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PERFORMANCE MEASURE

2017 AHA/ACC Clinical Performance and Quality Measures for Adults With ST-Elevation and Non–ST-Elevation Myocardial Infarction

A Report of the American College of Cardiology/American Heart Association Task Force on Performance Measures

Developed in Collaboration With the Society for Cardiovascular Angiography and Interventions
Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation

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TABLE OF CONTENTS

PREAMBLE

The American College of Cardiology (ACC)/American Heart Association (AHA) performance measure sets serve as vehicles to accelerate translation of scientific evidence into clinical practice. Measure sets developed by the ACC/AHA are intended to provide practitioners and institutions that deliver cardiovascular services with tools to measure the quality of care provided and identify opportunities for improvement.

Writing committees are instructed to consider the methodology of performance measure development (1) and to ensure that the measures developed are aligned with ACC/AHA clinical practice guidelines. The writing committees also are charged with constructing measures that maximally capture important aspects of care quality, including timeliness, safety, effectiveness, efficiency, equity, and patient-centeredness, while minimizing, when possible, the reporting burden imposed on hospitals, practices, and/or practitioners.

Potential challenges from measure implementation may lead to unintended consequences. The manner in which challenges are addressed is dependent on several factors, including the measure design, data collection method, performance attribution, baseline performance rates, reporting methods, and incentives linked to these reports.

The ACC/AHA Task Force on Performance Measures (Task Force) distinguishes quality measures from performance measures. Quality measures are those metrics that *may* be useful for local quality improvement but are not yet appropriate for public reporting or pay for performance programs (uses of performance measures). New measures are initially evaluated for potential inclusion as performance measures. In some cases, a measure is insufficiently supported by the guidelines. In other instances, when the guidelines support a measure, the writing committee may feel it is necessary to have the measure tested to identify the consequences of measure implementation. Quality measures may then be promoted to the status of performance measures as supporting evidence becomes available.

Gregg C. Fonarow, MD, FACC, FAHA
Chair, ACC/AHA Task Force on Performance Measures

1. INTRODUCTION

In the summer of 2015, the Task Force convened the writing committee to begin the process of revising the existing set of performance measures for adult patients hospitalized with ST-Elevation and Non-ST-Elevation Myocardial Infarction (STEMI and NSTEMI, respectively), that was last updated in 2008 (2). The writing committee was charged with the task of developing new measures to benchmark and improve the quality of care for patients with STEMI and NSTEMI.

All the measures included in the measure set are briefly summarized in **Table 1**, which provides information on the measure number, title, care setting, attribution, and domain. The detailed measure specifications (available in Appendix A) provide not only the information included in **Table 1**, but also more detailed information including the measure description, numerator, denominator (including denominator exclusions and exceptions), rationale for the measure, guideline recommendations that support the measure, measurement period, and sources of data.

The writing committee has developed a comprehensive STEMI/NSTEMI measure set that includes 24 total measures of which 17 are performance measures and 7 are quality measures (as reflected in **Table 1 and** Appendix A). The writing committee believes that implementation of this measure set by healthcare providers, physician practices, and hospital systems will enhance the quality of care and likely improve outcomes of patients with STEMI and NSTEMI.

1.1. Scope of the Problem

Acute myocardial infarction (AMI) is a frequent cause of hospital admission in the United States and is associated with significant short- and long-term mortality and morbidity. Every 42 seconds, approximately 1 American will suffer an AMI, and the estimated annual incidences of new and recurrent MI events are 550,000 and 200,000 events, respectively (3).

Fortunately, the rates of hospitalization and 30-day mortality for AMI have been on the decline (4,5). This reduction in mortality is likely related to the shift in the pattern of clinical presentation of AMI as well as to improved acute treatments and long-term care. Yeh and colleagues examined age- and sex-adjusted incidence rates for STEMI and NSTEMI from a community-based population (Northern California) between 1999 and 2008, and demonstrated an overall significant decrease in AMI incidence rate after 2000 (6). Although the adjusted 30-day mortality rate after AMI decreased significantly (driven by a significant reduction in NSTEMI mortality), the overall mortality rate in 2008 after an AMI was still 7.8% at 30 days (6).

Importantly, AMI patients who survive the initial event have substantial risk for future cardiovascular events, including recurrent MI, death, heart failure, and stroke. In the PLATO (Platelet Inhibition and Patient Outcomes) trial, the rate of the combined cardiovascular endpoint (vascular death, MI, or stroke) was 11.7% at 12 months among AMI patients treated with aspirin and clopidogrel (7). This included a 6.9% rate of recurrent MI at 12 months

TABLE 1 2017 AHA/ACC STEMI and NSTEMI Myocardial Infarction Clinical Performance and Quality Measures

No.	Measure Title	Care Setting	Attribution	Measure Domain
Performance Measures				
PM-1	Aspirin at Arrival	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-2	Aspirin Prescribed at Discharge	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-3	Beta Blocker Prescribed at Discharge	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-4	High-Intensity Statin Prescribed at Discharge	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-5	Evaluation of LVEF	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-6	ACEI or ARB Prescribed for LVSD	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-7	Time to Fibrinolytic Therapy*	Inpatient	Facility or Provider Level	Communication and Care Coordination
PM-8	Time to Primary PCI*	Inpatient	Facility or Provider Level	Communication and Care Coordination
PM-9	Reperfusion Therapy*	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-10	Time From ED Arrival at STEMI Referral Facility to ED Discharge From STEMI Referral Facility in Patients Transferred for Primary PCI*	Inpatient	Facility Level	Communication and Care Coordination
PM-11	Time From FMC (At or Before ED Arrival at STEMI Referral Facility) to Primary PCI at STEMI Receiving Facility Among Transferred Patients*	Inpatient	Facility Level	Communication and Care Coordination
PM-12	Cardiac Rehabilitation Patient Referral From an Inpatient Setting	Inpatient	Facility or Provider Level	Communication and Care Coordination
PM-13	PY12 Receptor Inhibitor Prescribed at Discharge	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-14	Immediate Angiography for Resuscitated Out-of-Hospital Cardiac Arrest in STEMI Patients*	Inpatient	Facility or Provider Level	Effective Clinical Care
PM-15	Noninvasive Stress Testing Before Discharge in Conservatively Treated Patients	Inpatient	Facility or Provider Level	Efficiency and Cost Reduction
PM-16	Early Cardiac Troponin Measurement† (Within 6 Hours of Arrival)	Inpatient	Facility or Provider Level	Efficiency and Cost Reduction
PM-17	Participation in ≥1 Regional or National Registries That Include Patients With Acute Myocardial Infarction Registry	Inpatient	Facility Level	Community, Population, and Public Health
Quality Measures				
QM-1	Risk Stratification of NSTEMI Patients With a Risk Score†	Inpatient	Facility or Provider Level	Effective Clinical Care
QM-2	Early Invasive Strategy (Within 24 Hours) in High-Risk NSTEMI Patients†	Inpatient	Facility or Provider Level	Effective Clinical Care
QM-3	Therapeutic Hypothermia for Comatose STEMI Patients With Out-of-Hospital Cardiac Arrest*	Inpatient	Facility or Provider Level	Effective Clinical Care
QM-4	Aldosterone Antagonist Prescribed at Discharge	Inpatient	Facility or Provider Level	Effective Clinical Care
QM-5	Inappropriate In-Hospital Use of NSAIDs	Inpatient	Facility or Provider Level	Patient Safety
QM-6	Inappropriate Prescription of Prasugrel at Discharge in Patients With a History of Prior Stroke or TIA	Inpatient	Facility or Provider Level	Patient Safety
QM-7	Inappropriate Prescription of High-Dose Aspirin With Ticagrelor at Discharge	Inpatient	Facility or Provider Level	Patient Safety

*These measures apply only to patients with STEMI. †These measures apply only to patients with NSTEMI.

ACC indicates American College of Cardiology; ACEI, angiotensin-converting enzyme inhibitor; AHA, American Heart Association; ARB, angiotensin receptor blocker; ED, emergency department; FMC, first medical contact; LVEF, left ventricular ejection fraction; LVSD, left ventricular systolic dysfunction; NSAIDs, nonsteroidal anti-inflammatory drugs; NSTEMI, non-ST-elevation myocardial infarction; PCI, percutaneous coronary intervention; PM, performance measures; QM, quality measures; STEMI, ST-elevation myocardial infarction; and TIA, transient ischemic attack.

(7). In 2010 alone, about 595,000 inpatient hospital discharges were attributed to AMI (3). AMI is also associated with a substantial direct and indirect cost burden, and is classified among the top 10 most expensive hospital principal discharge diagnoses (3).

As indicated in the Third Universal Definition of Myocardial Infarction consensus document published in 2012 (8), AMI is defined by the detection of a rise and/or fall of cardiac biomarkers (preferably cardiac troponin levels) with at least 1 value above the 99th percentile upper reference limit and with at least one of the following: (a) symptoms of ischemia; (b) new or presumed new significant ST-segment-T wave changes or new left bundle branch block; (c) development of pathological Q

waves in the electrocardiogram (ECG); (d) imaging evidence of new loss of viable myocardium or new regional wall motion abnormality; (e) identification of an intracoronary thrombus by angiography or autopsy. The Third Universal Definition of Myocardial Infarction consensus document, published in 2012, classifies MI into 5 types, based on pathological, clinical, and prognostic differences, along with different treatment strategies (8). The performance and quality measures described in the current document are predominantly pertinent to patients with spontaneous MI, or MI type 1. MI type 1 is an event related to atherosclerotic plaque disruption (e.g., rupture, ulceration, erosion) with superimposed thrombus formation in a coronary artery, resulting in acute reduction in myocardial blood supply and/or distal embolization with subsequent myonecrosis. MI type 2 is myocardial injury caused by conditions other than coronary artery disease that results in an imbalance between myocardial oxygen supply and/or demand (e.g., coronary artery embolism or spasm, tachyarrhythmias, anemia, respiratory failure, profound hypotension).

The measure set developed by our writing committee applies only to MI type 1 and does not uniformly apply to the other 4 types of MI. In fact, some of those measures are even contraindicated with certain MI type, such as aspirin or $P2Y_{12}$ receptor inhibitor therapies, which are contraindicated in patients with a MI type 2 resulting from severe hemorrhage and anemia. Given the widespread use of very sensitive assays for markers of myocardial necrosis (e.g., the highly sensitive and specific cardiac troponin [cTn] biomarkers) and advanced imaging modalities, very small amounts of myonecrosis unrelated to ischemia can be detected (e.g., heart failure, renal failure, myocarditis, pulmonary embolism). Our measures also do not apply to these myocardial injury events, which should be differentiated from true AMI events.

For the sake of immediate treatment strategies (e.g., reperfusion therapy), AMI is differentiated into STEMI and NSTEMI, depending on the existence of ST-segment elevation in ≥2 contiguous leads on the presenting ECG. Acute STEMI equivalent can, however, manifest as: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of left bundle branch block. The proportion of STEMI versus NSTEMI events varies in different registries and depends on the age of patients, their geographic location, and the type of surveillance used. In general, STEMI patients account for 29% to 47% of all AMI patients (9,10).

Updating the existing STEMI/NSTEMI measure set was a priority for the ACC and AHA. Particular attention was given to evidence-based diagnostic and therapeutic strategies that have high impact on outcomes (e.g., Class I or III guideline recommendations) of patients with STEMI/NSTEMI and that satisfy the attributes of performance measures (e.g., feasible, reliable, actionable). This writing committee developed the measures in this document after comprehensive examination of the most current relevant guidelines, internal discussion and internal voting, peer review, and public comment.

1.2. Disclosure of Relationships With Industry and Other Entities

The Task Force makes every effort to avoid actual, potential, or perceived conflicts of interest that could arise as a result of relationships with industry or other entities (RWI). Detailed information on the ACC/AHA policy on RWI can be found online. All members of the writing committee, as well as those selected to serve as peer reviewers of this document, were required to disclose all current relationships and those existing within the 12 months before the initiation of this writing effort. ACC/AHA policy also requires that the writing committee chairs and at least 50% of the writing committee have no relevant RWI.

Any writing committee member who develops new RWI during his or her tenure on the writing committee is required to notify staff in writing. These statements are reviewed periodically by the Task Force and by members of the writing committee. Author and peer reviewer RWI which are relevant to the document are included in the appendixes: Please see Appendix B for relevant writing committee RWI and Appendix C for relevant peer reviewer RWI. Additionally, to ensure complete transparency, the writing committee members' comprehensive disclosure information, including RWI not relevant to the present document, is available online. Disclosure information for the Task Force is also available online.

The work of the writing committee was supported exclusively by the ACC and the AHA without commercial support. Members of the writing committee volunteered their time for this effort. Meetings of the writing committee were confidential and attended only by writing committee members and staff from the ACC, AHA, and the Society for Cardiovascular Angiography and Interventions who served as a collaborator on this project.

2. METHODOLOGY

2.1. Literature Review

In developing the updated STEMI/NSTEMI measure set, the writing committee reviewed evidence-based guidelines and statements that would potentially impact the construct of the measures. The practice guidelines and statements that most directly contributed to the development of these measures are summarized in **Table 2**.

TABLE 2 Associated Guidelines and Other Clinical Guidance Documents

CLINICAL PRACTICE GUIDELINES	
1.	2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes (11)
2.	2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction (12)
3.	AHA/ACCF Secondary Prevention and Risk Reduction Therapy for Patients With Coronary and Other Atherosclerotic Vascular Disease: 2011 Update (13)
4.	2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults (14)
5.	2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction: An Update of the 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention and the 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction (15)
6.	2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease (16)
7.	2016 ACC/AHA/HFSA Focused Update on New Pharmacological Therapy for Heart Failure: An Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure (17)
STATEMENTS/PERFORMANCE MEASURES	
1.	2015 ACC/AHA Focused Update of Secondary Prevention Lipid Performance Measures (18)
2.	Third Universal Definition of Myocardial Infarction (8)
3.	ACC/AHA 2008 Performance Measures for Adults With ST-Elevation and Non-ST-Elevation Myocardial Infarction (2)
4.	ACC/AHA 2008 Statement on Performance Measurement and Reperfusion Therapy (19)

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; ESC indicates European Society of Cardiology; HFSA, Heart Failure Society of America; and SCAI, Society for Cardiovascular Angiography and Interventions.

2.2. Definition and Selection of Measures

The writing committee reviewed recent clinical practice guidelines and other clinical guidance documents (Table 2). The writing committee also examined available information on disparities in care to address which new measures might be appropriate as performance versus quality measures for this measure set update. To this effect, an extensive environmental scan of the published literature was performed. In a large retrospective analysis of STEMI patients transferred to primary percutaneous coronary intervention (PCI) centers in the ACTION-Get With The Guidelines registry (2007-2010), only 11% had timely door-in-door-out time ≤30 minutes (20). In another cohort of STEMI patients transferred from non-PCI-capable hospitals to STEMI receiving centers (2008-2012), timely primary PCI (≤120 minutes) was achieved in 65% of transferred patients (21). Another report showed that only 41% of patients were referred to cardiac rehabilitation after AMI (22,23). These reports highlight but a few examples of the persistent disparities in care. Importantly, it appears guideline-directed care can greatly reduce a large proportion of disparities previously noted in women (24,25).

All measures were designed to assess quality of care experienced by individuals who have STEMI or NSTEMI in the inpatient setting. Each measure was designed to limit performance measurement to patients without a valid reason for exclusion from the measure. Measure exclusions were those reasons that remove a patient from the denominator, regardless of whether they would be included in the numerator. For example, all measures excluded patients who were <18 years of age, who received comfort care measures only, or in hospice. In contrast to exclusions, denominator exceptions were those conditions that removed a patient from the denominator only if the numerator criteria were not met. Denominator exceptions were used in select cases to allow for a fairer measurement of quality for those providers with higher risk populations. Exceptions were also used to defer to the clinical judgment of the provider. Several of the measures included exceptions. For example, in the case of the "$P2Y_{12}$ Inhibitor at Discharge" measure, a care provider may write a prescription for an oral $P2Y_{12}$ receptor inhibitor (clopidogrel, ticagrelor, or prasugrel) even if the patient revealed that he/she will not take the medication due to a number of reasons (e.g., concerns about its bleeding risk). In this case, the provider would receive credit for the measure. However, if the patient had explicitly expressed to the provider that he/she did not wish to have the medication prescribed, no prescription will be written and the provider can then document in the medical record patient's refusal of the medication. In this scenario, the provider will not be penalized for this performance measure because a valid patient reason is documented. The writing committee closely deliberated the exceptions to be included with each measure and, in some cases, determined not to include any exceptions (as in the case of the patient safety measures).

During the course of developing the measure set, the writing committee evaluated the potential measures against the ACC/AHA attributes of performance measures (Table 3) to reach consensus on which measures should be advanced for inclusion in the final measure set. After the peer review and public comment period, the writing committee reviewed and discussed the comments received, and further refined the measure set. The writing committee acknowledges that the new measures created in this set will need to be tested and validated over time. By publishing this performance and quality measure set, the writing committee hopes to encourage their widespread and expeditious adoption, as well as facilitate the collection and analysis of data that are needed to continuously assess their relevance over time. In the future, the writing committee members anticipate having data that will allow them to reassess whether any of the measures included in this set should be revised (e.g., modified, deleted, or potentially upgraded from a quality measure to a performance measure).

TABLE 3 ACC/AHA Task Force on Performance Measures: Attributes for Performance Measures (26)

1. Evidence Based	
High-impact area that is useful in improving patient outcomes	a) For structural measures, the structure should be closely linked to a meaningful process of care that in turn is linked to a meaningful patient outcome. b) For process measures, the scientific basis for the measure should be well established, and the process should be closely linked to a meaningful patient outcome. c) For outcome measures, the outcome should be clinically meaningful. If appropriate, performance measures based on outcomes should adjust for relevant clinical characteristics through the use of appropriate methodology and high-quality data sources.
2. Measure Selection	
Measure definition	a) The patient group to whom the measure applies (denominator) and the patient group for whom conformance is achieved (numerator) are clearly defined and clinically meaningful.
Measure exceptions and exclusions	b) Exceptions and exclusions are supported by evidence.
Reliability	c) The measure is reproducible across organizations and delivery settings.
Face validity	d) The measure appears to assess what it is intended to.
Content validity	e) The measure captures most meaningful aspects of care.
Construct validity	f) The measure correlates well with other measures of the same aspect of care.
3. Measure Feasibility	
Reasonable effort and cost	a) The data required for the measure can be obtained with reasonable effort and cost.
Reasonable time period	b) The data required for the measure can be obtained within the period allowed for data collection.
4. Accountability	
Actionable	a) Those held accountable can affect the care process or outcome.
Unintended consequences avoided	b) The likelihood of negative unintended consequences with the measure is low.

ACC indicates American College of Cardiology; AHA, American Heart Association.

3. AHA/ACC STEMI AND NSTEMI MEASURE SET PERFORMANCE MEASURES

3.1. Discussion of Changes to 2008 STEMI and NSTEMI Measure Set

After reviewing the existing guidelines, and the 2008 performance and quality measure set (2), the writing committee discussed which measures should be revised to reflect the updated science, and worked to identify which guideline recommendations could serve as the basis for new performance or quality measures. The writing committee also reviewed existing measure sets that were publicly available.

The following subsections serve as a synopsis of the revisions that were made to previous measures, and a description of why the new inpatient measures were created.

3.1.1. Retired Measures

The writing committee decided to retire 1 performance measure for smoking cessation counseling because of the consistently high levels of performance achieved (Table 4). Other quality measures, previously included as test measures in the 2008 measure set, were retired for the reasons specified in Table 4.

3.1.2. Revised Measures

The writing committee reviewed and made changes to 4 measures, which are summarized in Table 5. Most the changes were made to reflect the new evidence and updated guideline recommendations, to strengthen the measure construct, or to expand the measures to include new proven pharmacotherapies.

3.1.3. New Measures

The new measure set includes 4 performance measures and 7 quality measures. Table 6 includes a list of the new measures and their rationale.

Four of the quality measures are structured in a typical format in which the goal is to seek a score of 100%. However, 3 of the new quality measures (QM-5, QM-6, and QM-7) are safety measures and, in those, the goal is to seek a score of 0% (e.g., 0% use or prescription of an inappropriate treatment reflects an optimal quality of care).

For more detailed information on the measure construct, please refer to the detailed measure specifications summarized in Appendix A.

TABLE 4 Retired STEMI and NSTEMI Measures From the 2008 Set

#	Care Setting	Measure Title	Rationale for Retiring the Measure
PM-12	Inpatient	Adult Smoking Cessation Advice/ Counseling	This measure is being retired because perfect scores are consistently achieved and the measure appears to have reached a ceiling effect. Therefore, given absence of room for further improvement, the writing committee opted to omit this measure from the inpatient performance measure set for AMI (realizing also that a separate outpatient CAD measure set will likely address smoking cessation advice/counseling). The writing committee also recognizes the importance of the American Medical Association/Physician Consortium for Performance Improvement Tobacco Use: Screening and Cessation Intervention measure that already exists (27).
QM-1	Inpatient	LDL Cholesterol Assessment	This measure is being retired to be concordant with the new lipid guidelines that no longer recommend LDL measurements to target statin prescription and/or dosing.
QM-2	Inpatient	Excessive Initial Heparin Dose	This measure is being retired because it covers only one aspect of medication use (e.g., overdosing) and misses other aspects such as under-dosing and inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines and has shortcomings pertinent to measure feasibility and accountability.
QM-3	Inpatient	Excessive Initial Enoxaparin Dose	This measure is being retired because it covers only one aspect of medication use (e.g., overdosing) and misses other aspects such as underdosing and inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines and has shortcomings pertinent to measure feasibility and accountability.
QM-4	Inpatient	Excessive Initial Abciximab Dose	This measure is being retired because it covers only one aspect of medication use, (e.g., overdosing) and misses other aspects such as underdosing and inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines and has shortcomings pertinent to measure feasibility and accountability.
QM-5	Inpatient	Excessive Initial Eptifibatide Dose	This measure is being retired because it covers only one aspect of medication use (e.g., overdosing) and misses other aspects such as underdosing and inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines and has shortcomings pertinent to measure feasibility and accountability.
QM-6	Inpatient	Excessive Initial Tirofiban Dose	This measure is being retired because it covers only one aspect of medication use (e.g., overdosing) and misses other aspects such as underdosing and inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines and has shortcomings pertinent to measure feasibility and accountability.
QM-7	Inpatient	Anticoagulant Dosing Protocol	This measure is being retired because it covers only one aspect of medication use and misses other aspects such as inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines and has shortcomings pertinent to measure feasibility and accountability.
QM-8	Inpatient	Anticoagulant Error Tracking System	This measure is being retired because it covers only limited aspects of medication use and misses other aspects such as inappropriate use. In addition, this is not a direct stand-alone Class I or III recommendation in the guidelines.

AMI indicates acute myocardial infarction; LDL, low-density lipoprotein; NSTEMI, non-ST-elevation myocardial infarction; PM, performance measure; QM, quality measure; and STEMI, ST-elevation myocardial infarction.

TABLE 5 Revised STEMI and NSTEMI Measures

#	Care Setting	Measure Title	Rationale for Revision of the Measure
PM-4	Inpatient	Statin for AMI	This measure is being revised to reflect the 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults (14), which recommended statin use for all patients with established atherosclerotic cardiovascular disease, including patients with AMI.
PM- 5	Inpatient	Evaluation of LVEF	The title of this measure is being revised from "Evaluation of Left Ventricular Systolic Function" to "Evaluation of Left Ventricular Ejection Fraction." The treatment recommendations regarding the use of guideline-directed medication therapies are based on LVEF, not qualitative estimates of left ventricular systolic function. The 2013 ACCF/AHA STEMI guideline (12) explicitly recommended measuring LVEF. The 2014 AHA/ACC NSTE-ACS guidelines (11) likewise have medication recommendations based on knowledge of the ejection fraction.
PM-12	Inpatient	Cardiac Rehabilitation Referral	This measure is being adapted from the AACVPR/ACCF/AHA 2010 Update: Performance Measures on Cardiac Rehabilitation for Referral to Cardiac Rehabilitation/Secondary Prevention Services (28). One modification since the publication of that 2010 measurement set was the removal of patient reasons from the list of measure exceptions. Specifically, patient refusal does not constitute a justifiable reason for a clinician not offering a referral to a patient. If documentation in the medical record exists noting that the provider has informed and discussed referral to cardiac rehabilitation/secondary prevention program with the patient, but that the patient refuses a referral, then the healthcare provider would not be expected to send communication about the patient to the cardiac rehabilitation/secondary prevention program. This is consistent with HIPAA confidentiality regulations and shared decision making, and performance would then be considered met by the provider (preventing unjust penalization of the provider).
PM-13	Inpatient	$P2Y_{12}$ Receptor Inhibitor Prescribed at Discharge	In the 2008 ACC/AHA STEMI/NSTEMI measure set (2), a test measure entitled "Clopidogrel at Discharge" was included. Since then, 2 newer FDA-approved medications—ticagrelor and prasugrel—have emerged and demonstrated safety, efficacy, and clinical effectiveness after AMI. All 3 medications are inhibitors of the $P2Y_{12}$ receptor and are recommended in addition to aspirin (as part of a dual antiplatelet regimen) to reduce recurrent ischemic events after AMI.

AACVPR indicates American Association of Cardiovascular and Pulmonary Rehabilitation; ACC, American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; FDA, U.S. Food and Drug Administration; HIPAA, the Health Insurance Portability and Accountability Act; LVEF, left ventricular ejection fraction; NSTEMI, non-ST-elevation myocardial infarction; NSTE-ACS, non-ST-segment elevation acute coronary syndromes; PM, performance measure; and STEMI, ST-elevation myocardial infarction.

TABLE 6 New STEMI/NSTEMI Measures

No.	Care Setting	Measure Title	Rationale for Creating New Measure	Rationale for Designating as a Quality Measure as Opposed to a Performance Measure (If Applicable)
PM-14	Inpatient	Immediate Angiography for Resuscitated Out-of-Hospital Cardiac Arrest in STEMI Patients	This measure seeks to implement a Class I (Level of Evidence B) recommendation in the 2013 ACCF/AHA STEMI guideline (12) that immediate angiography with PCI when indicated should be performed in resuscitated out-of-hospital cardiac arrest patients whose initial ECG shows STEMI. The writing committee opted to include angiography only, which is easily measurable, and not PCI because of the difficulty associated with ascertaining PCI appropriateness or its lack thereof.	Not Applicable
PM-15	Inpatient	Noninvasive Stress Testing Before Discharge in Conservatively Treated Patients	This measure seeks to implement Class I (Level of Evidence B) recommendations in both the 2013 STEMI (12) and 2014 AHA/ACC NSTE-ACS (11) guidelines to perform noninvasive stress testing to detect inducible ischemia in medically treated STEMI and NSTEMI patients.	Not Applicable
PM-16	Inpatient	Early Cardiac Troponin Measurement (Within 6 Hours of Arrival)	This measure seeks to implement Class I (Level of Evidence A) recommendations in the 2014 AHA/ACC NSTE-ACS guideline (11) to measure serial cardiac troponin levels (at presentation and 3 to 6 h after symptom onset in all patients).	Not Applicable
PM-17	Inpatient	Participation in Regional or National Acute Myocardial Infarction Registry	This measure seeks to implement Class I (Level of Evidence B) and Class IIa (Level of Evidence B) recommendations in the 2013 STEMI (12) and 2014 AHA/ACC NSTE-ACS guidelines (11), respectively. The writing group felt that participation in a regional or national AMI registry will help track and assess the outcomes, complications, and quality of care for patients with AMI, and is supported by evidence.	Not Applicable
QM-1	Inpatient	Risk Score Stratification for NSTEMI Patients	This measure seeks to implement a Class I (Level of Evidence A) recommendation in the 2014 AHA/ACC NSTE-ACS (11) guideline that risk scores should be used to assess prognosis in patients with NSTE-ACS. The writing committee realizes the importance of this measure to dictate the appropriate strategy (invasive versus ischemic-guided) and the timing of the strategy (early versus late invasive) in patients with NSTEMI.	The writing committee felt it was best to keep this as a quality measure because of issues related to the measure feasibility. Most registries do not include risk scores, and most risk scores (e.g., GRACE, TIMI, PURSUIT) are difficult to compute retrospectively from their respective components, and are likely to cause a significant abstraction burden.
QM-2	Inpatient	Early Invasive Strategy (Within 24 Hours) in High-Risk NSTEMI Patients	This measure seeks to implement a Class I (Level of Evidence A) recommendation in the 2014 AHA/ACC NSTE-ACS guideline (11) that an early invasive strategy should be performed in initially stabilized high-risk patients with NSTE-ACS.	The writing committee felt it was best to keep this as a quality measure for many reasons. The writing group acknowledges that early invasive strategy (compared with a delayed invasive strategy) in high-risk NSTE-ACS patients predominantly reduces recurrent ischemia (rather than the hard outcomes of recurrent MI or death). Although this strategy additionally reduces length of stay and costs, it creates a logistical burden on cardiac catheterization labs, especially during weekends. Finally, objective risk stratification by risk scores is usually not available in current registries; thus, ascertaining which patients benefit from early invasive strategy may not be readily feasible.
QM-3	Inpatient	Therapeutic Hypothermia for Comatose STEMI Patients With Out-of-Hospital Cardiac Arrest	This measure seeks to implement a Class I (Level of Evidence B) recommendation in the 2013 ACCF/AHA STEMI guideline (12) that therapeutic hypothermia should be started as soon as possible in comatose patients with STEMI and out-of-hospital cardiac arrest caused by VF or VT.	The writing committee felt it was best to keep this as a quality measure because of newer controversial data pertinent to the effectiveness, timing, and implementation of therapeutic hypothermia.
QM-4	Inpatient	Aldosterone Antagonist at Discharge	This measure seeks to implement Class I recommendations in the 2013 ACCF/AHA STEMI (12) and 2014 AHA/ACC NSTE-ACS (11) guidelines supporting the use of aldosterone antagonists in eligible patients with STEMI and NSTEMI, respectively.	The writing committee felt it is best to keep this as a quality measure because of issues related to the measure construct. This measure is likely to present a significant abstraction burden and may be relevant only to a small fraction of AMI patients (given the elaborate inclusion/exclusion criteria in the EPHESUS (29) clinical trial).

Continued on the next page

TABLE 6 Continued

No.	Care Setting	Measure Title	Rationale for Creating New Measure	Rationale for Designating as a Quality Measure as Opposed to a Performance Measure (If Applicable)
QM-5	Inpatient	Inappropriate In-Hospital Use of NSAIDs	This measure seeks to implement Class III recommendations (Class III Harm, Level of Evidence: B) in both the 2013 ACCF/AHA STEMI (12) and 2014 AHA/ACC NSTE-ACS (11) guidelines, cautioning against the use of these drugs after AMI.	The writing committee felt it is best to keep this as a quality measure given the low impact associated with the use of NSAIDs during the brief hospitalization period (this is likely more relevant in the outpatient setting). The existence of an extensive and evolving list of NSAIDs may also create significant abstraction burden.
QM-6	Inpatient	Inappropriate Prescription of Prasugrel at Discharge in Patients With a History of Prior Stroke or TIA	This measure seeks to implement Class III recommendations (Class III HARM, Level of Evidence: B) in both the 2013 ACCF/AHA STEMI (12) and 2014 AHA/ACC NSTE-ACS (11) guidelines, cautioning against the use of prasugrel in patients with prior TIA/stroke, because of net clinical harm in these patients. The FDA also issued a black box warning on this.	The writing committee felt it is best to keep this as a quality measure only for the time being until more data become available pertinent to this measure and its impact in real-world patients.
QM-7	Inpatient	Inappropriate Prescription of High-Dose Aspirin With Ticagrelor at Discharge	This measure seeks to implement Class III recommendations (Class III HARM, Level of Evidence: B) in both the 2013 ACCF/AHA STEMI (12) and 2014 AHA/ACC NSTE-ACS (11) guidelines, cautioning against the use of high-dose aspirin >100 mg among patients receiving ticagrelor. The FDA also issued a black box warning on this.	The writing committee felt it is best to keep this as a quality measure only for the time being until more data become available pertinent to this measure and its impact in real-world patients.

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; EPHESUS, Eplerenone Post-Acute Myocardial Infarction Heart Failure Efficacy and Survival Study; FDA, U.S. Food and Drug Administration; GRACE, Global Registry of Acute Coronary Events; NSAIDs, nonsteroidal anti-inflammatory drugs; NSTE- ACS, non-ST-segment elevation-acute coronary syndrome; NSTEMI, non-ST-elevation myocardial infarction; PM, performance measure; PCI, percutaneous coronary intervention; PURSUIT, Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin; QM, quality measure; STEMI, ST-segment elevation myocardial infarction; TIA, transient ischemic attack; TIMI, Thrombolysis in Myocardial Infarction; VF, ventricular fibrillation; and VT, ventricular tachycardia.

4. AREAS FOR FURTHER RESEARCH

The writing committee recognizes that the ultimate measure of performance lies in the assessment of outcomes, such as mortality (in-hospital or 30-day), health status, and other outcomes (recurrent MI, urgent repeat revascularization). However, the complexity associated with adjustment for the large number of patient characteristics that both influence treatment decisions and impact mortality make these measures less attractive to use. Thirty-day risk-adjusted AMI mortality has been used by CMS for payment incentives and in public reporting. The impact of these and other measures on hospital quality should be the focus of future research. The committee also realizes that many measures are already "topped-out" and can be retired to minimize abstraction burden. Additional research should examine the impact of dropping such measures. Furthermore, continuous research to examine temporal trends and disparities (i.e., with respect to sex, age, ethnicity) in the achievement of performance and quality measures will help guide future revisions as well as the implementation of the current set. While the majority of current measures are binary (for example, yes or no for medication prescription), the next frontier in performance evaluation may be also to measure doses of prescribed pharmacotherapies and compare them to doses used in randomized trials showing benefit. Finally, the ACC ACTION Registry- Get With The Guidelines implemented a "Defect-Free Care" measure for AMI patients, which was endorsed by the National Quality Forum. Our writing committee did not adopt this measure in the current document to avoid the additional burden of data abstraction and reporting. This is especially important given that we have expanded the performance measure set to include a larger and more comprehensive set of 17 performance measures than previously adopted. Our writing committee acknowledges the importance of the "Defect-Free Care" measure and would like to evaluate its performance and impact in real world before considering it in the future. We also emphasize the importance of assessing the impact of compliance (or lack thereof) to some or all performance measures on short- and long-term clinical outcomes. Our writing committee also recognizes that all performance measures and quality measures are dynamic and can be revised or retired based on the emergence of scientific evidence and new guideline recommendations.

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KEY WORDS ACC/AHA Performance Measures, ST-elevation myocardial infarction, non-ST-elevation myocardial infarction, acute myocardial infarction, performance measures, quality measures, quality indicators

APPENDIX A. STEMI AND NSTEMI PERFORMANCE MEASURES

Performance Measures for Use in Patients With Inpatient STEMI and NSTEMI

Inpatient Measures

SHORT TITLE: PM-1 **Aspirin at Arrival**

PM-1: AMI: Aspirin Received at Arrival

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI who received aspirin within 24 h before or after hospital arrival.

Numerator	Patients with AMI who have received aspirin within 24 h before or after hospital arrival
Denominator	All patients with AMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice on day of or day after arrival • Patients who die during hospitalization on day of or day after arrival • Patients who are on comfort measures/hospice only documented on day of or day after arrival • Patients who are transferred to another hospital for inpatient care on day of or day after arrival • Patients received in transfer from the inpatient, outpatient, or ED of another facility • Patients discharged on day of or day after arrival
Denominator Exceptions	• Documentation of a medical reason for not prescribing aspirin at arrival (e.g., aspirin allergy or intolerance, oral anticoagulant therapy as prearrival medication, active bleeding) • Patient currently enrolled in a clinical trial precluding the use of aspirin in its protocol (e.g., trials of triple versus dual therapy in atrial fibrillation patients)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Coronary heart disease with atherosclerotic plaque disruption (e.g., rupture, erosion, ulceration) and superimposed platelet-rich thrombus formation are the main pathophysiological mechanisms causing MI (type 1 or spontaneous MI).

Acute occlusion of the coronary artery by the "plaque + superimposed thrombus complex" results in acute imbalance in myocardial oxygen demand and supply which, when prolonged and unabated, leads to myocardial cell necrosis and infarction.

Acute and complete occlusion of the coronary artery usually results in STEMI, which usually presents with persistent ST-elevation on the ECG or as an STEMI equivalent (hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST-elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB). On the other hand, severely obstructive but incompletely occlusive coronary lesions usually result in NSTEMI, characterized by the absence of persistent ST elevation on ECG, but rather the presence of ST depression, T-wave inversion or other nonspecific changes.

Aspirin inhibits the formation of thromboxane A2, a potent stimulator of platelet aggregation, and is the first-line therapy for AMI (30). A loading dose of 162 to 325 mg of non–enteric-coated aspirin formulation should be administered as soon as possible (to be crushed or chewed to achieve rapid absorption), followed preferably by an 81-mg daily dose to minimize bleeding risk. (30–34)

In the ISIS-2 (Second International Study of Infarct Survival) trial (30), aspirin therapy administered within the first 24 h after acute STEMI resulted in a 23% relative risk reduction in 5-week vascular mortality (or 2.4% absolute risk reduction) in patients with STEMI. Significant reductions in the incidence of non-fatal reinfarction and stroke were also observed with aspirin (30).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Aspirin 162 to 325 mg should be given before primary PCI (33,35,36). *(Class I, Level of Evidence: B)*
2. Aspirin (162- to 325-mg loading dose) and clopidogrel (300-mg loading dose for patients <75 years of age, 75-mg dose for patients >75 years of age) should be administered to patients with STEMI who receive fibrinolytic therapy (30,37,38). *(Class I, Level of Evidence: A)*

2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes (11)

1. Non–enteric-coated, chewable aspirin (162 mg to 325 mg) should be given to *all* patients with NSTE-ACS without contraindications as soon as possible after presentation, and a maintenance dose of aspirin (81 mg/d to 162 mg/d) should be continued indefinitely (7,39–42). *(Class I, Level of Evidence: A)*
2. Patients not on aspirin therapy should be given non–enteric-coated aspirin (325 mg) as soon as possible before PCI (35,36,43,44). *(Class I, Level of Evidence: B)*
3. In patients with NSTE-ACS who are unable to take aspirin because of hypersensitivity or major gastrointestinal intolerance, a loading dose of clopidogrel followed by a daily maintenance dose should be administered (45). *(Class I, Level of Evidence: B)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association, AMI, acute myocardial infarction; ED, emergency department; ISIS-2, Second International Study of Infarct Survival; LBBB, left bundle branch block; MI, myocardial infarction; NSTE-ACS, non–ST-elevation acute coronary syndrome; NSTEMI, non–ST-elevation myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-2 **Aspirin at Discharge**

PM-2: AMI: Aspirin Prescribed at Discharge

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI who are prescribed aspirin at hospital discharge.	
Numerator	Patients with AMI who are prescribed aspirin at hospital discharge
Denominator	All patients with AMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	• Documentation of a medical reason for not prescribing aspirin at discharge (e.g., aspirin allergy or intolerance, oral anticoagulant therapy at discharge, active bleeding) • Patient currently enrolled in a clinical trial precluding the use of aspirin in its protocol (e.g., trials of triple versus dual therapy in atrial fibrillation patients)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Coronary heart disease with atherosclerotic plaque disruption (e.g., rupture, erosion, ulceration) and superimposed platelet-rich thrombus formation are the main pathophysiological mechanisms causing MI (type 1 or spontaneous MI).

Acute occlusion of the coronary artery by the "plaque + superimposed thrombus complex" results in acute imbalance in myocardial oxygen demand and supply which, when prolonged and unabated, leads to myocardial cell necrosis and infarction.

Aspirin inhibits the formation of thromboxane A2, a potent stimulator of platelet aggregation, and is the first-line therapy for AMI (30). Following an initial loading dose of 162 to 325 mg of non-enteric-coated aspirin, an 81-mg daily dose is preferred to higher doses to minimize bleeding risk (31–34).

Aspirin should be continued indefinitely after a MI (46). The Antithrombotic Trialists' Collaboration's meta-analyses firmly confirmed the benefits of long-term aspirin therapy in patients at high-risk of occlusive vascular events, including patients with prior or acute MI (32). A subsequent meta-analysis inclusive of 16 secondary prevention trials (n=17,000 patients) compared long-term aspirin versus control and demonstrated that aspirin allocation was associated with a 1.5% significantly lower risk of serious vascular events per year, as well as significant reductions in coronary events and total stroke events (39).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. After PCI, aspirin should be continued indefinitely (13,32,47). *(Class I, Level of Evidence: A)*
2. Aspirin should be continued indefinitely (30,37,38) *(Class I, Level of Evidence: A)*, and clopidogrel (75 mg daily) should be continued for at least 14 days (37,38) *(Class I, Level of Evidence: A)* and up to 1 year *(Class I, Level of Evidence: C)* in patients with STEMI who receive fibrinolytic therapy.

2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes (11)

1. After PCI, aspirin should be continued indefinitely at a dose of 81 mg to 325 mg daily (13,39,47). *(Class I, Level of Evidence: B)*
2. Aspirin should be continued indefinitely. The maintenance dose should be 81 mg daily in patients treated with ticagrelor and 81 mg to 325 mg daily in all other patients (39,40,42). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; MI, myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-3 **Beta Blocker at Discharge**

PM-3: AMI: Beta Blocker Prescribed at Discharge

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI, who are prescribed a beta blocker at hospital discharge.	
Numerator	Patients with AMI who are prescribed a beta blocker* at hospital discharge *Appropriate beta blockers to be used in patients with AMI and LVSD are: bisoprolol, carvedilol, extended-release metoprolol.
Denominator	All patients with AMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	• Documentation of a medical reason for not prescribing a beta blocker at hospital discharge (e.g., beta-blocker allergy or intolerance, advanced heart block and no pacemaker, significant bradycardia or hypotension prior to discharge, active asthma or reactive airways disease, increased risk of heart failure/cardiogenic shock, recent history of cocaine or methamphetamine use with signs of acute intoxication)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Beta blockers are excellent anti-ischemic and antianginal medications that decrease myocardial oxygen demand by reducing the heart rate, blood pressure, and contractility. They also reduce cardiac automaticity and the risk of VF after MI. In addition, they improve coronary perfusion by prolonging diastole.

Oral beta blockers should therefore be administered to all patients with MI without contraindications for their use. Common contraindications for beta blockers use include heart failure or risk for cardiogenic shock, bradycardia, hypotension, heart block, or active bronchospasm, or acute cocaine ingestion. Patients with initial contraindications to beta blockers in the first 24 h after an AMI should be reevaluated to determine their subsequent eligibility.

A systematic review of randomized controlled trials inclusive of 54,234 patients with acute or prior MI demonstrated that beta blockers are effective in secondary prevention after MI and impart a 23% reduction in the odds of death in long-term trials (48). Notably, the evidence is established predominantly in the pre-reperfusion era among patients with STEMI. The effects of beta blockers appear also to be greatest among patients with MI complicated by heart failure, systolic cardiomyopathy, or ventricular arrhythmias (48).

Although not prospectively studied, the AHA/ACCF secondary prevention guidelines recommend a 3-year treatment course with beta blockers for patients with uncomplicated MI (13). Many of these patients, however, have either hypertension or heart failure/systolic cardiomyopathy, and are usually continued on an oral beta blocker indefinitely.

It is advisable to use beta blockers without intrinsic sympathomimetic activity, and in patients with MI complicated with systolic cardiomyopathy with or without heart failure, 1 of the 3 proven beta blockers should be used: carvedilol, sustained-release metoprolol succinate, or bisoprolol.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Beta blockers should be continued during and after hospitalization for all patients with STEMI and with no contraindications to their use (48,49). *(Class I, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)

1. In patients with concomitant NSTE-ACS, *stabilized* HF, and reduced systolic function, it is recommended to continue beta-blocker therapy with 1 of the 3 drugs proven to reduce mortality in patients with HF: sustained-release metoprolol succinate, carvedilol, or bisoprolol. *(Class I, Level of Evidence: C)*
2. Beta blockers should not be administered to patients with ACS with a recent history of cocaine or methamphetamine use who demonstrate signs of acute intoxication due to the risk of potentiating coronary spasm. *(Class III, Level of Evidence: C)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; ACS, acute coronary syndrome; AHA, American Heart Association; AMI, acute myocardial infarction; HF, heart failure; LVSD, left ventricular systolic dysfunction; MI, myocardial infarction; NSTE-ACS, non–ST-elevation acute coronary syndrome; STEMI, ST-elevation myocardial infarction; and VF, ventricular fibrillation.

APPENDIX A. CONTINUED

SHORT TITLE: PM-4 **High-Intensity Statin at Discharge**

PM-4: AMI: High-Intensity Statin Prescribed at Discharge

Measure Description: Percentage of patients age ≥18 y, hospitalized with AMI, who were prescribed a high-intensity statin at hospital discharge.

Numerator	Patients with AMI who are prescribed a high-intensity statin* at hospital discharge *High-intensity statin dose is defined in Table 5 of the 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults (14)
Denominator	All patients with AMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are discharged to hospice or who are on comfort care measures only • Patients who are transferred to another acute care hospital
Denominator Exceptions	• Documentation of a medical reason for not prescribing a high-intensity statin (e.g., allergy, intolerance or contraindications to high-intensity statin(s), risk of interaction between drugs, or other medical reasons) • Documentation of prescription of a moderate-intensity statin for patients >75 y of age • Documentation of a patient reason for not prescribing a statin (e.g., patient refusal) • Patient currently enrolled in a clinical trial related to lipid-lowering therapy
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Patients with an MI are at high risk for recurrent cardiovascular events. Statins inhibit the HMG-CoA reductase enzyme, the rate-limiting step in cholesterol biosynthesis, and are powerful drugs for lowering LDL-C, with reductions ≥50% observed with the high-intensity statin regimens.

Statins have been shown in multiple secondary prevention trials to reduce cardiovascular events, including coronary heart disease death, recurrent MI, cerebrovascular events, coronary revascularization, and all-cause mortality (50–52). They have also been shown to delay coronary atherosclerosis progression and possibly induce plaque regression, on serial angiographic and intravascular ultrasonographic studies.

Given that the clinical evidence does not support the notion of titrating statin therapy to achieve a proposed LDL-C target and that statins are beneficial in all patients at high cardiovascular risk irrespective of their LDL-C levels, the paradigm of treating patients to LDL-C targets is largely abandoned (14,18). On the other hand, high-intensity statin therapy appears to confer incremental clinical benefit compared with less intensive therapy (53). The Cholesterol Treatment Trialists conducted meta-analyses of individual participant data from randomized trials of more versus less intensive statin regimens (5 trials; 39,612 patients) (53). They demonstrated that more intensive regimens produced a highly significant 15% further reduction in major vascular events, driven by reductions in coronary death or non-fatal MI, coronary revascularization, and ischemic stroke (53).

The 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults recommends treatment of patients ≤75 y of age who have clinical atherosclerotic cardiovascular disease (including those with MI) with high-intensity statin (14). Moderate-intensity statins are recommended in their counterparts >75 y of age and in those who have contraindications/intolerance to high-intensity regimens. The guideline emphasizes that statin therapy should be individualized in persons >75 y of age according to the potential for ASCVD risk-reduction benefits, adverse effects, drug-drug interactions, and patient preferences (14). Improved compliance with therapy is an impetus for timing the initiation of statin therapy before discharge in patients hospitalized with acute MI.

Clinical Recommendation(s)

The 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults (14):

1. High-intensity statin therapy should be initiated or continued as first-line therapy in women and men ≤75 years of age who have *clinical ASCVD*, unless contraindicated. *(Class I, Level of Evidence: A)*
2. In individuals with *clinical ASCVD** in whom high-intensity statin therapy would otherwise be used, when high-intensity statin therapy is contraindicated† or when characteristics predisposing to statin-associated adverse effects are present, moderate-intensity statin therapy should be used as the second option if tolerated. *(Class I, Level of Evidence: A)*
3. In individuals with *clinical* ASCVD* >75 years of age, it is reasonable to evaluate the potential for ASCVD risk-reduction benefits and for adverse effects, drug-drug interactions and to consider patient preferences, when initiating a moderate- or high-intensity statin. It is reasonable to continue statin therapy in those who are tolerating it. *(Class IIA; Level of Evidence: B)*

*Clinical ASCVD includes acute coronary syndromes, history of MI, stable or unstable angina, coronary or other arterial revascularization, stroke, TIA, or peripheral arterial disease presumed to be of atherosclerotic origin.

†Contraindications, warnings, and precautions are defined for each statin according to the manufacturer's prescribing information (14).

ACC indicates American College of Cardiology; ASCVD, atherosclerotic cardiovascular disease; AHA, American Heart Association; AMI, acute myocardial infarction; HMG-CoA, 3-hydroxy-3-methylglutaryl-coenzyme A; LDL-C, low-density lipoprotein-cholesterol; MI, myocardial infarction; and TIA, transient ischemic attack.

APPENDIX A. CONTINUED

SHORT TITLE: PM-5 **Evaluation of LVEF**

PM-5: AMI: Evaluation of LVEF

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI, with documentation in the hospital record that LVEF is evaluated during hospitalization or is planned for after discharge.

Numerator	Patients with AMI with documentation in the hospital record that LVEF assessment, which can be either qualitative or quantitative, is done during the hospitalization or is planned for after discharge
Denominator	All patients with AMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	None
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

LVEF is important from a therapeutic and prognostic standpoint for patients with acute AMI for many reasons:
- Patients with reduced LVEF may benefit from specific medical therapies, such as inhibitors of the renin-angiotensin-aldosterone system.
- The presence of LVSD may help inform and guide the invasive strategy and revascularization modality (e.g., further risk stratification in patients with NSTEMI, use of percutaneous circulatory assist devices during percutaneous coronary interventions, choice of surgical revascularization).
- LVEF is one of the strongest predictors of long-term survival following AMI.
- LVEF measurement during hospitalization provides a baseline and dictates outpatient reassessment a few weeks later in patients with initially depressed post-MI LVEF. This will help guide the need for device therapy.

LV function can be assessed by a variety of modalities (e.g., contrast ventriculography, echocardiography, CT angiography). However, a transthoracic echocardiogram is most useful. It is noninvasive, relatively inexpensive, and helps provide a comprehensive assessment of the LV function (regional and global) and size, and rule out post-MI mechanical and other complications.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)
1. LVEF should be measured in all patients with STEMI. *(Class I, Level of Evidence: C)*

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)
1. A noninvasive imaging test is recommended to evaluate LV function in patients with definite ACS (54–58). *(Class I, Level of Evidence: C)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; ACS, acute coronary syndrome; AHA, American Heart Association; AMI, acute myocardial infarction; CT, computed tomography; LV, left ventricular; LVEF, left ventricular ejection fraction; LVSD, left ventricular systolic dysfunction; LVSF, left ventricular systolic function, MI, myocardial infarction; NSTEMI, non ST-elevation myocardial infarction; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-6 **ACEI or ARB for LVSD**

PM-6: AMI: ACEI or ARB Prescribed for LVSD at Discharge

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI and LVSD who are prescribed an ACEI or ARB at hospital discharge.	
Numerator	Patients with AMI with LVSD (defined as chart documentation of a LVEF <40% or a narrative description of LVSF consistent with moderate or severe systolic dysfunction) who are prescribed an ACEI or ARB* at hospital discharge *Fixed dose combination medications that contain ACEI or ARB therapy fulfill the numerator criteria if prescribed (e.g., the ARNI, sacubitril/valsartan, contains the ARB valsartan and would fulfill the measure criteria if prescribed).
Denominator	All AMI patients with LVSD
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient care
Denominator Exceptions	• Documentation of medical reasons for not prescribing an ACEI and not prescribing an ARB at discharge (e.g., allergy or intolerance to ACEI and ARB including: angioedema, hyperkalemia, hypotension, renal artery stenosis, worsening renal function)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

ACEIs improve survival in patients with AMI, particularly in those with reduced LVEF. They attenuate LV remodeling and infarct expansion and have a variety of additional beneficial effects (effects on ischemic preconditioning, fibrinolysis, recurrent MI, sudden death).

The SAVE (Survival and Ventricular Enlargement) trial demonstrated the benefits of captopril in reducing mortality, recurrent MI and HF hospitalization in AMI patients with an LVEF <40%, but without overt HF on entry (59). Other studies showed comparable findings (60,61).

ARBs are reasonable alternatives to ACEIs in patients with AMI and LVSD and can be used for patients who are intolerant to ACEIs. In the VALIANT (Valsartan in Acute Myocardial Infarction) trial, losartan was noninferior to captopril in patients with MI complicated by LVSD, HF, or both (62).

Common contraindications to the use of these agents include hypotension, shock, bilateral renal artery stenosis, worsening of renal function with ACEI/ARB exposure, and drug allergy.

The ARNI, valsartan/sacubitril, is the first approved ARNI for the treatment of patients with HF and reduced ejection fraction. Compared with the ACEI, enalapril, it reduced the composite endpoint of cardiovascular death or HF hospitalization in the pivotal PARADIGM-HF (Prospective Comparison of ARNI with ACEI to Determine Impact on Global Mortality and Morbidity in Heart Failure) trial (17). The ARNI is even recommended as a replacement therapy for symptomatic HF reduced ejection fraction with New York Heart Association class II or III who tolerate an ACEI or ARB (17). An ACEI should not be added to AMI patients already treated with an ARNI given the increased risk of angioedema and other complications (e.g., hypotension, renal insufficiency). Additionally, an ARB is already a component of the ARNI regimen and as such, adding ARB is not clinically advocated.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. An angiotensin-converting enzyme inhibitor (ACE) should be administered within the first 24 hours to all patients with STEMI with anterior location, HF, or ejection fraction (EF) less than or equal to 0.40, unless contraindicated (59,63-65). *(Class I, Level of Evidence: A)*
2. An angiotensin receptor blocker (ARB) should be given to patients with STEMI who have indications for but are intolerant of ACE inhibitors (62,66). *(Class I, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes (11)

1. ACE inhibitors should be started and continued indefinitely in all patients with LVEF <0.40 and in those with hypertension, diabetes mellitus, or stable chronic kidney disease (CKD), unless contraindicated (67,68). *(Class I, Level of Evidence: A)*
2. ARBs are recommended in patients with HF or MI with LVEF less than 0.40 who are ACE inhibitor intolerant (62,69). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; ACEI, angiotensin-converting enzyme inhibitor; AHA, American Heart Association; AMI, acute myocardial infarction; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor; HF, heart failure; LV, left ventricular; LVEF, left ventricular ejection fraction; LVSD, left ventricular systolic dysfunction; LVSF, left ventricular systolic function; MI; myocardial infarction; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-7 **Door-to-Needle Time**

PM-7: Acute STEMI: Time to Fibrinolytic Therapy

Measure Description: Percentage of patients, age ≥18 y, with acute STEMI, or its equivalent, who receive fibrinolytic therapy (as the primary reperfusion modality) with a time from hospital arrival to fibrinolysis ≤30 min.

Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, whose time from hospital arrival to fibrinolytic therapy (DTN time) is ≤30 min *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB.
Denominator	All patients with acute STEMI and its equivalent
Denominator Exclusions	• Patients age <18 y • Patients received in transfer from the inpatient, outpatient, or ED of another facility
Denominator Exceptions	• Documentation of a medical reason for delayed fibrinolytic therapy (e.g., cardiopulmonary arrest, initial suspicion of bleeding/stroke or other contraindications to use fibrinolytic therapy, respiratory failure requiring intubation, intra-aortic balloon pump insertion, late presentation >12 h after symptom onset) • Documentation of a patient reason (e.g., initial patient concern with bleeding hazards)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

In the ISIS-2 (Second International Study of Infarct Survival) trial (30), the fibrinolytic streptokinase significantly reduced 5-week vascular mortality by 2.8% compared to placebo, which remained significant at a median follow-up of 15 mo. In that trial, the combination of streptokinase and aspirin was also associated with significantly fewer reinfarction, stroke, and death events compared to placebo (30). The benefits of acute reperfusion with fibrinolytic therapy in patients with STEMI was further corroborated by the report from the Fibrinolytic Therapy Trialists, which included nine trials randomizing a total of 58,600 patients to fibrinolytic therapy versus control (70). The aforementioned collaborative report also demonstrated an inverse relation between the benefit from fibrinolytic therapy and delay from symptom onset, with highly significant absolute mortality reductions of 3% for patients presenting within 0 to 6 h and 2% for those presenting 7 to 12 h from symptom onset (70).

The ACCF/AHA guideline for the management of STEMI (12) recommends that patients who present with STEMI to a non-PCI-capable hospital should receive timely fibrinolytic therapy, if interhospital timely transfer time for primary PCI is not feasible (to achieve mechanical reperfusion within ≤120 min of FMC). Despite the lack of strong supporting evidence, the clinical consensus is also to consider fibrinolytic administration in symptomatic STEMI patients presenting >12 h after symptom onset with STEMI when PCI is not feasible and when there is a large myocardium at jeopardy or hemodynamic instability (12).

The survival benefit observed with fibrinolytic agents is greatest when they are administered within the first 2 h after the onset of STEMI symptoms (71–73). As the length of time between patient's presentation and the delivery of fibrinolytic therapy (DTN time) increases, the benefit from therapy decreases and progressive increase in infarct size and reduction in LVEF ensue. Thus, the benefit of fibrinolytic therapy is most effective when provided promptly, and the ACCF/AHA guideline set a benchmark time goal from hospital arrival to drug administration, or DTN time, to be ≤30 min (12).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. In the absence of contraindications, fibrinolytic therapy should be administered to patients with STEMI at non-PCI-capable hospitals when the anticipated FMC-to-device time at a PCI-capable hospital exceeds 120 minutes because of unavoidable delays (70,74,75). *(Class I, Level of Evidence: B)*
2. When fibrinolytic therapy is indicated or chosen as the primary reperfusion strategy, it should be administered within 30 minutes of hospital arrival* (71,73,76–78). *(Class I, Level of Evidence: B)*
3. In the absence of contraindications, fibrinolytic therapy should be given to patients with STEMI and onset of ischemic symptoms within the previous 12 hours when it is anticipated that primary PCI cannot be performed within 120 minutes of FMC (30,70,79–83). *(Class I, Level of Evidence: A)*
4. Fibrinolytic therapy should not be administered to patients with ST depression except when a true posterior (inferobasal) MI is suspected or when associated with ST elevation in lead aVR (70,84–87). *(Class III, Level of Evidence: B)*
5. In the absence of contraindications, fibrinolytic therapy should be administered to patients with STEMI and cardiogenic shock who are unsuitable candidates for either PCI or CABG (70,88,89). *(Class I, Level of Evidence: B)*

*The proposed time windows are system goals. For any individual patient, every effort should be made to provide reperfusion therapy as rapidly as possible.

ACCF indicates American College of Cardiology Foundation; AHA, American Heart Association; CABG, coronary artery bypass graft; DTN, door-to-needle; ED, emergency department; FMC, first medical contact; LBBB, left bundle branch block; LVEF, left ventricular ejection fraction; MI, myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-8 **First Medical Contact-Device Time**

PM-8: Acute STEMI: Time to Primary PCI

Measure Description: Percentage of patients, age ≥18 y, with acute STEMI, or its equivalent, who receive primary PCI during the hospital stay with a time from FMC-to-device time ≤90 min.

Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, whose FMC-to-device time during primary PCI is ≤90 min *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB.
Denominator	All patients with acute STEMI or its equivalent who receive primary PCI
Denominator Exclusions	• Patients age <18 y • Patients received in transfer from the inpatient, outpatient, or ED of another facility
Denominator Exceptions	• Documentation of a medical reason for delayed primary PCI (e.g., cardiopulmonary arrest, cardiogenic shock, vascular access or lesion-crossing issues, percutaneous circulatory assist device insertion, respiratory failure requiring intubation, and late presentation >12 h after symptom onset) • Patients have received fibrinolytic therapy as the initial reperfusion therapy (e.g., nonprimary PCI, rescue PCI) • Patient currently enrolled in a clinical trial related to reperfusion therapy
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Primary PCI has been shown to be superior to fibrinolytic therapy in recanalizing the infarct-related artery and imparts better clinical outcomes (90,91). In a meta-analysis of 23 trials randomizing a total of 7,739 patients with acute STEMI to primary angioplasty or fibrinolytic therapy, primary angioplasty was superior in reducing short-term mortality, nonfatal reinfarction, stroke, and the combined cardiovascular endpoint (92). Primary angioplasty also resulted in higher rates of infarct artery patency, TIMI flow, lower rates of recurrent ischemia, emergency repeat revascularization procedures, and intracranial hemorrhage (92). The benefits of primary angioplasty persisted during long-term follow-up and were independent of the type of fibrinolytic therapy used (92).

Clinical Recommendation(s)

2013 ACCF/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Primary PCI is the recommended method of reperfusion when it can be performed in a timely fashion by experienced operators (92-94). *(Class I, Level of Evidence: A)*
2. EMS transport directly to a PCI-capable hospital for primary PCI is the recommended triage strategy for patients with STEMI, with an ideal FMC-to-device time system goal of 90 minutes or less* (95-97). *(Class 1, Level of Evidence: B)*
3. Primary PCI should be performed in patients with STEMI and ischemic symptoms of less than 12 hours' duration (90-92). *(Class I, Level of Evidence: A)*

*The proposed time windows are system goals. For any individual patient, every effort should be made to provide reperfusion therapy as rapidly as possible.

ACCF indicates American College of Cardiology Foundation; AHA, American Heart Association; ED, emergency department; EMS, emergency medical services; FMC, first medical contact; LBBB, left bundle branch block; MI, myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST-elevation myocardial infarction; and TIMI, Thrombolysis in Myocardial Infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-9 **Reperfusion Therapy**

PM-9: Acute STEMI: Reperfusion Therapy

Measure Description: Percentage of patients, age ≥18 y, with acute STEMI, or its equivalent, who receive fibrinolytic therapy or primary PCI.	
Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, who receive fibrinolytic therapy or primary PCI *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB.
Denominator	All patients with acute STEMI and its equivalent
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice shortly/immediately after arrival • Patients who are on comfort care measures only or hospice documented on arrival
Denominator Exceptions	• Documentation of a medical reason for not receiving reperfusion therapy (e.g., active major bleeding, acute stroke, terminal illness/futile culprit artery too small, no identifiable culprit or spontaneous reperfusion of the infarct artery without an obstructive lesion, severe CAD necessitating urgent/emergency CABG, attempted but unsuccessful PCI, late presentation >12 h after symptom onset)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Overall, patients presenting with acute STEMI can undergo either pharmacologic (fibrinolytic therapy) or mechanical (primary angioplasty/PCI) reperfusion. Given its superiority to fibrinolytic therapy, the ACCF/AHA guideline for the management of STEMI (12) outlines that primary PCI is the preferred treatment and should be performed timely in patients with acute STEMI. However, if primary PCI cannot be performed in a timely manner (within FMC-to-device time] ≤90 min, including the inability to transfer the patient timely from a non-PCI-capable to a PCI-capable hospital to achieve FMC-to-device time ≤120 min), timely fibrinolytic therapy (within DTN ≤30 min) is an acceptable alternative therapeutic strategy. On the other hand, if fibrinolytic therapy is contraindicated or if the complications of cardiogenic shock or acute severe heart failure ensue, primary PCI should be undertaken irrespective of the time delay from FMC or STEMI symptom onset.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Reperfusion therapy should be administered to all eligible patients with STEMI with symptom onset within the prior 12 hours (70,92). *(Class I, Level of Evidence: A)*
2. Primary PCI is the recommended method of reperfusion when it can be performed in a timely fashion by experienced operators (92-94). *(Class I, Level of Evidence: A)*
3. EMS transport directly to a PCI-capable hospital for primary PCI is the recommended triage strategy for patients with STEMI, with an ideal FMC-to-device time system goal of 90 minutes or less* (95-97). *(Class I, Level of Evidence: B)*
4. Immediate transfer to a PCI-capable hospital for primary PCI is the recommended triage strategy for patients with STEMI who initially arrive at or are transported to a non-PCI-capable hospital, with an FMC-to-device time system goal of 120 minutes or less* (93,94,98,99). *(Class I, Level of Evidence: B)*
5. In the absence of contraindications, fibrinolytic therapy should be administered to patients with STEMI at non-PCI-capable hospitals when the anticipated FMC-to-device time at a PCI-capable hospital exceeds 120 minutes because of unavoidable delays (70,74,75). *(Class I, Level of Evidence: B)*
6. Primary PCI should be performed in patients with STEMI and ischemic symptoms of less than 12 hours' duration (90-92). *(Class I, Level of Evidence: A)*
7. Primary PCI should be performed in patients with STEMI and ischemic symptoms of less than 12 hours' duration who have contraindications to fibrinolytic therapy, irrespective of the time delay from FMC (100,101). *(Class I, Level of Evidence: B)*
8. Primary PCI should be performed in patients with STEMI and cardiogenic shock or acute severe HF, irrespective of time delay from MI onset (102-105). *(Class I, Level of Evidence: B)*
9. In the absence of contraindications, fibrinolytic therapy should be given to patients with STEMI and onset of ischemic symptoms within the previous 12 hours when it is anticipated that primary PCI cannot be performed within 120 minutes of FMC (30,70,79-83). *(Class I, Level of Evidence: A)*

*The proposed time windows are system goals. For any individual patient, every effort should be made to provide reperfusion therapy as rapidly as possible.

ACCF indicates American College of Cardiology Foundation; AHA American Heart Association; CABG, coronary artery bypass graft; CAD, coronary artery disease; DTN, door-to-needle; EMS, emergency medical services; FMC, first medical contact; HF, heart failure; LBBB, left bundle branch block; MI, myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-10 **Door-in-Door-Out Time**

PM-10: Acute STEMI: Time From ED Arrival at STEMI Referral Facility to ED Discharge From STEMI Referral Facility in Patients Transferred for Primary PCI

Measure Description: Percentage of patients, age ≥18 y, with acute STEMI, or its equivalent, whose median time from the ED arrival at STEMI referral facility to ED discharge from STEMI referral facility is ≤30 min.

Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, who are seen initially at a non-PCI-capable hospital and who are transferred to a PCI-capable hospital within DIDO time ≤30 min *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB.
Denominator	All patients with acute STEMI, or its equivalent, who are seen initially at a non-PCI-capable hospital and who are transferred to a PCI-capable hospital
Denominator Exclusions	• Patients age <18 y • Patients who are transferred for a PCI that is described as nonprimary treatment for AMI by a healthcare provider (e.g., patients who receive fibrinolytic therapy as the primary reperfusion therapy)
Denominator Exceptions	• Documentation of a medical reason for the delay (e.g., cardiopulmonary arrest, balloon pump insertion, respiratory failure requiring intubation) • Documentation of a patient reason for the delay (e.g., initial concern, patient choice) • Patient currently enrolled in a clinical trial related to AMI and reperfusion therapy
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility level Only STEMI referral facility (non-PCI-capable facility) is accountable for this measure.
Care Setting	Inpatient

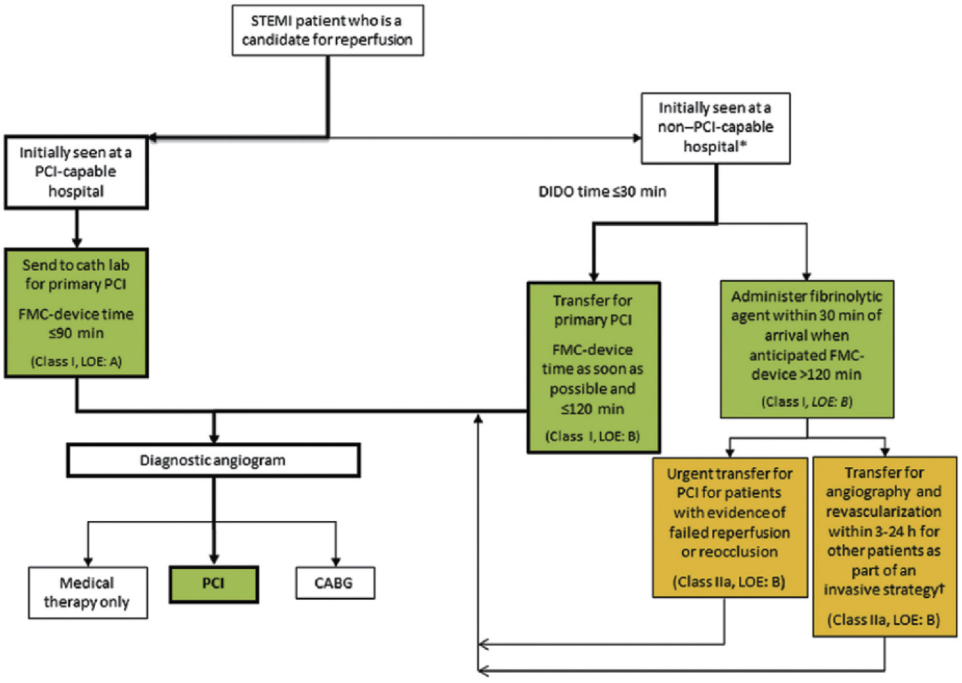
Rationale

Clinical trials have demonstrated improved outcome for patients with STEMI who are transferred to a primary PCI hospital in a timely manner. Current guidelines recommend that transfer occur immediately with an overall goal of FMC-to-device time of ≤120 min; this can be best achieved by shortening the time in the first ED and transferring the STEMI patient within DIDO of ≤30 min (20,98,99,106)

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Immediate transfer to a PCI-capable hospital for primary PCI is the recommended triage strategy for patients with STEMI who initially arrive at or are transported to a non-PCI-capable hospital, with an FMC-to-device time system goal of 120 minutes or less* (93,94,98,99). *(Class I, Level of Evidence: B)*
2. Immediate transfer to a PCI-capable hospital for coronary angiography is recommended for suitable patients with STEMI who develop cardiogenic shock or acute severe HF, irrespective of the time delay from MI onset (107). *(Class I, Level of Evidence: B)*



*The proposed time windows are system goals. For any individual patient, every effort should be made to provide reperfusion therapy as rapidly as possible.

ACCF indicates American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; CABG, coronary artery bypass graft; DIDO, door-in-door-out; ED, emergency department; FMC, first medical contact; LBBB; left bundle branch block; MI, myocardial infarction; LOE; level of evidence; PCI, percutaneous coronary intervention; and STEMI, ST- elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-11 **Time to Primary PCI Among Transferred Patients**

PM-11: Acute STEMI: Time From FMC (at or Before ED Arrival at STEMI Referral Facility) to Primary PCI at STEMI Receiving Facility Among Transferred Patients

Measure Description: Percentage of patients, age ≥18 y, with acute STEMI, or its equivalent, whose median time from FMC (at or before ED arrival to the STEMI referral facility [e.g., non-PCI-capable facility]) to primary PCI at the STEMI receiving facility (PCI-capable facility) is ≤120 min.	
Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, who are transferred to a PCI-capable hospital and have received primary PCI ≤120 min from FMC *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB.
Denominator	All patients with acute STEMI, or its equivalent, who are seen initially at non-PCI-capable hospital and who are transferred to a PCI-capable hospital and have received primary PCI
Denominator Exclusions	• Patients age <18 y • Patients who are transferred for a PCI that is described as nonprimary by a healthcare provider (e.g., patients who receive fibrinolytic therapy at the referral facility as the primary reperfusion therapy)
Denominator Exceptions	• Documentation of a medical reason for the delay (e.g., cardiopulmonary arrest, balloon pump insertion, respiratory failure requiring intubation) • Documentation of a patient reason for the delay (e.g., initial patient concern) • Patient currently enrolled in a clinical trial related to STEMI and reperfusion therapy
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility* level *Both STEMI referral facility (non-PCI-capable) and STEMI receiving facility (PCI-capable) are accountable for this measure.
Care Setting	Inpatient

Rationale

Patient outcome is improved if patients, initially presenting to a non-PCI-capable hospital, can be quickly transferred to a PCI-capable hospital for primary PCI. (93,94,98,99)

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Immediate transfer to a PCI-capable hospital for primary PCI is the recommended triage strategy for patients with STEMI who initially arrive at or are transported to a non-PCI-capable hospital, with an FMC-to-device time system goal of 120 minutes or less* (93,94,98,99). *(Class I, Level of Evidence: B)*

*The proposed time windows are system goals. For any individual patient, every effort should be made to provide reperfusion therapy as rapidly as possible.

ACCF indicates American College of Cardiology Foundation; AHA, American Heart Association; ED, emergency department; FMC, first medical contact; LBBB; left bundle branch block; MI, myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-12 **Cardiac Rehabilitation Referral**

PM-12: AMI: CR Patient Referral From an Inpatient Setting

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI who are referred to an outpatient CR/secondary prevention program during their AMI hospital stay.

Numerator	AMI patients who are referred to outpatient CR/secondary prevention program prior to hospital discharge
Denominator	Number of hospitalized patients in the reporting period hospitalized with qualifying event/diagnosis
Denominator Exclusions	None
Denominator Exceptions	• Provider-oriented criteria (patient deemed to have a high-risk condition or a contraindication to exercise, for example) • Healthcare system barriers (e.g., financial barriers or lack of CR programs near a patient's home)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

A key component to outpatient CR program utilization is the appropriate and timely referral of patients. Generally, the most important time for this referral to take place is while the patient is hospitalized for a qualifying event/diagnosis (e.g., MI, chronic stable angina, CABG, PCI, cardiac valve surgery, or cardiac transplantation).

This performance measure has been developed to help healthcare systems implement effective steps in their systems of care that will optimize the appropriate referral of a patient to an outpatient CR program.

This measure is designed to serve as a stand-alone measure or, preferably, to be included within other performance measurement sets that involve disease states or other conditions for which CR services have been found to be appropriate and beneficial (e.g., following MI, CABG surgery). This performance measure is provided in a format that is meant to allow easy and flexible inclusion into such performance measurement sets.

Effective referral of appropriate inpatients to an outpatient CR program is the responsibility of the healthcare team within a healthcare system that is primarily responsible for providing cardiovascular care to the patient during the hospitalization.

Clinical Recommendation(s)

ACC/AHA 2004 Guideline Update for Coronary Artery Bypass Graft Surgery (108)

1. Cardiac rehabilitation should be offered to all eligible patients after CABG. *(Class I, Level of Evidence: B).*

ACC/AHA 2007 Update of the Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction (109)

1. Advising medically supervised programs (cardiac rehabilitation) for high-risk patients (e.g., recent acute coronary syndrome or revascularization, HF) is recommended *(Class I, Level of Evidence: B).*

ACC/AHA 2007 Guidelines for the Management of Patients With Unstable Angina and Non–ST-Segment Elevation Myocardial Infarction (110)

1. Cardiac rehabilitation/secondary prevention programs are recommended for patients with UA/NSTEMI, particularly those with multiple modifiable risk factors and/or those moderate- to high-risk patients in whom supervised exercise training is particularly warranted. *(Class I, Level of Evidence: B)*
2. Cardiac rehabilitation/secondary prevention programs, when available, are recommended for patients with UA/NSTEMI, particularly those with multiple modifiable risk factors and those moderate- to high-risk patients in whom supervised or monitored exercise training is warranted. *(Class I, Level of Evidence: B)*

ACC/AHA 2007 Chronic Angina Focused Update of the Guidelines for the Management of Patients With Chronic Stable Angina (111)

1. Medically supervised programs (cardiac rehabilitation) are recommended for at-risk patients (e.g., recent acute coronary syndrome or revascularization, heart failure). *(Class I, Level of Evidence: B)*

ACC/AHA Guidelines for the Evaluation and Management of Chronic Heart Failure in the Adult (112)

1. Exercise training is beneficial as an adjunctive approach to improve clinical status in ambulatory patients with current or prior symptoms of HF and reduced LVEF. *(Class I, Level of Evidence: B)*

AHA Evidence-Based Guidelines for Cardiovascular Disease Prevention in Women: 2007 Update (113)

1. A comprehensive risk-reduction regimen, such as cardiovascular or stroke rehabilitation or a physician-guided home- or community-based exercise training program, should be recommended to women with a recent acute coronary syndrome or coronary intervention, new-onset or chronic angina, recent cerebrovascular event, peripheral arterial disease *(Class I, Level of Evidence: A)*, or current/prior symptoms of heart failure and an LVEF ≤40%. *(Class I, Level of Evidence: B)*

ACC/AHA/SCAI 2007 Focused Update of the Guidelines for Percutaneous Coronary Intervention (114)

1. Advising medically supervised programs (cardiac rehabilitation) for high-risk patients (e.g., recent acute coronary syndrome or revascularization, heart failure) is recommended. *(Class I, Level of Evidence: B)*

ACC indicates American College of Cardiology; AHA, American Heart Association; AMI, acute myocardial infarction; CABG, coronary artery bypass graft; CR, cardiac rehabilitation; LVEF, left ventricular ejection fraction; MI, myocardial infarction; PCI, percutaneous coronary intervention; SCAI, the Society for Cardiac Angiography and Interventions; and UA/NSTEMI, unstable angina/non-ST-segment elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-13 **$P2Y_{12}$ Inhibitor at Discharge**

PM-13: AMI: $P2Y_{12}$ Receptor Inhibitor Prescribed at Discharge

Measure description: Percentage of patients, age ≥18 y, hospitalized with AMI who are prescribed an appropriate $P2Y_{12}$ receptor inhibitor at hospital discharge.	
Numerator	Patients with AMI who are prescribed an appropriate $P2Y_{12}$ receptor inhibitor at hospital discharge Appropriate $P2Y_{12}$ receptor inhibitors include: • Clopidogrel, prasugrel, or ticagrelor in PCI-treated patients • Clopidogrel or ticagrelor in medically treated patients • Clopidogrel or prasugrel in STEMI patients receiving fibrinolytic therapy
Denominator	All patients with AMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	• Documentation of a medical reason for not prescribing a $P2Y_{12}$ receptor inhibitor at hospital discharge (e.g., allergy or intolerance to each of the three $P2Y_{12}$ receptor inhibitors, oral anticoagulant therapy at discharge, active bleeding, patients with planned CABG procedure done after discharge) • Documentation of a patient reason for not prescribing a $P2Y_{12}$ receptor inhibitor at hospital discharge • Patient currently enrolled in a clinical trial related to AMI and involving new antiplatelet therapies
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Coronary heart disease with atherosclerotic plaque disruption (e.g., rupture, erosion, ulceration) and superimposed platelet-rich thrombus formation are the main pathophysiological mechanisms causing MI (type 1 or spontaneous MI).

Dual antiplatelet therapy has become the mainstay treatment strategy after AMI. Aspirin inhibits the formation of thromboxane A2, a potent stimulator of platelet aggregation, and is the first-line therapy for AMI. $P2Y_{12}$ receptor inhibitors have incremental benefits to aspirin, and patients with acute MI who are treated with $P2Y_{12}$ receptor inhibitor at discharge have improved cardiovascular outcomes (predominantly, lower recurrent MI events) (11,12).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. $P2Y_{12}$ inhibitor therapy should be given for 1 year to patients with STEMI who receive a stent (bare-metal or drug-eluting) during primary PCI using the following maintenance doses:
   a. Clopidogrel 75 mg daily (115,116) *(Class I, Level of Evidence: B)*; or
   b. Prasugrel 10 mg daily (115) *(Class I, Level of Evidence: B)*; or
   c. Ticagrelor 90 mg twice a day* (117) *(Class I, Level of Evidence: B)*

   *The recommended maintenance dose of aspirin to be used with ticagrelor is 81 mg daily.
2. Prasugrel should not be administered to patients with a history of prior stroke or transient ischemic attack (116). *(Class III, Level of Evidence: B)*
3. Aspirin should be continued indefinitely (30,37,38) *(Class I, Level of Evidence: A)* and clopidogrel (75 mg daily) should be continued for at least 14 days (30,37,38) *(Class I, Level of Evidence: A)* and up to 1 year *(Class I, Level of Evidence: C)* in patients with STEMI who receive fibrinolytic therapy.
4. Clopidogrel should be provided as follows:
   a. A 300-mg loading dose should be given before or at the time of PCI to patients who did not receive a previous loading dose and who are undergoing PCI within 24 hours of receiving fibrinolytic therapy *(Class I, Level of Evidence: C)*;
   b. A 600-mg loading dose should be given before or at the time of PCI to patients who did not receive a previous loading dose and who are undergoing PCI more than 24 hours after receiving fibrinolytic therapy *(Class I, Level of Evidence: C)*; and
   c. A dose of 75 mg daily should be given after PCI (37,38,116,117). *(Class I, Level of Evidence: C)*

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)

1. A $P2Y_{12}$ inhibitor (either clopidogrel or ticagrelor) in addition to aspirin should be administered for up to 12 months to all patients with NSTE-ACS without contraindications who are treated with either an early invasive or ischemia-guided strategy. Options include:
   • Clopidogrel: 300-mg or 600-mg loading dose, then 75 mg daily (33,42). *(Class I, Level of Evidence: B)*
   • Ticagrelor: 180-mg loading dose, then 90 mg twice daily (7,118). *(Class I, Level of Evidence: B)*
2. In patients receiving a stent (bare-metal stent or drug-eluting stent [DES]) during PCI for NSTE-ACS, $P2Y_{12}$ inhibitor therapy should be given for at least 12 months (119). Options include:
   • Clopidogrel: 75 mg daily (120,121) *(Class I, Level of Evidence: B)* or
   • Prasugrel: 10 mg daily (116) *(Class I, Level of Evidence: B)* or
   • Ticagrelor: 90 mg twice daily (7) *(Class I, Level of Evidence: B)*
3. In addition to aspirin, a $P2Y_{12}$ inhibitor (either clopidogrel or ticagrelor) should be continued for up to 12 months in all patients with NSTE-ACS without contraindications who are treated with an ischemia-guided strategy. Options include:
   • Clopidogrel: 75 mg daily (42,120) *(Class I, Level of Evidence: B)* or
   • Ticagrelor: 90 mg twice daily (7,118) *(Class I, Level of Evidence: B)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; CABG, coronary artery bypass graft; MI, myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST-elevation myocardial infarction; and NSTE-ACS, non-ST-elevation acute coronary syndrome.

APPENDIX A. CONTINUED

SHORT TITLE: PM-14 **Immediate Angiography After Cardiac Arrest**

PM-14: STEMI: Immediate Angiography for Resuscitated Out-of-Hospital Cardiac Arrest in STEMI Patients

Measure Description: Percentage of patients, age ≥18 y, who are resuscitated from out-of-hospital cardiac arrest and whose initial ECG shows STEMI, who receive immediate angiography.	
Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, who are resuscitated from out-of-hospital cardiac arrest and receive immediate angiography *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB Note: Immediate angiography is defined as invasive angiography within 120 min after resuscitation from out-of-hospital cardiac arrest.
Denominator	All patients with STEMI who are resuscitated from out-of-hospital cardiac arrest
Denominator Exclusions	• Patients age <18 y • Patients who die during hospitalization shortly following their out-of-hospital cardiac arrest (<120 min) • Patients who are transferred to hospice or are placed on comfort care measures shortly after their out-of-hospital cardiac arrest (<120 min) • Patients received in transfer from another facility
Denominator Exceptions	• Documentation of a medical reason for not receiving immediate angiography after resuscitated out-of-hospital cardiac arrest (e.g., contraindications to invasive angiography, terminal illness/futile medical condition) • Documentation of a patient reason for not receiving immediate angiography after resuscitated out-of-hospital cardiac arrest (e.g., patient's will or family wishes) • Documentation of a system reason for not receiving immediate angiography after resuscitated out-of-hospital cardiac arrest (e.g., presentation to a non-PCI capable hospital and too unstable to transfer)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Many patients with cardiac arrest and ST elevation on the ECG often have high-risk coronary anatomy, which may benefit from timely coronary angiography to identify severe coronary artery disease and possibly guide/dictate revascularization (usually with PCI) (12,122–137).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Immediate angiography and PCI when indicated should be performed in resuscitated out-of-hospital cardiac arrest patients whose initial ECG shows STEMI (122–137). *(Class I, Level of Evidence: B)*

ACCF indicates American College of Cardiology Foundation; AHA, American Heart Association; LBBB; left bundle branch block; MI, myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-15 **Stress Test in Conservatively Treated Patients**

PM-15: AMI: Non-Invasive Stress Testing Before Discharge in Conservatively Treated Patients

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI, who are initially conservatively managed (have not received invasive coronary angiography) and with documentation in the hospital record that a noninvasive stress testing was performed before discharge.

Numerator	Patients with AMI who are initially conservatively managed and who received a noninvasive stress test prior to discharge
Denominator	All patients with AMI who are initially treated with a conservative management strategy (medical therapies alone without invasive coronary angiography as a planned initial therapy)
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	• Documentation of a medical reason for not receiving a noninvasive stress test before discharge (e.g., contraindications to noninvasive stress testing [for instance, patients with intolerance to dobutamine or vasodilator, or patients with ongoing ischemia], terminal illness/futile, not candidate for invasive strategy or revascularization) • Documentation of a patient reason for not receiving a noninvasive stress test before discharge (e.g., patient choice not to undergo ischemic work-up or to postpone to the outpatient setting) • Documentation of cross-over from an initial conservative management to undergo invasive coronary angiography without the need for a noninvasive stress test (as in the case of recurrent spontaneous ischemia)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Some patients with AMI who are managed conservatively (e.g., managed with medical therapies, with coronary angiography not planned as an initial treatment strategy) have high-risk coronary artery disease. These patients may not experience spontaneous ischemia during their hospitalization and need to be further risk stratified before discharge with a stress test (preferably, a submaximal stress test). This will help identify the high-risk patient who needs invasive angiography and possible revascularization, predominantly to mitigate recurrent ischemia/MI (11,12,138–141). A noninvasive stress test can be exercise-based or pharmacological, and the means for detecting ischemia may be via ECG alone or with an added imaging modality.

Notably, many patients with AMI who are managed conservatively initially may cross over to undergo invasive coronary angiography, without undergoing a noninvasive stress test. Common clinical indications for resorting to coronary angiography during the same AMI hospitalization after an initial conservative management trial include, but are not limited to: spontaneous non-inducible ischemia among patients already treated with aggressive medical therapies; LVSD, where a high level of suspicion for left main or multi-vessel coronary artery disease exists. These aforementioned scenarios are to be differentiated (and excluded from the denominator) from those during which coronary angiography is performed in initially conservatively managed AMI patients because of a high-risk noninvasive stress test.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Noninvasive testing for ischemia should be performed before discharge to assess the presence and extent of inducible ischemia in patients with STEMI who have not had coronary angiography and do not have high-risk clinical features for which coronary angiography would be warranted (138,140,141). *(Class I, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)

1. Noninvasive stress testing is recommended in low- and intermediate-risk patients who have been free of ischemia at rest or with low-level activity for a minimum of 12 to 24 hours (54–57,139). *(Class I, Level of Evidence: B)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; LVSD, left ventricular systolic dysfunction; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-16 **Early Troponin Measurement After NSTEMI**

PM-16: Acute NSTEMI: Early Cardiac Troponin Measurement (Within 6 Hours of Arrival)

Measure Description: Percentage of patients, age ≥18 y, hospitalized with acute NSTEMI, who have cardiac troponin biomarkers measured within 6 h of hospital arrival.

Numerator	Patients with acute NSTEMI who have at least 1 set of cardiac troponin biomarkers, measured by central laboratory troponin assays and excluding point-of-care assays in the ED or elsewhere, within 6 h of hospital arrival
Denominator	All patients with acute NSTEMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice shortly after arrival (<6 h) • Patients who die during hospitalization shortly after arrival (<6 h) • Patients who are on comfort measures/hospice only documented shortly after arrival (<6 h) • Patients who are transferred to another hospital for inpatient care shortly after arrival (<6 h) • Patients received in transfer from the inpatient, outpatient, or ED of another facility • Patients discharged shortly after arrival (<6 h)
Denominator Exceptions	None
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Troponins are components of the myocardial cell contractile apparatus. When measured in the circulation, they are very sensitive and specific to diagnose myocardial necrosis. In the correct clinical setting (e.g., angina/ischemic symptoms, ischemic changes on the ECG, imaging evidence of ischemia), a pattern of rise and fall in troponin I or T levels is essential to the diagnosis of AMI. Although STEMI is usually readily diagnosed by the presence of acute current of injury on the presenting ECG, patients with NSTE-ACS can present with nonspecific changes on the ECG (e.g., subtle or nonspecific ST or T wave changes). Thus, measuring troponin levels expeditiously help in the early diagnosis and risk stratification of these patients, which can lead to earlier triage and institution of appropriate medical and interventional treatments (11).

Clinical Recommendation(s)

2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes (11)

1. Serial cardiac troponin I or T levels (when a contemporary assay is used) should be obtained at presentation and 3 to 6 hours after symptom onset in all patients who present with symptoms consistent with ACS to identify a rising and/or falling pattern of values (8,142-147). *(Class I, Level of Evidence: A)*
2. Additional troponin levels should be obtained beyond 6 hours after symptom onset in patients with normal troponin levels on serial examination when changes on ECG and/or clinical presentation confer an intermediate or high index of suspicion for ACS (8,148-150). *(Class I, Level of Evidence: A)*
3. If the time of symptom onset is ambiguous, the time of presentation should be considered the time of onset for assessing troponin values (143,145,150). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; ACS; acute coronary syndrome; AHA, American Heart Association; AMI, acute myocardial infarction; ED, emergency department; NSTE-ACS, non-ST-elevation acute coronary syndrome; NSTEMI, non-ST-elevation myocardial infarction; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: PM-17 **AMI Registry Participation**

PM-17: AMI: Participation in ≥1 Regional or National Registries That Include Patients With Acute Myocardial Infarction

Measure Description: Participation in a national or regional AMI registry that provides regular performance reports based on benchmarked data.

Numerator	Does the facility participate in a national or regional AMI registry* that provides regular performance reports based on benchmarked data? (yes/no) *Examples of such registries include the NCDR ACTION Registry-Get With The Guidelines, Mission Lifeline, and the D2B Alliance.
Denominator	Not applicable
Denominator Exclusions	None
Denominator Exceptions	None
Measurement Period	Not applicable
Sources of Data	Facility attestation
Attribution	Measure reportable at the facility level only
Care Setting	Inpatient

Rationale

Participation in registries allows tracking of quality of care and benchmarking against best practices (12).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. All communities should create and maintain a regional system of STEMI care that includes assessment and continuous quality improvement of emergency medical services and hospital-based activities. Performance can be facilitated by participating in programs such as Mission: Lifeline and the D2B Alliance (95,151–153). *(Class I, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients With Non St-Elevation Acute Coronary Syndromes (11)

1. Participation in a standardized quality-of-care data registry designed to track and measure outcomes, complications, and performance measures can be beneficial in improving the quality of NSTE-ACS care (2,152,154–160). *(Class IIa, Level of Evidence: B)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI acute myocardial infarction; D2B, Door-to-Balloon; NCDR, National Cardiovascular Data Registry; NSTE-ACS, non-ST-elevation acute coronary syndrome; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

Quality Improvement Measures for Inpatient STEMI and NSTEMI Patients

Inpatient Measures

SHORT TITLE: QM-1 **Risk Score Stratification for NSTEMI**

QM-1: NSTEMI: Risk Stratification of NSTEMI Patients With a Risk Score

Measure Description: Percentage of patients, age ≥18 y, hospitalized with NSTEMI, who have a risk stratification score documented during hospitalization.	
Numerator	Patients with NSTEMI who have a risk score documented during hospitalization Examples of commonly utilized risk stratification scores include: • TIMI risk score • GRACE risk score
Denominator	All patients with NSTEMI
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	None
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Objective risk stratification with validated risk scores help triage and dictate the initial treatment strategy in patients with NSTEMI. For example, those at high-risk will likely benefit from an early invasive strategy (within 12 to 24 h), while intermediate-risk patients may receive delayed invasive strategy (within 24 to 72 h). In addition, risk scores, such as the TIMI risk index and GRACE risk model are useful in predicting recurrent cardiovascular outcomes (short- and intermediate-term) following NSTEMI (11,161,162).

Clinical Recommendation(s)

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)
1. Risk scores should be used to assess prognosis in patients with NSTE-ACS (161,163-170). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; AHA, American Heart Association; GRACE, Global Registry of Acute Coronary Events; NSTE-ACS, non-ST-elevation acute coronary syndrome; NSTEMI, non-ST-elevation myocardial infarction; and TIMI, Thrombolysis in Myocardial Infarction.

APPENDIX A. CONTINUED

SHORT TITLE: QM-2 **Early Invasive Strategy for High-Risk NSTEMI**

QM-2: Acute NSTEMI: Early Invasive Strategy (Within <24 Hours) for High-Risk NSTEMI Patients

Measure Description: Percentage of patients, age ≥18 y, hospitalized with acute NSTEMI, who are at high risk and who receive an early invasive strategy within 24 h of admission.

Numerator	Patients with acute NSTEMI who are high risk* and receive early invasive strategy (diagnostic angiography with intent to perform revascularization if appropriate based on coronary anatomy) within 24 h of admission *A high-risk NSTEMI patient is best defined by an objective risk score (e.g., GRACE risk score >140 or TIMI risk score >4).
Denominator	All patients with acute NSTEMI who are at high risk
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice on day of or day after arrival • Patients who die early during hospitalization on day of or day after arrival • Patients who are on comfort care measures only or hospice on day of or day after arrival • Patients who are transferred to another hospital for inpatient care on day of or day after arrival • Patients discharged on day of or day after arrival • Patients received in transfer from the inpatient, outpatient, or ED of another facility • Patients who are unstable (refractory angina/ischemia, new or worsening heart failure, mitral regurgitation, hemodynamic instability, sustained ventricular fibrillation or pulseless ventricular tachycardia), need urgent/immediate invasive strategy within 2 h, and are excluded from denominator and numerator
Denominator Exceptions	• Documentation of a medical reason for not receiving an early invasive strategy after high-risk NSTEMI (e.g., extensive clinical comorbidities, contraindications to invasive angiography, terminal illness/futile) • Documentation of a patient reason for not receiving an early invasive strategy after high-risk NSTEMI • Documentation of a system reason for not receiving an early invasive strategy after high-risk NSTEMI (e.g., financial barriers, hospitalization at a facility without a cardiac catheterization laboratory)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Several studies (171–176) and meta-analyses (177,178) have concluded that a strategy of routine invasive therapy is generally superior to an ischemia-guided strategy or a selectively invasive approach. Compared with a delayed invasive strategy (within 24 to 72 h), an early invasive strategy (within the initial 24 h) in patients with NSTEMI reduces recurrent/refractory ischemia, length of stay, and costs. However, there is no definitive evidence that it has an incremental benefit in reducing MI or death.

Patients who are unstable (refractory angina/ischemia, new or worsening heart failure, mitral regurgitation, hemodynamic instability, sustained ventricular fibrillation or ventricular tachycardia) need an urgent/immediate invasive strategy within 2 h, and are excluded from the denominator and numerator.

Clinical Recommendation(s)

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)

1. An early invasive strategy (diagnostic angiography with intent to perform revascularization if appropriate based on coronary anatomy) is indicated in initially stabilized patients with NSTE- ACS (without serious comorbidities or contraindications to such procedures) who have an elevated risk for clinical events (Table 8) (161,163,179–183). *(Class I, Level of Evidence: B)*
2. An early invasive strategy (i.e., diagnostic angiography with intent to perform revascularization) is not recommended in patients with:
   a. (e.g., hepatic, renal, pulmonary failure, cancer), in whom the risks of revascularization and comorbid conditions are likely to outweigh the benefits of revascularization. *(Class III, Level of Evidence: C)*
   b. Acute chest pain and a low likelihood of ACS *(Class III, Level of Evidence: B)* who are troponin-negative, especially women (178). *(Class: III, Level of Evidence: C)*
3. Older patients with NSTE-ACS should be treated with GDMT, an early invasive strategy, and revascularization as appropriate (184–188). *(Class I, Level of Evidence: A)*
4. Patients with prior CABG and NSTE-ACS should receive antiplatelet and anticoagulant therapy according to GDMT and should be strongly considered for early invasive strategy because of their increased risk (143,145,177,178,189,190). *(Class I, Level of Evidence: B)*
5. Women with NSTE-ACS and high-risk features (e.g., troponin positive) should undergo an early invasive strategy (172,173,178,191). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; ACS, acute coronary syndromes; AHA, American Heart Association; CABG, coronary artery bypass graft; ED, emergency department; GDMT, guideline-directed medical therapy; GRACE, Global Registry of Acute Coronary Events; MI, myocardial infarction; NSTE-ACS, non–ST-elevation acute coronary syndrome; NSTEMI, non–ST-elevation myocardial infarction; and TIMI, Thrombolysis in Myocardial Infarction.

APPENDIX A. CONTINUED

SHORT TITLE: QM-3 **Therapeutic Hypothermia for STEMI Patients**

QM-3: STEMI: Therapeutic Hypothermia for Comatose STEMI Patients With Out-of-Hospital Cardiac Arrest

Measure Description: Percentage of patients, age ≥18 y, with STEMI who become comatose after resuscitated out-of-hospital cardiac arrest (secondary to VF or pulseless VT) and who receive therapeutic hypothermia.

Numerator	Patients with acute STEMI (or its equivalent*) defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG, who are comatose after resuscitated out-of-hospital cardiac arrest (VF or pulseless VT), who receive therapeutic hypothermia *Patients with STEMI equivalent on ECG may have: hyperacute T-wave changes, true posterior MI, multilead ST depression with coexistent ST elevation in lead aVR, characteristic diagnostic criteria in the setting of LBBB.
Denominator	All patients with STEMI who are comatose after resuscitated out-of-hospital cardiac arrest (VF or pulseless VT)
Denominator Exclusions	• Patients age <18 y • Patients who die shortly after arrival (<12 h) • Patients who become comfort care measures only or hospice shortly after arrival (<12 h) • Patients who are transferred to another hospital for inpatient care shortly after arrival (<12 h) • Patients received in transfer from the inpatient setting from another facility
Denominator Exceptions	• Documentation of a medical reason for not receiving therapeutic hypothermia for comatose STEMI patients with out-of-hospital cardiac arrest (e.g., intracranial hemorrhage, severe/active bleeding, significant hypotension refractory to multiple vasopressors, severe sepsis, pregnancy, other evidence of medical futility)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g. administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

Therapeutic hypothermia in comatose patients with acute MI after certain types of cardiac arrest (predominantly related to VF or pulseless VT) has been shown to improve outcomes (e.g., increased survival to hospital discharge with good neurologic function, higher rate of a favorable neurologic outcome, and possibly reduced intermediate-term mortality) (12,192–194).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Therapeutic hypothermia should be started as soon as possible in comatose patients with STEMI and out-of-hospital cardiac arrest caused by ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), including patients who undergo primary PCI (192–194). *(Class I, Level of Evidence: B)*

ACCF indicates American College of Cardiology Foundation; AHA, American Heart Association; LBBB, left bundle branch block; MI, myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST-elevation myocardial infarction; VF, ventricular fibrillation; and VT, ventricular tachycardia.

APPENDIX A. CONTINUED

SHORT TITLE: QM-4 **Aldosterone Antagonist at Discharge**

QM-4: AMI: Aldosterone Antagonist Prescribed at Discharge

Measure description: Percentage of eligible patients, age ≥18 y, hospitalized with AMI, who are prescribed an aldosterone antagonist at hospital discharge.	
Numerator	Eligible* patients with AMI who are prescribed an aldosterone antagonist at hospital discharge *Eligible AMI patients for an aldosterone antagonist are patients with no contraindications who are already receiving an ACE inhibitor and beta blocker, and who have an EF ≤40%, and either HF or diabetes mellitus (aldosterone antagonists are appropriately used when the ACE inhibitor and/or beta blocker cannot be used or tolerated).
Denominator	All post-AMI patients who: [a] are receiving an ACE inhibitor and a beta blocker; AND [b] have a LVEF ≤40%; AND [c] have either diabetes mellitus or HF
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	• Documentation of a medical reason for not prescribing an aldosterone antagonist at hospital discharge (e.g., allergy or intolerance to aldosterone antagonist, significant renal dysfunction [Cr >2.5 mg/dL in men; >2.0 mg/dL in women], hyperkalemia [K >5.0 mEq/L]) • Patient currently enrolled in a clinical trial related to AMI (e.g., trials involving renin-angiotensin-aldosterone system inhibitors)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

The EPHESUS (Eplerenone Post-Acute Myocardial Infarction Heart Failure Efficacy and Survival) study demonstrated benefits from adding eplerenone, a selective aldosterone antagonist, to ACE inhibitors or ARBs (in 87% of patients) and beta blockers (75%), including a 15% and 17% reduction in overall and cardiovascular mortality, respectively. Therefore, in the absence of contraindications, post-MI patients with HF may benefit from adding an aldosterone antagonist to an ACE inhibitor or ARB, and a beta blocker. Monitoring of patients' renal function, electrolytes (screening for hyperkalemia, in particular), and blood pressure should be undertaken (11,12,29).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. An aldosterone antagonist should be given to patients with STEMI and no contraindications who are already receiving an ACE inhibitor and beta blocker and who have an EF less than or equal to 0.40 and either symptomatic HF or diabetes mellitus (29). *(Class I, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes (11)

1. Aldosterone blockade is recommended in post-MI patients without significant renal dysfunction (creatinine >2.5 mg/dL in men or >2.0 mg/dL in women) or hyperkalemia (K +>5.0 mEq/L) who are receiving therapeutic doses of ACE inhibitor and beta blocker and have a LVEF 0.40 or less, diabetes mellitus, or HF (29). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; ACE, angiotensin-converting enzyme; AHA, American Heart Association; AMI, acute myocardial infarction; ARB, angiotensin receptor blockers; Cr, creatinine; EF, ejection fraction; K, potassium; HF, heart failure; LVEF, left ventricular ejection fraction; MI, myocardial infarction; and STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: QM-5 **Inappropriate In-Hospital Use of NSAIDs**

QM-5: AMI: Inappropriate In-Hospital Use of NSAIDs

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI who are inappropriately prescribed NSAIDs during hospitalization.	
Numerator	Patients with AMI who were prescribed NSAIDs (with the exception of aspirin) in the hospital For purposes of this measure, a noninclusive list of NSAIDs include these medications: • Ibuprofen • Ketoprofen • Sulindac • Naproxen • Etodolac • Fenoprofen • Diclofenac • Flurbiprofen • Ketorolac • Piroxicam • Indomethacin • Mefenamic Acid • Meloxicam • Celecoxib • Nabumetone • Oxaprozin • Ketoprofen • Meclofenamate • Tolmeti • Salsalate
Denominator	All patients with AMI
Denominator Exclusions	Patients age <18 y
Denominator Exceptions	Documentation of a medical reason for prescribing NSAIDs during the AMI hospitalization (e.g., patient with refractory arthritis pain that is unresponsive to other analgesics)
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry).
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

NSAIDs likely increase the risk of major adverse events in patients with myocardial infarction (e.g., impaired infarct healing, possibly increased risk of rupture following transmural infarction, higher risk of accompanying acute kidney injury, and increased risk of gastrointestinal bleeding in at-risk AMI patients who are already receiving antithrombotic therapies) (195,196).

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Glucocorticoids and nonsteroidal anti-inflammatory drugs are potentially harmful for treatment of pericarditis after STEMI (197,198). *(Class III, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)

1. Nonsteroidal anti-inflammatory drugs (NSAIDs) (except aspirin) should not be initiated and should be discontinued during hospitalization for NSTE-ACS because of the increased risk of MACE associated with their use (195,196). *(Class III, Level of Evidence: B)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; MACE, major adverse cardiac events; NSAIDs, nonsteroidal anti-inflammatory drugs; NSTE-ACS, non–ST-elevation acute coronary syndrome; STEMI, ST-elevation myocardial infarction.

APPENDIX A. CONTINUED

SHORT TITLE: QM-6 **Inappropriate Prasugrel at Discharge in TIA/Stroke Patients**

QM-6: AMI: Inappropriate Prescription of Prasugrel at Discharge in Patients With a History of Prior Stroke or TIA

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI, who had a history of prior stroke or TIA and who are inappropriately prescribed prasugrel at discharge.

Numerator	Patients with AMI who are prescribed prasugeral at discharge
Denominator	All patients with AMI and a history of prior stroke (ischemic or hemorrhagic) or TIA
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	None
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

The TRITON-TIMI 38 (Trial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet Inhibition with Prasugrel–Thrombolysis in Myocardial Infarction) randomized clinical trial demonstrated the superiority of prasugrel over clopidogrel in reducing the composite of cardiovascular death, nonfatal MI, or nonfatal stroke among AMI patients (albeit with an increased risk of major bleeding).

Although the elderly and underweight patients did not experience net clinical benefit from the use of prasugrel, the subgroup of patients with TIA or stroke had an increased net clinical harm with prasugrel compared with clopidogrel (12,116). Notably, a history of ischemic or hemorrhagic stroke or TIA symptoms were considered exclusion criteria in the TRITON-TIMI 38 trial, although a small group ended up being randomized in error and exhibited increased harm with prasugrel. Subsequently, the FDA issued a boxed warning cautioning against the use of prasugrel in patients with TIA or stroke. Overall, patients with prior history of ischemic or hemorrhagic stroke or TIA symptoms should not receive prasugrel.

Although ischemic stroke is defined as a permanent infarction (symptomatic or asymptomatic) of the central nervous system, TIA is defined as a transient neurologic dysfunction caused by focal ischemia without ensuing infarction. Hemorrhagic strokes result from either subarachnoid or intracerebral bleeding, and usually represent 20% of all stroke events.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. Prasugrel should not be administered to patients with a history of prior stroke or transient ischemic attack (116). *(Class III, Level of Evidence: B)*

2014 AHA/ACC Guideline for the Management of Patients With Non–ST-Elevation Acute Coronary Syndromes (11)

1. Prasugrel should not be administered to patients with a prior history of stroke or transient ischemic attack (116). *(Class III, Level of Evidence: B)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI acute myocardial infarction; and TIA, transient ischemic attack.

APPENDIX A. CONTINUED

SHORT TITLE: QM-7 **Inappropriate High-Dose Aspirin With Ticagrelor at Discharge**

QM-7: AMI: Inappropriate Prescription of High-Dose Aspirin With Ticagrelor at Discharge

Measure Description: Percentage of patients, age ≥18 y, hospitalized with AMI who are prescribed ticagrelor and high-dose aspirin at discharge.	
Numerator	Patients with AMI who are prescribed ticagrelor and high-dose aspirin at discharge Note: The recommended maintenance dose of aspirin is 81 mg daily in patients treated with ticagrelor. A high-dose aspirin is defined as a daily maintenance dose >100 mg. In the United States, a high-dose aspirin for thromboprophylaxis is usually a 162 mg or a 325-mg regimen.
Denominator	All patients with AMI who are prescribed ticagrelor at discharge
Denominator Exclusions	• Patients age <18 y • Patients who leave against medical advice • Patients who die during hospitalization • Patients who are on comfort care measures only or hospice • Patients who are transferred to another hospital for inpatient acute care
Denominator Exceptions	None
Measurement Period	Encounter
Sources of Data	Medical record or other database (e.g., administrative, clinical, registry)
Attribution	Measure reportable at the facility or provider level
Care Setting	Inpatient

Rationale

In the PLATO (Platelet Inhibition and Patient Outcomes) trial, a prespecified subgroup analysis showed a significant regional variation in the comparative efficacy of ticagrelor with diminished benefits in North America compared with the rest of the world. Subsequent analyses demonstrated that the lowest risk of the composite ischemic outcome with ticagrelor compared with clopidogrel is associated with a low-maintenance dose of concomitant aspirin. (7,12,40). Overall, a high-dose aspirin (>100 mg) is associated with increased bleeding hazard without an improved antiplatelet efficacy. The FDA also issued a boxed warning indicating that aspirin daily maintenance doses of >100 mg decrease the effectiveness of ticagrelor.

Clinical Recommendation(s)

2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction (12)

1. $P2Y_{12}$ inhibitor therapy should be given for 1 year to patients with STEMI who receive a stent (bare-metal or drug-eluting) during primary PCI using the following maintenance doses:
   a. Clopidogrel 75 mg daily (115,116) *(Class I, Level of Evidence: B);* or
   b. Prasugrel 10 mg daily (115) *(Class I, Level of Evidence: B); or*
   c. Ticagrelor 90 mg twice a day* (117) *(Class I, Level of Evidence: B)*

   *The recommended maintenance dose of aspirin to be used with ticagrelor is 81 mg daily.

2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes (11)

1. Aspirin should be continued indefinitely. The maintenance dose should be 81 mg daily in patients treated with ticagrelor and 81 mg to 325 mg daily in all other patients (39,40,42). *(Class I, Level of Evidence: A)*

ACC indicates American College of Cardiology; ACCF, American College of Cardiology Foundation; AHA, American Heart Association; AMI, acute myocardial infarction; FDA, U.S. Food and Drug Administration; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

APPENDIX B. AUTHOR LISTING OF RELATIONSHIPS WITH INDUSTRY AND OTHER ENTITIES (RELEVANT)—2017 AHA/ACC CLINICAL PERFORMANCE AND QUALITY MEASURES FOR ADULTS WITH ST-ELEVATION AND NON–ST-ELEVATION MYOCARDIAL INFARCTION

Committee Member	Employment	Consultant	Speaker	Ownership/ Partnership/ Principal	Research	Institutional, Organizational, or Other Financial Benefit	Expert Witness
Hani Jneid (*Chair*)	Baylor College of Medicine — Associate Professor of Medicine; Director of Interventional Cardiology Research The Michael DeBakey VA Medical Center—Director of Interventional Cardiology	None	None	None	None	None	None
Daniel Addison	Fellow at Massachusetts General Hospital	None	None	None	None	None	None
Deepak L. Bhatt	Executive Director of Interventional Cardiovascular Programs, Brigham and Women's Hospital Heart & Vascular Center; Harvard Medical School — Professor of Medicine	• Duke Clinical Research Institute: Ferring Pharmaceuticals • Duke Clinical Research Institute: Novartis • Duke Clinical Research Institute: Bristol-Myers Squibb/Pfizer • Duke Clinical Research Institute: Eli Lilly	None	None	• Amarin† • Amgen Inc.† • AstraZeneca† • BIOFLOW-V (Biotronik)-clinical trial • Bristol Myers Squibb† • Eisai† • Ethicon† • EVOLVE Short DAPT Study (Boston Scientific) • Flowco* • Forest Laboratories† • Ischemix† • Medtronic† • Merck and Co, Inc* • Pfizer† • PLxPharma* • Roche† • Sanofi Aventis† • Takeda* • The Medicines Company†	• Cardax* • Duke Clinical Research Institute Data Safety Monitoring Board • Harvard Clinical Research Institute: Boehringer Ingelheim • Harvard Clinical Research Institute: St. Jude Data Safety Monitoring Board • Harvard Clinical Research Institute (St. Jude) Data Safety Monitoring Board • Merck & Co., Inc. Planning Committee for Clinical Study* • Novartis	None
Gregg C. Fonarow	Ahmanson-UCLA Cardiomyopathy Center Division of Cardiology — Director of UCLA's Cardiology Fellowship Program	• Amgen • Boston Scientific • Janssen • Johnson&Johnson • Medtronic • Novartis† • St. Jude Medical • Takeda • The Medicines Company • ZS Pharma	None	None	• Medtronic • Novartis†	None	None
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Kathleen L. Grady	Northwestern University Feinberg School of Medicine — Professor of Surgery and Medicine; and Administrative Director for Heart Failure	None	None	None	None	None	None
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P. Michael Ho	VA Eastern Colorado Health Care System University of Colorado School of Medicine — Associate Professor of Medicine	• Anthem, Inc.† • Janssen Pharmaceuticals, Inc† • Premier, Inc.† • Telligen*	None	None	None	None	None

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APPENDIX B. CONTINUED

Committee Member	Employment	Consultant	Speaker	Ownership/ Partnership/ Principal	Research	Institutional, Organizational, or Other Financial Benefit	Expert Witness
Corrine Y. Jurgens	Stony Brook University — Associate Professor	None	None	None	None	None	None
Marjorie L. King	Helen Hayes Hospital	None	None	None	None	None	None
Dharam J. Kumbhani	UT Southwestern Medical Center — Assistant Professor of Medicine	None	None	None	None	None	None
Samir Pancholy	The Wright Center for Graduate Medical Education	None	• Medtronic • Pfizer† • Terumo Medical		• Duke Clinical Research Institute Odyssey Outcomes Trial	None	None

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ACC indicates American College of Cardiology; AHA, American Heart Association; BIOFLOW-V, A Prospective Randomized Multicenter Study to Assess the SaFety and Effectiveness of the Orsiro SiroLimus Eluting Coronary Stent System in the Treatment Of Subjects With up to Three De Novo or Restenotic Coronary Artery Lesions - V; EVOLVE DAPT, A Prospective, Multicenter, Single-arm Study Designed to Assess the Safety of 3-month Dual Antiplatelet Therapy in Subjects at High Risk for Bleeding Undergoing Percutaneous Coronary Intervention With the SYNERGY Everolimus-Eluting Platinum Chromium Coronary Stent System; and UT, University of Texas.

APPENDIX C. PEER REVIEWER RELATIONSHIPS WITH INDUSTRY AND OTHER ENTITIES—2017 AHA/ACC CLINICAL PERFORMANCE AND QUALITY MEASURES FOR ADULTS WITH ST-ELEVATION AND NON–ST-ELEVATION MYOCARDIAL INFARCTION

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Fredrick A. Masoudi	Official AHA	None	None	None	None	None	None
Hitinder Gurm	Official SCAI	• Osprey Medical†	None	None	None	None	None
Michael Kontos	Content: ACTION Steering Committee	• Astra Zeneca† • Medicure • Roche Diagnostics	None	None	None	• Astellas • Novartis*	None
Matthew Roe	Content: NCDR SQOC	• AstraZeneca† • Boehringer Ingelheim Pharmaceuticals, Inc • Quest Diagnostics	None	None	• Daiichi-Sankyo • Ely Lilly† • Janssen Pharmaceuticals† • Merck† • Sanofi-Aventis†	• Bristol-Myers Squibb Company • Eli Lilly and Company	None
Claire Duvernoy	Content: AUCTF	None	None	None	None	None	None
H. Vernon Anderson	Content: ACC/AHA TFDS	None	None	None	• Capricor: ALLSTAR (Clinical Trial Enroller)	• DSMB: MedPace Medical Devices	None
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*No financial relationship.

†Significant (greater than $5,000) relationship.

ACC indicates American College of Cardiology; AHA, American Heart Association; ALLSTAR, The Allogeneic Heart Stem Cells to Achieve Myocardial Regeneration clinical trial; AUCTF, Appropriate Use Criteria Task Force; BOG, Board of Governors; DSMB, Data and Safety Monitoring Board; MER, Medical Education Resources; NCDR, National Cardiovascular Data Registry; NIH, National Institutes of Health; SCAI, Society for Cardiovascular Angiography and Interventions; SQOC, Science and Quality Oversight Committee; TFDS, Task Force on Data Standards; TFPG, Task Force on Practice Guidelines; TFPM, Task Force on Performance Measures; VA, U.S. Department of Veterans Affairs; and VHAC, Virginia Heart Attack Coalition.