

Acute Myocardial Infarction (AMI) Episode-of-Care for 30 days following onset

Measure Description

Resource use and costs associated with acute myocardial infarction (AMI) episode of care in 30 day period following onset of AMI. An index AMI event is identified and all AMI-related services are identified in the 30 day period following the onset of the acute event.

Required Data Elements

Administrative claims data

Calculation

Identify index hospitalization during the measurement year as a hospitalization for an AMI (see Table AMI-A for codes) in which the patient was discharged alive and had a length of stay greater than 1 day. Patients with an admission for AMI in the preceding 30 days from their index event will be excluded. For each patient, all AMI-related resources used during the 30 days from their admission will be identified. Prices from a standard price list will be applied to the AMI-related resource use to estimate the costs of the episode of care related to the AMI event. Resources will be defined for the following categories: 1) inpatient facility; 2) evaluation and management; 3) procedures; 4) imaging; 5) tests; 6) DME; 7) other drugs and services; 8) medications; 9) other and 10) outpatient facility. Costs will be risk adjusted for age and selected comorbidities. For inpatient facility costs, the standard cost is based on a per diem cost for a DRG and will be multiplied by the length of stay for the index event. For each of the other resource use categories, standardized prices will be available for each of the unique codes available under the other categories.

Episode Definition

AMI-related care provided in the 30 days following an AMI.

Rationale

The Institute of Medicine and AQA have identified acute myocardial infarction (AMI) as one of 20 conditions that should be considered a priority area in need of quality improvement based on the prevalence of the condition, its impact on morbidity and mortality, and the opportunity to significantly improve the quality of related care. AMI had also been previously identified as a priority area in other national initiatives including

HRSA Health Disparities Collaboratives and the Quality Improvement Program at CMS.¹ In addition, AMI episodes tend to be relatively high-resource use episodes – hospital discharges for AMI cost approximately \$17,500 on average in 2006 for a total of nearly \$12 billion nationwide.² Furthermore, costs per AMI patient can vary dramatically from one provider to the next as well as across regions, in part because of underlying patient risk factors and comorbidities (for which this measure adjusts), but also because of variations in practice patterns.

Importantly, guidelines for the management of AMI differentiate ST-segment elevation myocardial infarction (STEMI) from non-ST-segment elevation myocardial infarction (NSTEMI).^{3,4} A factor contributing to the differentiation is the evidence available around effective treatments for STEMI and NSTEMI. While the evidence base and clinical practice guidelines differ for the two, quality improvement measures group STEMI and non-STEMI events together as many of the interventions are similar between the two and it is not possible to differentiate the events in administrative datasets.⁵ Therefore, this measure includes STEMI and NSTEMI in a single measuring due to the inability to differentiate these in administrative datasets, while acknowledging it may be important to create separate measures when it becomes possible to accurately identify STEMI versus NSTEMI as resource use and quality of care differ between the two.⁶

While AMI is primarily an acute condition, the successful management of patients that are post-AMI also involves need for longer-term treatment and secondary prevention. Additionally, the initial event and resource use around that event will be associated with disproportionate costs than the medical management following the initial event. Therefore, resource use during an AMI episode will be measured in two ways. First, to measure variation in resource use at the hospital following patient presentation and during the post-hospitalization period (so as to capture variability associated with readmissions and the use of post-acute care), this measure begins at admission and follows the patient for the next 30 days. Measuring resource use associated with patient management post-AMI for the following 11 months is reserved for a separate measure. Only initial AMI episodes will be considered for these measures, given that treatment patterns may be different in the care for a patient with a secondary MI, particularly if the secondary MI took place within 30 days of the initial MI.

¹ Priority Areas for National Action: Transforming Health Care Quality. Institute of Medicine. Karen Adams and Janet Corrigan Editors. March 10, 2003.

² Health Care and Utilization Project. AHRQ. <http://hcupnet.ahrq.gov/>. Accessed March 2009.

³ Antman EM, Anbe DT, et al. ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction; a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol*. 2004;44:e1-e211.

⁴ Anderson JL, Adams CD, et al. ACC/AHA 2007 Guidelines for the Management of Patients with Unstable Angina/Non-ST-Elevation Myocardial Infarction. *J Am Coll Cardiol*. 2007; 50:1-157.

⁵ Chen J, Rathore SS, et al. JCAHO accreditation and quality of care for acute myocardial infarction. *Health Aff (Milwood)*. 2003; 22:243-254.

⁶ Roe MT, Parson LS, et al. Quality of care by classification of myocardial infarction: treatment patterns for ST-segment elevation vs non-ST-segment elevation myocardial infarction. *Arch Intern Med*. 2005; 165(14):1630-1636.

This measure will be attributed at the level of the hospital. It was determined this measure could not be attributed to individual physicians or physician practice groups because AMI patients almost always present in the emergency department where they do not have a choice of provider – their care will be rendered by whichever physicians are making rounds or are on call. The hospital is believed to have greater control over the patient’s treatment during and immediately following hospitalization under this scenario.

Measures

- AMI-related resource use / costs
 - Inpatient Facility
 - Evaluation and Management
 - Procedures
 - Imaging
 - Tests
 - DME
 - Other drugs and services
 - Exceptions / Unclassified
 - Other
 - Pharmacy
 - Outpatient Facility

Eligible Population

Age	18 to 85 years during the measurement year
Patient Inclusion Criteria	Continuous medical and pharmacy benefit enrollment for at least one year preceding the onset of the AMI episode and for one year following the episode onset, with no more than one gap in enrollment of more than 45 days during each year of continuous enrollment. Patients that die during the year following the event are included in the sample
Event/diagnosis	Admitted to an inpatient setting for an AMI between January 1 and December 31 of the measurement year and no AMI admission in the preceding 30 days with a length of stay > 1 day and discharged alive. Refer to Table AMI-A for codes to identify AMIs.
Exclusion	Hospitalizations excluded with ICD-9 Code 410.x2; Exclude patients with DRG (v24) 123 (MS-DRG 283, 284, 285) at index hospitalization. Persons with any of the following diagnoses in the measurement year or the year prior to measurement are

excluded (see tables AMI-D for codes):
active cancer; end stage renal disease
(ESRD); dialysis; renal failure; organ transplant;
HIV/AIDS

Patients discharged to a skilled nursing facility (SNF)

Table AMI-A: Codes to identify initial AMI episode

Description	ICD-9 Code
AMI	410.xx

Primary diagnosis of AMI 410.xx (excluding 410.x2)

Table AMI-B: Diagnostic codes to identify AMI-related services

Description	ICD-9 Code	DRG v24	DRG v25 (MS-DRG)
AMI	410.xx	121, 122, 535	280, 281, 282, 222, 223
Unstable angina	411.xx, 413.x	140, 143	311, 313
Arrhythmia and ICD / Pacemaker	427.xx, except 427.5	138, 139, 117, 118, 515, 535, 536, 551, 552	308, 309, 310, 260, 261, 262, 258, 259, 226, 227, 222, 223, 224, 225, 242, 243, 244
Cardiac arrest	427.5	129	296, 297, 298
PCI	00.66, 36.01, 36.02, 36.05, 36.06, 36.07	555, 556, 557, 558	248, 249, 246, 247
CABG	36.10-36.16	547, 548, 549, 550	233, 234, 235, 236
Coronary Atherosclerosis	414.0x, 414.8, 414.9		
Heart failure	402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.00, 428.1, 428.10, 428.90, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, 428.9		

Codes present in *any* diagnostic field during 30 day measurement period

Table AMI-C: Other Codes to Identify AMI-related Services

Categories of service are classified according to Berenson-Eggers Type of Services (BETOS) codes which assign CPT and HCPCs codes to the measurement categories.

Inpatient Facility Codes

Description	CPT
Nonacute inpatient	99301-99313, 99315, 99316, 99318, 99321-99328, 99331-99337
Acute inpatient	99221-99223, 99231-99233, 99238, 99239, 99251-99255, 99261-99263, 99291

Codes present with another code (eg. ICD-9, CPT, HCPCs, DRG) for AMI-related service

Evaluation and Management Codes

Description	CPT Codes
Office or Other Outpatient Services	99201–99215
Hospital Observation Services	99217–99220, 99358–99360
Hospital Inpatient Services	99221–99239
Consultations	99241–99255, 99261–99263, 99271–99275
Critical Care and Intensive Care Services	99289–99298
Nursing Facility, Domiciliary and Home Services	99301–99350
Case Management Services and Care Plan Oversight Services	99361–99380
Preventive Medicine Services	99385–99390, 99395–99405, 99410–99429
Other E&M Services	99450–99456, 99354–99357

Codes present with another code (eg. ICD-9, CPT, HCPCs, DRG) for AMI-related service

Surgery and Procedure Codes

Description	ICD-9 Code	CPT	DRG	MS-DRG (v25)
PCI	00.66, 36.01, 36.02, 36.05, 36.06, 36.07	92982-92984, 92995	555, 556, 557, 558	248, 249, 246, 247
CABG	36.10-36.16	33503-33505, 33510-33516, 33517-33519, 33521-33523, 33533-33535	547, 548, 549, 550	233, 234, 235, 236
Coronary thrombolysis	36.04			
Diagnostic cardiac catheterization;	37.21-37.23, 88.52-88.57	93526-93529, 93536, 93503, 93561-93562,		

coronary arteriography		93555-93556, 93539-93545, 93510-93524		
Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator	00.50-00.57, 37.70-37.83, 37.85-37.87, 37.89, 37.94-37.98	33200-33201, 33206-33208, 33210-33211, 33216-33217, 33212-33213	117, 118, 515, 535, 536, 551, 552	260, 261, 262, 258, 259, 226, 227, 222, 223, 224, 225, 242, 243, 244
Other vascular procedures			553, 554	253, 254
Radiology		71010, 71015, 71020, 71021, 71022, 71030, 71035, 71090, 71250, 71260, 71270, 71275		
EKG		93000, 93005, 93010, 93012, 93014, 93015, 93016, 93017, 93018, 93040, 93041, 93042, 93224, 93225, 93226, 93227, 93230, 93231, 93232, 93233, 93235, 93237		

Pharmacy

Following classes of medications are included as AMI-related medications:

1. Beta-blockers
2. ACE Inhibitors
3. ARBs
4. Clopidogrel, plavix
5. Lipid lowering medications (statins, niacin, etc.)
6. Nitrates

The following HCPCs codes identify additional AMI-related medications

HCPC	Short Description
C9109	Tirofiban hcl, 6.25 mg
C9121	Injection, argatroban
J0130	Abciximab injection
J0350	Injection anistreplase 30 u
J0365	Aprotonin, 10,000 kiu
J0583	Bivalirudin
J1160	Digoxin injection
J1162	Digoxin immune fab (ovine)
J1245	Dipyridamole injection

J1327	Eptifibatide injection
J1642	Inj heparin sodium per 10 u
J1644	Inj heparin sodium per 1000u
J1645	Dalteparin sodium
J1650	Inj enoxaparin sodium
J1652	Fondaparinux sodium
J1655	Tinzaparin sodium injection
J2993	Retepase injection
J2995	Inj streptokinase /250000 IU
J2997	Alteplase recombinant
J3100	Tenecteplase injection
J3245	Tirofiban hydrochloride
J3246	Tirofiban HCl
J3265	Injection torsemide 10 mg/ml
J3364	Urokinase 5000 IU injection
J3365	Urokinase 250,000 IU inj

Table AMI-D: Codes to Identify Exclusions

Table AMI-D-Cancer: Codes to Identify Active Cancer Treatment

Description	ICD-9-CM Diagnosis
Cancer	140-208, 230-239

WITH

Description	CPT	ICD-9-CM Procedure	UB Revenue
Treatment	38230, 38240-38242, 77261-77799, 79000-79999, 96400-96549	41.0, 41.91, 92.2	028x, 033x, 0342, 0344, 0973

Table AMI-D-ESRD: Codes to Identify ESRD

Description	CPT	HCPCS	ICD-9-CM Diagnosis	ICD-9-CM Procedure	UB Revenue	UB Type of Bill	POS
ESRD (including renal dialysis)	36145, 36800-36821, 36831-36833, 90919-90921, 90923-90925, 90935, 90937, 90939, 90940, 90945, 90947, 90989, 90993, 90997, 90999, 99512	G0257, G0311-G0319, G0321-G0323, G0325-G0327, G0392, G0393, S9339	585.5, 585.6, V42.0, V45.1, V56	38.95, 39.27, 39.42, 39.43, 39.53, 39.93, 39.94, 39.95, 54.98	080x, 082x-085x, 088x	72x	65

Table AMI-D-Transplant: Codes to Identify Organ Transplant

Description	CPT	HCCPS	ICD-9-CM Procedure	UB Revenue
Organ transplant	32850-32856, 33930-33945, 44132-44137, 44715-44721, 47133-47147, 48160, 48550-48556, 50300-50380	S2152, S2053-S2055, S2060, S2061, S2065	33.5, 33.6, 37.5, 41.94, 46.97, 50.5, 52.8, 55.6	0362, 0367, 0810-0813, 0819

Table AMI-D-Transplant: Codes to Identify Organ Transplant

Description	ICD-9-CM Diagnosis
HIV	042

Risk Adjustment Method

Comorbid conditions indentified as HCCs in 12 months preceding event date using inpatient and outpatient ICD-9 codes.

Episode Severity / Disease Staging

Two separate stratifications will be created. First, we will stratify patients that are transferred compared to those that are transferred. Second, patients will be stratified by the presence of heart failure in the year preceding the event.

Outlier Methodology

All individuals are included in the analysis with costs winsorized at the 2nd and 98th percentile.

Level of Measurement/Analysis

Measurement will take place at the level of the hospital and the provider team within the hospital.

Applicable Care Settings

- Inpatient
- Outpatient
- Post-Acute Care

Note: Portions of these measure specifications are based on existing HEDIS measure specifications.