Template

Peer Reviewed Journal Article Requirement

Section 101(c)(1) of the MACRA requires submission of new measures for publication in applicable specialty-appropriate, peer-reviewed journals prior to implementing in MIPS. These measures will be submitted by CMS, to a journal(s) before including any new measure in the final list of annual clinical quality measures (CQM) under MIPS. The measure owner shall provide the required information for article submission under the MACRA per CMS “Call for Measures” submission process.

Measure owners submitting measures into JIRA must complete the required information by the Call for Measures deadline. Some of the information requested below may be listed in specific fields in the JIRA tool; however, to ensure that CMS has all of the necessary information and to avoid delays in the evaluation of your submission, please fully complete this form as an attached Word document in JIRA. The information in JIRA must be consistent with the information below. This includes, but is not limited to:

***Measure Title: Clinician and Clinician Group Risk-standardized Hospital Admission Rates for Patients with Multiple Chronic Conditions***

***Domain: Communication and Care Coordination***

**Measure Owner:** *Centers for Medicare & Medicaid Services*

**Measure Developer:** *Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation*

**Description:** *The measure is a risk-adjusted outcome measure that uses the outcome of acute, unplanned admissions to assess care quality for patients with multiple chronic conditions cared for in the outpatient setting.*

1. **Statement**
* *Background (Why is this measure important?)*

Hospital admission rates are an effective marker of ambulatory care quality. Hospital admissions from the outpatient setting reflect a deterioration in patients’ clinical status and as such reflect an outcome that is meaningful to both patients and providers. Patients receiving optimal, coordinated high-quality care should use fewer inpatient services than patients receiving fragmented, low-quality care. Thus, high population rates of hospitalization may, at least to some extent, signal poor quality of care or inefficiency in health system performance.

Patients with multiple chronic conditions (MCCs) are at high risk for hospital admission, often for potentially preventable causes, such as exacerbation of pulmonary disease. [1] Evidence from several Medicare demonstration projects suggests that care coordination results in decreased hospital admission rates among high-risk patients. In addition, studies have shown that the types of ambulatory care clinicians this measure targets (for example, primary care providers and specialists caring for patients with MCCs) can influence admission rates through team-based and enhanced access to care, found specifically in the patient-centered medical home (PCMH) model of interventions, and broadly through increased primary care supply and continuity of care. [2-4]

Thus, the anticipated net benefits of this unplanned hospital admission measure include, but are not limited to:

* Reduced numbers of hospitalizations and days hospitalized;
* Improved outpatient disease management;
* Reduced rates of complications, including mortality; and
* Cost savings resulting from fewer hospitalizations.

Overall, this measure will provide the Centers for Medicare & Medicaid Services (CMS) with a valuable tool for assessing the performance of outpatient clinicians and groups of clinicians in the Merit-Based Incentive Payment System (MIPS) program.

References

1. Abernathy K, Zhang J, Mauldin P, et al. Acute Care Utilization in Patients With Concurrent Mental Health and Complex Chronic Medical Conditions. J Prim Care Community Health. 2016;7(4):226-233.

2. van Loenen T, van den Berg MJ, Westert GP, Faber MJ. Organizational aspects of primary care related to avoidable hospitalization: a systematic review. Fam Pract. 2014;31(5):502-516.

3. Dale SB, Ghosh A, Peikes DN, et al. Two-Year Costs and Quality in the Comprehensive Primary Care Initiative. N Engl J Med. 2016;374(24):2345-2356.

4. Casalino LP, Pesko MF, Ryan AM, et al. Small primary care physician practices have low rates of preventable hospital admissions. Health Aff (Millwood). 2014;33(9):1680-1688.

* *Environmental Scan (Are there existing measures in this area?)*

 There is one related measure to the measure being submitted for initial endorsement: ACO-38/NQF #2888 “Risk-Standardized Acute Admission Rates for Patients with Multiple Chronic Conditions”. The measure being submitted is conceptually based on NQF #2888 and is being adapted for the MIPS setting.

CMS intends to harmonize the ACO-38/NQF #2888 measure with this MIPS MCC measure in the future.

1. **Gap Analysis**
* *Provide Evidence for the Measure (What are the gaps and opportunities to improve care?)*

Patients with MCCs are at high risk for hospital admission, often for potentially preventable causes, such as exacerbation of pulmonary disease. [1] Previous Medicare demonstration projects show that care coordination resulted in decreased hospital admission rates among high-risk patients. [2,3] Using 2013 Chronic Conditions Data Warehouse (CCW) Medicare FFS claims data, we found a high acute unplanned admission rate of 68.5 admissions per 100 person-years (i.e., 68.5% of patients were admitted once per year on average) among MCC patients. In addition, leading causes of admission included potentially preventable reasons, such as septicemia, pneumonia, and obstructive chronic bronchitis with acute exacerbation. Moreover, the literature suggests that the types of ambulatory care clinicians this measure targets can influence admission rates [4-6]; however, there are mixed findings in the literature. [7-10] Given the magnitude of acute unplanned admissions and evidence that ambulatory care clinicians can influence hospital admission rates through optimal care and coordination, this measure will incentivize quality improvement efforts leading to improved patient outcomes for a large population.

Although MIPS eligible providers are required to report at least one outcome measure, currently there are few outcome measures available from which they can select. To expand the list of available reporting options for clinicians, CMS is developing the MCC measure for use in the MIPS program.

In measure testing, we calculated risk-standardized acute admission rate (RSAAR) measure scores across the 65,242 TINs who had at least one MCC patient. RSAAR measure scores, including adjustment for the social risk factors of AHRQ SES Index, Medicare-Medicaid dual-eligibility status, and specialist density, ranged widely from 17.3 to 113.5 per 100 person-years, with a median of 42.1 and an IQR of 39.6 to 45.4.

Overall, measure results suggest that there is substantial need to both reduce the number of admissions for this patient population and decrease the variation in admissions across providers, and that improvement goals are achievable.

References

1. Abernathy K, Zhang J, Mauldin P, et al. Acute care utilization in patients with concurrent mental health and complex chronic medical conditions. J Prim Care Community Health. 2016;7(4):226-233.

2. Altaf FK, Peltz A, Alonso AM, Loh K, Drye EE. Environmental scan: adaptation of the multiple chronic conditions accountable care organization admission measure for the Merit-based Incentive Payment System. Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (CORE): Centers for Medicare & Medicaid Services (CMS);2017.

3. Brown RS, Peikes D, Peterson G, Schore J, Razafindrakoto CM. Six features of Medicare coordinated care demonstration programs that cut hospital admissions of high-risk patients. Health Aff. (Millwood). 2012;31(6):1156-1166.

4. van Loenen T, van den Berg MJ, Westert GP, Faber MJ. Organizational aspects of primary care related to avoidable hospitalization: a systematic review. Fam Pract. 2014;31(5):502-516.

5. Dale SB, Ghosh A, Peikes DN, et al. Two-year costs and quality in the Comprehensive Primary Care Initiative. N Engl J Med. 2016;374(24):2345-2356.

6. Casalino LP, Pesko MF, Ryan AM, et al. Small primary care physician practices have low rates of preventable hospital admissions. Health Aff. (Millwood). 2014;33(9):1680-1688.

7. Jackson GL, Powers BJ, Chatterjee R, et al. Improving patient care. the patient centered medical home. a systematic review. Ann Intern Med. 2013;158(3):169-178.

8. Mendelson A, Kondo K, Damberg C, et al. The effects of pay-for-performance programs on health, health care use, and processes of care: a systematic review. Ann Intern Med. 2017;166(5):341-353.

9. Smith SM, Wallace E, O'Dowd T, Fortin M. Interventions for improving outcomes in patients with multimorbidity in primary care and community settings. Cochrane Database Syst Rev. 2016;3:CD006560.

10. Damberg CL, Sorbero ME, Lovejoy SL, Martsolf GR, Raaen L, Mandel D. Measuring success in health care value-based purchasing programs: findings from an environmental scan, literature review, and expert panel discussions. RAND Health Quarterly. 2014;4(3).

* *Expected Outcome (Patient care/patient health improvements, cost savings)*

In a comprehensive literature search, we found evidence supporting the assertion that ambulatory care clinicians can influence admission rates through quality of care. [1,2,3-7] For example, Brown et al. pointed to four Medicare Coordinated Care Demonstration programs that reduced hospitalizations for high-risk patients by 13-30 per 100 beneficiaries per year (833% of hospitalizations). Brown et al. highlighted six program features that were associated with successfully reducing hospitalizations: 1) supplementing patient telephone calls with in person meetings; 2) occasionally meeting in person with providers; 3) acting as a communication hub for providers; 4) providing patients with evidence-based education; 5) providing strong medication management; and 6) providing comprehensive and timely transitional care after hospitalizations. [5] In addition, van Loenen et al. found that higher levels of provider continuity decreased the risk of avoidable hospitalizations for ambulatory care sensitive conditions (ACSCs) and chronic diseases, regardless of country and age group. [6] Favorable results were also shown by Dorr et al. (2000), Levine et al. (2012), Littleford et al. (2010), and Zhang et al. (2008). [3, 5-7]

The MIPS MCC admission measure is consistent with CMS’s goal of providing eligible clinicians with actionable data, while at the same time providing patients with a meaningful outcome. CORE expects that sharing measure scores with eligible clinicians, in addition to tying reimbursement payment adjustments to these scores, will strongly encourage eligible clinicians to improve care quality and patient outcomes.

Although difficult to precisely quantify, lowering hospital admission rates among MCC patients would have a direct impact on lowering healthcare costs. As noted above, evidence from the literature indicates that ambulatory care clinicians can lower hospital admission rates by providing high-quality, coordinated care. A recent study found that being in a PCMH can lead to sustainable, long-term improvements in health outcomes and reduced healthcare costs. Specifically, over a 7.5-year period, total costs associated with PCMH exposure declined by approximately 7.9%, with the largest source of savings coming from reductions in acute inpatient care. [8] Another recent study found that patients enrolled in a PCMH experienced a 2.4% reduction in inpatient admissions by Year 3, with a corresponding 42% decline in spending. [9] Given the magnitude of admissions related to ambulatory care and evidence that ambulatory care clinicians can influence hospital admission rates through optimal care and coordination, it is evident that the use of this measure will lower healthcare costs.

References

1. Brown RS, Peikes D, Peterson G, Schore J, Razafindrakoto CM. Six features of Medicare coordinated care demonstration programs that cut hospital admissions of high-risk patients. Health Aff. (Millwood). 2012;31(6):1156-1166.

2. van Loenen T, van den Berg MJ, Westert GP, Faber MJ. Organizational aspects of primary care related to avoidable hospitalization: a systematic review. Fam Pract. 2014;31(5):502-516.

3. Levine S, Steinman BA, Attaway K, Jung T, Enguidanos S. Home care program for patients at high risk of hospitalization. Am J Manag Care. 2012;18(8):e269-276.

4. Sommers LS, Marton KI, Barbaccia JC, Randolph J. Physician, nurse, and social worker collaboration in primary care for chronically ill seniors. Archives of internal medicine. 2000;160(12):1825-1833.

5. Littleford A, Kralik D. Making a difference through integrated community care for older people. J Nurs Healthc Chronic Illn. 2010;2(3):178-186.

6. Zhang NJ, Wan TT, Rossiter LF, Murawski MM, Patel UB. Evaluation of chronic disease management on outcomes and cost of care for Medicaid beneficiaries. Health policy (Amsterdam, Netherlands). 2008;86(2-3):345-354.

7. Dorr DA, Wilcox AB, Brunker CP, Burdon RE, Donnelly SM. The effect of technology supported, multidisease care management on the mortality and hospitalization of seniors. Journal of the American Geriatrics Society. 2008;56(12):2195-2202.

8. Maeng DD, Khan N, Tomcavage J, Graf TR, Davis DE, Steele GD. Reduced acute inpatient care was largest savings component of Geisinger Health System's patient-centered medical home. Health Aff. (Millwood). 2015;34(4):636-644.

9. Cuellar A, Helmchen LA, Gimm G, et al. The CareFirst patient-centered medical home program: cost and utilization effects in its first three years. J Gen Intern Med. 2016;31(11):1382-1388.

* *Recommendation for the Measure (Is it based on a study, consensus opinion, USPSTF recommendation etc.?)*

This measure is being developed at the recommendation of CMS to increase the number of outcome measures that providers can report for in the MIPS program. CMS is committed to using at least one outcome measure to assess the quality of care provided by each clinician (81 FR 77290 through 77291, 82 FR 30047, 83 FR 59756), in alignment with the statutory requirement to use outcome measures to measure quality under MIPS (Pub L 114–10, 129 Stat 87). Currently, however, there are few outcome measures available from which clinicians can select. CMS is therefore developing this MCC measure for use under MIPS. In the context of CMS’s commitment to expanding the list and requirements for reporting outcomes and stakeholders’ support for risk-adjusted quality measures, this MCC measure under development will satisfy CMS’s intent and address stakeholder support for outcome measures.

1. **Reliability/Validity**
2. *What testing has been performed at the clinician level? Please provide testing results including the N value, Bonnie test case results, correlation coefficient and any other pertinent information or values to be considered.*
* Reliability Testing Results:

Data Element Reliability

Because this measure is calculated from claims submitted by hospitals and providers, adjudicated by CMS, and stored electronically, the reliability of the data is extremely high. When the measure is computed on the same set of admissions, for the same providers, using the same time period, precisely the same results are obtained.

We assessed the reliability of the data elements by comparing the risk factor frequencies and rate ratios (RRs) in the Development and Validation Samples (see table 1 below). The Development and Validation Samples are each a random 50% sample of the full cohort of included patients (n=5,066,812). For each sample, the risk factor frequencies and RRs were nearly identical.

Table 1: Frequencies and adjusted rate ratios for the final set of demographic and clinical risk factors in the Development and Validation Samples

| **Variable** | **Prevalence of risk factor, number (%)** | **Adjusted rate ratio** **(95% confidence interval)** |
| --- | --- | --- |
| **Development SampleN=2,544,558** | **Validation SampleN=2,544,558** | **Development** **SampleN=2,544,558** | **Validation** **SampleN=2,544,558** |
| **Demographic** |
| Age <70 years | 392,633(15.4%) | 392,133(15.4%) | Reference |
| Age 70 to <75 years | 529,298(20.8%) | 530,106(20.8%) | 1.10 (1.09, 1.11) | 1.10(1.09, 1.11) |
| Age 75 to <80 years | 518,812(20.4%) | 520,041(20.4%) | 1.24 (1.22, 1.25) | 1.23 (1.21, 1.24) |
| Age 80 to <85 years | 474,463(18.7%) | 474,275(18.6%) | 1.42 (1.41, 1.43) | 1.42 (1.41, 1.44) |
| Age >85 years | 629,352(24.7%) | 628,003(24.7%) | 1.73 (1.72, 1.75) | 1.73 (1.71, 1.74) |
| **Nine chronic disease groups**Defined using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes  |
| **Acute myocardial infarction** | 53,754(2.1%) | 54,066(2.1%) | 1.07 (1.05, 1.08) | 1.08 (1.07, 1.10) |
| **Alzheimer’s disease and related disorders or senile dementia** | 671,804(26.4%) | 672,181(26.4%) | 1.24 (1.24, 1.25) | 1.25(1.24, 1.26) |
| **Atrial fibrillation** | 671,323(26.4%) | 671,807(26.4%) | 1.14 (1.13, 1.15) | 1.14 (1.13, 1.15) |
| **Chronic kidney disease** | 1,196,043 (47.0%) | 1,194,407(46.9%) | 1.21 (1.21, 1.22) | 1.22 (1.21, 1.23) |
| **Chronic obstructive pulmonary disease or asthma** | 888,029(34.9%) | 887,790(34.9%) | 1.25 (1.24, 1.25) | 1.24 (1.23, 1.25) |
| **Depression** | 859,351(33.8%) | 858,900(33.8%) | 1.08 (1.07, 1.08) | 1.07 (1.07, 1.08) |
| **Diabetes** | 1,493,093 (58.7%) | 1,492,765(58.7%) | 1.08 (1.08, 1.09) | 1.09 (1.08, 1.09) |
| **Heart failure** | 1,054,385 (41.4%) | 1,055,521(41.5%) | 1.35 (1.35, 1.36) | 1.36 (1.35, 1.37) |
| **Stroke or transient ischemic attack** | 280,562(11.0%) | 282,045(11.1%) | 1.07 (1.06, 1.08) | 1.07 (1.06, 1.07) |
| **Clinical comorbidities** Defined using Condition Categories (CCs) or International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes |
| **Dialysis status** (CC 134) | 45,540(1.8%) | 45,750(1.8%) | 1.47 (1.45, 1.49) | 1.46 (1.44, 1.48) |
| **Respiratory failure** (CC 82, 83, 84) | 217,787(8.6%) | 218,815(8.6%) | 1.10 (1.09, 1.11) | 1.09 (1.08, 1.10) |
| **Liver disease** (CC 27 [remove ICD-9-CM 572.4], 28, 29, 30) | 53,091(2.1%) | 52,583(2.1%) | 1.21 (1.20, 1.23) | 1.24 (1.22, 1.26) |
| **Pneumonia** (CC 114, 115, 116) | 420,915(16.5%) | 421,504(16.6%) | 1.21 (1.20, 1.22) | 1.21 (1.20, 1.21) |
| **Septicemia/shock** (CC 2) | 148,333(5.8%) | 149,243 (5.9%) | 1.03 (1.02, 1.04) | 1.04 (1.03, 1.05) |
| **Marked disability/frailty** (CC 21, 70, 71, 73, 157, 158, 159, 160, 161, 189, 190) | 312,325(12.3%) | 311,757(12.3%) | 1.17 (1.17, 1.18) | 1.18 (1.17, 1.18) |
| **Hematologic/al diseases** (CC 46 [remove ICD-9-CM 283.11], 48) | 277,044(10.9%) | 276,490(10.9%) | 1.06(1.05, 1.06) | 1.05 (1.04, 1.06) |
| **Advanced cancer** (CC 8, 9, 10, 13) | 174,573(6.9%) | 175,027(6.9%) | 1.31 (1.30, 1.33) | 1.31 (1.30, 1.32) |
| **Infectious and immune disorders** (CC 1, 3, 4, 5 [remove ICD-9-CM 016.00, 016.01, 016.02, 016.03, 016.04, 016.05, 016.06], 6, 47, 90) | 139,070(5.5%) | 138,667(5.4%) | 1.10 (1.09, 1.11) | 1.09 (1.08, 1.10) |
| **Severe cognitive impairment** (CC 50, 64, 65, 80) | 201,729(7.9%) | 201,910(7.9%) | 1.06 (1.05, 1.07) | 1.06 (1.05, 1.07) |
| **Major organ transplant status** (CC 132, 186) | 18,697(0.7%) | 18,577(0.7%) | 1.09 (1.06, 1.11) | 1.07 (1.05, 1.10) |
| **Pulmonary heart disease** (ICD-9-CM 415.0, 416.0, 416.1, 416.8, 416.9, 417.0, 417.1, 417.8, 417.9) | 193,350(7.6%) | 194,346(7.6%) | 1.10 (1.09, 1.11) | 1.10 (1.09, 1.11) |
| **Cardiomyopathy** (ICD-9-CM 425.2, 425.4, 425.5, 425.7, 425.8, 425.9, 429.0, 429.1, 425.11, 425.18) | 237,930(9.4%) | 238,488(9.4%) | 1.09 (1.08, 1.10) | 1.09 (1.08, 1.10) |
| **Gastrointestinal disease** (CC 31, 32, 33, 35, 36) | 529,734(20.8%) | 528,954(20.8%) | 1.07 (1.07, 1.08) | 1.07 (1.07, 1.08) |
| **Iron deficiency anemia** (CC 49) | 1,157,680 (45.5%) | 1,158,739(45.5%) | 1.12 (1.12, 1.13) | 1.13 (1.12, 1.13) |
| **Ischemic heart disease except AMI** (CC 87, 88, 89, 98; ICD-9-CM 429.5, 429.6) | 1,346,690 (52.9%) | 1,348,832(53.0%) | 1.15 (1.14, 1.15) | 1.14 (1.14, 1.15) |
| **Other lung disorders** (CC 112 [remove ICD-9-CM 494.0, 494.1], 118 [remove ICD-9 CM 490]) | 934,374(36.7%) | 934,118(36.7%) | 1.03 (1.02, 1.03) | 1.03 (1.03, 1.04) |
| **Vascular or circulatory disease** (CC 106, 107, 108, 109 [remove ICD-9-CM codes 440.1, 442.1]) | 1,220,671 (48.0%) | 1,220,923(48.0%) | 1.11 (1.11, 1.12) | 1.12 (1.11, 1.12) |
| **Other significant endocrine disorders** (CC 23 [remove ICD-9-CM codes 271.4, 588.1, 588.81]) | 135,624(5.3%) | 135,902(5.3%) | 1.04 (1.03, 1.05) | 1.04 (1.03, 1.04) |
| **Other disabilities and paralysis** (CC 72, 74, 103, 104, 119) | 146,082(5.7%) | 145,630(5.7%) | 1.08 (1.07, 1.09) | 1.09 (1.08, 1.10) |
| **Substance abuse** (CC 54, 55, 56) | 280,579(11.0%) | 280,259(11.0%) | 1.21 (1.20, 1.22) | 1.21 (1.20, 1.22) |
| **Other neurologic disorders** (75, 77, 78, 79, 81, 105) | 821,639(32.3%) | 821,856(32.3%) | 1.10 (1.10, 1.11) | 1.10 (1.09, 1.10) |
| **Specified arrhythmias and other heart rhythm disorders** (CC 96 [remove ICD-9-CM 427.31] and 97) | 795,045(31.2%) | 794,787(31.2%) | 1.06(1.05, 1.06) | 1.05 (1.05, 1.06) |
| **Hypertension** (CC 95) | 2,295,094 (90.2%) | 2,295,906 (90.2%) | 1.04 (1.03, 1.05) | 1.04 (1.03, 1.05) |
| **Hip or vertebral fracture** (CC 169, 170) | 152,277(6.0%) | 152,497(6.0%) | 1.06 (1.05, 1.07) | 1.07 (1.06, 1.08) |
| **Lower-risk cardiovascular disease** (CC 91, 92, 93) | 685,161(26.9%) | 686,223(27.0%) | 1.02 (1.02, 1.03) | 1.01 (1.01, 1.02) |
| **Cerebrovascular disease** (CC 102) | 181,806(7.1%) | 181,123(7.1%) | 1.07 (1.06, 1.07) | 1.08 (1.07, 1.09) |
| **Morbid obesity** (ICD-9-CM V853.5, V853.6, V853.7, V853.8, 278.01, V853.9, V854.4, V854.5, V854.3) | 186,631(7.3%) | 186,745(7.3%) | 1.05 (1.04, 1.06) | 1.05 (1.04, 1.06) |
| **Urinary disorders** (CC 142 [remove ICD-9-CM codes 591, 753.21, 753.20, 753.29, 753.22, 753.23] and 145 [remove ICD-9-CM 587, 588.9, 588.89, 753.12, 753.13, 753.15, 753.16, 753.17, 753.19]) | 753,383(29.6%) | 753,208(29.6%) | 1.05 (1.05, 1.06) | 1.04 (1.04, 1.05) |
| **Psychiatric disorders other than depression** (CC 57, 59 [remove ICD-9 CM 298.0], 60, 62, 63) | 673,981(26.5%) | 672,927(26.4%) | 1.10 (1.09, 1.10) | 1.09 (1.09, 1.10) |
| **Measures of frailty/disability** Defined using Policy Group Maps maintained by Palmetto GBA under contract to CMS for Durable Medical Equipment or original reason for Medicare entitlement |
| **Walking aids** (140 and 590) | 145,999(5.7%) | 145,609(5.7%) | 0.97 (0.97, 0.98) | 0.97 (0.96, 0.98) |
| **Wheelchairs** (602, 603, 604, 606) | 121,994(4.8%) | 121,215(4.8%) | 1.13(1.12, 1.14) | 1.12 (1.11, 1.13) |
| **Hospital bed** (250) | 53,048(2.1%) | 52,835(2.1%) | 1.12 (1.10, 1.13) | 1.12 (1.10, 1.13) |
| **Lifts** (430 and 460) | 12,996(0.5%) | 12,914(0.5%) | 1.09 (1.07, 1.12) | 1.11 (1.08, 1.13) |
| **Oxygen** (400) | 253,381(10.0%) | 252,275(9.9%) | 1.40 (1.39, 1.41) | 1.41 (1.40, 1.42) |
| **Original reason for** **entitlement: disability** **insurance beneficiary** | 352,268(13.8%) | 352,256 (13.8%) | 1.27 (1.26, 1.27) | 1.27(1.26, 1.27) |
| **Original reason for** **entitlement: end stage** **renal disease** | 12,307(0.5%) | 12,367(0.5%) | 1.27 (1.23, 1.31) | 1.33 (1.29, 1.37) |

Measure Score Reliability

We used the formula for signal-to-noise reliability presented by Adams et al. and the formula for intraclass correlation coefficient (ICC) presented by Nakagawa et al. to calculate TIN-level reliability scores. [1, 2] The median signal-to-noise reliability score was 0.46 (IQR: 0.21 – 0.69) for all TINs included in testing. A minimum acceptable reliability of 0.5 was achieved for TINs with at least 27 MCC patients. At this threshold, reliability scores ranged from 0.51 to nearly 1.00, with a median value of 0.71 and an IQR of 0.61-0.82. With this 27-patient volume minimum, the measure included only 45.3% of clinician groups; however, 93.3% of the patients, 93.8% of the admissions, and 79.9% of clinicians, who reported under these TINs, were retained.

References

1. Adams JL, Mehrotra A, Thomas JW, McGlynn EA. Physician Cost Profiling — Reliability and Risk of Misclassification. New England Journal of Medicine. 2010;362(11):1014-1021.

2. Nakagawa S, Johnson PCD, Schielzeth H. The coefficient of determination R(2) and intra-class correlation coefficient from generalized linear mixed-effects models revisited and expanded. J R Soc Interface. 2017;14(134).

* Validity Testing Results, clinician sites:

We held meetings with a national technical expert panel (TEP) consisting of a diverse group of stakeholders during measure development to review draft measure specifications. We will systematically assess the face validity of the measure score as an indicator of quality by confidentially soliciting the TEP members’ input using an online survey as CMS does for quality measures.

* *Exclusion frequency:*

 The excluded group was older (median age of 80 vs. 78 years), was three times more like to have died or entered hospice in 2015 (31.2% vs. 10.1%), and had a substantially higher prevalence of Alzheimer’s and related disorders (41.1% vs. 26.7%). As the excluded group was closer to the end of life, they contributed less at-risk time and had a lower crude hospital admission rate (35.2 vs. 44.4 admissions per 100 person-years).

Of the patients eligible for attribution, a total of 659,167 (9.3%) were unassigned to a provider based on the measure’s attribution algorithm. After further excluding patients assigned to risk-bearing ACOs who would participate in the Quality Payment Program (QPP) as an advanced Alternative Payment Models (APM) (n=368,462) and those not at risk for admission at any time in 2015 (n=32,006), the index MIPS MCC cohort included 5,089,116 patients; we used this sample for measure development and testing.

1. *What were the minimum sample sizes used for reliability results?* **Other Information**

We identified 7,063,390 Medicare beneficiaries aged >=65 years with MCCs who met the cohort inclusion criteria. 7.0% of initially eligible patients were excluded from the sample because they did not have an E&M visit with a MIPS eligible clinician in 2015 (the measurement year), and therefore could not be attributed to a provider leaving 6,148,751 patients eligible for attribution.

* *Is it risk adjusted? If so, how?*

Initially, we identified 54 candidate demographic and clinical risk factors. In total, we excluded seven variables because their prevalence was <0.5% (pancreatic disease), their unadjusted RR was <1.3 (other malignancy, precerebral arterial occlusion and transient cerebral ischemia, and diabetic retinopathy), or they did not meet the 90% threshold for inclusion based bootstrapping results (pleural effusion/pneumothorax, bone/joint/muscle infections/necrosis, and other organ transplants). Thus, the final risk-adjustment model included 47 demographic and clinical risk variables including age, clinical comorbidities, and measures of frailty/disability based on use of selected durable medical equipment (DME) and original reason for Medicare entitlement. Frequencies and adjusted rate ratios (RRs) and 95% confidence intervals (CIs) for the final set of 47 demographic and clinical variables were similar in the Development and Validation Samples.

Model Variables

*Demographic*

* 1. Age

*Nine chronic disease groups defined using ICD-9-CM and ICD-10-CM codes*

* 1. Acute myocardial infarction
	2. Alzheimer’s disease and related disorders or senile dementia
	3. Atrial fibrillation
	4. Chronic kidney disease
	5. Chronic obstructive pulmonary disease or asthma
	6. Depression
	7. Diabetes
	8. Heart failure
	9. Stroke or transient ischemic attack

*Clinical comorbidities defined using Condition Categories (CCs) or ICD-9-CM codes*

* 1. Dialysis status (CC 134)
	2. Respiratory failure (CC 82, 83, 84)
	3. Liver disease (CC 27 [remove ICD-9-CM 572.4], 28, 29, 30)
	4. Pneumonia (CC 114, 115, 116)
	5. Septicemia/shock (CC 2)
	6. Marked disability/frailty (CC 21, 70, 71, 73, 157, 158, 159, 160, 161, 189, 190)
	7. Hematologic/al diseases (CC 46 [remove ICD-9-CM 283.11], 48)
	8. Advanced cancer (CC 8, 9, 10, 13)
	9. Infectious and immune disorders (CC 1, 3, 4, 5 [remove ICD-9-CM 016.00, 016.01, 016.02, 016.03, 016.04, 016.05, 016.06], 6, 47, 90)
	10. Severe cognitive impairment (CC 50, 64, 65, 80)
	11. Major organ transplant status (CC 132, 186)
	12. Pulmonary heart disease (ICD-9-CM 415.0, 416.0, 416.1, 416.8, 416.9, 417.0, 417.1, 417.8, 417.9)
	13. Cardiomyopathy (ICD-9-CM 425.2, 425.4, 425.5, 425.7, 425.8, 425.9, 429.0, 429.1, 425.11, 425.18)
	14. Gastrointestinal disease (CC 31, 32, 33, 35, 36)
	15. Iron deficiency anemia (CC 49)
	16. Ischemic heart disease except AMI (CC 87, 88, 89, 98; ICD-9-CM 429.5, 429.6)
	17. Other lung disorders (CC 112 [remove ICD-9-CM 494.0, 494.1], 118 [remove ICD-9 CM 490])
	18. Vascular or circulatory disease (CC 106, 107, 108, 109 [remove ICD-9-CM codes 440.1, 442.1])
	19. Other significant endocrine disorders (CC 23 [remove ICD-9-CM codes 271.4, 588.1, 588.81])
	20. Other disabilities and paralysis (CC 72, 74, 103, 104, 119)
	21. Substance abuse (CC 54, 55, 56)
	22. Other neurologic disorders (75, 77, 78, 79, 81, 105)
	23. Specified arrhythmias and other heart rhythm disorders (CC 96 [remove ICD-9-CM 427.31] and 97)
	24. Hypertension (CC 95)
	25. Hip or vertebral fracture (CC 169, 170)
	26. Lower-risk cardiovascular disease (CC 91, 92, 93)
	27. Cerebrovascular disease (CC 102)
	28. Morbid obesity (ICD-9-CM V853.5, V853.6, V853.7, V853.8, 278.01, V853.9, V854.4, V854.5, V854.3)
	29. Urinary disorders (CC 142 [remove ICD-9-CM codes 591, 753.21, 753.20, 753.29, 753.22, 753.23] and 145 [remove ICD-9-CM 587, 588.9, 588.89, 753.12, 753.13, 753.15, 753.16, 753.17, 753.19])
	30. Psychiatric disorders other than depression (CC 57, 59 [remove ICD-9 CM 298.0], 60, 62, 63)
	31. Walking aids (140 and 590)\*
	32. Wheelchairs (602, 603, 604, 606)\*
	33. Hospital bed (250)\*
	34. Lifts (430 and 460)\*
	35. Oxygen (400)\*
	36. Original reason for entitlement: disability insurance beneficiary
	37. Original reason for entitlement: end stage renal disease

\* Measures of frailty/disability defined using Policy Group Maps maintained by Palmetto GBA under contract to CMS for Durable Medical Equipment or original reason for Medicare entitlement

Risk adjustment for Social Risk Factors

We also evaluated four residential and community context variables for possible inclusion in the risk-adjustment model: 1) the AHRQ SES Index, 2) rural residence, 3) PCP density, and 4) specialist density. Of the four, only AHRQ SES Index and specialist density met our thresholds of having a demographic and clinical variables-adjusted RR of ≥1.05 and remaining statistically significant at the 0.05 level in the multivariable model that included all of the risk adjusters. When the demographic and clinical variables, AHRQ SES Index, and specialist density were included in the model, the adjusted RRs for AHRQ SES Index and specialist density were 1.07 and 1.04, respectively; when dual eligibility was also added to the model, the RR for AHRQ SES Index was 1.06, and the RR for specialty density remained unchanged.

Model Variables for Social Risk

1. Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status (SES) Index, from the American Community Survey (ACS)
2. Density of specialists, from the AHRF

CMS decided to adjust the measure for Medicare-Medicaid dual-eligibility status in May 2019. The measure is being updated to include adjustment for Medicare-Medicaid dual-eligibility status. Updated measure results and face validity testing will be available prior to the Measure Applications Partnership (MAP) meeting in December 2019.

* *What benchmarking information is available?*

We have not established any benchmarks for this measure. For MIPS quality measures, CMS establishes benchmarks using historical data and displays them in terms of deciles.

For more information on CMS quality measure benchmarking, please see the QPP 2019 Quality measure Benchmarks Overview. [1]

References

1. (2019). "2019 Quality Measure Benchmarks Overview." Retrieved May 10, 2019, from <https://qpp-cm-prod-content.s3.amazonaws.com/uploads/342/2019%20MIPS%20Quality%20Benchmarks.zip>.

1. **Endorsement**
* *Provide NQF endorsement status (and ID) and/or other endorsing body*

This measure is not currently NQF endorsed.

1. **Summary**
* *Alignment with CMS Quality Strategy or MACRA:* This measure falls into the domain of Communication and Care Coordination.
* *Importance to MIPS or other CMS programs*: By incentivizing improved coordination of care for patients with chronic conditions, this measure is expected to reduce the number of hospitalizations and days hospitalized for patients, improved outpatient disease management, reduced rates of complications including mortality; and produce cost savings resulting from fewer hospitalizations.
* *Rationale: Use of measure for inclusion in program (specialty society, regional collaborative, other)* This measure has not yet been implemented, CMS is developing the MIPS MCC measure for use in the MIPS program.
* *Public reporting (if applicable)*: N/A; this measure has not yet been implemented.
* *Preferable relevant Peer-Review Journal for publication:* We recommend submitting this measure to Medical Care or Health Affairs.