A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction

1 Onset of Myocardial Infarction: Recommendations

1.1 Regional Systems of STEMI Care, Reperfusion Therapy, and Time-to-Treatment Goals

See (Figure 1).

Figure 1.

Reperfusion therapy for patients with STEMI. The bold arrows and boxes are the preferred strategies. Performance of PCI is dictated by an anatomically appropriate culprit stenosis. *Patients with cardiogenic shock or severe heart failure initially seen at a non–PCI-capable hospital should be transferred for cardiac catheterization and revascularization as soon as possible, irrespective of time delay from MI onset (Class I, LOE: B). †Angiography and revascularization should not be performed within the first 2 to 3 hours after administration of fibrinolytic therapy. CABG indicates coronary artery bypass graft; DIDO, door-in–door-out; FMC, first medical contact; LOE, Level of Evidence; MI, myocardial infarction; PCI, percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

Class I

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 Door-to-Balloon Alliance. (*Level of Evidence: B*)

2. Performance of a 12-lead electrocardiogram (ECG) by emergency medical services personnel at the site of first medical contact (FMC) is recommended in patients with symptoms consistent with STEMI. (*Level of Evidence: B*)

3. Reperfusion therapy should be administered to all eligible patients with STEMI with symptom onset within the prior 12 hours. (*Level of Evidence: A*)

4. Primary PCI is the recommended method of reperfusion when it can be performed in a timely fashion by experienced operators. (*Level of Evidence: A*)

5. Emergency medical services 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*. (*Level of Evidence: B*)

6. 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*. (*Level of Evidence: B*)

7. 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. (*Level of Evidence: B*)

8. When fibrinolytic therapy is indicated or chosen as the primary reperfusion strategy, it should be administered within 30 minutes of hospital arrival*. (*Level of Evidence: B*)

Class IIa

1. Reperfusion therapy is reasonable for patients with STEMI and symptom onset within the prior 12 to 24 hours who have clinical and/or ECG evidence of ongoing ischemia. Primary PCI is the preferred strategy in this population. (*Level of Evidence: B*)

1.2 Evaluation and Management of Patients With STEMI and Out-of-Hospital Cardiac Arrest

Class I

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 or pulseless ventricular tachycardia, including patients who undergo primary PCI. (*Level of Evidence: B*)

2. Immediate angiography and PCI when indicated should be performed in resuscitated out-of-hospital cardiac arrest patients whose initial ECG shows STEMI. (*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.

2. Reperfusion At a PCI-capable Hospital: Recommendations

2.1 Primary PCI in STEMI

See Table 2 for a summary of recommendations from this section.

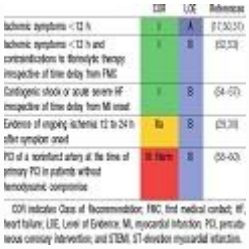

Table 2.

Primary PCI in STEMI

Class I

1. Primary PCI should be performed in patients with STEMI and ischemic symptoms of less than 12 hours' duration. (*Level of Evidence: A*)
2. 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. (*Level of Evidence: B*)
3. Primary PCI should be performed in patients with STEMI and cardiogenic shock or acute severe HF, irrespective of time delay from myocardial infarction (MI) onset (Section 8.1). (*Level of Evidence: B*)

Class IIa

1. Primary PCI is reasonable in patients with STEMI if there is clinical and/or ECG evidence of ongoing ischemia between 12 and 24 hours after symptom onset. (*Level of Evidence: B*)

Class III: Harm

1. PCI should not be performed in a noninfarct artery at the time of primary PCI in patients with STEMI who are hemodynamically stable. (*Level of Evidence: B*)

2.2 Aspiration Thrombectomy

Class IIa

1. Manual aspiration thrombectomy is reasonable for patients undergoing primary PCI.[1] (*Level of Evidence: B*)

2.3 Use of Stents in Patients With STEMI

Class I

1. Placement of a stent (bare-metal stent or drug-eluting stent) is useful in primary PCI for patients with STEMI. (*Level of Evidence: A*)
2. Bare-metal stents† should be used in patients with high bleeding risk, inability to comply with 1 year of dual antiplatelet therapy (DAPT), or anticipated invasive or surgical procedures in the next year. (*Level of Evidence: C*)

Class III: Harm

1. Drug-eluting stents should not be used in primary PCI for patients with STEMI who are unable to tolerate or comply with a prolonged course of DAPT because of the increased risk of stent thrombosis with premature discontinuation of one or both agents. (*Level of Evidence: B*)

2.4 Antiplatelet Therapy to Support Primary PCI for STEMI

See Table 3 for a summary of recommendations from this section.

(Enlarge Image)

Table 3.

Adjunctive Antithrombotic Therapy to Support Reperfusion With Primary PCI

Class I

1. Aspirin 162 to 325 mg should be given before primary PCI. (*Level of Evidence: B*)
2. After PCI, aspirin should be continued indefinitely. (*Level of Evidence: A*)

3. A loading dose of a $P2Y_{12}$receptor inhibitor should be given as early as possible or at time of primary PCI to patients with STEMI. Options include

    a. Clopidogrel 600 mg (*Level of Evidence: B*); or

    b. Prasugrel 60 mg (*Level of Evidence: B*); or

    c. Ticagrelor 180 mg. (*Level of Evidence: B*)

4. $P2Y_{12}$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 (*Level of Evidence: B*); or

    b. Prasugrel 10 mg daily (*Level of Evidence: B*); or

    c. Ticagrelor 90 mg twice a day‡ *Level of Evidence: B*)

Class IIa

1. It is reasonable to use 81 mg of aspirin per day in preference to higher maintenance doses after primary PCI. (*Level of Evidence: B*)

2. It is reasonable to start treatment with an intravenous glycoprotein (GP) IIb/IIIa receptor antagonist such as abciximab (*Level of Evidence: A*), high-bolus-dose tirofiban (*Level of Evidence: B*), or double-bolus eptifibatide (*Level of Evidence: B*) at the time of primary PCI (with or without stenting or clopidogrel pretreatment) in selected patients with STEMI who are receiving unfractionated heparin (UFH).

Class IIb

1. It may be reasonable to administer intravenous GP IIb/IIIa receptor antagonist in the precatheterization laboratory setting (e.g., ambulance, emergency department) to patients with STEMI for whom primary PCI is intended (*Level of Evidence: B*)

2. It may be reasonable to administer intracoronary abciximab to patients with STEMI undergoing primary PCI. (*Level of Evidence: B*)

3. Continuation of a $P2Y_{12}$inhibitor beyond 1 year may be considered in patients undergoing drug-eluting stent placement. (*Level of Evidence: C*)

Class III: Harm

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

2.5 Anticoagulant Therapy to Support Primary PCI

Class I

1. For patients with STEMI undergoing primary PCI, the following supportive anticoagulant regimens are recommended:
    a. UFH, with additional boluses administered as needed to maintain therapeutic activated clotting time levels, taking into account whether a GP IIb/IIIa receptor antagonist has been administered (*Level of Evidence: C*); or
    b. Bivalirudin with or without prior treatment with UFH. (*Level of Evidence: B*)

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Class IIa

1. In patients with STEMI undergoing PCI who are at high risk of bleeding, it is reasonable to use bivalirudin monotherapy in preference to the combination of UFH and a GP IIb/IIIa receptor antagonist. (*Level of Evidence: B*)

Class III: Harm

1. Fondaparinux should not be used as the sole anticoagulant to support primary PCI because of the risk of catheter thrombosis. (*Level of Evidence: B*)

†Balloon angioplasty without stent placement may be used in selected patients.

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

3. Reperfusion at a Non–PCI-capable Hospital: Recommendations

3.1 Fibrinolytic Therapy When There Is an Anticipated Delay to Performing Primary PCI Within 120 Minutes of FMC

See Table 4 for a summary of recommendations from this section.

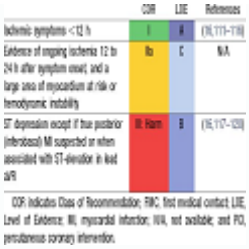

Table 4.

Indications for Fibrinolytic Therapy When There Is a >120-Minute Delay From FMC to Primary PCI (Figure 1)

Class I

1. 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. (*Level of Evidence: A*)

Class IIa

1. In the absence of contraindications and when PCI is not available, fibrinolytic therapy is reasonable for patients with STEMI if there is clinical and/or electrocardiographic evidence of ongoing ischemia within 12 to 24 hours of symptom onset and a large area of myocardium at risk or hemodynamic instability. (*Level of Evidence: C*)

Class III: Harm

1. 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. (*Level of Evidence: B*)

3.2 Adjunctive Antithrombotic Therapy With Fibrinolysis

See Table 5 for a summary of recommendations from this section.

Table 5.

Adjunctive Antithrombotic Therapy to Support Reperfusion With Fibrinolytic Therapy

3.2.1 Adjunctive Antiplatelet Therapy With Fibrinolysis

Class I

1. 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. (*Level of Evidence: A*)

2. Aspirin should be continued indefinitely (*Level of Evidence: A*) and clopidogrel (75 mg daily) should be continued for at least 14 days (*Level of Evidence: A*) and up to 1 year (*Level of Evidence: C*) in patients with STEMI who receive fibrinolytic therapy.

Class IIa

1. It is reasonable to use aspirin 81 mg per day in preference to higher maintenance doses after fibrinolytic therapy. (*Level of Evidence: B*)

3.2.2 Adjunctive Anticoagulant Therapy With Fibrinolysis

Class I

1. Patients with STEMI undergoing reperfusion with fibrinolytic therapy should receive anticoagulant therapy for a minimum of 48 hours, and preferably for the duration of the index hospitalization, up to 8 days or until revascularization if performed. (*Level of Evidence: A*) Recommended regimens include

    a. UFH administered as a weight-adjusted intravenous bolus and infusion to obtain an activated partial thromboplastin time of 1.5 to 2.0 times control, for 48 hours or until revascularization (*Level of Evidence: C*);

    b. Enoxaparin administered according to age, weight, and creatinine clearance, given as an intravenous bolus, followed in 15 minutes by subcutaneous injection for the duration of the index hospitalization, up to 8 days or until revascularization (*Level of Evidence: A*); or

    c. Fondaparinux administered with initial intravenous dose, followed in 24 hours by daily subcutaneous injections if the estimated creatinine clearance is greater than 30 mL/min, for the duration of the index hospitalization, up to 8 days or until revascularization. (*Level of Evidence: B*)

3.3 Transfer to a PCI-Capable Hospital After Fibrinolytic Therapy

3.3.1 Transfer of Patients With STEMI to a PCI-Capable Hospital for Coronary Angiography After Fibrinolytic Therapy

See Table 6 for a summary of recommendations from this section; Online Data Supplement 4 for additional data on early catheterization and rescue PCI for fibrinolytic failure in the stent era; and Online Data Supplement 5 for additional data on early catheterization and PCI after fibrinolysis in the stent era.

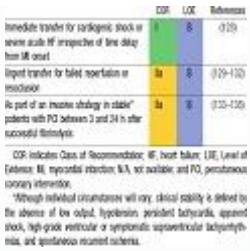

Table 6.

Indications for Transfer for Angiography After Fibrinolytic Therapy

Class I

1. 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. (*Level of Evidence: B*)

Class IIa

1. Urgent transfer to a PCI-capable hospital for coronary angiography is reasonable for patients with STEMI who demonstrate evidence of failed reperfusion or reocclusion after fibrinolytic therapy. (*Level of Evidence: B*)
2. Transfer to a PCI-capable hospital for coronary angiography is reasonable for patients with STEMI who have received fibrinolytic therapy even when hemodynamically stable§ and with clinical evidence of successful reperfusion. Angiography can be performed as soon as logistically feasible at the receiving hospital, and ideally within 24 hours, but should not be performed within the first 2 to 3 hours after administration of fibrinolytic therapy. (*Level of Evidence: B*)

§Although individual circumstances will vary, clinical stability is defined by the absence of low output, hypotension, persistent tachycardia, apparent shock, high-grade ventricular or symptomatic supraventricular tachyarrhythmias, and spontaneous recurrent ischemia.

4. Delayed Invasive Management: Recommendations

4.1 Coronary Angiography in Patients Who Initially Were Managed With Fibrinolytic Therapy or Who Did Not Receive Reperfusion

See Table 7 for a summary of recommendations from this section.

Table 7.

Indications for Coronary Angiography in Patients Who Were Managed With Fibrinolytic Therapy or Who Did Not Receive Reperfusion Therapy

Class I

1. Cardiac catheterization and coronary angiography with intent to perform revascularization should be performed after STEMI in patients with any of the following:
    a. Cardiogenic shock or acute severe HF that develops after initial presentation (*Level of Evidence: B*);
    b. Intermediate- or high-risk findings on predischarge noninvasive ischemia testing (*Level of Evidence: B*); or
    c. Myocardial ischemia that is spontaneous or provoked by minimal exertion during hospitalization. (*Level of Evidence: C*)

Class IIa

1. Coronary angiography with intent to perform revascularization is reasonable for patients with evidence of failed reperfusion or reocclusion after fibrinolytic therapy. Angiography can be performed as soon as logistically feasible. (*Level of Evidence: B*)
2. Coronary angiography is reasonable before hospital discharge in stable§ patients with STEMI after successful fibrinolytic therapy.

Angiography can be performed as soon as logistically feasible, and ideally within 24 hours, but should not be performed within the first 2 to 3 hours after administration of fibrinolytic therapy. (*Level of Evidence: B*)

4.2 PCI of an Infarct Artery in Patients Who Initially Were Managed With Fibrinolysis or Who Did Not Receive Reperfusion Therapy

See Table 8 for a summary of recommendations from this section.

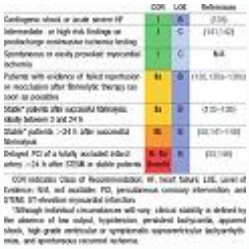

Table 8.

Indications for PCI of an Infarct Artery in Patients Who Were Managed With Fibrinolytic Therapy or Who Did Not Receive Reperfusion Therapy

Class I

1. PCI of an anatomically significant stenosis in the infarct artery should be performed in patients with suitable anatomy and any of the following:
    a. Cardiogenic shock or acute severe HF (*Level of Evidence: B*);
    b. Intermediate- or high-risk findings on predischarge noninvasive ischemia testing (*Level of Evidence: C*); or
    c. Myocardial ischemia that is spontaneous or provoked by minimal exertion during hospitalization. (*Level of Evidence: C*)

Class IIa

1. Delayed PCI is reasonable in patients with STEMI and evidence of failed reperfusion or reocclusion after fibrinolytic therapy. PCI can be performed as soon as logistically feasible at the receiving hospital (*Level of Evidence: B*)
2. Delayed PCI of a significant stenosis in a patent infarct artery is reasonable in stable§ patients with STEMI after fibrinolytic therapy. PCI can be performed as soon as logistically feasible at the receiving hospital, and ideally within 24 hours, but should not be

performed within the first 2 to 3 hours after administration of fibrinolytic therapy. (*Level of Evidence: B*)

Class IIb

1. Delayed PCI of a significant stenosis in a patent infarct artery greater than 24 hours after STEMI may be considered as part of an invasive strategy in stable§ patients. (*Level of Evidence: B*)

Class III: No Benefit

1. Delayed PCI of a totally occluded infarct artery greater than 24 hours after STEMI should not be performed in asymptomatic patients with 1- or 2-vessel disease if they are hemodynamically and electrically stable and do not have evidence of severe ischemia. (*Level of Evidence: B*)

4.3 PCI of a Noninfarct Artery Before Hospital Discharge

Class I

1. PCI is indicated in a noninfarct artery at a time separate from primary PCI in patients who have spontaneous symptoms of myocardial ischemia. (*Level of Evidence: C*)

Class IIa

1. PCI is reasonable in a noninfarct artery at a time separate from primary PCI in patients with intermediate- or high-risk findings on noninvasive testing. (*Level of Evidence: B*)

4.4 Adjunctive Antithrombotic Therapy to Support Delayed PCI After Fibrinolytic Therapy

See Table 9 for a summary of recommendations from this section.

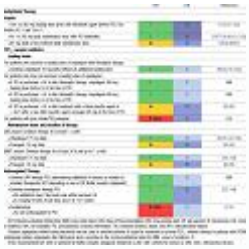

Table 9.

Adjunctive Antithrombotic Therapy to Support PCI After Fibrinolytic Therapy

4.4.1 Antiplatelet Therapy to Support PCI After Fibrinolytic Therapy

Class I

1. After PCI, aspirin should be continued indefinitely.[1] (*Level of Evidence: A*)

2. 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 (*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 (*Level of Evidence: C*); and

    c. A dose of 75 mg daily should be given after PCI.[1] (*Level of Evidence: C*)

Class IIa

1. After PCI, it is reasonable to use 81 mg of aspirin per day in preference to higher maintenance doses.[1] (*Level of Evidence: B*)

2. Prasugrel, in a 60-mg loading dose, is reasonable once the coronary anatomy is known in patients who did not receive a previous loading dose of clopidogrel at the time of administration of a fibrinolytic agent, but prasugrel should not be given sooner than 24 hours after administration of a fibrin-specific agent or 48 hours after administration of a non–fibrin-specific agent. (*Level of Evidence: B*)

3. Prasugrel, in a 10-mg daily maintenance dose, is reasonable after PCI. (*Level of Evidence: B*)

Class III: Harm

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

4.4.2 Anticoagulant Therapy to Support PCI After Fibrinolytic Therapy

Class I

1. For patients with STEMI undergoing PCI after receiving fibrinolytic therapy with intravenous UFH, additional boluses of intravenous UFH should be administered as needed to support the procedure,

taking into account whether GP IIb/IIIa receptor antagonists have been administered. (*Level of Evidence: C*)

2. For patients with STEMI undergoing PCI after receiving fibrinolytic therapy with enoxaparin, if the last subcutaneous dose was administered within the prior 8 hours, no additional enoxaparin should be given; if the last subcutaneous dose was administered between 8 and 12 hours earlier, enoxaparin 0.3 mg/kg IV should be given. (*Level of Evidence: B*)

Class III: Harm

1. Fondaparinux should not be used as the sole anticoagulant to support PCI. An additional anticoagulant with anti-IIa activity should be administered because of the risk of catheter thrombosis. (*Level of Evidence: C*)

§Although individual circumstances will vary, clinical stability is defined by the absence of low output, hypotension, persistent tachycardia, apparent shock, high-grade ventricular or symptomatic supraventricular tachyarrhythmias, and spontaneous recurrent ischemia.

5. Coronary Artery Bypass Graft Surgery: Recommendations

5.1 CABG in Patients With STEMI

Class I

1. Urgent CABG is indicated in patients with STEMI and coronary anatomy not amenable to PCI who have ongoing or recurrent ischemia, cardiogenic shock, severe HF, or other high-risk features. (*Level of Evidence: B*)

2. CABG is recommended in patients with STEMI at time of operative repair of mechanical defects. (*Level of Evidence: B*)

Class IIa

1. The use of mechanical circulatory support is reasonable in patients with STEMI who are hemodynamically unstable and require urgent CABG. (*Level of Evidence: C*)

Class IIb

1. Emergency CABG within 6 hours of symptom onset may be considered in patients with STEMI who do not have cardiogenic

shock and are not candidates for PCI or fibrinolytic therapy. (*Level of Evidence: C*)

5.2 Timing of Urgent CABG in Patients With STEMI in Relation to Use of Antiplatelet Agents

Class I

1. Aspirin should not be withheld before urgent CABG. (*Level of Evidence: C*)
2. Clopidogrel or ticagrelor should be discontinued at least 24 hours before urgent on-pump CABG, if possible. (*Level of Evidence: B*)
3. Short-acting intravenous GP IIb/IIIa receptor antagonists (eptifibatide, tirofiban) should be discontinued at least 2 to 4 hours before urgent CABG. (*Level of Evidence: B*)
4. Abciximab should be discontinued at least 12 hours before urgent CABG. (*Level of Evidence: B*)

Class IIb

1. Urgent off-pump CABG within 24 hours of clopidogrel or ticagrelor administration might be considered, especially if the benefits of prompt revascularization outweigh the risks of bleeding. (*Level of Evidence: B*)
2. Urgent CABG within 5 days of clopidogrel or ticagrelor administration or within 7 days of prasugrel administration might be considered, especially if the benefits of prompt revascularization outweigh the risks of bleeding. (*Level of Evidence: C*)

6. Routine Medical Therapies: Recommendations

6.1 Beta Blockers

Class I

1. Oral beta blockers should be initiated in the first 24 hours in patients with STEMI who do not have any of the following: signs of HF, evidence of a low-output state, increased risk for cardiogenic shock,‖ or other contraindications to use of oral beta blockers (PR interval more than 0.24 seconds, second- or third-degree heart

block, active asthma, or reactive airways disease). (*Level of Evidence: B*)

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

3. Patients with initial contraindications to the use of beta blockers in the first 24 hours after STEMI should be reevaluated to determine their subsequent eligibility. (*Level of Evidence: C*)

Class IIa

1. It is reasonable to administer intravenous beta blockers at the time of presentation to patients with STEMI and no contraindications to their use who are hypertensive or have ongoing ischemia (*Level of Evidence: B*)

6.2 Renin-Angiotensin-Aldosterone System Inhibitors

Class I

1. An angiotensin-converting enzyme inhibitor should be administered within the first 24 hours to all patients with STEMI with anterior location, HF, or ejection fraction less than or equal to 0.40, unless contraindicated. (*Level of Evidence: A*)

2. An angiotensin receptor blocker should be given to patients with STEMI who have indications for but are intolerant of angiotensin-converting enzyme inhibitors. (*Level of Evidence: B*)

3. An aldosterone antagonist should be given to patients with STEMI and no contraindications who are already receiving an angiotensin-converting enzyme inhibitor and beta blocker and who have an ejection fraction less than or equal to 0.40 and either symptomatic HF or diabetes mellitus. (*Level of Evidence: B*)

Class IIa

1. Angiotensin-converting enzyme inhibitors are reasonable for all patients with STEMI and no contraindications to their use. (*Level of Evidence: A*)

6.3 Lipid Management

Class I

1. High-intensity statin therapy should be initiated or continued in all patients with STEMI and no contraindications to its use. (*Level of Evidence: B*)

Class IIa

1. It is reasonable to obtain a fasting lipid profile in patients with STEMI, preferably within 24 hours of presentation. (*Level of Evidence: C*)

Risk factors for cardiogenic shock (the greater the number of risk factors present, the higher the risk of developing cardiogenic shock) are age >70 years, systolic blood pressure <120 mmHg, sinus tachycardia >110 bpm or heart rate <60 bpm, and increased time since onset of symptoms of STEMI.

7. Complications After Stemi: Recommendations

7.1 Treatment of Cardiogenic Shock

Class I

1. Emergency revascularization with either PCI or CABG is recommended in suitable patients with cardiogenic shock due to pump failure after STEMI irrespective of the time delay from MI onset. (*Level of Evidence: B*)
2. 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. (*Level of Evidence: B*)

Class IIa

1. The use of intra-aortic balloon pump counterpulsation can be useful for patients with cardiogenic shock after STEMI who do not quickly stabilize with pharmacological therapy. (*Level of Evidence: B*)

Class IIa

1. Alternative left ventricular (LV) assist devices for circulatory support may be considered in patients with refractory cardiogenic shock. (*Level of Evidence: C*)

7.2 Implantable Cardioverter-Defibrillator Therapy Before Discharge

Class I

1. Implantable cardioverter-defibrillator therapy is indicated before discharge in patients who develop sustained ventricular tachycardia/ventricular fibrillation more than 48 hours after STEMI, provided the arrhythmia is not due to transient or reversible ischemia, reinfarction, or metabolic abnormalities. (*Level of Evidence: B*)

7.3 Pacing in STEMI

Class I

1. Temporary pacing is indicated for symptomatic bradyarrhythmias unresponsive to medical treatment. (*Level of Evidence: C*)

7.4 Management of Pericarditis After STEMI

Class I

1. Aspirin is recommended for treatment of pericarditis after STEMI. (*Level of Evidence: B*)

Class IIa

1. Administration of acetaminophen, colchicine, or narcotic analgesics may be reasonable if aspirin, even in higher doses, is not effective. (*Level of Evidence: C*)

Class III: HARM

1. Glucocorticoids and nonsteroidal antiinflammatory drugs are potentially harmful for treatment of pericarditis after STEMI. (*Level of Evidence: B*)

7.5 Anticoagulation

Class I

1. Anticoagulant therapy with a vitamin K antagonist should be provided to patients with STEMI and atrial fibrillation with CHADS2# score greater than or equal to 2, mechanical heart valves, venous thromboembolism, or hypercoagulable disorder. (*Level of Evidence: C*)
2. The duration of triple-antithrombotic therapy with a vitamin K antagonist, aspirin, and a $P2Y_{12}$receptor inhibitor should be minimized to the extent possible to limit the risk of bleeding.** After

this initial treatment period, consider therapy with a vitamin K antagonist plus a single antiplatelet agent. For patients treated with fibrinolysis, consider triple therapy for 14 days, followed by a vitamin K antagonist plus a single antiplatelet agent. (*Level of Evidence: C*)

Class IIa

1. Anticoagulant therapy with a vitamin K antagonist is reasonable for patients with STEMI and asymptomatic LV mural thrombi. (*Level of Evidence: C*)

Class IIa

1. Anticoagulant therapy may be considered for patients with STEMI and anterior apical akinesis or dyskinesis. (*Level of Evidence: C*)
2. Targeting vitamin K antagonist therapy to a lower international normalized ratio (e.g., 2.0 to 2.5) might be considered in patients with STEMI who are receiving DAPT. (*Level of Evidence: C*)

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#CHADS2 (Congestive heart failure, Hypertension, Age ≥75 years, Diabetes mellitus, previous Stroke/transient ischemic attack [doubled risk weight]) score.

**Individual circumstances will vary and depend on the indications for triple therapy and the type of stent placed during PCI.

¶These recommendations apply to patients who receive intracoronary stents during PCI for STEMI. Among individuals with STEMI who do not receive an intracoronary stent, the duration of DAPT beyond 14 days has not been studied adequately for patients who undergo balloon angioplasty alone, are treated with fibrinolysis alone, or do not receive reperfusion therapy. In this subset of patients with STEMI who do not receive an intracoronary stent, the threshold for initiation of oral anticoagulation for secondary prevention, either alone or in combination with aspirin, may be lower, especially if a shorter duration (i.e., 14 days) of DAPT is planned (204).

8. Risk Assessment After Stemi: Recommendations

8.1 Use of Noninvasive Testing for Ischemia Before Discharge

Class I

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. (*Level of Evidence: B*)

Class IIa

1. Noninvasive testing for ischemia might be considered before discharge to evaluate the functional significance of a noninfarct artery stenosis previously identified at angiography. (*Level of Evidence: C*)
2. Noninvasive testing for ischemia might be considered before discharge to guide the postdischarge exercise prescription. (*Level of Evidence: C*)

8.2 Assessment of LV Function

Class I

1. LV ejection fraction should be measured in all patients with STEMI. (*Level of Evidence: C*)

8.3 Assessment of Risk for Sudden Cardiac Death

Class I

1. Patients with an initially reduced LV ejection fraction who are possible candidates for implantable cardioverter-defibrillator therapy should undergo reevaluation of LV ejection fraction 40 or more days after discharge.

9. Posthospitalization Plan of Care: Recommendations

Class I

1. Posthospital systems of care designed to prevent hospital readmissions should be used to facilitate the transition to effective, coordinated outpatient care for all patients with STEMI. (*Level of Evidence: B*)

2. Exercise-based cardiac rehabilitation/secondary prevention programs are recommended for patients with STEMI. (*Level of Evidence: B*)

3. A clear, detailed, and evidence-based plan of care that promotes medication adherence, timely follow-up with the healthcare team, appropriate dietary and physical activities, and compliance with interventions for secondary prevention should be provided to patients with STEMI. (*Level of Evidence: C*)

4. Encouragement and advice to stop smoking and to avoid secondhand smoke should be provided to patients with STEMI.