Global Heart Attack Treatment Initiative (GHATI)

DATA GUIDE

Version 1.4

19 November 2024

Definitions

In order of appearance on Data Collection Sheet

Performance Metric: A measurement determined by the ACC and published as part of a Guidelines-related document. A definition and evidence supporting the reasoning for measuring the components or data points that are part of the metric are provided in the publication. For the initial GHATI program, our 10 performance metrics can be found in the 2017 AHA/ACC Clinical Performance and Quality Measures for Adults with ST-Elevation and Non-ST-Elevation Myocardial Infarction[1]. The GHATI program focuses only on STEMI patients.

Data Element: A data point that is captured as part of the GHATI program, but is unique from a performance metric. Data elements are valuable pieces of data, but definitions have not been published as part of an ACC guideline.

First Medical Contact (FMC): The point at which **medical** personnel arrived to assist the patient with STEMI*, which includes, non-GHATI facility medical staff, prehospital paramedical staff (Bata 2009[2]) or triage personnel at the GHATI participating facility. In the GHATI program, FMC depends on the mode of transportation of the patient. If the patient arrives to the facility via ambulance, FMC is the first personal contact by ambulance personnel, general practitioners, pharmacist. If the patient arrives to the facility via personal transportation, such as car, taxi, family member vehicle, FMC is the first personal contact at the facility with nurse, receptionist, physician.

Arrival time: Time at which patient arrives at transferred facility and/or GHATI participating facility

Transportation time: Duration of time between FMC and Arrival time. (Arrival time minus FMC time)

ECG: Electrocardiogram

Fibrinolytic therapy: drug administered with indication to dissolve blood clot. Examples of fibrinolytic therapy are: tissue plasminogen activators (i.e., Retaplase), streptokinase.

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[1] Jneid H, Addison D, Bhatt DL, et al. 2017 AHA/ACC Clinical Performance and Quality Measures for Adults With ST-Elevation and Non-ST-Elevation Myocardial Infarction. J Amer Coll Cardiol 2017 Oct 17;70(16):2048-2090. doi: 10.1016/j.jacc.2017.06.032. Epub 2017 Sep 21. https://www.acc.org/guidelines#tab3

[2] Bata I, Armstrong PW, Westerhout CM, et al. Time from first medical contact to reperfusion in ST elevation myocardial infarction: a Which Early ST Elevation Myocardial Infarction Therapy (WEST) substudy. *Can J Cardiol*. 2009;25(8):463–468. doi:10.1016/s0828-282x(09)70118-7

Catheterization Lab: Location in facility where catheterization procedure is completed

PCI, Percutaneous Coronary Intervention: Refers to stenting, plain ballooning, or aspirating a coronary lesion

Device Activation Time: The time when a percutaneous device is deployed across the occluded artery with a device such as direct stenting, guide, wire or rarely thrombus aspiration devices).

Left ventricle ejection fraction (LVEF), <40%: the measurement of how much blood is being pumped out of the left ventricle of the heart with each contraction[3]. Reduced LVEF of <40% indicates heart failure.[4]

P2Y12 Inhibitors: Antiplatelet drugs such as prasugrel, clopidogrel, ticlopidine, ticagrelor, and cangrelor.

Cardiogenic shock: A state of impaired end-organ perfusion, due to a reduced cardiac output. It is characterized by hypotension, pulmonary congestion, and an impaired tissue and vital organ perfusion.[5]

Current smokers (Smoking status): Patients who report being current smokers

Sex – Female/Male/Other: Sex as determined by chromosomal sex at birth

Numerator: Count of patients/episodes who meet the processes or outcomes expected for each patient, episode, or other unit of measurement defined (e.g. AMI patients who received a beta-blocker at discharge).

Denominator: Count of patients/episodes who remain after denominator exceptions/exclusions are applied to the eligible metric population.

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[3] https://my.clevelandclinic.org/health/articles/16950-ejection-fraction

[4] Yancy CW, et al. (2013). 2013 ACCF/AHA Guideline for the management of heart failure: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology*, 62(16): e147–e239.

[5] The ESC Textbook of Intensive and Acute Cardiovascular Care (2 ed.) Edited by Marco Tubaro, Pascal Vranckx, Susanna Price, and Christiaan Vrints. Authors: Holger Thiele and Uwe Zeymer. Latest update: This online textbook has been comprehensively reviewed for the February 2018 update, with revisions made to 28 chapters.

Denominator Exclusions: Patients/episodes that are removed from the eligible metric population (e.g. patients who received comfort measures only and are therefore not required to receive aspirin at discharge).

Denominator Exceptions: Patients/episodes that have not met the metric numerator criteria and have acceptable rationale such as a medical reason or patient reason are removed from the eligible metric population. (e.g. AMI patients with a medical reason for not receiving a beta-blocker at discharge). In this way, the metric is only considering "eligible" patients/episodes.

Median (NOT REPORTED): The median is the 50^{th} percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17.*

Median/Mean population (NOT REPORTED): Patients/episodes who remain after population exceptions/exclusions are applied to the eligible metric population.

Mean (NOT REPORTED): The mean is the average of the values (e.g. the sum of all the values divided by the total number of values). The mean can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the mean is 20 (142/7).*

Onset of Symptoms Time: Time the patient first reports feeling symptoms of STEMI

Transferred Patients: Patients received at a GHATI facility, from an emergency capable hospital, within 24 hours of arrival at transferring institution.

Main Reason for Delay to GHATI Facility:

- Transportation: Transportation of patient caused delay (this includes ambulance, self-transportation, or other transportation, traffic, et cetera)
- Late diagnosis: The patient was not diagnosed with STEMI for a long time while at the transfer facility
- Patient refusal: Patient did not want to transfer facilities from FMC to GHATI facility
- Administrative Issues/Extraneous Factors (Bureaucracy): Hospital bureaucracy caused delay to transfer to GHATI facility.

Departing Transfer Facility Time: The time the patient departed the FMC facility for the GHATI facility

Total Ischemic Time: The time from symptom onset until successful reperfusion. A successful reperfusion is:

1) TIMI 3 flow after Primary PCI

or

2) Two or more clinical/ECG criteria of reperfusion at 2 hours after thrombolytic treatment.

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

PM-1: AMI: Aspirin Received at Arrival

Measure Description: Percentage of patients, age 2:18 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 5T-elevation on the ECG or as an 5TEMI equivalent (hyperacute T-wave changes, true posterior MI, multilead 5T depression with coexistent 5T-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 N5TEMI, characterized by the absence of persistent 5T elevation on ECG, but rather the presence of 5T 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 1515-2 (5econd International 5tudy of Infarct 5urvival) trial (30), aspirin therapy administered within the first 24 h after acute 5TEMI resulted in a 23% relative risk reduction in 5-week vascular mortality (or 2.4% absolute risk reduction) in patients with 5TEMI. 5ignificant 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* 1, *Level of Evidence: 8)*
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 5TEMI who receive fibrinolytic therapy (30,37,38). *(Class* 1, *Level of Evidence: A)*

ACC indicates American Cotlege of Cardiotogy; ACCF, American Cotlege of Cardiotogy Foundation; AHA, American Heart Association, AMI, acute myocardiaL infarction; ED, emergency department; 1515-2, Second Internationat Study of Infarct SurvivaL; LBBB, left bundle branch btock; MI, myocardiat 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.

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	Aplatlients 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 onty 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 antico-agulant 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 af 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 uo to 1 vear *(Class I. Level af Evidence:* C) in oatients with STEMI who receive fibrinolvtic theraov.

ACC indicates American Cottege of Cardiotogy; ACCF, American CoLtege of CardioLogy Foundation; AHA, American Heart Association; AMI, acute myocardiaL infarction; MI, myocardiat infarction; PCI. percutaneous coronary intervention; and STEMJ, ST-etevation myocardiat infarction.

SHORT TITLE: PM-3 Beta Blocker at Discharge

PM-3: AMI: Beta Blocker Prescribed at Discharge

Measure Description: Percentage of patients, age 2:18 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, carveditol, 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 onty 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 exceltent anti-ischemic and antianginat medications that decrease myocardiat 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)

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.

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

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

Measure Description: Percentage of patients age ;e: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 AM1
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. 5tatins inhibit the HMG-CoA reductase enzyme, the rate-limiting step in cholesterol biosynthesis, and are powerful drugs for lowering LDL-C, with reductions ;e: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 *clinica/ ASCVD,* unless contraindicated. *(Class /, Level of Evidence: A)*
2. ın individuals with c/inica/ *ASCVD** in whom high-intensity statin therapy would otherwise be used, when high-intensity statin therapy is contraindicatedt or when characteristics predisposing to statin-associated adverse effects are present, moderate-intensity statin therapy should be used as the secand option if tolerated. *(Class /, Level af Evidence: A)*
3. In individuals with clinica/ ASCVD* >75 years of age, it is reasonable to evaluate the potential for A5CVD 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* 1/A; *Level of Evidence, B)*

*CtinicaLASCVD inctudes acute coronary syndromes, history of MI, stabte or unstabte angina, coronary or other arteriaLrevascuLarization, stroke, TIA, or peripherat arterial disease presumed to be of atheroscLerotic origin.

tContraindications, 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, tow-density Lipoprotein-<hotesterol; MI, myocardiaL infarction; and TIA, transient ischemic attack.

SHORT TITLE: PM-5 Evaluation of LVEF

PM-5: AMI: Evaluation of LVEF

Measure Description:	Percentage of patients, age :e: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 onty 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 GuideUne 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)*

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

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 2':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 <4D% 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 fuLfiLLthe numerator criteria if prescribed (e.g., the ARNI, sacubitriVvatsartan, contains the ARB val.sartan and would fulfiLLthe measure criteria if prescribed).
Denominator	All AMI patients with LVSD
Denominator Exctusions	• 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 11 or 111who 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 af Evidence: B)*

ACC indicates American CoLLege of Cardiology; ACCF, American Cottege 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, teft ventricutar ejection fraction; LVSD, teft ventricutar systoLic dysfunction; LVSF, teft ventricuLar systoLic function; MI; myocardiat infarction; and STEMI, ST-eLevation myocardiaL infarction.

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 1515-2 (5econd International 5tudy of Infarct 5urvival) 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 5TEMI 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 O to 6 h and 2% for those presenting 7 to 12 h from symptom onset (70).

The ACCF/AHA guideline for the management of 5TEMI (12) recommends that patients who present with 5TEMI 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 5TEMI patients presenting >12 h after symptom onset with 5TEMI 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 5TEMI symptoms (n-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 5TEMI 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 5T depression except when a true posterior (inferobasal) **MI** is suspected or when associated with 5T elevation in lead aVR (70,84-87). *(Class 111, 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 possibte.**

ACCF indicates American ColLege of CardioLogy Foundation; AHA, American Heart Association; CABG, coronary artery bypass graft; DTN, door-to-needLe; EO, 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 myocardiaLinfarction.

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 r-wave changes, true posterior MI, muLtiLead ST depression with coexistent ST etevation 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 **I**, Level of Evidence: B)*
3. Primary PCI should be perfarmed in patients with STEMI and ischemic symptoms of less than 12 hours' duration (90-92). *(Class **I**, Level af Evidence: A)*

• rhe proposed time windows are system goats. For any individuaLpatient, every effort shoutd be made to provide reperfusion therapy as rapidty as possibte.

ACCF indicates American CoLLege of CardioLogy Foundation; AHA, American Heart Association; ED, emergency department; EMS, emergency medicaL services; FMC, first medicat contact; LBBB, teft bundte branch btock; MI, myocardiat infarction; PCI, percutaneous coronary intervention; STEMI, ST-etevation myocardiat infarction; and TIMI, Thrombotysis in MyocardiaL Infarction.

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 af 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, Leve/ 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: 8)*
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: 8)*
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: 8)*
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: 8)*
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: 8)*
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, Leve/ af 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.

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 ticagretor 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)*

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.

E1a - E1d Transferred Patients: Delay to GHATI Facility **Description: Reason for Transferred Patient's delayed arrival at the facility, if any.**	
Automated field	Numerator (Count if Drop Down) and denominator (Arrival – Departing Transfer Facility Time > 45 minutes) calculated.
Numerator (Dropdown Options)	Transferred Patient with STEMI who experience a greater than 45-minute delay due to: - Transportation (E1a) - Late diagnosis (E1b) - Patient refusal (E1c) - Bureaucracy (E1d)
Denominator	Transferred Patients with STEMI with a delay of over 45 minutes from Transfer Facility to Arrival at GHATI facility.
Exception/Exclusions	Transferred Patients with STEMI with a transfer time of less than 45 minute. Transferred Patients with STEMI with transfer time over 45 minutes, with unknown reason for delay.
Departing Transfer Facility Time	Time at which patient departs first medical facility
Arrival Time	Time at which patient arrives at GHATI participating facility
Rationale/ Clinical Recommendations	

E2. Transportation time **Description: Reported time from first medical contact to arrival at facility**	
Automated field **No calculation required**	Duration of time between First Medical Contact (FMC) and Arrival time. (Arrival time minus FMC time)
Numerator	- The total time of all patients from first medical contact to arrival at emergency capable facility. The total time can be affected by outliers and skewed data. *Example: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the total time is 142. (24+16+10+32+29+14+17)*
Denominator	The total number of patients who arrived at the emergency capable facility (GHATI or transfer facility). *Example: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 = 7 total patients* **Value will then calculate Numerator (142 minutes) / over denominator (7 patients) to reach = 20 minutes*
Median **NOT COLLECTED IN THE ONLINE DATA SURVEY**	The median is the 50th percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17. **THIS IS NOT COLLECTED IN THE DATA SUVEY***
Exclusions	Not applicable for patients who arrive via private transportation, who sought medical attention immediately upon symptom onset.
Notes	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG. If no FMC outside of GHATI facility, FMC is the same time as arrival time

E3. First Medical Contact (FMC) to Electrocardiogram (ECG) **Description: The amount of time between FMC and ECG for STEMI patients**	
Numerator	The total time between first medical contact (FMC) and Electrocardiogram (ECG). This can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the total time is 142 minutes.*
Denominator	The total number of patience who received an Electrocardiogram (ECG). *EXAMPLE: Of the following time in minutes 24, 16, 10, 32, 29, 14, 17, = 7 total patients.* *Value will then calculate numerator (142 minutes) / over denominator (7 patients) = 20 minutes*
Median **NOT COLLECTED IN ONLINE DATA SURVEY	The median is the 50^{th} percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17.*
Exclusions	Patients with no ECG time reported. Patients with reported ECG time equal to or less than FMC time.
First medical contact (FMC)	The point at which **medical** personnel arrived to assist the patient with STEMI*, which includes, other emergency capable hospital, prehospital paramedical staff[1] or triage personnel at the medical facility.
Electrocardiogram (ECG)	Time at which ECG is administered
FMC to ECG	**Fields filled automatically. No calculations required.**
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E4. Arrival to Electrocardiogram (ECG) **Description: The amount of time between Arrival to emergency capable facility and ECG for STEMI patients**	
Numerator	The total time from patient arrival at emergency capable facility to ECG. The total time can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the total time is 142 minutes (24+16+10+32+29+14+17).*
Denominator	The total number of patients who arrived at the emergency capable facility and received an ECG for STEMI. *EXAMPLE: Of the following time in minutes: 24, 16, 10, 32, 29, 14, 17 = 7 total patients.* *Value will then calculate numerator (142) / over denominator (7) = 20 minutes*
Median **NOT COLLECTED IN ONLINE DATA SURVEY**	The median is the 50^{th} percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17.*
Exclusions	Patients with no ECG time reported. Patients with reported ECG time equal to or less Arrival time.
Arrival time	Time at which patient arrives at GHATI participating facility
Electrocardiogram (ECG)	Time at which ECG is administered
Arrival to ECG	**Fields filled automatically. No calculations required.**
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E5. Arrival to Cath Lab **Description: The amount of time between Arrival to emergency capable facility and Cath Lab for STEMI patients**	
Numerator	The total time of patients between arriving at the emergency capable facility and the Cath Lab. The total time can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the total time is 142 minutes (24+16+10+32+29+14+17)*
Denominator	The total number of patients who went to the Cath Lab. *EXAMPLE: Of the following time in minutes: 24, 16, 10, 32, 29, 14, 17 = 7 total patients.* *Value will then calculate numerator (142) / over denominator (7) = 20 minutes*
Median **NOT COLLECTED IN ONLINE DATA SURVEY**	The median is the 50^{th} percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17.*
Exclusions	Patients with no Cath Lab arrival time reported. Patients with reported Cath Lab Arrival Time equal to or less than Arrival time.
Arrival time	Time at which patient arrives at GHATI participating facility
Cath Lab Arrival time	Time at which patient arrives at Cath Lab
Arrival at emergency capable facility to Arrival at Cath Lab	**Fields filled automatically. No calculations required.** Emergency Capable facility Arrival time – Cath Lab Arrival time
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E6. Arrival to Fibrinolytic Therapy **Description: Mean and median amount of time between Arrival to GHATI facility and Administration of Fibrinolytic Therapy for STEMI patients**	
Numerator	The total time of all patients who received Fibrinolytic Therapy. The total time can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – total time is 142 minutes (24+16+10+32+29+14+17).*
Denominator	The total number of patience who received Fibrinolytic Therapy. *EXAMPLE: Of the following time in minutes: 24, 16, 10, 32, 29, 14, 17 = 7 total patients.* *Value will then calculate numerator (142) / over denominator (7) = 20 minutes*
Median **NOT REPORTED IN ONLINE DATA SURVEY**	The median is the 50^{th} percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17.*
Exclusions	Patients with no fibrinolytic date/time reported. Patients with reported fibrinolytic date/time equal to or less than Arrival time.
Arrival time	Time at which patient arrives at GHATI participating facility
Fibrinolytic Therapy time	Time at which patient received fibrinolytic therapy. Fibrinolytic therapy: drug administered with indication to dissolve blood clot. Examples of fibrinolytic therapy are: tissue plasminogen activators (i.e., Retaplase), streptokinase.
Arrival at emergency capable facility to Fibrinolytic Therapy administration	**Fields filled automatically. No calculations required.** Emergency capable facility Arrival time – Fibrinolytic therapy administration time
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E7. Arrival to Device Time **Description: The total amount of time between Arrival to Emergency Capable facility and Device Activation Time**	
Numerator	The total time of patients who arrived at the emergency capable facility and device activation time. The total time can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the total time is 142 minutes (24+16+10+32+29+14+17).*
Denominator	The total number of patients who arrived at the emergency capable facility and device activation time. *EXAMPLE: Of the following time in minutes: 24, 16, 10, 32, 29, 14, 17 = 7 total patients.* *Value will then calculate numerator (142) / over denominator (7) = 20 minutes*
Median **NOT COLLECTED IN ONLINE DATA SURVEY**	The median is the 50^{th} percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the median is 17.*
Exclusions	Patients who did not receive PCI. Patients with no recorded Device Activation Time. Patients with a recorded Device Activation Time equal to or less than Arrival time.
Arrival time	Time at which patient arrives at GHATI participating facility
Device Activation Time	Time at which device activated, if patient receives percutaneous coronary intervention (PCI) PCI, Percutaneous Coronary Intervention: Refers to stenting, plain ballooning, or aspirating a coronary lesion
Arrival at Emergency capable facility to Device Activation Time	**Fields filled automatically. No calculations required.** GHATI facility Arrival time – Device Activation time
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E8. Proportion of Patients with LVEF <40% **Description:** Percentage of patients, hospitalized with AMI, with documentation in the hospital record that LVEF was evaluated during the hospitalization and LVEF was <40%	
Numerator	Patients with STEMI* with an LVEF assessment completed during the hospitalization with LVEF valued at <40%. **Please use last LVEF assessment to determine final valuation of LVEF performance**
Denominator	All patients with STEMI who had an LVEF assessment completed during the hospitalization
Denominator Exclusions	Patients with ***any*** of the following: • Left against medical advice • Deceased during hospitalization • Comfort measures only • Hospice care • Transferred to other acute care hospital
Denominator Exceptions	None
Time Period	N/A
Clinical Rationale/ Recommendation	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., 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.

Relevant Citations	**2017 AHA/ACC Clinical Performance and Quality Measures for Adults with ST-Elevation and Non-ST-Elevation Myocardial Infarction: PM-5** 2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction 2014 AHA/ACC Guideline for the Management of Patients with Non–ST-Elevation Acute Coronary Syndromes
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E9. Proportion of Patients Discharged Alive **Description:** Percentage of patients, hospitalized with AMI, who were alive at discharge	
Numerator	Patients with STEMI* who were alive at discharge
Denominator	Patients with STEMI*
Denominator Exclusions	Patients with ***any*** of the following: • Left against medical advice • Transferred to other acute care hospital
Denominator Exceptions	None
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E11. Proportion of Patients receiving P_2Y_{12} inhibitor between First Medical Contact (FMC) and Catheterization

Description: Percentage of patients, hospitalized with AMI, who received P_2Y_{12} receptor inhibitor at any point between arrival at GHATI facility and catheterization

Numerator	• Patients with STEMI* who reported taking prescription P_2Y_{12} inhibitor prior to arriving at the facility • Patients who had caregivers report that the patient was taking prescription P_2Y_{12} inhibitor prior to arriving at the facility • Patients who received P_2Y_{12} inhibitor while in care at the GHATI facility, specifically between arrival time and time of catheterization • P2Y12 inhibitors include: clopidogrel, prasugrel, ticagrelor, cangrelor
Denominator	Patients with STEMI*
Denominator Exclusions	None
Denominator Exceptions	• Medical reason for not prescribing a P_2Y_{12} receptor inhibitor • Patient reason for not prescribing a P_2Y_{12} receptor inhibitor • Patient currently enrolled in a clinical trial related to AMI and involving new antiplatelet therapies
Time Period	N/A
Clinical Rationale/ Recommendation	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. P_2Y_{12} receptor inhibitors have incremental benefits to aspirin, and patients with acute MI who are treated with P_2Y_{12} receptor inhibitor at discharge have improved cardiovascular outcomes (predominantly, lower recurrent MI events).
Relevant Citations	**2017 AHA/ACC Clinical Performance and Quality Measures for Adults with ST-Elevation and Non-ST-Elevation Myocardial Infarction** 2013 ACCF/AHA Guideline for the Management of Patients With ST-Elevation Myocardial Infarction 2014 AHA/ACC Guideline for the Management of Patients with Non–ST-Elevation Acute Coronary Syndromes
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E12. Proportion of Patients Received at facility in Cardiogenic Shock **Description:** Percentage of patients, hospitalized with AMI, who were received at facility in cardiogenic shock	
Numerator	Patients with STEMI* who were in cardiogenic shock upon arrival at facility *Cardiogenic shock: A state of impaired end-organ perfusion, due to a reduced cardiac output. It is characterized by hypotension, pulmonary congestion, and an impaired tissue and vital organ perfusion.*[6]
Denominator	Patients with STEMI*
Denominator Exclusions	Patients with ***any*** of the following: • Left against medical advice • Transferred to other acute care hospital
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

[6] **The ESC Textbook of Intensive and Acute Cardiovascular Care (2 ed.)** Edited by Marco Tubaro, Pascal Vranckx, Susanna Price, and Christiaan Vrints. Authors: Holger Thiele and Uwe Zeymer. **Latest update:** This online textbook has been comprehensively reviewed for the February 2018 update, with revisions made to 28 chapters.

E13. Proportion of Patients who experienced cardiac arrest before intervention **Description:** Percentage of patients, hospitalized with AMI, who experienced cardiac arrest prior to receiving intervention	
Numerator	Patients with STEMI* who experienced cardiac arrest prior to receiving intervention
Denominator	Patients with STEMI*
Denominator Exclusions	Patients with ***<u>any</u>*** of the following: • Left against medical advice • Transferred to other acute care hospital
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E14. Proportion of Patients who experienced cardiac arrest after intervention **Description:** Percentage of patients, hospitalized with AMI, who experienced cardiac arrest while hospitalized, but after receiving intervention	
Numerator	Patients with STEMI* who experienced cardiac arrest while hospitalized, but after receiving intervention
Denominator	Patients with STEMI*
Denominator Exclusions	Patients with ***any*** of the following: • Left against medical advice • Transferred to other acute care hospital
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E15. Proportion of Patients who are current smokers **Description:** Percentage of patients, hospitalized with AMI, who report being current smokers	
Numerator	Patients with STEMI* who report being current smokers
Denominator	Patients with STEMI*
Denominator Exclusions	Patients who are unable to respond or report on smoking status
Denominator Exceptions	None
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E16a - E16b. Proportion of Patients who are female and male (sex) **Description:** Percentage of patients, hospitalized with AMI, who are female	
Numerator	Patients with STEMI* who are female (as defined by chromosomal sex at birth) E16a Patients with STEMI* who are male (as defined by chromosomal sex at birt((E16b)
Denominator	Patients with STEMI*
Denominator Exclusions	Patients who choose not to report sex
Denominator Exceptions	None
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E17. Transferred Patients delay to GHATI Facility **Description:** Reported time (in minutes) of transferred patients delay to GHATI facility	
Numerator	The total time of patients who transferred to the GHATI facility from an emergency capable facility. The total time can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17 – the total time is 142 minutes (24+16+10+32+29+14+17).*
Denominator	Total number of patients who transferred to the GHATI facility from an emergency capable facility. *EXAMPLE: Of the following time in minutes: 24, 16, 10, 32, 29, 14, 17 = 7 total patients.* *Value will then calculate numerator (142) / over denominator (7) = 20 minutes*
Denominator Exclusions	Patients who were delayed to the GHATI facility within 24 hours of symptom onset.
Denominator Exceptions	None
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E18a – E18d -. Transferred Patients: Reason for Transfer **Description : Reason for patient's transfer from Emergency Capable institution to GHATI facility.**	
Numerator {Dropdown Options)	Transferred Patients with STEMI who were transferred to GHATI facility due to: - Transferring facility unable to offer lytic therapy/PCI (E18a) - Lack of beds at transferring facility (E18b) - Patient request (18c) - Clinical Indications (E18d) - Pharmaco-invasive strategy - Failed reperfusion - Clinically unstable sick patients
Denominator	Patients with STEMI, transferred within 24 hours to GHATI facility from an emergency capable hospital.
Exceptions/Exclusions	Not applicable for patients with unknown reason for transfer.
Rationale/ Clinical Recommendations	

E19a – E19b. Transferred Patients: means of Transfer **Description:** Form of transportation for patients transferred from transfer facility to GHATI Facility	
Numerator (dropdown Options)	Transferred Patients with STEMI who were received at GHATI facility via: - Ambulance (E19a) - Self-transport (E19b)
Denominator	Patients with STEMI, transferred within 24 hours to GHATI facility from an emergency capable hospital.
Denominator Exclusions	Patients who did not transfer to the GHATI facility within 24 hours of symptom onset.
Denominator Exceptions	Not applicable for patients who were not transferred from emergency capable facilities

E20a – E20h. Patients Age **Description:** Proportion of patients, hospitalized with AMI, who are aged over 18 years	
Numerator	Patients hospitalized with AMI who are: - Aged 18 – 31 years (E20a) *For example (18, 31, 29, 22, 25) = 5 patients* - Aged 32-44 years (E20b) *For example (32, 44, 37, 39, 33, 41) = 6 patients* - Aged 45-54 years (E20c) - Aged 55-64 years (E20d) - Aged 65-69 years (E20e) - Aged 70-74 years (E20d) - Aged 75-79 years (E20g) - Aged 80+ years (E20h)
Denominator	Total number of patients with STEMI* *For example, the numerator for 18-31 years old (5 patients) will be divided by the total number of patients with STEMI (11 patients) for the proportion of patients in the 18-31 bracke*
Denominator Exclusions	Patients who are under the age of 18 years
Denominator Exceptions	None
	*Acute STEMI patients as defined by characteristic symptoms of myocardial ischemia with diagnostic ST elevation on ECG.

E22a – E22b. Proportion of Transferred Patients: Received Fibrinolytic Therapy Prior to Arrival **Description:** Percentage of Transferred Patients who received Fibrinolytic Therapy Prior to Arrival	
Numerator	E22a: Total number of transferred patients where it is known if they received fibrinolytic therapy or not (Yes successful, Yes unsuccessful, or No). E22b: Total number of transferred patients where it is unknown if fibrinolytic therapy was received.
Denominator	Total transferred patients (total patients)
Total number of patients	Patients with STEMI, transferred within 24 hours to GHATI facility from an emergency capable hospital.
Exclusions	Any patient who was not transferred to GHATI facility

E23. Transferred Patients: Total Ischemic Time **Description: Time of onset of symptoms to reperfusion achieved for transferred patients**	
Automated field **No calculation required**	Arrival Time - Onset of Symptoms Time
Numerator	Total ischemic time of all transferred patients (total time)
Denominator	Total transferred patients (total patients)
Mean	The mean is the average of the values (e.g. the sum of all the values divided by the total number of values). The mean can be affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17- the mean is 20 (142/7). -*
Median-NOT REPORTED	The median is the **SO**th percentile (e.g. middle value for a set of data that was arranged in order of magnitude). It is less affected by outliers and skewed data. *EXAMPLE: Of the following times in minutes: 24, 16, 10, 32, 29, 14, 17- the median is 17. **NOTREPORTED***
Total number of patients	Patients with STEMI, transferred within 24 hours to GHATI facility from an emergency capable hospital.
Exclusions	Any patient who was not transferred to GHATI facility
Onset of Symptoms Time	Time at which patient first reported feeling symptoms
Arrival Time	Time at which patient arrives at GHATI participating facility
Rationale/ Clinical Recommendations	Infarct size and mortality are strongly correlated with total ischemic time.

E24a – E24c -. Patient Mode of Arrival at GHATI **Description : Patient's mode of arrival to the GHATI Facility**	
Numerator (Dropdown Options)	Patients with STEMI who arrived at the GHATI facility: - Ambulance (24a) - Self presented (24b) - Transfer (24c)
Denominator	All patients with STEMI to arrive to the GHATI facility.
Exceptions/Exclusions	Not applicable for patients with unknown reason for transfer.
Rationale/ Clinical Recommendations	