

Reason / Problem UpToDate UpToDate
ST Elevation Myocardial Infarction (STEMI)

ST Elevation Myocardial Infarction (STEMI) Order Set

Quality Indicators 

CMS EP CQM Quality Indicators:

Aspirin or another antithrombotic should be prescribed in patients with ischemic vascular disease

Complete lipid panel should be performed and LDL should be controlled to less than 100 mg/dL in patients with ischemic vascular disease

CMS/TJC NHIQM Quality Indicators:

ACE inhibitor or angiotensin receptor blocker should be prescribed for acute myocardial infarction with confirmed left ventricular systolic dysfunction at discharge

Aspirin should be prescribed at discharge

Aspirin should be prescribed within 24 hours before or after hospital arrival

Beta-blocker should be prescribed at discharge

Fibrinolytic therapy should be provided within 30 minutes of hospital arrival for acute myocardial infarction with ST-segment elevation or left bundle branch block (LBBB)

Primary percutaneous coronary intervention should be performed within 90 minutes of hospital arrival for acute myocardial infarction with ST-segment elevation or left bundle branch block (LBBB)

Statin medication should be prescribed at discharge

PQRS Quality Indicators:

ACE inhibitor or angiotensin receptor blocker should be prescribed for patients seen within a 12 month period with coronary artery disease who also have diabetes or LVEF less than 40%

Aspirin should be prescribed within 24 hours before or after emergency department arrival in patients with acute myocardial infarction

Beta-blocker should be prescribed with diagnosis of coronary artery disease and history of prior myocardial infarction or current or prior LVEF less than 40%

Patients with coronary artery disease should have an LDL Cholesterol less than 100 mg/dL or a documented plan of care, including at a minimum the prescription of a statin

Aspirin or clopidogrel should be prescribed for coronary artery disease

Admit / Transfer UpToDate UpToDate

- *Patients at high risk require an aggressive management strategy in addition to standard medical management. Direct prehospital transport or, less optimally, prompt interhospital transfer to a facility with revascularization capabilities is recommended for such patients. (UpToDate)*
- *High-risk features include advanced age, low blood pressure, tachycardia, heart failure (HF), and an anterior myocardial infarction (AMI). Specific scoring systems, such as the TIMI risk score, permit a fairly precise determination of the risk of in-hospital mortality. (UpToDate)*

Admit inpatient to Medicine as soon as possible

Transfer

Condition

Fair

Serious

Critical

Code Status:

Full code

Do not resuscitate

Activity

- *Activity level in-hospital is determined by clinical status; most uncomplicated patients will be able to ambulate when the risk of bleeding from the arterial puncture site is low. (UpToDate)*

Bed rest

Patient out of bed; encourage ambulation

Activities:

Cardiac chair

Up ad lib with assistance
Up to chair with assistance

Diet

Regular diet
Nothing by mouth
Sodium restricted diet, no added salt

Vital Signs

Monitor blood pressure with arm cuff and then continuously
Monitor heart rhythm and then continuously
Check vital signs

IV

Crystalloid:

Half-normal saline and

Lock IV:

Saline lock IV

Other Nursing

Assessments:

Complete adult pain assessment and then
Obtain weight every morning

Cardiac:

Continuous bedside cardiac monitoring
Continuous cardiac monitoring with telemetry

Circulatory:

Insert peripheral IV line, 20-gauge peripheral IV line, left antecubital vein
antiembolism stockings
Arterial line care per protocol
Insert arterial line
sequential compression device

Education:

Provide disease/medical condition education

Fluid Balance:

Intake and output and then

Respiratory:

- *UpToDate recommends supplemental oxygen for patients with an arterial saturation less than 90 percent, patients in respiratory distress, or those with other high risk features for hypoxemia. (UpToDate)*
- Maintain oxygen saturation between greater than or equal to 90% and
Monitor pulse oximetry

Bedside POC Testing:

- *For both stable and unstable patients with acute myocardial infarction with hyperglycemia, including patients with and without diabetes, UpToDate suggests an insulin based regimen to achieve and maintain blood glucose less than 180 mg/dL (10 mmol/L). (UpToDate)*

Blood glucose monitoring

Protocols:

- *UpToDate suggests cautious initiation of nicotine replacement during hospitalization for those patients with acute coronary syndrome (ACS) in whom the benefits appear to outweigh the risks. (UpToDate)*

Smoking cessation protocol  

Urinary:

Catheter care per protocol

Insert _____ and then _____

Therapies

- *Patients with symptoms suggestive of an acute myocardial infarction (MI) and having electrocardiographic evidence of an acute MI manifested by ST elevations (greater than 1 mm in two contiguous leads after nitroglycerin to rule out coronary vasospasm) that is considered to represent ischemia are candidates for reperfusion therapy with either primary percutaneous coronary intervention or fibrinolytic therapy. Patients with typical symptoms in the presence of a new or presumably new left bundle branch block or a true posterior MI are also considered eligible. (UpToDate)*
- *For patients who are transported to or arrive at a percutaneous coronary intervention (PCI)-capable hospital, UpToDate recommends primary PCI, rather than fibrinolysis, as long as it can be performed with a door-to-balloon time 90 minutes or less (Grade 1A). (UpToDate)*
- *For patients who are transported to or arrive at a hospital not capable of immediate percutaneous coronary intervention (PCI), UpToDate recommends immediate transfer to a PCI capable hospital for primary PCI rather than fibrinolysis at the first hospital, as long as it can be performed with a first medical contact to PCI time of less than 120 minutes (Grade 1A). (UpToDate)*
- *For patients who present between 12 and 36 hours after symptom onset and have severe heart failure (HF), hemodynamic or electrical instability, or persistent ischemic symptoms, UpToDate recommends primary PCI (Grade 1B). (UpToDate)*

Procedures:

Coronary angiography

Percutaneous coronary intervention to be performed by cardiology

Pulmonary arterial catheter

Respiratory Therapy Service:

oxygen

Medications

Fibrinolytic Agents:

- *The 2013 American College of Cardiology Foundation/American Heart Association guideline for the management of STEMI recommends the use of fibrinolytic therapy in patients with symptom onset within 12 hours who cannot receive primary percutaneous coronary intervention within 120 minutes of first medical contact. The time interval from hospital arrival to initiation of fibrinolytic drug infusion should be less than 30 minutes. (UpToDate)*
- *The time interval from hospital arrival to initiation of fibrinolytic drug infusion should be less than 30 minutes. (UpToDate)*

Alteplase 15 mg via intravenous bolus Step 1 - weight less than or equal to 67 kg.

Alteplase 0.75 mg/kg intravenously single dose Step 2 - weight less than or equal to 67 kg; Infusion following bolus.

Alteplase 0.5 mg/kg intravenously single dose Step 3 - weight less than or equal to 67 kg; second Infusion.

Alteplase 15 mg via intravenous bolus Step 1 - weight greater than 67 kg.

Alteplase 50 mg intravenously single dose Step 2 - weight greater than 67 kg; Infusion following bolus.

Alteplase 35 mg intravenously single dose Step 3 - weight greater than 67kg.

Retepase 10 units intravenously every 30 minutes for 2 doses (not to exceed 20 units)

Tenecteplase 30 mg intravenously single dose Weight less than 60 kg; with heparin.

Tenecteplase 35 mg intravenously single dose Weight 60-69kg; with heparin.

Tenecteplase 40 mg intravenously single dose Weight 70-79kg; with heparin.

Tenecteplase 45 mg intravenously single dose Weight 80-89kg; with heparin.

Tenecteplase 50 mg intravenously single dose Weight greater than or equal to 90; with heparin.

Anticoagulants:

- All patients with ST-elevation myocardial infarction (STEMI) should receive anticoagulation. (UpToDate)
- The choice of anticoagulant agent depends upon the treatment strategy for each patient. (UpToDate)
- For patients undergoing percutaneous coronary intervention (PCI), anticoagulant therapy is stopped at the end of the procedure in uncomplicated cases. (UpToDate)
- For patients receiving fibrinolytic therapy or no reperfusion therapy, anticoagulant therapy is continued for at least two days; if low molecular weight heparins (LMWH) or fondaparinux are used, therapy should be continued, preferably for up to eight days or until hospital discharge, whichever occurs earlier. (UpToDate)

Enoxaparin sodium 30 mg intravenously single dose *Step 1 - with fibrinolysis, less than 75 years, creatinine less than 2.5 mg/dL in men and less than 2.0 mg/dL in women.*

Enoxaparin sodium 1 mg/kg subcutaneously every 12 hours *Step 2 - with fibrinolysis, less than 75 years, creatinine less than 2.5 mg/dL in men and less than 2.0 mg/dL in women.*

Enoxaparin sodium 0.75 mg/kg subcutaneously every 12 hours *With fibrinolysis, greater than or equal to 75 years: give no loading dose, subq only.*

Enoxaparin sodium 1 mg/kg subcutaneously every 24 hours *With fibrinolysis, creatinine clearance less than 30 mL/min: give no loading dose, subq only every 24 hrs.*

Enoxaparin sodium 1 mg/kg subcutaneously every 12 hours *Not reperfused: give no loading dose, subq every 12 hours.*

Heparin sodium 60 units/kg via intravenous bolus (not to exceed 4,000 units per dose)

Heparin sodium at 12 units/kg/hour via intravenous continuous infusion until desired activated partial thromboplastin time (aPTT) is attained (not to exceed 1,000 units/hour)

Fondaparinux sodium 2.5 mg intravenously single dose *Step 1 - do not use fondaparinux if creatinine clearance less than 30 mL/min.*

Fondaparinux sodium 2.5 mg subcutaneously 1 time per day *Step 2 - Maintenance dosing.*

Bivalirudin 0.75 mg/kg via intravenous bolus

Bivalirudin at 1.75 mg/kg/hour via intravenous continuous infusion

Antiplatelet Agents: UpToDate

- UpToDate recommends aspirin plus a platelet P2Y12 receptor blocker as soon as possible after presentation (Grade 1A). The first aspirin tablet should contain 162 to 325 mg and be chewed. The suggested maintenance dose of aspirin is 75 to 162 mg/day, unless ticagrelor is used, in which case the aspirin dose should be 75 to 100 mg/day. (UpToDate)
- For patients 75 years of age or older, clopidogrel 75 mg should be given as a loading dose. (UpToDate)

Aspirin chewable tablet 162 mg orally single dose

Aspirin chewable tablet 324 mg orally single dose

Aspirin 81 mg orally 1 time per day

Clopidogrel bisulfate 300 mg orally single dose *Loading dose.*

Clopidogrel bisulfate 600 mg orally single dose *Loading dose.*

Clopidogrel bisulfate 75 mg orally 1 time per day

Prasugrel 60 mg orally single dose *Loading dose.*

Prasugrel 10 mg orally 1 time per day

Ticagrelor 180 mg orally single dose *Loading dose.*

Ticagrelor 90 mg orally 2 times per day

Beta-Adrenergic Blockers: UpToDate

- For all patients who have sustained an acute myocardial infarction (MI), UpToDate recommends treatment with oral beta blockers (Grade 1A). (UpToDate)
- For all patients with acute myocardial infarction (MI), UpToDate recommends initiation of oral beta blockers within the first 24 hours, as long as no contraindications are present (Grade 1B). (UpToDate)
- Patients who do not receive a beta blocker during the first 24 hours because of early contraindications should be reevaluated for beta blocker candidacy for subsequent therapy. (UpToDate)
- The optimal duration of beta blocker therapy is not known. UpToDate suggests treating most patients for a minimum of three years. In high risk patients, such as those who present with cardiogenic shock, heart failure, or chronic kidney disease, UpToDate suggests treating for longer than three years. (UpToDate)

Atenolol 25 mg orally 2 times per day

Metoprolol tartrate 25 mg orally 4 times per day for 48 hours *Step 1.*

Metoprolol tartrate 100 mg orally 2 times per day *Step 2 - Maintenance dosing.*

Glycoprotein IIb/IIIa Inhibitors:

- For patients not at high risk of bleeding in whom heparin is chosen as the anticoagulant and who receive a P2Y12 receptor blocker prior to PCI, UpToDate suggests the addition of a GP IIb/IIIa inhibitor, as opposed to not adding this antiplatelet agent, after diagnostic angiography (Grade 2C). For those patients at high risk of bleeding who are treated with heparin, the risks and benefits of adding a GP IIb/IIIa inhibitor will need to be weighed. (UpToDate)
- For patients who receive bivalirudin, UpToDate suggests not routinely adding GP IIb/IIIa inhibitor therapy (Grade 2B). (UpToDate)
- The duration of therapy depends on the agent selected, and is 12 hours for abciximab and 18 to 24 hours for eptifibatide or tirofiban. (UpToDate)

Abciximab 0.25 mg/kg via intravenous bolus 30 minutes before intervention *Step 1*.

Abciximab at 0.125 mcg/kg/minute via intravenous continuous infusion over 12 hours (not to exceed 10 mcg/minute) *Step 2 - Maintenance dosing*.

Eptifibatide 180 mcg/kg via intravenous bolus every 10 minutes for 2 doses (not to exceed 22.6 mg per dose) *Step 1 - if performing PCI, give a 2nd bolus in 10 minutes*.

Eptifibatide at 2 mcg/kg/minute via intravenous continuous infusion *Step 2 - Maintenance dosing*.

Eptifibatide at 1 mcg/kg/minute via intravenous continuous infusion (not to exceed 250 mcg/minute) *Step 2 - if creatinine clearance less than 50 mL/min or serum creatinine greater than 2 mg/dL*.

Tirofiban HCl at 0.4 mcg/kg/minute via intravenous continuous infusion for 30 minutes *Initial dose*.

Tirofiban HCl at 0.1 mcg/kg/minute via intravenous continuous infusion *Step 2 - Maintenance dosing*.

Tirofiban HCl at 0.2 mcg/kg/minute via intravenous continuous infusion for 30 minutes *Initial dose - creatinine clearance less than 30 mL/min*.

Tirofiban HCl at 0.05 mcg/kg/minute via intravenous continuous infusion *Step 2 - creatinine clearance less than 30 mL/min*.

Nitrates:

- Avoid nitrates in patients with systolic blood pressure less than 90 mmHg or greater than or equal to 30 mmHg below baseline, marked bradycardia or tachycardia, known or suspected right ventricular infarction, phosphodiesterase inhibitor use within the last 24 to 48 hours, hypertrophic cardiomyopathy, or severe aortic stenosis. (UpToDate)
- In view of their marginal treatment benefits, nitrates should not be used in preference to beta blockers or morphine for the management of refractory chest pain. In addition, the chronic administration of nitroglycerin should not preclude therapy with beta blockers and angiotensin converting enzyme inhibitors. (UpToDate)

Nitroglycerin sublingual tablet 0.4 mg sublingually every 5 minutes as needed for angina (not to exceed 3 doses in 15 minutes)

Isosorbide dinitrate 10 mg orally 3 times per day

Isosorbide mononitrate extended release 24-hour tablet 30 mg orally 1 time per day

Nitroglycerin 0.2 mg/hour 24-hour patch 1 patch via the transdermal route 1 time per day for 12 to 14 hours

Opioid Analgesics:

morphine sulfate 2 mg intravenously every 5 minutes as needed for pain (not to exceed 10 mg per hour) *May be given for the relief of chest pain or anxiety. (UpToDate)*

ACE Inhibitors:

- The 2013 American College of Cardiology Foundation/American Heart Association guideline for the management of STEMI gave a strong recommendation for chronic therapy with an angiotensin converting enzyme (ACE) inhibitor (unless contraindicated) for patients with STEMI with anterior location, heart failure, or left ventricular ejection fraction less than or equal to 40 percent. A weak recommendation for ACE inhibitor was made for all patients with STEMI. (UpToDate)

Captopril 6.25 mg orally single dose

Captopril 12.5 mg orally 3 times per day

Enalapril maleate 2.5 mg orally 1 time per day

Lisinopril 2.5 mg orally 1 time per day

Angiotensin II Receptor Blockers:

- Angiotensin receptor blockers (ARBs) are recommended in patients who are intolerant of angiotensin converting enzyme (ACE) inhibitors and have clinical or radiologic signs of heart failure, a left ventricular ejection fraction (LVEF) less than or equal to 40 percent, or hypertension. (UpToDate)

Candesartan cilexetil 4 mg orally 1 time per day

Eprosartan mesylate 600 mg orally 1 time per day

Irbesartan 150 mg orally 1 time per day

Losartan potassium 50 mg orally 1 time per day

Olmesartan medoxomil 20 mg orally 1 time per day

Telmisartan 40 mg orally 1 time per day

Valsartan 40 mg orally 2 times per day

Antihyperlipidemics: UpToDate

- *Intensive statin therapy should be initiated as early as possible in all patients with ST-elevation myocardial infarction. UpToDate recommends therapy with atorvastatin 80 mg/day. Among patients who were previously treated with a different statin regimen, UpToDate suggests switching to atorvastatin 80 mg/day. (UpToDate)*

Atorvastatin calcium 80 mg orally 1 time per day

Aldosterone Antagonists: UpToDate

- *The 2013 American College of Cardiology Foundation/American Heart Association guideline for the management of STEMI gave a strong recommendation for chronic therapy with an aldosterone antagonist (unless contraindicated) for patients with STEMI who are receiving an angiotensin converting enzyme inhibitor and a beta blocker and who have a left ventricular ejection fraction less than or equal to 40 percent and either heart failure or diabetes. (UpToDate)*
- *The serum potassium should be monitored closely during treatment. (UpToDate)*

Spirololactone 25 mg orally 1 time per day

Calcium Channel Blockers: UpToDate

- *Calcium channel blockers primarily serve as adjunctive therapy in patients with ongoing or recurrent symptoms of ischemia despite optimal therapy with beta blockers (with or without nitrates), in patients who are unable to tolerate adequate doses of one or both of these agents, or in patients with rapid atrial fibrillation when beta blockers are contraindicated. (UpToDate) (UpToDate)*
- *No calcium channel blocker has been shown to reduce mortality in acute ST segment elevation myocardial infarction (STEMI), and in certain patients they may be harmful, such as those with evidence of heart failure (HF), left ventricular dysfunction, or atrioventricular block. (UpToDate)*

Diltiazem HCl 30 mg orally 4 times per day

Diltiazem HCl extended release 24-hour capsule (equivalent to Cardizem CD) 120 mg orally 1 time per day

Verapamil HCl 80 mg orally 3 times per day

Verapamil HCl extended release 24-hour capsule (equivalent to Verelan) 240 mg orally 1 time per day

Vaccines:

- *UpToDate recommends influenza and pneumococcal vaccination as part of a comprehensive secondary prevention program in adults with coronary and other atherosclerotic vascular diseases. If indicated, UpToDate suggests vaccination for these during hospitalization for an acute coronary syndrome. (UpToDate)*

Influenza virus vaccine with thimerosal (equivalent to FluLaval) 0.5 mL intramuscularly single dose

Pneumococcal polysaccharide vaccine 0.5 mL intramuscularly single dose

Laboratory

Cardiac Markers:

Troponin-I (serum) STAT and then every 6 hours for 12 hours

Troponin-T (serum) STAT and then every 6 hours for 12 hours

Creatine kinase-MB (serum) STAT and then every 6 hours for 12 hours

Chemistry:

Arterial blood gas (arterial blood)

Comprehensive metabolic panel (serum)

Lipid with total cholesterol: HDL ratio (serum)

Magnesium (serum)

Hematology:

CBC with platelets and differential (blood)

Coagulation:

Partial thromboplastin time (plasma)

Prothrombin time/international normalized ratio (plasma)

Diabetes:

Hemoglobin A1c (blood)

Toxicology:

Drugs of abuse, qualitative (urine)

Imaging

X-Ray:

Portable inspiration AP (upright) X-ray of the chest today

Routine inspiration PA/lateral X-ray of the chest today

Computed Tomography Angiography:

Coronary artery CTA scan today

Magnetic Resonance:

- *One possible indication for cardiac magnetic resonance (CMR) would be to determine the source of myocardial damage in a patient with elevated troponin levels but without obstructive coronary disease at invasive coronary angiography. (UpToDate)*

Myocardial perfusion rest MRI with IV contrast today

Nuclear Medicine:

Planar radionuclide gated cardiac blood pool (MUGA) scan, single study today

SPECT myocardial perfusion exercise stress scan today

SPECT resting myocardial perfusion scan today

Ultrasound:

Intravascular ultrasound of the _____ today

Other Tests UpToDate® UpToDate®**Cardiovascular Testing:**

12-lead ECG STAT

12-lead serial ECG STAT and then every 5 to 10 minutes

Right-sided leads ECG today

12-lead ECG with ST segment monitoring beginning today

Transesophageal echocardiogram STAT

Transthoracic echocardiogram

Consultations

Anticoagulation Clinic consultation today

Cardiac Rehabilitation consultation today

Cardiology consultation today

Cardiothoracic Surgery consultation today

Diabetic nurse specialist consultation today

Dietitian consultation today

Home Care Nursing consultation today

Occupational Therapy consultation today

Physical Therapy consultation today

Social Services consultation today
