Measure Information Form
Collected For: CMS Outcome Measures (Claims Based)

Measure Set: CMS Episode-of-Care Payment Measures

Set Measure ID#: PAYM-30-AMI

Performance Measure Name: Hospital-level, risk-standardized payment associated with a 30-day episode of care for Acute Myocardial Infarction (AMI)

Description: This measure estimates hospital-level, risk-standardized payment (RSP) for an AMI episode of care starting with inpatient admission to a short term acute-care facility and extending 30 days post-admission for Medicare fee-for-service (FFS) patients who are 65 years of age or older with a principal discharge diagnosis of AMI.

Rationale: This measure is aligned with current quality measures to facilitate profiling hospital value (payments and quality). Given that AMI is a condition with substantial variability in costs of care, aligning this payment measure with quality measures will allow the assessment of hospital value. By evaluating their RSPs and risk-standardized mortality rates (RSMRs) for AMI, hospitals have an opportunity to consider actionable improvements and efficiencies to impact value of care.

Type of Measure: Cost/Resource Use

Improvement Noted As: Results of the measure alone do not necessarily reflect the quality of care provided by hospitals. Accordingly, lower payment should not be interpreted as better care. The AMI RSP is most meaningful when presented in the context of another AMI outcome measure, such as the publicly reported AMI mortality measure. This is because a measure of payments to hospitals that is aligned with current quality of care measures facilitates profiling hospital value (payments and quality).

Numerator Statement:
This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define our outcome. The calculation of the rate is defined below under Measure Calculation.

The measure reports total 30-day episode-of-care payment for Medicare FFS patients who had an AMI admission and met all other measure inclusion criteria. An AMI admission was defined as a hospitalization with a primary discharge diagnosis of AMI (ICD-9 CM codes 410.xx excluding those with 410.x2).

The AMI payment measure includes payments made by CMS, patients (i.e., co-pays and/or deductibles), and other insurers to care providers. The measure captures payments for Medicare FFS patients across the following care settings, services, and supplies:

Inpatient care settings
- Acute inpatient hospitals
- Inpatient psychiatric facilities
- Inpatient rehabilitation facilities
- Long-term care hospitals
- Skilled nursing facilities

Outpatient care settings
- Hospital outpatient services
- Community mental health centers
- Comprehensive outpatient rehabilitation facilities and outpatient rehabilitation facilities
- Renal dialysis facilities
- Rural health clinics
- Federally qualified health clinics
- Ambulatory surgical centers
- Emergency department
- Observation stay

Other care settings
- Home health agencies
- Hospice

Services and supplies
- Laboratory services
- Ambulance services
- Part B drugs
- Physicians, physician extenders, social work services
- Durable medical equipment/prosthetics and orthotics/parenteral and enteral nutrition

Denominator Statement:
The cohort includes acute inpatient admissions for Medicare FFS patients age 65 years or older discharged with a principal diagnosis of AMI (as defined by ICD-9 codes 410.xx, excluding 410.x2) and with continuous enrollment in Medicare Part A and Part B for the 12 months prior to the index admission.

Included Populations: Admissions for Medicare FFS beneficiaries aged ≥65 years discharged from non-federal acute care hospitals, having a principal discharge diagnosis of AMI.

CMS FFS beneficiaries hospitalized within an acute care non-federal hospital are included if they have been enrolled in Part A and Part B Medicare for the 12 months prior to the date of admission to ensure a full year of administrative data for risk-adjustment.

For patients with more than one admission in a given year for AMI, only one admission is randomly selected to include in the cohort as an index admission).

The episode of care begins with an admission for AMI to a short-term acute care hospital. The hospital that initially admits the patient is assigned all payments that occur during the episode of care. This includes payments for patients who are subsequently transferred to another hospital for further care of the index AMI. A claim from an emergency department does not begin the episode of care because CMS does not classify emergency department care as an inpatient admission. If a patient is transferred from an emergency department to another hospital and then subsequently admitted, the episode of care begins with the inpatient admission at the receiving hospital.

ICD-9-CM codes that define the patient cohort are located in appendix A, Table 14.1.

410.00	AMI (anterolateral wall) – episode of care unspecified
410.01	AMI (anterolateral wall) – initial episode of care
410.10	AMI (other anterior wall) – episode of care unspecified
410.11	AMI (other anterior wall) – initial episode of care
410.20	AMI (inferolateral wall) – episode of care unspecified
410.21	AMI (inferolateral wall) – initial episode of care
410.30	AMI (inferoposterior wall) – episode of care unspecified
410.31	AMI (inferoposterior wall) – initial episode of care
410.40	AMI (other inferior wall) – episode of care unspecified
410.41	AMI (other inferior wall) – initial episode of care
410.50	AMI (other lateral wall) – episode of care unspecified
410.51	AMI (other lateral wall) – initial episode of care
410.60	AMI (true posterior wall) – episode of care unspecified
410.61	AMI (true posterior wall) – initial episode of care
410.70	AMI (subendocardial) – episode of care unspecified
410.71	AMI (subendocardial) – initial episode of care
410.80	AMI (other specified site) – episode of care unspecified
410.81	AMI (other specified site) – initial episode of care
410.90	AMI (unspecified site) – episode of care unspecified
410.91	AMI (unspecified site) – initial episode of care

Note: We do not include 410.x2 (AMI, subsequent episode of care)

Excluded Populations:
The measure excludes admissions for patients:

- with fewer than 30 days of post-admission enrollment in Medicare FFS (because this is necessary in order to identify the outcome (payments) in the dataset over our analytic period);
- with a same or next day discharge where the patient did not die or was not transferred to another acute care facility (because these patients likely did not suffer a clinically significant AMI)
- who transferred in from another acute care facility (the acute episode is included in the measure but episode-of-care payments are assigned to the hospital where the patient was initially admitted rather than the hospital receiving the transferred patient)

- who are transferred to federal hospitals (because we do not have claims data for these hospitals, thus including these patients would cause payments to be underestimated)
- with missing, irregular, or unknown patient vital status
- who have unreliable data (e.g., age over 115)
- who were discharged against medical advice (because hospitals had limited opportunity to implement high quality care)
- who had a hospice assignment within 12 months prior to or on date of index admission (because we want to align the cohort with the CMS 30-day risk-standardized AMI mortality measure)
- with missing diagnosis-related group (DRG) or DRG weight for their index admission (because we cannot calculate a payment for these patients' index admission; this would make the entire episode-of-care appear significantly less expensive)
- with an index admission within 30 days of a prior index admission (this exclusion criterion is applied after one admission per patient per year is randomly selected and so it is only applicable when multiple years of data are used)

Risk Adjustment: The AMI payment measure adjusts for patient age and a variety of clinical risk factors, including prior percutaneous coronary intervention (PCI) and/or coronary artery bypass graft (CABG)], and patient comorbid conditions. There are 32 risk factors in the measure. The diagnosis codes for the comorbid risk factors are defined in the CMS Condition Categories (CC). The CCs are 189 clinically relevant diagnostic groups including the more than 15,000 International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. Most of the risk factors are made up of one or more CCs. A crosswalk of CCs to ICD-9-CM codes is posted on QualityNet (http://www.qualitynet.org). See the AMI payment measure methodology report posted on QualityNet for more information.

The final set of risk-adjustment variables included:

Demographics	Age (65 – 74) Age (75 – 84) Age (>=85)
Cardiovascular	History of PCI History of CABG Congestive Heart Failure Angina Pectoris/Old Myocardial Infarction Heart Infection/Inflammation, Except Rheumatic Valvular and Rheumatic Heart Disease Congenital cardiac/circulatory defect Hypertension and Hypertension Complications

Comorbidity	Metastatic Cancer and Acute Leukemia and Other Major Cancers Diabetes and Diabetes Complications Protein-Calorie Malnutrition Other Significant Endocrine and Metabolic Disorders Obesity/Disorders of Thyroid, Cholesterol, Lipids Other Gastrointestinal Disorders Osteoporosis and Other Bone/Cartilage Disorders Iron Deficiency and Other/Unspecified Anemias and Blood Disease Delirium and Encephalopathy Dementia Drug/Alcohol Psychosis Drug/Alcohol Abuse/Dependence Severe Mental Illness Reactive and Unspecified Psychosis Depression/Anxiety Precerebral Arterial Occlusion and Transient Cerebral Ischemia Vascular Disease and Complications Other Lung Disorders Legally Blind Dialysis Status Internal Injuries

The objective of the AMI payment measure is to calculate payments that capture differences in the care provided or coordinated by hospitals for patients with AMI. The measure removes variation in payments that are due to payment adjustments not directly related to clinical care through a process called “standardizing”. The AMI payment measure standardizes payments by either (a) removing geographic differences (e.g., wage index) and policy adjustments (e.g., indirect medical education) in payment rates for individual services or (b) averaging payments across geographic areas for those services where geographic differences in payment cannot be removed (e.g., laboratory services). By removing payment adjustments unrelated to clinical care, the AMI payment measure reflects differences in payment due to practice variation at the hospital level.

Model Validation:

In model development and validation, we assessed the reliability of the risk-adjustment model by comparing model performance in a randomly selected 50 percent of the full-year 2008 sample (Sample A1) with its performance in the other 50 percent of the full-year 2008 sample (Sample A2) and in the full-year 2008 sample (Sample A). The full-year 2008 cohort included 180,562 admissions; 90,281 admissions were included in the random 2008 Sample A1; and 90,281 admissions were included the remaining 2008 Sample A2.

Model performance was not substantively different in the validation sample A2 (50 percent sample of 2008 data, mutually exclusive from the development sample) compared with the development sample A1 (50 percent random sample of 2008 data). The models appeared well calibrated, with over-fitting indices of (Sample A1 0,1; Sample A2 -0.226,1.023). Results are summarized below:

Residuals lack of fit:
<-2 = A1 0.00%; A2 0.00%
[-2, 0) = A1 64.66; A2 64.43%
[0, 2) = A1 29.54%; A2 29.80%
[2+ = A1 5.80%; A2 5.76%

Predictive ratios by decile and top 1% of predicted payment:

First Decile: A1 0.96; A2 0.95
Second Decile: A1 1.01; A2 1.01
Third Decile: A1 1.02; A2 1.03
Fourth Decile: A1 1.03; A2 1.03
Fifth Decile: A1 1.02; A2 1.04
Sixth Decile: A1 1.04; A2 1.03
Seventh Decile: A1 1.03; A2 1.02
Eighth Decile: A1 0.99; A2 1.01
Ninth Decile: A1 0.97; A2 0.96
Tenth Decile: A1 0.93; A2 0.93
Top 1%: A1 0.96; A2 0.93

MAPE: A1 9,711; A2 9,661
Model Chi-square (DF): A1 2.117 (30); A2 2.065 (30)
R-squared: A1 0.050; A2 0.055
RMSE: A1 14,060; A2 13,984

Data Accuracy: In constructing the AMI payment measure we aim to utilize only those data elements from the claims that have both face validity and reliability. CMS has in place several hospital auditing programs used to assess overall claims code accuracy, to ensure appropriate billing, and for overpayment recoupment. CMS routinely conducts data analysis to identify potential problem areas and detect fraud, and audits important data fields used in our measures, including diagnosis and procedure codes and other elements that are consequential to payment. We draw on these CMS efforts and avoid the use of fields that are thought to be coded inconsistently across hospitals or providers.

Measure Analysis Suggestions: None

Sampling: No

Data Reported As: Hospital-level, risk-standardized payment associated with a 30-day episode-of-care for Acute Myocardial Infarction (AMI)

Measure Calculation:
The RSP is calculated as the ratio of “predicted” AMI payment to expected AMI payment, multiplied by the national unadjusted average AMI payment. The expected AMI payment for each hospital is estimated using its patient mix and the average of the hospital specific intercepts. The predicted AMI payment for each hospital was estimated given the same patient mix but an estimated hospital-specific intercept. Operationally, the expected AMI payment for each hospital is obtained by summing the expected AMI payments for all

patients in the hospital. The expected AMI payment for each patient is calculated via the hierarchical model by applying the subsequent estimated regression coefficients to the observed patient characteristics and adding the average of the hospital-specific intercepts. The predicted AMI payment for each hospital is calculated by summing the predicted AMI payments for all patients in the hospital. The predicted AMI payment for each patient is calculated through the hierarchical model by applying the estimated regression coefficients to the patient characteristics observed and adding the hospital-specific intercept.

The statistical modeling approach is described fully in the original methodology report.

Selected References:

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- Kim N, Ott LS, Spivack S, et al. 2013. 2013 Measure Updates and Specifications Report: Hospital-Level, Risk-Standardized Payment Associated with a 30-Day Episode of Care for AMI (Version 2.0).