right) * \bar{Y}$$

6 SPECIFICATIONS FOR IRF MEDICARE SPENDING PER BENEFICIARY – POST-ACUTE CARE (MSPB-PAC) MEASURE

The IRF MSPB-PAC measure assesses an IRF's resource use relative to the resource use of the national median IRF. The measure is reported as the ratio of the price-standardized, risk-adjusted MSPB amount for each IRF divided by the episode-weighted median MSPB amount across all IRFs. Specifically, the IRF MSPB-PAC measure assesses the cost to Medicare for services performed by IRFs and other healthcare providers during an MSPB episode of care (episode), which is composed of the periods during and following a patient's IRF stay. The IRF that triggers the episode is the provider to whom the episode is attributed for the purpose of calculating the MSPB-PAC measures.

The episode window is the time period during which Medicare FFS Part A and Part B services are counted toward the IRF MSPB-PAC episode. The episode window is comprised of a treatment period and an associated services period. The treatment period of an IRF MSPB-PAC episode begins at IRF admission and ends at IRF discharge. The associated services period begins at IRF admission and ends 30 days after the end of the treatment period (or 30 days post-IRF discharge). The definition of MSPB-PAC episodes allows episodes to overlap with the MSPB hospital measure and with other MSPB-PAC episodes to create continuous accountability and align incentives to improve care planning and coordination across IP and PAC settings.

The IRF MSPB-PAC measure is calculated using the following steps:

- 1. Select IRF episodes for the measure period.** IRF MSPB-PAC episodes are constructed using final action Medicare FFS Parts A and B claims data. Episode construction begins by linking claims that share the same beneficiary identifier, IRF CCN, and admission date. The episode trigger is the beneficiary's admission to the provider, and the episode is attributed to the IRF at which the beneficiary triggers the episode, meaning that the episode is counted toward that provider's IRF MSPB-PAC measure. To implement measure calculation restrictions and apply risk adjustment, episodes are linked to other Medicare claims and enrollment data using the beneficiary identifier.
 - 1.1. Episodes are created by collapsing adjacent stays into a single stay if the discharge date of the stay and the admission date of the subsequent stay occur within zero to seven days.

1.2. Readmissions of the same beneficiary to the same provider within seven days of discharge do not trigger a new episode. Readmissions after eight or more days trigger a new episode.¹³

2. **Define the episode window.** The episode window of an IRF MSPB-PAC episode begins at IRF admission and ends 30 days after IRF discharge.
3. **Apply price standardization.** The IRF MSPB-PAC measure uses a detailed price standardization methodology to exclude geographic payment rate differences. In other words, the measure adjusts observed payments for Medicare geographic adjustment factors, such as the hospital wage index and geographic practice cost index (GPCI). Full details of the price standardization methodology for the IRF MSPB-PAC measure are available from the Research Data Assistance Center (ResDAC).¹⁴
4. **Exclude clinically unrelated services.** Services and related costs are subject to exclusions to ensure providers are not disincentivized from treating beneficiaries with certain conditions or complex care needs. The full list of excluded services is summarized in the supplementary materials (see Section 2.2), but broadly include the following categories:
 - Planned hospital admissions.
 - Routine management of certain preexisting chronic conditions (e.g., dialysis for ESRD, enzyme treatments for genetic conditions, treatment for preexisting cancers, and treatment for organ transplants).
 - Some routine screening and healthcare maintenance (e.g., colonoscopies and mammograms).
 - Immune-modulating medications (e.g., immunosuppressants for organ transplant or rheumatoid arthritis).
5. **Exclude first-day services.** Services occurring on the first day of MSPB-PAC episodes are subject to exclusions related to prior institutional care, including ambulance transport to the attributed PAC provider facility and Durable Medical Equipment, Prosthetics, Orthotics, and Supplies (DMEPOS) orders preceding the patient's admission to the PAC provider. The supplementary materials include a detailed description of the rules pertaining to first-day services (see Section 2.2).

¹³ By collapsing closely adjacent stays in this way, the length of the treatment period is extended (i.e., it begins on the day of the beneficiary's first admission and ends at the beneficiary's latest discharge). Given the way that the associated services period is constructed, it too is extended when adjacent stays are collapsed (i.e., it begins on the day of the beneficiary's first admission and ends 30 days after the end of the treatment period).

¹⁴ <https://resdac.org/articles/cms-price-payment-standardization-overview>.

- 6. Calculate standardized episode spending.** For each IRF MSPB-PAC episode, sum all standardized Medicare FFS Part A and Part B claims payments for services in the episode window, other than services excluded in Steps 4 and 5 above.
- 7. Identify eligible IRF episodes.** For each episode ending within the measure period, episodes are excluded based on the criteria listed below. All remaining episodes are eligible for measure calculations.
 - Any episode that is triggered by an IRF claim outside the 50 states, District of Columbia, Puerto Rico, and U.S. Territories.
 - Any episode where the claim(s) constituting the attributed IRF provider's treatment have a standard allowed amount of zero or where the standard allowed amount cannot be calculated.
 - Any episode in which a beneficiary is not enrolled in Medicare FFS for the entirety of a 90-day lookback period (that is, a 90-day period prior to the episode trigger) plus episode window (including where a beneficiary dies), or is enrolled in Part C for any part of the lookback period plus episode window.
 - Any episode in which a beneficiary has a primary payer other than Medicare for any part of the 90-day lookback period plus episode window.
 - Any episode where the claim(s) constituting the attributed IRF provider's treatment include at least one related condition code indicating that it is not a prospective payment system bill.
 - Any episode that is associated with problematic or incomplete data. This includes anomalous records for episodes that overlap wholly or in part, or are otherwise erroneous or contradictory.
- 8. Calculate expected episode cost.** The MSPB-PAC methodology uses an ordinary least squares (OLS) regression to estimate the relationship between the independent variables described below and standardized episode payment. All covariates are defined using a 90-day lookback period unless otherwise noted. The predicted values from this regression represent the expected spending for each episode. The following covariates are included in the risk-adjustment model¹⁵:
 - Beneficiary's age categories.

¹⁵ A detailed list of individual covariates used in the model is available in the supplemental workbook (see Section 2.2). The covariate list may be subject to non-substantive updates and changes.

- HCCs, including HCC interaction terms,¹⁶ as described in Section 2.1.
- OREC of either ESRD or disability.
- Rehabilitation Impairment Categories (RICs), identified via the combination of the third and fourth positions of the episode’s Health Insurance Prospective Payment System (HIPPS) code.
- Long-term care institutionalization at start of episode.¹⁷
- Six clinical case mix categories reflecting recent prior care, using a 60-day lookback period, as described in Appendix B.
- Hospice utilization during the episode.
- Prior acute ICU utilization days categories.
- Prior acute length-of-stay categories.

9. Winsorize predicted values. To prevent creating extreme predicted values, this step Winsorizes (i.e., “bottom-codes”) predicted values at the 0.5th percentile.¹⁸ The resultant values are renormalized to maintain a consistent average episode payment. This renormalization multiplies the Winsorized predicted values by the ratio of the average original predicted payment and the average Winsorized predicted payment and ensures that the average of the resulting Winsorized predicted values is equal to the average of the original predicted values.

10. Exclude outliers. This step excludes outliers from the calculation and renormalizes the resultant predicted values to maintain a consistent average episode payment level. MSPB-PAC episodes whose residuals fall above the 99th percentile or below the 1st percentile of the distribution of residuals across all IRF MSPB-PAC episodes are excluded from the IRF MSPB-PAC calculation to eliminate the episodes that deviate most from their predicted values in absolute terms. This step also renormalizes the predicted values to ensure that the average expected episode spending levels are the same as average standardized spending levels after outlier exclusions. This renormalization multiplies the predicted values after excluding outliers by the ratio of the average standardized spending level and the average Winsorized predicted spending level after excluding outliers.

¹⁶ CMS Risk Adjustment model software can be found here: <https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk-Adjustors>.

¹⁷ Identifies beneficiaries who have been institutionalized for at least 90 days in a given year. The indicator is based on 90-day assessments from the MDS and is calculated based on CMS’s definition of institutionalized individuals.

¹⁸ Winsorization 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.

The residuals for each episode are calculated as the difference between standardized episode spending and standardized predicted spending for episode i and provider j :

$$Residual_{ij} = Y_{ij} - \hat{Y}_{ij}$$

where:

Y_{ij} is the attributed standardized spending for episode i and provider j

\hat{Y}_{ij} is the standardized predicted spending for episode i and provider j , from Step 9 above.

11. Calculate IRF MSPB-PAC measure. The measure is calculated for individual IRFs, allowing them to be compared to other IRFs. The MSPB-PAC measure for individual provider j is calculated as the following ratio:

$$\frac{MSPB-PAC\ Amount_j}{National\ Median\ MSPB-PAC\ Amount}$$

The numerator is the MSPB-PAC amount, or the average risk-adjusted episode spending across all episodes for the attributed IRF. To calculate the MSPB-PAC amount for each IRF, the average ratio of standardized episode spending over expected episode spending across all episodes for the IRF is found and then this ratio is multiplied by the average episode spending level across all IRFs. The MSPB-PAC Amount numerator is calculated as:

$$MSPB-PAC\ Amount_j = \left(\frac{1}{n_j} \sum_{i \in \{I_j\}} \frac{Y_{ij}}{\hat{Y}_{ij}} \right) \left(\frac{1}{n} \sum_j \sum_{i \in \{I_j\}} Y_{ij} \right)$$

where:

Y_{ij} is the attributed standardized spending for episode i and provider j

\hat{Y}_{ij} is the expected standardized spending for episode i and provider j , as predicted from risk adjustment, and resulting from Step 9 above

n_j is the number of episodes for provider j

n is the total number of episodes nationally

$i \in \{I_j\}$ indicates all episodes i in the set of episodes attributed to provider j

The denominator is the episode-weighted national median of the IRF MSPB-PAC amounts for all IRFs.

Appendix A – ACRONYMS USED

Appendix A lists all acronyms utilized in this manual.

ACH: acute care hospital

AHRQ: Agency for Healthcare Research and Quality

CBM: claims-based measure

CCN: CMS Certification Number

CCS: Clinical Classification Software

CCU: cardiac care unit

CM: Clinical Modification

CMG: Case-Mix Group

CMS: Centers for Medicare & Medicaid Services

DMEPOS: Durable Medical Equipment, Prosthetics, Orthotics, and Supplies

DTC: Discharge to Community

ESRD: end-stage renal disease

FFS: fee-for-service

GPCI: geographic practice cost index

HCC: Hierarchical Condition Category

HCPCS: Healthcare Common Procedure Coding System

HCUP: Healthcare Cost and Utilization Project

HHA: home health agency

HIPPS: Health Insurance Prospective Payment System

HWR: Hospital-Wide Readmission

ICD-10: International Classification of Diseases, Tenth Revision

ICU: intensive care unit

IMPACT: Improving Medicare Post-Acute Care Transformation

IOM: Internet-Only Manual

IP: inpatient

IRF: Inpatient Rehabilitation Facility

LTCH: Long-Term Care Hospital
MBSF: Master Beneficiary Summary File
MDS: Minimum Data Set
MSPB: Medicare Spending per Beneficiary
NH: Nursing Home
OBRA: Omnibus Budget Reconciliation Act
OLS: ordinary least squares
OREC: Original Reason for Entitlement Code
PAC: post-acute care
PCS: Procedure Coding System
PD: post-discharge
PDC: Provider Data Catalog
PPR: Potentially Preventable Readmission
PRA: Planned Readmission Algorithm
QRP: Quality Reporting Program
ResDAC: Research Data Assistance Center
RIC: Rehabilitation Impairment Category
RSDTCR: Risk-Standardized Discharge to Community Rate
RSRR: Risk-Standardized Readmission Rate
SNF: Skilled Nursing Facility
SOM: State Operations Manual
SRR: standardized risk ratio
WS: within-stay

Appendix B – MSPB-PAC CLINICAL CASE MIX RISK ADJUSTMENT METHODOLOGY

The clinical case mix category variables used in the MSPB-PAC risk adjustment models are included to account for differences in intensity and type of care received by beneficiaries prior to the start of an MSPB-PAC episode. Taking the most recent institutional claim (by end date) in the 60 days prior to the start of an MSPB-PAC episode, the episode is assigned to one of the following mutually exclusive and exhaustive clinical case mix categories:

- (1) **Prior Acute Surgical IP – Orthopedic** – beneficiaries who have most recently undergone orthopedic surgery in an acute IP hospital
- (2) **Prior Acute Surgical IP – Non-Orthopedic** – beneficiaries who have most recently undergone a non-orthopedic surgery in an acute IP hospital
- (3) **Prior Acute Medical IP with ICU** – beneficiaries who have most recently stayed in an acute IP hospital for non-surgical reasons and had a stay in the ICU
- (4) **Prior Acute Medical IP without ICU** – beneficiaries who have most recently stayed in an acute IP hospital for non-surgical reasons but did not have a stay in the ICU
- (5) **Prior PAC - Institutional** – beneficiaries who are continuing PAC from an institutional PAC setting (i.e., coming from an LTCH, IRF, or Skilled Nursing Facility [SNF])
- (6) **Prior PAC - HHA** – beneficiaries who are continuing PAC from an HHA
- (7) **Community** – all other beneficiaries

If there are multiple prior claims with the same end date in the 60 days prior to the start of a PAC episode, additional logic is employed to determine the episodes' clinical case mix category. For conflicts occurring between two IP claims, the clinical case mix category corresponding to the claim with the longest length of stay (LOS) is assigned. For all other types of conflicts, including those where the LOS is the same between two IP claims, the clinical case mix category is assigned using a hierarchy in the order of the categories listed above.