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

Measure Set: CMS Episode-of-Care Payment Measures

Set Measure ID #: PAYM-30-HF

Performance Measure Name: Hospital-level, risk-standardized payment associated with a 30-day episode-of-care for heart failure (HF)

Description: This measure estimates hospital-level, risk-standardized payment for a HF 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 HF.

Rationale: This measure is aligned with current quality measures to facilitate profiling hospital value (payments and quality). Given that HF 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 HF, hospitals have an opportunity to improve efficiencies in the care of their HF patients.

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 HF RSP is most meaningful when presented in the context of another HF outcome measure, such as the publicly reported HF 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 admission for HF and met all other measure inclusion criteria. An admission for HF was defined as a hospitalization with a primary discharge diagnosis of HF.

The HF payment measure includes payments made by CMS, patients (i.e., co-pays and/or deductibles), and other insurers. 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 HF 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 greater than or equal to 65 years of age discharged from non-federal acute care hospitals, having a principal discharge diagnosis of HF.

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 HF, only one admission is randomly selected to include in the cohort as an index admission.

The episode of care begins with an admission for HF 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 HF. 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:

402.01	Malignant hypertensive heart disease with congestive heart failure (CHF)
402.11	Benign hypertensive heart disease with CHF
402.91	Hypertensive heart disease with CHF
404.01	Malignant hypertensive heart and renal disease with CHF
404.03	Malignant hypertensive heart and renal disease with CHF & renal failure (RF)
404.11	Benign hypertensive heart and renal disease with CHF
404.13	Benign hypertensive heart and renal disease with CHF & RF
404.91	Unspecified hypertensive heart and renal disease with CHF
404.93	Hypertension and non-specified heart and renal disease with CHF & RF
428.0	Congestive heart failure, unspecified
428.1	Left heart failure
428.20	Systolic heart failure, unspecified
428.21	Systolic heart failure, acute
428.22	Systolic heart failure, chronic
428.23	Systolic heart failure, acute or chronic
428.30	Diastolic heart failure, unspecified
428.31	Diastolic heart failure, acute
428.32	Diastolic heart failure, chronic
428.33	Diastolic heart failure, acute or chronic
428.40	Combined systolic and diastolic heart failure, unspecified
428.41	Combined systolic and diastolic heart failure, acute
428.42	Combined systolic and diastolic heart failure, chronic
428.43	Combined systolic and diastolic heart failure, acute or chronic
428.9	Heart failure, unspecified

Cohort exclusions (excluded admissions):

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 clinically significant HF)

- 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 (this exclusion is made for CMS's 30-day HF mortality measure and allows the cohort to be as closely aligned with this measure as possible)
- 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)
- who receive a heart transplant during the episode of care (these patients are clinically distinct, generally very high payment cases, and not representative of the typical heart failure patient that this measure aims to capture)
- who receive a Left Ventricular Assist Device (LVAD) during the episode of care (these patients are clinically distinct, generally very high payment cases, and not representative of the typical heart failure patient that this measure aims to capture)
- 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 HF payment measure adjusts for patient age and a variety of clinical risk factors and comorbid conditions that are clinically relevant and have strong relationships with the outcome. There are 32 clinical 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*).*

The final set of risk-adjustment variables included:

Demographics	Age (65 – 74) Age (75 – 84) Age (>=85)

Cardiovascular	Respiratory Arrest/Cardiorespiratory Failure/Respirator Dependence (CC 77-79) Angina Pectoris/Old Myocardial Infarction (CC 83) Heart Infection/Inflammation, Except Rheumatic (CC 85) Major Congenital Cardiac/Circulatory Defect (CC87) Hypertension (CC 91)
Other Comorbidity	History of Infection (CC 1, 3-5) Other Infectious Diseases (CC 6) Protein-Calorie Malnutrition (CC 21) Other Significant Endocrine and Metabolic Disorders (CC 22) Obesity/Disorders of Thyroid, Cholesterol, Lipids (CC 24) Other Gastrointestinal Disorders (CC 36) Bone/Joint/Muscle Infections/Necrosis (CC 37) Other Musculoskeletal and Connective Tissue Disorders (CC 43) Delirium and Encephalopathy (CC 48) Dementia and Senility (CC 49, 50) Schizophrenia/Major Depressive/Bipolar Disorders (CC 54-55) Other Psychiatric Disorders (CC60) Arrhythmias (CC 92, 93) Cerebrovascular Disease (CC 97-99) Vascular or Circulatory Disease (CC 104-106) History of Pneumonia (CC 111-113) Other Ear, Nose, Throat, and Mouth Disorders (CC 127) Dialysis Status (CC 130) Renal Failure (CC 131) Decubitus Ulcer of Skin (CC 148) Chronic Ulcer of Skin, Except Decubitus (CC 149) Cellulitis, Local Skin Infection (CC 152) Hip Fracture/Dislocation (CC 158) Internal Injuries (CC 160)

The objective of the HF payment measure is to calculate payments that capture differences in the care provided or coordinated by hospitals for patients with HF. The measure removes variation in payments that are due to payment adjustments not directly related to clinical care through a process called “standardizing”. The HF 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 HF 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 patient-level risk-adjustment model by comparing model performance in a randomly selected 50 percent of the full-year 2009 sample (Sample A1) with its performance in the other 50 percent of the full-year 2009 sample (Sample A2) and the full 2008 sample (Sample A3). 173,296 admissions at 4,508 hospitals were included in the random 2009 Sample A1; 173,296 admissions at 4,493 hospitals were included in the remaining 2009 Sample A2; 348,061 admissions at 4,579 hospitals were included in the full 2008 sample.

Model performance results are summarized below:

Residuals lack of fit:

<-2 = A1 0.00%; A2 0.00%; A3 0.00%
[-2, 0) = A1 64.47%; A2 64.52%; A3 64.68%
[0, 2) = A1 32.87%; A2 32.80%; A3 32.62%
[2+ = A1 2.68%; A2 2.68%; A3 2.70%

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

Bottom Decile:	A1 1.01; A2 1.01; A3 1.02
First Decile:	A1 1.02; A2 1.03; A3 1.02
Second Decile:	A1 1.02; A2 1.02; A3 1.01
Third Decile:	A1 1.00; A2 1.01; A3 1.00
Fourth Decile:	A1 0.99; A2 0.99; A3 1.00
Fifth Decile:	A1 1.00; A2 0.99; A3 1.00
Sixth Decile:	A1 0.98; A2 0.98; A3 0.99
Seventh Decile:	A1 0.99; A2 0.99; A3 0.99
Eighth Decile:	A1 0.99; A2 0.98; A3 1.00
Ninth Decile:	A1 1.00; A2 1.00; A3 0.99
Tenth Decile:	A1 1.02; A2 1.03; A3 1.02
Top 1%:	A1 1.09; A2 1.07; A3 1.06

MAPE:

Sample A1 – 7274.62
Sample A2 – 7279.82
Sample A3 – 6825.75

Model Chi-square (DF):

Sample A1 – 3060.13 (31)
Sample A2 – 3066.00 (31)
Sample A3 – 4593.50 (31)

R-squared:

Sample A1 – 0.035
Sample A2 – 0.034
Sample A3 – 0.027

Over-fitting indices (Calibration γ0, γ1):

Sample A1 – 0,1
Sample A2 – 0.10,0.99
Sample A3 – 1.24, 0.87

RMSE:

Sample A1 – 10100.44
Sample A2 – 10113.85
Sample A3 – 9473.21

Data Collection Approach: Medicare claims data

Data Accuracy: In constructing the HF 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 Heart Failure (HF)

Measure Calculation:

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