Quality Payment
PROGRAM

Inpatient Percutaneous Coronary Intervention

Measure Justification Form

December 2023

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1.0 Introduction

This Measure Justification Form (MJF) provides results for the testing and evaluation of the Inpatient (IP) Percutaneous Coronary Intervention (PCI) measure. The form is intended to provide detailed information about the testing conducted on this measure, and accompanies the Measure Methodology[1] and Measure Codes List[2] file, which together, comprise the specifications for this cost measure.

1.1 Project Title

Physician Cost Measure and Patient Relationship Codes

1.2 Date

Information included is current on December 08, 2023.

1.3 Project Overview

The Centers for Medicare & Medicaid Services (CMS) has contracted with Acumen, LLC to develop care episode and patient condition groups for use in cost measures to meet the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) requirements. The contract name is "Physician Cost Measure and Patient Relationship Codes (PCMP)." The contract number is 75FCMC18D0015, Task Order 75FCMC19F0004.

1.4 Measure Name

Inpatient (IP) Percutaneous Coronary Intervention (PCI) Episode-Based Cost Measure

1.5 Type of Measure

Cost/Resource Use

1.6 Measure Description

Episode-based cost measures represent the cost to Medicare for the items and services provided to a patient during an episode of care ("episode"). In all supplemental documentation, the term "cost" generally means the standardized[3] Medicare allowed amount[4], and claims data from Medicare Parts A and B[5] are used to construct this episode-based cost measure.

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[1]CMS, "Inpatient Percutaneous Coronary Intervention Measure Methodology," *QPP Cost Measure Information Page,* https://www.cms.gov/medicare/quality/value-based-programs/cost-measures

[2]CMS, "Inpatient Percutaneous Coronary Intervention Measure Codes List" *QPP Cost Measure Information Page*, https://www.cms.gov/medicare/quality/value-based-programs/cost-measures

[3] Claim payments are standardized to account for differences in Medicare payments for the same service(s) across Medicare providers. Payment standardized costs remove the effect of differences in Medicare payment among health care providers that are the result of differences in regional health care provider expenses measured by hospital wage indexes and geographic price cost indexes or other payment adjustments such as those for teaching hospitals. For more information, please refer to the "CMS Part A and Part B Price (Payment) Standardization - Basics" and "CMS Part A and Part B Price (Payment) Standardization - Detailed Methods" documents posted on the CMS Price (Payment) Standardization Overview page (https://www.resdac.org/articles/cms-price-payment-standardization-overview).

[4] Cost is defined by allowed amounts on Medicare claims data, which include both Medicare trust fund payments and any applicable beneficiary deductible and coinsurance amounts.

[5] Part D branded drug costs are also adjusted to account for post-point of sale drug rebates; more information can be found in the Methodology for Rebates in Part D Standardized Amounts on the CMS.gov QPP Cost Measures Information Page's QPP Cost Measure Information page (https://www.cms.gov/medicare/quality-payment-program/cost-measures/about).

The IP PCI episode-based cost measure evaluates a clinician's or clinician group's risk-adjusted cost to Medicare for patients who present with a cardiac event and emergently receive PCI as treatment. This acute inpatient medical condition measure includes the costs of services that are clinically related to the attributed clinician's role in managing care during an IP PCI episode.

2.0 Importance

2.1 Evidence to Support the Measure Focus

The IP PCI measure was developed for use in the Merit-based Incentive Payment System (MIPS) to meet the requirements of the Social Security Act section 1848(r), added by the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA). MIPS aims to reward high-value care by measuring clinician performance through four areas: quality, improvement activities, promoting interoperability, and cost. Each category assesses different aspects of care, and the categories are weighted to combine into one composite score. CMS is introducing MIPS Value Pathways (MVPs) to align and connect quality measures, cost measures, and improvement activities across performance categories of MIPS for different specialties or conditions. MVPs aim to provide a holistic assessment of clinician value for a specific type of care to achieve better healthcare outcomes and lower patient costs.

The use of cost measures is required by statute, and their purpose is to assess resource use. To be effective, they should capture costs related to a clinician's care decisions and account for factors outside their influence. This measure provides clinicians with information about their care costs that they can use to understand the costs associated with their decision-making. Clinicians play an important role in variation in health care expenditures due to their ability to affect costs.[6] A cost measure offers an opportunity for improvement if clinicians can exercise influence on the intensity or frequency of a significant share of costs during the episode, or if clinicians can achieve lower spending and better quality of care quality through changes in clinical practice.

According to the literature and feedback received through stakeholder input activities, this measure's focus represents an area with opportunities for improvement. As discussed in the rest of this section, primary opportunities for improving PCI cost outcomes include reducing PCI readmissions, acute kidney injury (AKI) due to PCI, and complications related to bleeding, thrombosis, and ischemic events.

PCI is used to treat adverse outcomes of coronary artery disease (CAD). CAD is the leading cause of death in the US and accounts for one third of all deaths in people older than age 35.[7,8] CAD incidence and prevalence are projected to increase by 26% and 47%, respectively, by 2040.[9] More than 7 million people worldwide are affected by acute coronary syndromes (ACS), characterized by a sudden reduction in blood supply to the heart, including ST-segment elevation myocardial infarction (STEMI), non-STEMI, and unstable angina, all adverse

[6]David Cutler et al., "Physician Beliefs and Patient Preferences: A New Look at Regional Variation in Health Care Spending," American Economic Journal: Economic Policy 11, no. 1 (February 1, 2019): 192–221, https://doi.org/10.1257/pol.20150421.

[7] Duggan JP, Peters AS, Trachiotis GD, Antevil JL. Epidemiology of Coronary Artery Disease. *Surg Clin North Am*. 2022;102(3):499-516. doi:10.1016/j.suc.2022.01.007.

[8] Ralapanawa U, Sivakanesan R. Epidemiology and the Magnitude of Coronary Artery Disease and Acute Coronary Syndrome: A Narrative Review. *J Epidemiol Glob Health*. 2021;11(2):169-177. doi:10.2991/jegh.k.201217.001.

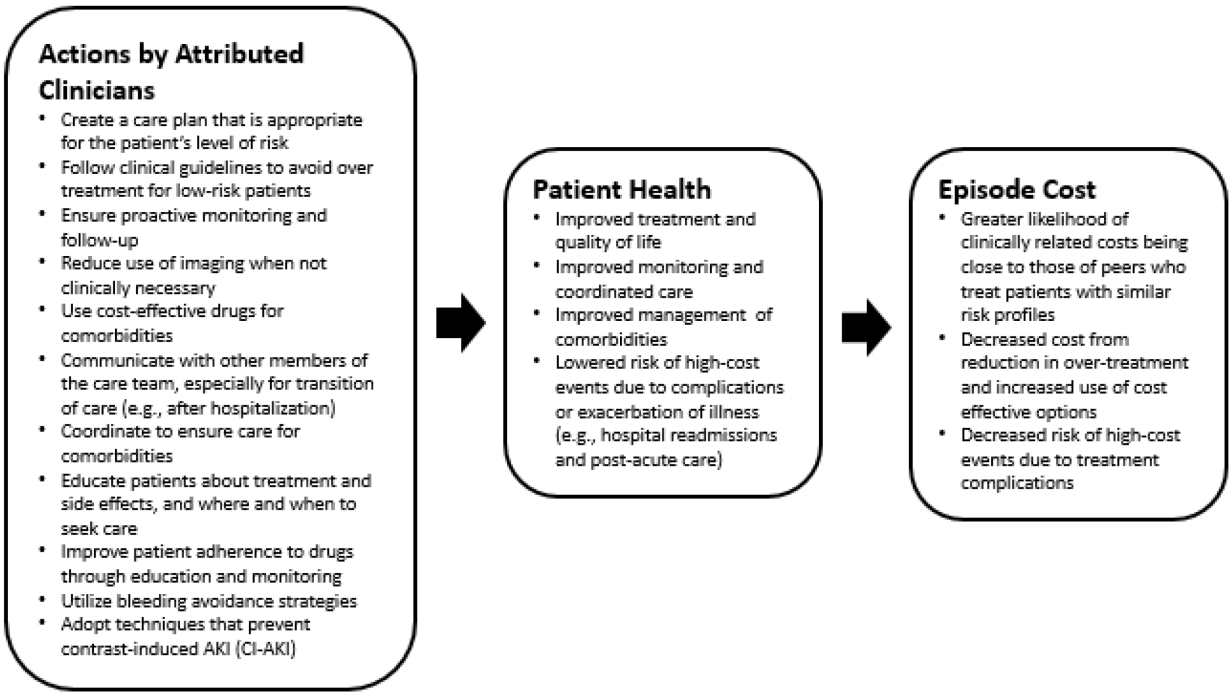
[9] Odden MC, Coxson PG, Moran A, Lightwood JM, Goldman L, Bibbins-Domingo K. The impact of the aging population on coronary heart disease in the United States. *Am J Med*. 2011;124(9):827-33.e5. doi:10.1016/j.amjmed.2011.04.010.

outcomes of CAD.[10] PCI volume increased from 550,872 in 2013 to 637,650 in 2017, a 15.8% increase that is primarily due to an increase in non-elective PCIs.[11]

CAD is costly to the U.S. healthcare system, with CAD-related costs projected to increase by 41%, from $126.2 billion in 2010 to $177.5 billion by 2040.[7,9] In 2007, annual PCI costs were estimated at $10 billion,[12] and the average Medicare payments for acute myocardial infarction (AMI) patients treated with PCI ranged from $9,303 to $17,500 in 2009.[13] Moreover, claims data demonstrates that total Medicare expenditures within 30 days of PCI averaged $13,234 for elective outpatient PCI episodes between 2016 and 2017.

2.1.1 Logic Model

Figure 1: Logic Model of Steps between Actions by Attributed Clinicians and Episode Cost



2.2 Performance Gap

2.2.1 Rationale

The literature scan suggests that some patients experience increased risk of PCI complications, leading to increased costs due to bleeding complications, hospital readmissions, and contrast-

[10] Bhatt DL, Lopes RD, Harrington RA. Diagnosis and Treatment of Acute Coronary Syndromes: A Review [published correction appears in JAMA. 2022 May 3;327(17):1710]. *JAMA*. 2022;327(7):662-675. doi:10.1001/jama.2022.0358
[11] Inohara T, Kohsaka S, Spertus JA, et al. Comparative Trends in Percutaneous Coronary Intervention in Japan and the United States, 2013 to 2017. *J Am Coll Cardiol*. 2020;76(11):1328-1340. doi:10.1016/j.jacc.2020.07.037
[12] Amin AP, Miller S, Rahn B, et al. Reversing the "Risk-Treatment Paradox" of Bleeding in Patients Undergoing Percutaneous Coronary Intervention: Risk-Concordant Use of Bleeding Avoidance Strategies Is Associated with Reduced Bleeding and Lower Costs. *J Am Heart Assoc*. 2018;7(21):e008551. doi:10.1161/JAHA.118.008551.
[13] Afana M, Brinjikji W, Cloft H, Salka S. Hospitalization costs for acute myocardial infarction patients treated with percutaneous coronary intervention in the United States are substantially higher than Medicare payments. *Clin Cardiol*. 2015;38(1):13-19. doi:10.1002/clc.22341.

induced acute kidney injury (CI-AKI). Bleeding due to PCI is estimated to cost $12,000 per episode. Although many hospitals experience high rates of bleeding, few have systematically attempted to reduce bleeding to make PCI safe and inexpensive.[12] Other bleeding-related issues can occur as a result of PCI including thrombosis and ischemic events. Reducing complications related to bleeding, thrombosis, and ischemic events can improve patient outcomes and reduce downstream costs associated with subsequent treatment.[12] Research showed that the use of bleeding avoidance strategies that can be implemented pre-procedure, during PCI, and post-PCI, which included identifying patients at high risk of bleeding, providing pre-treatment with dual antiplatelet therapy (DAPT), use of radial access as the default approach, and tracking complications unique to PCI approach.[14] Additionally, PCI approach choice can reduce bleeding risks. For instance, several studies have reported lower risk of bleeding when using a transradial approach instead of transfemoral approach.[15,16,17,18] Lastly, drug therapy can reduce thrombosis and ischemic events. For instance, trials have found that one-month DAPT regimens post-PCI are associated with lower rates of bleeding events in high risk patients.[19,20]

Moreover, reducing readmissions following PCI may lessen costs, given that the average cost of unplanned and all 30-day readmissions has been estimated to be $12,636 and $17,576.[21] Overall, the 30-day readmission rate after PCI varied can vary from 3.3% to 15.8%.[22] Additionally, among patients undergoing PCI between 2013 and 2014, 9.3% had an unplanned 30-day readmission.[22] Furthermore, to reduce readmissions, evidence has shown that calculation of a validated readmission risk score for readmission prior to the PCI procedure can be integrated into the EHR to allow clinicians at subsequent follow-up appointments to tailor

[14] Singh M. Bleeding Avoidance Strategies During Percutaneous Coronary Interventions. *J Am Coll Cardiol*. 2015;65(20), 2225–2238.
[15] de Oliveira Cardoso C, de Moraes CV, Teixeira JV, et al. Randomized Noninferiority Trial of Radiation Exposure During Coronary Angiography: the Transradial and Transfemoral Approach by EXPERienced Operators in Daily rouTine (EXPERT) Trial. *Tex Heart Inst J*. 2023;50(2):e227930. doi:10.14503/THIJ-22-7930
[16] Diego-Nieto A, Núñez JC, Miñana G, et al. Safety and feasibility of transradial access for percutaneous coronary intervention in chronic total occlusions. *Rev Esp Cardiol (Engl Ed)*. 2023;76(4):253-260. doi:10.1016/j.rec.2022.05.019.
[17] Gargiulo G, Giacoppo D, Jolly SS, et al. Effects on Mortality and Major Bleeding of Radial Versus Femoral Artery Access for Coronary Angiography or Percutaneous Coronary Intervention: Meta-Analysis of Individual Patient Data From 7 Multicenter Randomized Clinical Trials. *Circulation*. 2022;146(18):1329-1343. doi:10.1161/CIRCULATIONAHA.122.061527
[18] Reifart J, Göhring S, Albrecht A, et al. Acceptance and safety of femoral versus radial access for percutaneous coronary intervention (PCI): results from a large monitor-controlled German registry (QuIK). *BMC Cardiovasc Disord*. 2022;22(1):7. Published 2022 Jan 12. doi:10.1186/s12872-021-02283-0.
[19] Pivato CA, Reimers B, Testa L, et al. One-Month Dual Antiplatelet Therapy After Bioresorbable Polymer Everolimus-Eluting Stents in High Bleeding Risk Patients [published correction appears in J Am Heart Assoc. 2022 Aug 16;11(16):e020787]. *J Am Heart Assoc*. 2022;11(6):e023454. doi:10.1161/JAHA.121.023454
[20] Watanabe H, Domei T, Morimoto T, et al. Effect of 1-Month Dual Antiplatelet Therapy Followed by Clopidogrel vs 12-Month Dual Antiplatelet Therapy on Cardiovascular and Bleeding Events in Patients Receiving PCI: The STOPDAPT-2 Randomized Clinical Trial. *JAMA*. 2019;321(24):2414-2427. doi:10.1001/jama.2019.8145
[21] Shroff A, Kupfer J, Gilchrist IC, et al. Same-Day Discharge After Percutaneous Coronary Intervention: Current Perspectives and Strategies for Implementation. *JAMA Cardiol*. 2016;1(2):216-223. doi:10.1001/jamacardio.2016.0148
[22] Kwok CS, Narain A, Pacha HM, et al. Readmissions to Hospital After Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis of Factors Associated with Readmissions. *Cardiovasc Revasc Med*. 2020;21(3):375-391. doi:10.1016/j.carrev.2019.05.016

treatments and therapies to a patient's risk profile.[23,24] Additionally, prevention or clinical management of complications can reduce factors leading to readmission.[12] For instance, the use of a checklist to promote safe practices, such as the safe procedure checklist, has been shown to reduce complications of procedures performed in the cardiac catheterization laboratory.[25]

Lastly, in cardiac patients undergoing PCI, contrast-induced AKI (CI-AKI) is the most common complication following angiographic procedures.[26] Of 509,039 Medicare beneficiaries undergoing inpatient PCI between January 2017 and June 2020, 1.9% were diagnosed with CI-AKI, leading to an additional $6,566 in index admission costs and $13,381 in cumulative one-year costs.[27] Patients with chronic CAD are more likely to experience CI-AKI based on factors such as age, diabetes, hemoglobin, body weight adapted contrast media. and urinary system blush.[28] Chronic kidney disease (CKD) and CAD often occur together, with CKD as a risk factor for CI-AKI, which can occur during cardiovascular procedures involving contrast administration.[29] A study of NSTEMI patients randomized to routine hydration therapy were less likely to develop CI-AKI compared to those who did not receive routine hydration therapy.[30] In addition to preprocedural hydration, CI-AKI can be prevented by reducing contrast volume utilization, adopting techniques for zero- or ultra-low-contrast procedures, and treating patients with statins.[31] Also, using urinary system contrast blush grading can be used to risk assess patients and predict post-procedure CI-AKI.[28]

The ST-Elevation Myocardial Infarction (STEMI) with Percutaneous Coronary Intervention (PCI) Measure episode-based measure was originally developed because of its high impact in terms of patient population and Medicare spending.

Now, the revised Inpatient PCI episode-based measure increases the number of clinicians participating in the measure without compromising the measure's reliability. This was achieved by expanding the patient cohort to include of beneficiaries receiving a PCI with a Non-ST-Elevation Myocardial Infarction (NSTEMI) diagnosis as well as beneficiaries receiving a PCI without a STEMI or NSTEMI diagnosis. These subpopulations were added to the measure based on input from the Clinician Expert Workgroup, and expected cost differences not under the influence of the attributed clinician are accounted for through risk adjustment. Further, as

[23] Kalra A, Shishehbor MH, & Simon DI. Percutaneous Coronary Intervention Readmissions. *JACC: Cardiovascular Interventions*. 2018;11(7), 675–676.
[24] Tanguturi VK, Temin E, Yeh RW, et al. Clinical Interventions to Reduce Preventable Hospital Readmission After Percutaneous Coronary Intervention. *Circ Cardiovasc Qual Outcomes*. 2016;9(5):600-604. doi:10.1161/CIRCOUTCOMES.116.003086
[25] Lindsay AC, Bishop J, Harron K, Davies S, Haxby E. Use of a safe procedure checklist in the cardiac catheterisation laboratory. *BMJ Open Qual*. 2018;7(3):e000074. Published 2018 Jul 13. doi:10.1136/bmjoq-2017-000074.
[26] Kumar R, Ahmed Khan K, Rai L, et al. Comparative analysis of four established risk scores for predicting contrast induced acute kidney injury after primary percutaneous coronary interventions. *Int J Cardiol Heart Vasc*. 2021;37:100905. Published 2021 Oct 29. doi:10.1016/j.ijcha.2021.100905.
[27] Griffiths RI, Cavalcante R, McGovern AM et al. Cost to Medicare of Acute Kidney Injury in Percutaneous Coronary Intervention. *Am Heart J*. 2023. doi:10.1016/j.ahj.2023.03.013
[28] Efe SC, Keskin M, Toprak E, et al. A Novel Risk Assessment Model Using Urinary System Contrast Blush Grading to Predict Contrast-Induced Acute Kidney Injury in Low-Risk Profile Patients. *Angiology*. 2021;72(6):524-532. doi:10.1177/00033197211005206.
[29] Ali ZA, Escaned J, Dudek D, Radhakrishnan J, Karimi Galougahi K. Strategies for Renal Protection in Cardiovascular Interventions. *Korean Circ J*. 2022;52(7):485-495. doi:10.4070/kcj.2022.0093.
[30] Arslan S, Yildiz A, Dalgic Y, et al. Avoiding the emergence of contrast-induced acute kidney injury in acute coronary syndrome: routine hydration treatment. *Coron Artery Dis*. 2021;32(5):397-402. doi:10.1097/MCA.0000000000000966.
[31] Bugani G, Ponticelli F, Giannini F, et al. Practical guide to prevention of contrast-induced acute kidney injury after percutaneous coronary intervention. *Catheter Cardiovasc Interv*. 2021;97(3):443-450. doi:10.1002/ccd.28740

evidenced by the literature review, there are opportunities to improve efficiency (i.e., reduce bleeding due to PCI and CI-AKI) and thereby reducing the cost to Medicare for patients with this acute inpatient medical condition.

2.2.2 Performance Scores

Table 1 shows the distribution of the measure score for clinician groups identified by a Tax Identification Number (TIN) and individual clinicians identified by a combination of a Tax Identification Number and National Provider Identifier (TIN-NPI).

There are variations in cost performance observed in the measure score for both TINs and TIN-NPIs, as evidenced by the interquartile ranges and score standard deviations. For both TINs and TIN-NPIs, the maximum score is more than 1.5 times larger than the minimum score. The variation in the measure score is in the thousands of dollars, which highlights an opportunity for improvement in the costs of care for an IP PCI episode by closing the gap between the most and least efficient providers.

Table 1. Distribution of the Measure Score

Metric	TIN	TIN-NPI
Count	1,202	338
Mean Score	$20,468	$22,713
Score Standard Deviation	$1,060	$1,634
Minimum Score	$16,967	$19,742
Maximum Score	$26,308	$29,750
Score Interquartile Range (IQR)	$1,295	$2,023
Score Percentile		
10th	$19,238	$20,759
20th	$19,589	$21,427
30th	$19,899	$21,752
40th	$20,159	$22,166
50th	$20,356	$22,404
60th	$20,598	$22,821
70th	$20,894	$23,241
80th	$21,255	$23,943
90th	$21,795	$25,008

2.2.3 Disparities

Data on how the measure, as specified, addresses disparities is described in Sections 3.1.7 and 3.5.5.

3.0 Scientific Acceptability

3.1 Data Sample Description

Testing is based on the full population of measured entities and patients meeting inclusion and exclusion criteria for the measure, not based on a sample.

3.1.1 Type of Data Used for Testing

Medicare administrative claims data from the Common Working File (CWF), Long-Term Care Minimum Data Set (LTC MDS), and Medicare Enrollment Database (EDB).

3.1.2 Specific Dataset Used for Testing

The IP PCI measure uses Medicare Part A and Part B claims data maintained by CMS. Part A and B claims data are used to build episodes of care, calculate episode costs, and construct risk adjustors. Episode costs are payment standardized and risk adjusted to ensure accurate comparison of cost across clinicians. Payment standardization adjusts the allowed amount for a Medicare service to limit observed differences in costs to those that may result from health care delivery choices. Data from the EDB are used to determine beneficiary-level exclusions and secondary risk adjustors, specifically Medicare Parts A, B, and C enrollment, primary payer, disability status, end-stage renal disease (ESRD), patient birth dates, and patient death dates. The risk adjustment model also accounts for expected differences in payment for services provided to patients in long-term care based on data from the LTC MDS. Specifically, the LTC MDS is used to create the long-term care indicator variable in risk adjustment.

3.1.3 Dates of the Data Used in Testing

IP PCI episodes ending from January 1, 2022, through December 31, 2022.

3.1.4 Levels of Analysis Tested

The measure was tested at group/practice (TIN) and individual clinician (TIN-NPI) levels.

3.1.5 Entities Included in the Testing and Analysis

Table 2 shows the individual clinician (identified by combination of TIN and NPI) and clinician group/practice (identified by TIN) included in the testing of the IP PCI measure.

Table 2: Measured Entities Demographics

Metric	TIN		TIN-NPI	
	Count	%	Count	%
Count	1,202	100%	338	100%
Number of Episodes Attributed	-	-	-	-
20-39 Episodes	548	45.59%	325	96.15%
40-59 Episodes	268	22.30%	11	3.25%
60-79 Episodes	150	12.48%	1	0.30%
80-99 Episodes	73	6.07%	0	-
100-199 Episodes	131	10.90%	1	0.30%
200-299 Episodes	24	2.00%	0	-
300+ Episodes	8	0.67%	0	-
Census Region	-	-	-	-
Northeast	163	13.56%	54	15.98%
Midwest	299	24.88%	84	24.85%

Metric	TIN		TIN-NPI	
	Count	%	Count	%
South	513	42.68%	136	40.24%
West	227	18.89%	64	18.93%
Unknown	0	-	0	-

3.1.6 Patient Cohort Included in the Testing and Analysis

Table 3 shows the patient population for the IP PCI measure testing. It consists of Medicare beneficiaries enrolled in Medicare Parts A and B who undergo PCI that triggers an IP PCI episode and do not meet the measure's exclusion criteria, as outlined in section 3.4.1.

Table 3: Beneficiary Demographics

Metric	Value
Count	68,030
Mean Age	74.84
Female %	37.59%

3.1.7 Social Risk Factors Included in Analysis

The analysis of social risk factors (SRFs) focused on examining the impact of Dual Medicare and Medicaid enrollment status on the measure. Table 4 outlines variables that may indicate SRFs and their advantages and disadvantages as indicators of individual-level SRFs. On balance, the analysis used dual Medicare and Medicaid enrollment status as the proxy of SRFs due to their broad availability in claims data, accurate measurement at the individual level, and wide acceptance of being a powerful indicator of health outcomes.[32]

Table 4: Social Risk Factors Available for Analysis

Variable	Advantages	Disadvantages	Used in Testing
Dual Medicare and Medicaid enrollment status	• Available for all beneficiaries • Most powerful predictor of poor outcomes[32]	• Variation in Medicaid eligibility across states	Yes
Race/Ethnicity	• Available for most beneficiaries, except for ambiguous categories of "Unknown" or "Other"	• Social risk driven by someone's race is often correlated with and partially captured by dual status[32] • Only 5 categories available, which may lack granularity	No

[32] Office of the Assistant Secretary for Planning and Evaluation. "Second report to Congress on social risk and Medicare's value-based purchasing programs." (2020) https://aspe.hhs.gov/pdf-report/second-impact-report-to-congress

Variable	Advantages	Disadvantages	Used in Testing
		to fully capture disparities[33,34]	
ICD-10 Z codes for social determinants of health	• Reflects individual-level factors that influence health status and contact with health services	• Not routinely and consistently coded on claims, only available for 0.1% of all fee-for-service claims in 2019[35]	No
American Community Survey	• Can link beneficiary's zip code to socioeconomic (SES) measurement of their neighborhood • Many SES indices can be derived from the survey data (e.g., AHRQ index, deprivation index)	• Only a proxy measure, not always accurate at individual-level	No

3.2 Reliability Testing

3.2.1 Level of Reliability Testing

The following levels of reliability were tested: critical data elements used in the measure, group/practice (TIN) and individual clinician (TIN-NPI) levels.

3.2.2 Method of Reliability Testing

Data Element Reliability

The IP PCI measure is constructed using CMS claims data, as described in Section 3.1.2. CMS has implemented several auditing programs to assess overall claims code accuracy, ensure appropriate billing, and recoup any overpayments.

- First, CMS routinely conducts data analyses to identify potential problem areas and detect fraud and audits necessary data fields used in this measure, including diagnosis and procedure codes and other elements consequential to payment. Specifically, CMS works with Zone Program Integrity Contractors, formerly Program Safeguard Contractors, to ensure program integrity; the agency also uses Recovery Audit Contractors to identify and correct for underpayments and overpayments.
- Second, CMS also uses the Comprehensive Error Rate Testing (CERT) Program to ensure that Medicare payments are correct under coverage, coding, and billing rules. CMS continues to perform corrective actions and give providers additional education to ensure accurate billing.

[33] Nguyen, Kevin H., Kaitlyn P. Lew, and Amal N. Trivedi. "Trends in Collection of Disaggregated Asian American, Native Hawaiian, and Pacific Islander Data: Opportunities in Federal Health Surveys." *American Journal of Public Health* (2022).
[34] Kader, Farah, Lan N. Doan, Matthew Lee, Matthew K. Chin, Simona C. Kwon, and Stella S. Yi. "Disaggregating Race/Ethnicity Data Categories: Criticisms, Dangers, And Opposing Viewpoints", *Health Affairs Forefront* (2022).
[35] Centers for Medicare and Medicaid, Office of Minority Health. "Utilization of Z Codes for Social Determinants of Health among Medicare Fee-for-Service Beneficiaries." (2019) https://www.cms.gov/files/document/z-codes-data-highlight.pdf

- Lastly, to ensure claims completeness and inclusion of any corrections, the measure was developed and tested using data with three-month claims run-out from the end of the measurement period.

Clinician-level Reliability

Measure reliability is the degree to which repeated measurements of the same entity agree with each other). For measures of clinician performance, the measured entity is the TIN or TIN-NPI, and reliability is the extent to which repeated measurements of the TIN or TIN-NPI give similar results. To estimate measure reliability, we used a signal-to-noise analysis.

This approach seeks to determine how much of the variation in the measure score is explained by differences among clinician performance (i.e., signal) rather than random variation (i.e., statistical noise) among clinicians due to the sample of cases observed. To achieve this, we calculate reliability scores as:

$$R_j = \frac{\sigma_b^2}{\sigma_b^2 + \sigma_{w_j}^2}$$

Where:

$\sigma_{w_j}^2$ is the within-group variance of the mean measure score of clinician *j*

σ_b^2 is the between-group variance of clinicians within the episode group

That is, reliability is calculated as the ratio of between-group variance to the sum of between-group variance and within-group variance. Reliability closer to a value of one indicates that the between-group variance is relatively large compared to the within-group variance, which suggests that the measure is effectively capturing the systematic differences between the clinician and their peer cohort.

3.2.3 Statistical Results from Reliability Testing

Data Element Reliability

Between 2005 and 2020, CMS Comprehensive Error Rate Testing (CERT) estimates that proper payment, which includes payments that met Medicare coverage, coding, and billing rules, ranged from 87.3% to 93.7% of total payments each year.[36] The fiscal year 2022 Medicare fee-for-service program proper payment rate was 92.5%.[37]

Clinician-level Reliability

The table below shows reliability metrics at the 20-episode testing volume threshold. While higher thresholds generally yield higher reliability results, these increases must be considered against decreasing the number of clinicians and clinician groups eligible for the measure, which would limit the applicability of measures to larger group practices and potentially limit the impact of the measure in encouraging performance improvement. For testing purposes, we used a 20-episode volume threshold. If the measure is implemented in MIPS in the future, CMS will establish a case minimum through notice-and-comment rulemaking.

[36]Comprehensive Error Rate Testing (CERT) Program. "Appendices Medicare Fee-for-Service 2020 Improper Payments Report". Table A6. https://www.cms.gov/files/document/2020-medicare-fee-service-supplemental-improper-payment-data.pdf-1.
[37]Ibid.

Table 5: Reliability at the Accountability Entity Level

Reporting Level	Entities Meeting Case Minimum	Mean Reliability	Median Reliability	% Above 0.4	% Above 0.7
TIN	1,202	0.63	0.62	100.00%	30.95%
TIN-NPI	338	0.52	0.51	100.00%	1.18%

3.2.4 Interpretation

The results of the data element testing show very high reliability of the critical data elements used by the measure. At the accountability entity level, the measure is highly reliable for both the TIN and TIN-NPI reporting levels, at 0.63 and 0.52 respectively. A measure with high reliability suggests that performance comparisons across clinicians reflects systematic differences in actual performance better. Based on existing scientific evidence on the different interpretations and methods of estimating reliability, CMS finalized in the CY 2022 Physician Fee Schedule (86 FR 64996) rule that the 0.4 threshold for mean reliability continues to be appropriate for indicating moderate reliability for performance measures in the Cost category in the MIPS program. Mean reliability levels above 0.7 continue to demonstrate high reliability for cost measures, as previously established in the CY 2017 Quality Payment Program final rule (81 FR 77169 through 77171).[38] Additionally, at each testing volume threshold, 100.00% of TINs and TIN-NPI meet or exceed the moderate reliability threshold of 0.4, while 30.95% and 1.18% of TINs and TIN-NPIs, respectively, are above the high reliability threshold of 0.7.

3.3 Validity Testing

3.3.1 Level of Validity Testing

The validity of the measure was tested using empirical validity at the accountable entity level (TIN and TIN-NPI).

3.3.2 Method of Validity Testing

Face Validity

The IP PCI measure was developed through a structured, iterative process for gathering detailed input on the measure from recognized clinician experts. Experts in this clinical area evaluated specifications to ensure that each aspect of the measure (e.g., assigned services) was intentionally capturing only the costs of care within the reasonable influence of the attributed clinician for a defined patient population (i.e., the ability of the measure score to differentiate between good from poor performance).

In developing this measure, Acumen incorporated input from:

(i) an IP PCI Clinician Expert Workgroup;
(ii) a Technical Expert Panel (TEP); and
(iii) the Person and Family Partners.

[38] CMS, "Medicare Program; CY 2022 Payment Policies Under the Physician Fee Schedule and Other Changes to Part B Payment Policies; Medicare Shared Savings Program Requirements; Provider Enrollment Regulation Updates; and Provider and Supplier Prepayment and Post-Payment Medical Review Requirements," 86 FR 64996-66031.

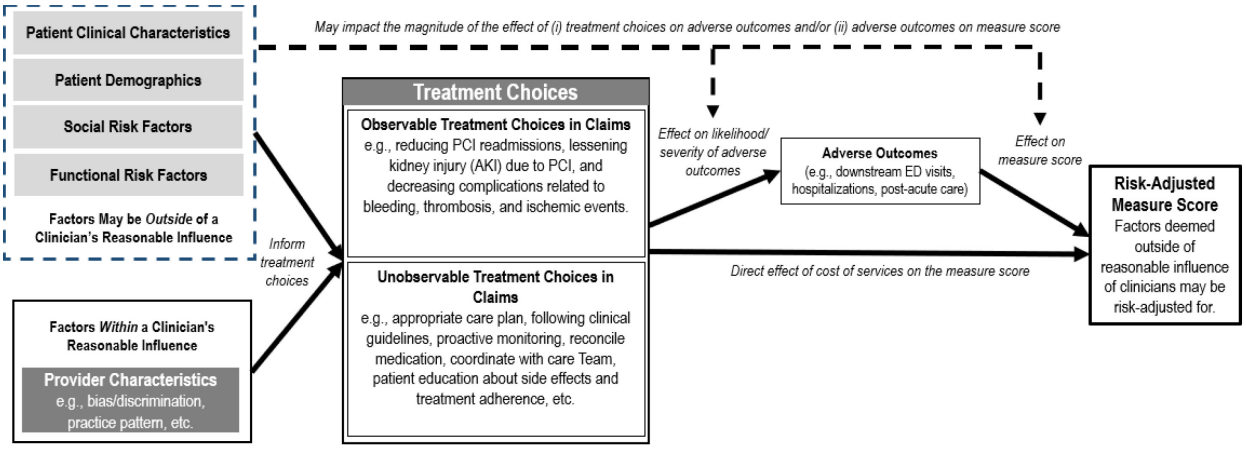
This process is detailed in the Episode-Based Cost Measures Development Process document posted on the QPP Cost Measure Information Page.[39]

One of the primary roles of the Clinician Expert Workgroup is to develop service assignment rules for the cost measure. These service assignment rules seek to ensure clinicians are evaluated on services and costs that are clinically related to the attributed clinician's role associated with the PCI procedure and hospitalization, thus limiting cost variation unrelated to clinician care in this measure. Therefore, assigned services are services that the Clinical Expert Workgroup believed an attributed clinician could influence their occurrence, frequency, or intensity.

Empirical Validity Testing

Validity is a criterion used to assess whether the cost measure can quantify the construct it aims to measure, which is the cost directly related to treatment choices and the cost of adverse outcomes resulting from care. We evaluated the empirical validity of the IP PCI measure by estimating the effect of relevant treatment choices on the measure score using multiple regression, based on the conceptual model outlined in Figure 2.

Figure 2: Conceptual Model of Treatment Choices on the Measure Score



The cost measure is designed to reflect costs directly related to treatment choices, and the cost of adverse outcomes resulting from care. Therefore, treatment choices, either observable in claims or otherwise, by an attributed clinician can directly impact the measure score or indirectly when they are mediated through the cost of adverse outcomes. In turn, the cost of adverse effects is related to the total cost captured by the measure score.

This analysis first estimates the association between treatment choices and the measure score while controlling for the cost of adverse outcomes to demonstrate that the score reflects both the direct and indirect effects of treatment choices. Then, the association between treatment choices and the cost of adverse outcomes is estimated to illustrate the indirect effect.

Generally, adverse outcomes are non-trigger inpatient hospitalizations, non-trigger emergency room visits, and post-acute care. The remaining cost categories are generally considered treatment. For each of these categories, the regression models use the mean cost across episodes that were attributed to an individual clinician. The measure score is represented by a clinician's mean observed cost over expected cost ratio across their attributed episodes.

[40]CMS, QPP Cost Measure Information Page, https://www.cms.gov/medicare/quality/value-based-programs/cost-measures.

3.3.3 Statistical Results from Validity Testing

Empirical Validity Testing

Table 6 shows two regression models for each reporting level. Model 1 shows the effect on the clinicians' mean observed cost to expected cost ratio for each additional one thousand dollar of a cost category that is assigned to an episode, on average, while holding the remaining categories of cost constant. Model 2 shows the effect on the mean cost of adverse events for each additional one thousand dollar of a cost category that is assigned to an episode, on average, while holding the remaining categories of cost constant.

Table 6. Estimated Effect on Treatment Choices on the Measure Score

Service Categories	Coefficient in Thousands [95% Confidence Interval] (p-value)			
	TIN		TIN-NPI	
	Model 1: Mean O/E = Mean Cost of Treatment Choices + Mean Cost of Adverse Events	Model 2: Mean Cost of Adverse Events = Mean Cost of Treatment Choices	Model 1: Mean O/E = Mean Cost of Treatment Choices + Mean Cost of Adverse Events	Model 2: Mean Cost of Adverse Events = Mean Cost of Treatment Choices
Adverse Events	0.04 [0.03,0.04] (p < 0.01)	-	0.03 [0.03,0.04] (p < 0.01)	-
Outpatient Evaluation & Management Services	0.03 [0.00,0.07] (p = 0.06)	2.14 [1.27,3.00] (p < 0.01)	-0.01 [-0.09,0.06] (p = 0.75)	3.22 [1.34,5.11] (p < 0.01)
Major Procedures	0.04 [0.02,0.06] (p < 0.01)	0.52 [0.02,1.03] (p = 0.04)	0.03 [-0.01,0.07] (p = 0.19)	0.86 [-0.27,2.00] (p = 0.14)
Ambulatory/Minor Procedures	0.05 [0.04,0.06] (p < 0.01)	0.0 [-0.19,0.18] 1.0 (p = 0.96)	0.06 [0.05,0.07] (p < 0.01)	-0.21 [-0.53,0.12] (p = 0.22)
Outpatient Physical, Occupational, or Speech and Language Pathology Therapy	0.03 [0.00,0.06] (p = 0.04)	-0.46 [-1.25,0.32] (p = 0.25)	0.07 [0.01,0.14] (p = 0.04)	-1.27 [-2.97,0.43] (p = 0.14)
Laboratory, Pathology, and Other Tests	0.09 [0.03,0.16] (p < 0.01)	3.24 [1.72,4.75] (p < 0.01)	-0.06 [-0.16,0.04] (p = 0.21)	4.50 [2.00,7.01] (p < 0.01)
Imaging Services	0.07 [0.01,0.12] (p = 0.02)	-0.82 [-2.20,0.55] (p = 0.24)	0.15 [0.07,0.24] (p < 0.01)	-0.65 [-2.95,1.65] (p = 0.58)
Durable Medical Equipment and Supplies	0.02 [0.00,0.04] (p = 0.01)	0.27 [-0.14,0.68] (p = 0.20)	0.02 [-0.01,0.04] (p = 0.27)	-0.46 [-1.15,0.23] (p = 0.20)
Inpatient Hospital Trigger	0.01 [0.01,0.01] (p < 0.01)	0.04 [0.00,0.09] (p = 0.07)	0.01 [0.01,0.02] 0.02 (p < 0.01)	0.07 [-0.01,0.15] (p = 0.10)

Physician Services During Hospitalization Trigger	0.02 [0.01,0.02] (p < 0.01)	0.47 [0.28,0.66] (p < 0.01)	0.03 [0.01,0.04] (p < 0.01)	0.32 [-0.02,0.65] (p = 0.06)
Anesthesia Services	0.29 [0.17,0.42] (p < 0.01)	5.55 [2.45,8.65] (p < 0.01)	0.23 [0.05,0.41] (p = 0.01)	4.20 [-0.43,8.83] (p = 0.08)
Chemotherapy and Other Part B-Covered Drugs	0.05 [0.04,0.06] (p < 0.01)	1.13 [0.86,1.40] (p < 0.01)	0.06 [0.05,0.08] (p < 0.01)	1.19 [0.83,1.54] (p < 0.01)
Dialysis	-0.16 [-0.41,0.09] (p = 0.22)	6.77 [0.65,12.88] (p = 0.03)	0.14 [-0.29,0.57] (p = 0.53)	11.40 [0.35,22.44] (p = 0.04)
All Other Services Not Otherwise Classified	0.07 [0.03,0.11] (p < 0.01)	-0.73 [-1.75,0.28] (p = 0.16)	-0.18 [-0.36,0.00] (p = 0.05)	0.77 [-3.94,5.48] (p = 0.75)

3.3.4 Interpretation

Overall, the results demonstrate that the cost measure reflects cost directly related to treatment choices and the cost of related adverse outcomes (Table 6).

Model 1 shows that adverse events are associated with worse measure scores. Costs of major procedures, outpatient evaluation and management (E/M), laboratory testing, hospitalization, physician services during hospitalization, anesthesia, and Part B medications are associated with worse measure scores (Model 1) and higher costs of adverse events (Model 2), which suggests that avoidance of adverse events may also reduce spending related to these services and improve measure performance. Other services, such as minor procedures, outpatient therapy services (i.e., physical therapy, occupational therapy, and speech and language therapy), imaging, and any other services not classified, are associated with worse measure scores, but they do not appear to be associated with adverse events, which suggests that overuse of these services may negatively impact measure scores. These results suggest that the measure is capturing what it aims to measure.

3.4 Exclusions Analysis

3.4.1 Method of Testing Exclusions

Exclusions are used in the IP PCI measure to ensure a comparable patient population within the scope of the measure's focus on patients who present with a cardiac event and emergently receive PCI as treatment and that episodes provide meaningful information to attributed clinicians. Exclusions are also used as part of data processing so that sufficient data are available to accurately determine episode spending and calculate risk adjustment for each episode.

For the exclusions analysis discussed in this section, we focused on exclusion criteria intended to ensure a comparable patient population.

- Episodes where patient death date occurred before the episode end date
    - These episodes were excluded as they may not accurately reflect a clinician's performance as the truncated episode window does not capture the full length of care intended by the measure.

- Episodes with patients recently hospitalized for STEMI or respiratory failure, patients with a new cardiac device implantation, or patients with a history of intracranial hemorrhage or cerebral infarction, cardiac arrest, ventilator dependence, transplant, or shock.
    - These episodes may not accurately reflect a clinician's performance and were excluded as these cases may substantially deviate from the projected cost for a given patient risk profile.
- Episodes with patients with overlapping IP admission days or who are treated at non-acute hospital, psychiatric facilities
    - These episodes were excluded as they may be influenced by exceptional payments that substantially deviate from the projected cost.

Given the rationales for these exclusions, we expect these excluded episodes to have a different profile than the included episodes, such as a higher mean cost, or a different distribution of costs (e.g., a long tail of high-cost episodes). For each exclusion, we examined the number of episodes and beneficiaries affected, as well as the distributions of observed cost. We then compared the cost characteristics of the excluded episodes to those of episodes included in the measure calculation to assess the distinctness between the two patient cohorts. A full list of the exclusions used for the IP PCI measure is provided in the Measure Codes List available on the QPP Cost Measure Information Page.[40]

3.4.2 Statistical Results from Testing Exclusions

Table 7 below presents descriptive statistics of all episodes meeting the measure's triggering logic, excluded episodes, and final reportable episodes at both TIN and TIN-NPI levels. These exclusion criteria ensure that the reportable episode populations are more homogenous and comparable than all episodes meeting triggering logic.

[40]CMS, QPP Cost Measure Information Page, https://www.cms.gov/medicare/quality/value-based-programs/cost-measures.

Table 7: Cost Statistics for Measure Exclusions

Exclusion	Episodes		Observed Cost					
				Percentile				
	#	% of All Episodes Meeting Triggering Logic	Mean	10th	25th	50th	75th	90th
All Episodes Meeting Triggering Logic	86,125	100.00%	$21,841	$14,197	$14,936	$20,303	$24,464	$32,552
Beneficiary Death in Episode	3,577	4.15%	$29,543	$18,185	$22,528	$24,622	$31,469	$44,157
Outlier	1,392	1.62%	$45,890	$19,085	$22,123	$37,042	$66,350	$80,950
No Attributed TIN-NPI	10,032	N/A	$17,158	$12,783	$12,783	$13,638	$20,221	$22,792
Not an IPPS Acute Hospital or Psychiatric Facility	42	0.05%	$25,746	$14,935	$17,502	$22,391	$25,624	$40,990
Overlapping IP Admission Days	794	0.92%	$30,205	$19,432	$20,418	$26,922	$32,799	$43,867
TIN does not Meet Testing Volume Threshold	10,534	12.23%	$21,782	$14,087	$14,854	$20,108	$24,360	$32,955
TIN-NPI does not Meet Testing Volume Threshold	75,798	88.01%	$21,609	$14,188	$14,910	$19,535	$24,230	$32,060
Recent hospitalization for STEMI	7,967	9.25%	$23,128	$14,009	$15,082	$21,938	$25,664	$34,721
Recent hospitalization for respiratory failure	370	0.43%	$28,362	$15,811	$22,184	$24,347	$31,665	$41,573
Patients with new cardiac device implantation	458	0.53%	$22,950	$14,121	$14,974	$21,568	$25,479	$35,203
History of intracranial hemorrhage or cerebral infarction	3,796	4.41%	$24,374	$14,335	$15,485	$22,400	$27,234	$37,867
Ventilator dependence	261	0.30%	$29,027	$14,878	$21,439	$24,592	$32,837	$46,061
Principle diagnosis for cardiac arrest	29	0.03%	$29,402	$18,709	$22,773	$23,728	$32,545	$51,210
Shock	735	0.85%	$30,179	$16,053	$21,910	$25,248	$33,821	$47,380
Transplant patients	941	1.09%	$24,516	$14,485	$15,742	$22,587	$26,179	$36,416
Reportable Episodes (if all clinicians reported as TIN at the Testing Volume Threshold)	59,187	68.72%	$20,531	$14,179	$14,838	$17,769	$23,639	$30,110
Reportable Episodes (if all clinicians reported as TIN-NPI at the Testing Volume Threshold)	7,178	8.33%	$21,138	$14,168	$14,895	$18,870	$24,233	$31,501

3.4.3 Interpretation

The statistical results show that applying the above exclusion criteria decreased the observed cost of all episodes meeting trigger logic so they are closer to the expected range of costs for IP

PCI, from the mean of $21,841 to $20,531 at the TIN-level and $21,138 at the TIN-NPI level. The cost distribution also decreased, the difference between the 90th percentile and the 10th percentile was $18,335. After exclusions, the difference was $15,931 for TINs and $10,363 for TIN-NPIs. This supports the exclusion of these episodes to ensure a comparable patient cohort that yields a clinically coherent measure and meaningful information to attributed clinicians. Further discussion of the results for exclusions applied based on the clinical validity of the study population are provided below.

Most of the episodes excluded had a higher mean observed cost than all episodes meeting the trigger logic. In particular, the largest mean observed costs came from episodes that included the beneficiary's death; were outliers; included overlapping IP admission stays; include patients who were recently hospitalized for respiratory failure; or included patients with cardiac arrest, shock, or ventilator dependence. Note, only the observed cost is shown, which has not been risk adjusted. The differences in cost may appear much smaller after risk adjustment.

Episodes where a beneficiary died before the episode end date were excluded because they did not provide sufficient data in the episode window period and had a mean observed cost of $29,543, higher than for all episodes meeting the trigger logic.

Episodes where a beneficiary has overlapping IP admissions stays were excluded because their observed cost, $30,205, was much higher than for all episodes meeting the trigger logic, which could have disadvantaged some providers if they were not excluded.

Episodes classified as outlier cases were excluded because they deviate substantially from the projected cost for a given patient risk profile, as seen by their high mean observed cost of $45,890. The wide variability of observed episode costs for outlier cases also supports their exclusion: at the 10th percentile the observed cost is $19,085 and at the 90th percentile the observed cost is $80,950.

Episodes where a beneficiary who was recently hospitalized for respiratory failure, had a history of ventilator dependence, shock, or cardiac arrest were excluded because their care may substantially deviate from an average patient. Additionally, they had a mean observed cost of $28,362, $29,027, $30,179, and $29,402 respectively, higher than for all episodes meeting the trigger logic.

3.5 Risk Adjustment or Stratification

3.5.1 Method of Controlling for Differences

Differences in case mix are controlled for using a statistical risk model with 115 risk factors and stratification by 3 risk categories.

The risk adjustment model for the IP PCI measure adjusts for comorbidities based on the CMS Hierarchical Condition Category (HCC) model, count of HCCs, end-stage renal disease (ESRD) status, disability status, number and types of clinician specialties from which the patient has received care, recent use of institutional long-term care, and age.

The model also includes measure-specific factors:

- Anemia
- Cardiomyopathy

- Multivessel CAD
- Pulmonary hypertension
- Valve disease (i.e., aortic stenosis)
- Prior stents/bypass
- History of gastrointestinal bleed or smoking
- Recent cardiac arrest, PCI, or STEMI

A separate linear regression is run for each sub-group combination to ensure fair comparison:

- PCI with ST-Elevation Myocardial Infarction (STEMI) Diagnosis
- PCI with Non-ST-Elevation Myocardial Infarction (NSTEMI) Diagnosis
- PCI without STEMI or NSTEMI diagnosis

The episode's scaled (i.e., annualized) observed costs are winsorized at the 98th percentile prior to the regression for each model to handle extreme observations. Full details of the risk adjustment model are in the Measure Codes List File available on the Cost Measures Information page.[41]

3.5.2 Conceptual, Clinical, and Statistical Methods

We selected the CMS-HCC model based on previous studies evaluating its appropriateness for use in risk adjusting Medicare claims data. This model was developed specifically for use in the Medicare population, meaning that it accounts for conditions found in the Medicare population. In addition, the CMS-HCC model is routinely updated for changes in coding practices (e.g., the transition from ICD-9 to ICD-10 codes). Because the CMS-HCC model has already been extensively tested, we focus our testing on the adaptation of the CMS-HCC model to the IP PCI measure's patient population.

The workgroup provided input on measure-specific risk adjustors after reviewing empirical analyses on subpopulations of interest to assess whether and if so, how, particular factors should be accounted for in the model. These could include patient characteristics, factors outside of the reasonable influence of the clinician, or any other factors that would help prevent unintended consequences. These additional risk adjustors are listed in the section above.

As previously noted, the risk adjustment model is run on episodes stratified into episode sub-groups, which may qualify as "ordering" of risk factors. Episode sub-groups were also determined based on the workgroup's input, with the goal of ensuring clinical comparability among episodes so that the cost measure fairly compares clinicians with similar patient case-mix.

3.5.3 Conceptual Model of Impact of Social Risks

Figure 3 shows the conceptual model that outlines how SRFs can influence the measure score, which is informed by published external research and Acumen's data analysis.[32,42,43,44,45] The

[41]CMS, Cost Measures Information Page, https://www.cms.gov/medicare/quality/value-based-programs/cost-measures.
[42]Assistant Secretary of Health and Human Services for Planning and Evaluation. Report to Congress: Social Risk Factors and Performance Under Medicare's Value-Based Purchasing Programs. Washington, D.C. December 2016.
[43]Chen LM, Epstein AM, Orav EJ, Filice CE, Samson LW, Joynt Maddox KE. Association of Practice-Level Social and Medical Risk With Performance in the Medicare Physician Value-Based Payment Modifier Program. JAMA. 2017;318(5):453-461
[44]Medicare Payment Advisory Commission. Beneficiaries Dually Eligible for Medicare and Medicaid. 2018; https://www.macpac.gov/publication/data-book-beneficiaries-dually-eligible-for-medicare-and-medicaid-3/.
[45] Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health & Human Services. Second Report to Congress on Social Risk Factors and Performance in Medicare's Value-Based Purchasing Program. 2020. https://aspe.hhs.gov/social-risk-factors-and-medicares-value-basedpurchasing-programs

conceptual model outlines risk factors that are either known by the literature or informed by the Clinical Expert Workgroup to be within or outside the influence of the attributed clinician. Risk factors, including SRFs, can influence the treatment choices and impact the size of the effect of treatment choices on mitigating the risk and cost of adverse outcomes.

A systematic approach then guides the decision of which factors to include in the risk adjustment model:

1. First, we reviewed the literature to gather known risk factors and drivers of resource use. These factors are usually diagnoses. Therefore, the first set of risk adjustors are commonly the HCCs.
2. Then, we consulted our clinical expert panels on additional factors that are known to be associated with resource use. Together with our clinical expert panel, we reviewed the stratified results on episode cost across many patient characteristics. We arrived at the final list of risk adjustors based on those discussions and consensus among the clinical experts.
3. During our testing phases, we also follow a structured and systematic approach to deciding whether SRFs should be adjusted for, further described in Section 3.5.5.

3.5.4 Statistical Results

The literature has extensively tested using the HCC model for Medicare claims data. Although the variables in the HCC model were selected to predict annual cost, CMS has also used this risk adjustment model in several other settings (e.g., Accountable Care Organizations, previous physician Quality and Resource Use Report programs, and other administrative claims-based measures such as the Knee Arthroplasty episode-based cost measure, Total Per Capita Cost (TPCC) cost measure, Medicare Spending Per Beneficiary (MSPB)-PAC cost measure and MSPB-Hospital cost measure). Recalling that the risk model relies on the existing CMS-HCC model, testing results for factors included in the CMS-HCC V24 model can be found in the Evaluation of the CMS-HCC Risk-Adjustment Model report[46] and the Report to Congress: Risk Adjustment in Medicare Advantage[47]. For measure-specific factors not included in the CMS-HCC model, we sought expert clinician input through the workgroup, which provided recommendations on additional risk adjustors and sub-groups.

3.5.5 Analyses and Interpretation in Selection of Social Risk Factors

To determine whether it is appropriate to risk adjust for SRFs, the following criteria are considered:

(i) whether there is an association between social risk and performance by examining the coefficient of patient-level dual status when added into the risk model,

(ii) whether the observed association is most influenced by patient-level factors or clinician-level factors by examining the stability of the patient-level dual status coefficient after adding clinician's dual share variable, as well as including clinician's fixed effects,

(iii) whether patient's need or complexity rather than poor quality is driving the observed performance differences by examining the differences in performance on dual patients versus non-dual patients and if there are many clinicians who are able to perform similarly or better on their dual patients than their non-dual patients, and

[46]Pope, Gregory C., John Kautter, et al., "Evaluation of the CMS-HCC Risk-Adjustment Model: Final Report." RTI International: March 2011.
[47]CMS, "Report to Congress: Risk Adjustment in Medicare Advantage," https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/RTC-Dec2018.pdf.

(iv) the impact of risk adjusting for SRFs by examining the performance shift of clinicians compared to a risk adjustment model that does not risk adjust for SRFs.

Table 8: Coefficient of Patient-level Dual Status under Different Models

Reporting Level	Subgroup Risk Model	% of All Episodes	Coefficient of Patient-level Dual Status		
			Base Model + Patient-level Dual Status	Base Model + Patient-level Dual Status + Clinician's Dual Share	Base Model + Patient-level Dual Status + Clinician's Fixed Effect
TIN	PCI with NSTEMI Diagnosis	16.07%	$846 (p < 0.0001)	$531 (p < 0.0001)	$613 (p < 0.0001)
TIN	PCI without STEMI or NSTEMI Diagnosis	16.18%	$946 (p < 0.0001)	$554 (p < 0.0001)	$480 (p = 0.00)
TIN	PCI with STEMI Diagnosis	15.24%	$1,043 (p < 0.0001)	$945 (p < 0.0001)	$894 (p < 0.0001)
TIN-NPI	PCI with NSTEMI Diagnosis	16.18%	$1,019 (p < 0.0001)	$762 (p < 0.0001)	$862 (p < 0.0001)
TIN-NPI	PCI without STEMI or NSTEMI Diagnosis	16.17%	$737 (p < 0.0001)	$386 (p = 0.01)	$175 (p = 0.28)
TIN-NPI	PCI with STEMI Diagnosis	15.51%	$1,336 (p < 0.0001)	$1,062 (p < 0.0001)	$828 (p < 0.0001)

Table 9: Mean Ratio of Episode Observed Cost to Expected Cost (O/E) Stratified by Clinician's Dual Share and Patient's Dual Status

Dual Share Percentile	TIN			TIN-NPI		
	All Episode	Dual Episodes	Non-Dual Episodes	All Episodes	Dual Episodes	Non-Dual Episodes
(ALL)	1.00	1.02	0.99	1.00	1.05	0.99
0%-20%	0.99	1.00	0.98	1.00	1.08	1.00
21%-40%	1.00	1.02	0.99	0.99	1.07	0.98
41%-60%	1.00	1.03	0.99	1.00	1.04	0.99
61%-80%	1.00	1.01	0.99	1.00	1.05	0.99
81%-100%	1.00	1.01	0.99	0.99	1.02	0.98

Table 10. Proportions of Clinicians Who Perform Significantly Worst, Equally Well, or Significantly Better on Their Dual Episodes than Non-Dual Episodes

Reporting Level	Significantly Worse	Equally Well	Significantly Better
TIN	8.36%	91.51%	0.13%
TIN-NPI	9.19%	89.97%	0.84%

Table 11. Clinicians' Performance Shift after Adding a Dual Status Risk Adjustor

TIN or TIN-NPI	Proportion of Clinicians Affected at Various Levels of Performance Shift	
	Ranking Shift by 1% or more	Ranking Shift by 5% or more
TIN	74.57%	5.20%
TIN-NPI	72.05%	4.35%

There's a statistically significant association between the patient's dual status and episode cost for episodes in each sub-group (Table 8). This association is stable in the PCI with STEMI Diagnosis and PCI with NSTEMI Diagnosis sub-groups as they maintain statistically significance even after adding variables to account for clinician-level factors. The PCI without STEMI or NSTEMI Diagnosis sub-group is less stable, dropping statistical significance after adding variables to account for clinician-level factors. However, for all sub-groups, the coefficients generally decrease as clinician-level factors are added. These results suggest that the patient-clinician-level factors may influence performance for episodes with patients with dual status.

Additionally, both dual and non-dual episodes remain relatively stable as clinician dual share increases (Table 9), suggesting that clinicians can mitigate the impact of dual share. Also, Table 10 shows that many clinicians perform equally well for dual and non-dual episodes and some even perform significantly better on dual episodes. Lastly, risk adjusting for dual status appears to change measure performance for many clinicians, but few clinician's ranks shift by 5% or more (Table 11). These results suggest that clinicians are able to mitigate many effects of SRFs.

3.5.6 Method for Statistical Model or Stratification Development

To analyze the validity of current risk adjustment model, we examined two criteria: discrimination and calibration.

1) Discrimination is a statistical criterion that evaluates the measure's ability to distinguish high-cost episodes from low-cost episodes, or the ability to explain the variance in cost of individual episodes. The amount of variance explained is estimated by the R-squared metric with the range between 0 and 1. These results are provided in Section 3.5.7.
2) Calibration evaluates the consistency of the measure in estimating episode cost across the full range of resource use patterns in the population. Calibration is estimated by the average predictive ratios across groups within the population, specifically groups are partitioned by deciles of expected episode cost. A well-calibrated measure should have predictive ratios close to 1.0 across all deciles. These are discussed in Sections 3.5.8 and 3.5.9.

3.5.7 Statistical Risk Model Discrimination Statistics

The overall R-squared for the IP PCI cost measure, calculated by dividing explained sum of squares by total sum of squares is 0.48. The adjusted R-squared is 0.48. More information on discrimination testing for the CMS-HCC model can be found at Pope et al. 2011.[48]

[48]Pope, Gregory C., John Kautter, et al., "Evaluation of the CMS-HCC Risk-Adjustment Model: Final Report." RTI International: March 2011.

3.5.8 Statistical Risk Model Calibration Statistics

The predictive ratio is calculated using the formula of average expected cost / average observed cost for all episodes in each decile.

3.5.9 Statistical Risk Model Calibration – Risk Decile

Analysis of predictive ratios by risk decile for the measure shows minimal variation among risk deciles, as predictive ratios range from 1.02 to 0.97 across all risk deciles (with an overall average of 1.00).

Table 12: Predictive Ratio by Decile of Predicted Episode Cost

Decile	Average Predictive Ratio
Decile 1	0.97
Decile 2	0.99
Decile 3	0.99
Decile 4	1.00
Decile 5	1.00
Decile 6	1.01
Decile 7	1.01
Decile 8	1.01
Decile 9	1.02
Decile 10	0.99

3.5.10 Interpretation

The R-squared values for the model, which measure the percentage of variation in results predicted by the model, are higher than the values presented in similar analyses of risk adjustment models.[49] As noted in Section 3.5.6 and 3.5.7, these results should be interpreted alongside service assignment rules, which remove clinically unrelated services.

The remaining unexplained variance is due to variation in factors that are not adjusted for by the measure, such as the clinician's performance. The objective of a cost measure is to evaluate and differentiate the performance of clinicians. Therefore, achieving high explained variance is optional because the measure should only adjust for some variations in the cost of care. In collaboration with the experts from our clinical workgroup, this measure only adjusts for factors that are deemed outside the reasonable influence of clinicians. The service assignment rules provide context for which costs are included in the measure and which are not.

Table 12 shows that the risk adjustment model is consistent, with the average predictive ratios observed to be close to 1.00 across all deciles, with the range between 1.02 and 0.97. Overall, the risk adjustment model does not over- or under-predict cost across the full range of resource use patterns in the population.

[49]Pope, Gregory C., John Kautter, Melvin J. Ingber, Sara Freeman, Rishi Sekar, and Cordon Newhart. "Evaluation of the CMS-HCC Risk-Adjustment Model: Final Report." RTI International: March 2011.

3.6 Identification of Meaningful Differences in Performance

3.6.1 Method

To identify meaningful differences in performance, this analysis first examines the distribution of the measure score to highlight the performance gap between the most and least efficient clinicians. Then, this analysis examines the rate of adverse events that may occur during an episode of care to highlight the variation in frequency and cost of those events.

3.6.2 Statistical Results

Table 1 shows the distribution of the measure score at the TIN and TIN-NPI levels. There is a difference in mean score for TIN and TIN-NPI levels because each level has its own attribution rules, which resulted in slightly different populations of episodes used for measure score calculation (Table 1). However, clinicians are only compared to their peers at either the TIN or TIN-NPI level, therefore the differences in score across different levels can be ignored.

The rate of episodes with readmission is observed to be at 5.63%, with an average observed episode cost of $32,556, more than 1.5 times the average observed cost of IP PCI episodes that meet the trigger logic. Additionally, the rate of episodes with emergency E/M services is observed to be at 13.37%, with an average observed episode cost of $23,752, $2,392 more than the average observed cost of an episode that meets trigger logic.

3.6.3 Interpretation

There is substantial variation observed in the measure score in both TIN and TIN-NPI levels, indicated by the interquartile ranges, standard deviations, and coefficients of variation. The magnitude of the observed variation is in the thousands of dollars, which indicates that there are opportunities to close the gaps between the most and least efficient clinicians.

Since each episode with readmissions and emergency department visits is very costly, every percentage reduction in readmission and emergency department visit rates represents substantial performance improvement for the attributed clinician or clinician group.

3.7 Missing Data Analysis and Minimizing Bias

3.7.1 Method

Since CMS uses Medicare claims data to calculate the IP PCI measure, Acumen expects a high degree of data completeness. To further ensure that we have complete and accurate data for each patient, Acumen excludes episodes where patient date of birth information (an input to the risk adjustment model) cannot be found in the EDB, the patient does not appear in the EDB, or the patient death date occurs before the episode trigger date.

The IP PCI measure also excludes episodes where the patient is enrolled in Medicare Part C or has a primary payer other than Medicare in the 120-day lookback period and episode window. In such situations, Medicare Parts A and B claims data may not capture the complete clinical profile for the patient needed to capture the clinical risk of the patient in risk adjustment. Furthermore, Parts A and B claims data may not capture all Medicare resource use if some portion of the patient's care is covered under Medicare Part C.

3.7.2 Missing Data Analysis

The table below presents the frequency of missing data across the categories of missing data which caused episodes to be excluded from the IP PCI measure. Frequency is presented in terms of the number of episodes excluded due to missing data, as well as the cost profile of episodes with missing data compared to episodes included in the measure reporting.

As a note, the episode counts below reflect exclusion from the initial population of triggered episodes. After the missing data exclusions are applied, we apply additional exclusions, as outlined in section 3.4, to this overall patient cohort to narrow the population to only applicable episodes.

Table 13: Cost Statistics for Missing Data Category

Missing Data Categories	Episodes	Observed Cost					
		Mean	Percentile				
	#		10th	25th	50th	75th	90th
Primary Payer Other than Medicare	12,522	$19,588	$12,783	$13,591	$16,328	$22,492	$28,118
Beneficiary Death before Trigger	417	$20,150	$13,800	$15,244	$21,519	$22,522	$24,716
No Continuous Enrollment in Medicare Parts A and B, and Any Enrollment in Part C	11,942	$18,530	$12,783	$12,783	$15,358	$20,427	$26,010

3.7.3 Interpretation

The results show that the missing data episodes don't appear to be substantially different than all episodes in the initial population in terms of cost (Table 13). Given their limited frequencies, the impact of removing these episodes on the overall measure should be minimal while ensuring that clinicians are fairly evaluated on episodes with complete data

4.0 Feasibility

4.1 Data Elements Generated as Byproduct of Care Processes

The data elements used in this measure are pulled from Medicare claims. They can be based on information generated, collected and/or used by healthcare personnel during the provision of care (e.g., diagnoses), which are then translated into the appropriate coding system (e.g., ICD-10 diagnoses, MS-DRGs) for use in Medicare claims by either the original healthcare personnel or another individual.

4.2 Electronic Sources

All data elements are in defined fields in electronic claims.

4.3 Data Collection Strategy

4.3.1 Data Collection Strategy Difficulties

Lessons and associated modifications may be categorized into three types: data collection procedures, handling of missing data, and sampling data associated with beneficiaries who died during an episode of care.

4.3.1.1 Data Collection

Acumen receives claims data directly from the CWF maintained at the CMS Baltimore Data Center. Healthcare providers submit Medicare claims to a Medicare Administrative Contractor (MAC), which are subsequently added to the CWF. However, these claims may be denied or disputed by the MAC, leading to changes to historical CWF data. In rare circumstances, finalizing claims may take many months or even years. As such, it is not practical to wait until all claims for a given month are finalized before calculating the measure, resulting in a trade-off between efficiency (accessing the data on time) and accuracy (waiting until most claims are finalized) when determining the duration (i.e., the “claims run-out” period) after which to pull claims data. To determine the appropriate claims run-out period, Acumen has tested the delay between claim service dates and claims data finalization. Based on this analysis, Acumen uses a run-out period of three months after the end of the calendar year to collect data for development and testing purposes. If CMS adopts this measure for use in a program, calculation and reporting would align with the program’s reporting practices.

4.3.1.2 Missing Data

This measure requires complete beneficiary information, therefore, a small number of episodes with missing data are excluded to ensure data completeness and accurate comparability across episodes. For example, episodes where the beneficiary was not enrolled in Medicare Parts A and B for the 120 days before the episode start date are excluded from this measure. Excluding these episodes enables the risk adjustment model to accurately adjust for the beneficiary’s comorbidities using data from the previous 120 days of Medicare claims. Additionally, the risk adjustment model includes a categorical variable for beneficiary age bracket, so episodes for which the beneficiary’s date of birth cannot be located are excluded from the measure.

4.3.1.3 Sampling

During measure testing, Acumen noted that episodes in which the beneficiary died before the episode end date exhibited different cost distributions than other episodes. As such, this measure excludes episodes to avoid negatively impacting clinician scores.

5.0 Usability and Use

5.1 Use

5.1.1 Current and Planned Use

A previous version of this measure is currently in use in MIPS. However, this measure has been revised as part of the comprehensive re-evaluation process specifically for potential use in the cost performance category of MIPS to assess clinicians reporting as individuals or groups under a contract with CMS.

For CMS to approve this measure for use in MIPS, it must be reviewed by the Pre-Rulemaking Measure Review and Measure Set Review process (PRMR-MSR; formerly referred to as the Measure Application Partnership [MAP]) and then undergo the notice-and-rulemaking process. Given these next steps, the earliest the measure could be used in MIPS is CY 2025. If in use, CMS can then determine whether to publicly report the cost measure.

5.1.2 Feedback on the Measure by Those being Measured or Others

Throughout the Inpatient PCI measure re-evaluation, we used an iterative and extensive process to gather feedback on the measure and its results to ensure that it can be used appropriately in the MIPS program by clinicians and clinician groups who practice in this clinical area. This process also seeks to ensure that the measured entities can understand and interpret their performance results to help support decision-making. A couple of the main ways we gathered input was through reoccurring Clinician Expert Workgroup meetings, which incorporated feedback from the patient and caregiver perspective, empirical data, and discussion between clinician experts who recommend measure specifications, and through public comment periods for the measures.

5.1.2.1 Technical Assistance Provided During Development or Implementation

Clinician Expert Workgroup Meetings
For each Clinician Expert Workgroup meeting, Acumen provided empirical data (e.g., analyses on potentially relevant revisions for the measure) to inform the Clinician Expert Workgroup members' recommendations. These analyses were conducted using all administrative claims data for Medicare Parts A and B. This data was shared with Workgroup members to help inform their feedback on the measure specifications throughout its re-evaluation to ensure that the measure is appropriately assessing costs for these clinicians.

Public Comment Period
Additionally, Acumen and CMS provided two public comment periods to gather feedback the measure's re-evaluation. The first public comment period was held from February 25, 2022 to May 28, 2022, to identify which measures in use in MIPS require re-evaluation and potential revisions to those measures. A second public comment period was head in February 2023, where interested parties were invited to submit feedback via an online survey on the potential revision before consideration of their potential use in the cost performance category of the MIPS. During this feedback period, interested parties had the opportunity to view (i) measure specifications documentation, (ii) measure testing forms, (iii) clinician expert workgroup meeting summaries, and (vi) summaries of previous Wave 1 measure feedback.

5.1.2.2 Technical Assistance with Results

Clinician Expert Workgroup Meetings
Acumen provided data before or during the Comprehensive Reevaluation Webinar. During the meeting, Acumen guided Workgroup members through these analyses, providing clinical and

programmatic context when needed. The Workgroup members discussed the testing results in depth and allowed the data to inform their recommendations for measure specifications. The goal was to ensure that the measure appropriately assessed clinicians' cost of care within their reasonable influence without creating potential unintended consequences so that it could be usable in the MIPS program.

Public Comment Periods

During the February 2023 public comment period, interested parties provided feedback on the appropriateness of the measures and the usability of the data. The public comments were summarized and considered the Clinician Expert Workgroup when recommending further refinements to the measures through a final survey.

Education and Outreach

Acumen directly conducted outreach via email to tens of thousands of interested parties using a contact list developed through previous public engagement efforts, as well as CMS and Quality Payment Program (QPP) listservs. Acumen also contacted specialty societies that may have interest in these measures due to the types of clinicians that they represent.

Acumen worked closely with QPP Service Center to respond to stakeholder inquiries during the public comment period and continued to answer questions after the period ended.

5.1.2.3 Feedback on Measure Performance and Implementation

Clinician Expert Workgroup Meetings

Feedback from the Workgroup members were recorded throughout the meeting. More formal feedback was gathered using polls, typically requesting for votes on certain specifications or appropriateness of the measure. These polls were conducted following each meeting and on an ad hoc basis, as needed.

Public Comment Periods

For the 2022 public comment period, Acumen received 20 comments and for the 2023 public comment period, Acumen received 18 comments. These responses included comments from specialty societies representing large numbers of potentially attributed clinicians and from individuals.

Survey responses were collected via an online survey, which contained general and detailed questions on the measure specifications.

5.1.2.4 Feedback from Measured Entities and Other Entities

Public Comment Periods

The MACRA Episode-Based Cost Measures: Comprehensive Reevaluation Public Comment Summary Report presents interested parties' feedback from the initial public comment period in 2022.[50] The 2023 Revised Cost Measure Feedback Period Summary Report presents stakeholder feedback gathered during the second public comment period.[51] The measure-specific feedback was used as the basis for refinements that were made to the measures. See Section 5.1.2.5 for refinements made to the Inpatient PCI measure.

[50] CMS, "MACRA Episode-Based Cost Measures: Comprehensive Reevaluation Public Comment Summary Report," Cost Measures Feedback Page, https://www.cms.gov/files/document/wave-one-public-comment-summary-report.pdf.

[51] CMS, "2023 Revised Cost Measure Feedback Period Summary Report," Cost Measures Feedback Page, https://www.cms.gov/files/document/2023-revised-cost-measure-feedback-period-summary-report.pdf.

5.1.2.5 Consideration of Feedback

Public Comments

Careful consideration was given to all feedback gathered through public comment, and several updates were made to the measure based on the recommendations of commenters and the Clinician Expert Workgroup comprised of subject matter and measure-development experts. Acumen conducted analyses into potential adjustments that could be made to the measures to improve their ability to assess the intended clinician population.

After public comment periods, Acumen compiled the feedback and provided the Clinician Expert Workgroup this information, along with the empirical analyses, to inform recommendations for any refinements needed to ensure that the measure is capturing what it was intended to capture.

The changes to the IP PCI measure made through re-evaluation include:

- Expand the patient cohort beyond beneficiaries treated with PCI for STEMI to include beneficiaries receiving a PCI with a Non-STEMI (NSTEMI) diagnosis and without a STEMI or NSTEMI diagnosis

5.2 Usability

5.2.1 Improvement

The version of the measure has not yet been implemented, and as such has not had influence over performance. Our testing suggests that there is a sufficiently large difference in measure scores among clinicians to meaningfully determine a difference in performance. The potential for this measure to distinguish between good and poor performance is promising in its ability to encourage improvement in cost efficient care.

5.2.2 Unexpected Findings

There were no unexpected findings during the development and testing of this measure. This version of the measure has not been implemented at this time, so we do not have data that confirms unexpected findings related to its implementation.

However, Acumen did consider potential unintended consequences of having a cost measure for this clinical area (e.g., potential stinting in care to receive a better cost score). For example, the empiric validity data previously presented in section 3.3 demonstrates that while providing additional E/M services is associated with a higher score, it is often mediated by an adverse event. If a provider attempted to stint on providing E/M services, this increases risk for high-cost issues downstream, so it is not in providers' best interest to do so for their cost measure score.

Additionally, CMS monitors measures that are in use and has multiple processes in place to allow for changes to a measure if appropriate. These include i) annual maintenance for non-substantial changes and upkeep, ii) ad hoc maintenance if a specific issue occurs or a large change in clinical guidance takes place, and iii) measure reevaluation every three years where the suitability of a measure's specifications is comprehensively reassessed. If in the event the measure did have any unexpected findings, it would be identified and resolved through one of these methods.

5.2.3 Unexpected Benefits

Since this version of the measure has not been implemented at this time, there are no testing results that identify unexpected benefits. However, many clinicians can only be assessed by the MSPB Clinician and TPCC measures in the cost performance category currently. This measure would provide a more tailored assessment of the care they have influence over, which many

clinicians may prefer to be measured by compared to the population-based cost measures like MSPB Clinician or TPCC.

6.0 Related and Competing Measures

6.1 Relation to Other Measures

There are no competing measures with this measure. However, the following measures have been identified as potentially related.

Table 14. MIPS Quality Measures Potentially Relevant for the IP PCI Episode Group

Measure Title	Measure ID	Measure Description	Measure Type
Cardiac Stress Imaging Not Meeting Appropriate Use Criteria: Routine Testing After Percutaneous Coronary Intervention (PCI)	00102	Percentage of all stress single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI), stress echocardiogram (ECHO), cardiac computed tomography angiography (CCTA), and cardiovascular magnetic resonance (CMR) performed in patients aged 18 years and older routinely after percutaneous coronary intervention (PCI), with reference to timing of test after PCI and symptom status.	Process
Coronary Artery Disease (CAD): Beta-Blocker Therapy—Prior Myocardial Infarction (MI) or Left Ventricular Systolic Dysfunction (LVEF <40%)	00179	Percentage of patients aged 18 years and older with a diagnosis of coronary artery disease seen within a 12-month period who also have a prior MI or a current or prior LVEF =< 40% who were prescribed beta-blocker therapy.	Process
Ischemic Vascular Disease (IVD) All or None Outcome Measure (Optimal Control)	00406	Percentage of patients 18 years of age and older who were diagnosed with acute myocardial infarction (AMI), coronary artery bypass graft (CABG) or percutaneous coronary interventions (PCI) in the 12 months prior to the measurement period, or who had an active diagnosis of ischemic vascular disease (IVD) during the measurement period, and who had documentation of use of aspirin or an antiplatelet during the measurement period.	Outcome
Rate of Carotid Artery Stenting (CAS) for Asymptomatic Patients, Without Major	00629	Percent of asymptomatic patients undergoing CAS who are discharged to home no later than post-operative day #2.	Outcome

The MIPS quality measures listed in Table 14 above are related to the IP PCI measure as they may include metrics focused on similar patient cohorts or clinically related to the care provided for the episode group. While two quality measures are specific to inpatient PCI, the remaining measures apply to a broader cohort of patients with pain management related to readmissions

following coronary-related events, cardiac rehabilitation, preoperative testing, or other treatment-related complications.

6.2 Harmonization

During the measure's development, the Clinician Expert Workgroup specifically considered how to align relevant cost and quality measures (e.g., episode window length). This cost measure aligns with the Patient-Focused Episode of Care goal of CMS's Meaningful Measures initiative, and the domain of Efficiency and Cost Reduction. Through this measure, we aim to improve care by optimizing health outcomes and resource use associated with managing care during each episode of this acute inpatient medical condition. The development of episode groups for resource use analysis is also required by section 101(f) of MACRA.

6.3 Competing Measures

There are no measures that conceptually address both the same measure focus and the same target population as the IP PCI measure.

Additional Information

IP PCI Clinician Expert Workgroup Members:
As noted above, the following members provided detailed feedback on the measure specifications throughout its development based on public comments, clinical expertise, and empirical analyses.

Donna Kucharski, MD, MBA
James Blankenship, MD, MHCM
John Sverha, MD
Lloyd Klein, MD, MSCAI, FACC, FACP
Marvin Konstam, MD
Peter Rahko, MD
Sabrena McCarley, MBA-SL, OTR/L, CLIPP, RAC-CT, QCP, FAOTA
Sridevi Pitta, MD, MBA, FACC, FSCAI, RPVI
William Van Decker, MD

Measure Developer Updates and Ongoing Maintenance
The measure is not currently in use, but the earliest possible release of the measure in MIPS would be CY2025. If the measure becomes finalized for use in MIPS, it would undergo annual maintenance and a comprehensive re-evaluation every 3 years. This measure is included on the 2023 Measures Under Consideration (MUC) List and will be reviewed by PRMR in winter of 2023-2024. There are no further updates or reviews for this measure scheduled at this time.