General

Guideline Title

ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation.

Bibliographic Source(s)


Guideline Status

This is the current release of the guideline.


Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- August 31, 2016 – Opioid pain and cough medicines combined with benzodiazepines: A U.S. Food and Drug Administration (FDA) review has found that the growing combined used of opioid medicines with benzodiazepines or other drugs that depress the central nervous system (CNS) has resulted in serious side effects, including slowed or difficult breathing and deaths. FDA is adding Boxed Warnings to the drug labeling of prescription opioid pain and prescription opioid cough medicines and benzodiazepines.

Recommendations

Major Recommendations
MAJOR RECOMMENDATIONS

The class of recommendations (I-III) and levels of evidence (A-C) are defined at the end of the "Major Recommendations" field.

Emergency Care

Initial Diagnosis

Recommendations for Initial Diagnosis

A 12-lead electrocardiogram (ECG) must be obtained as soon as possible at the point of first medical contact (FMC), with a target delay of ≤10 min. (Class of recommendation I, level of evidence B) (Diercks et al., 2006; Rokos et al., 2009)

ECG monitoring must be initiated as soon as possible in all patients with suspected ST-segment elevation myocardial infarction (STEMI). (Class of recommendation I, level of evidence B) (O’Doherty et al., 1983; Mehta et al., 2009)

Blood sampling for serum markers is recommended routinely in the acute phase but one should not wait for the results before initiating reperfusion treatment. (Class of recommendation I, level of evidence C)

The use of additional posterior chest wall leads (V7–V9 ≥0.05 mV) in patients with high suspicion of inferobasal myocardial infarction (circumflex occlusion) should be considered. (Class of recommendation IIa, level of evidence C)

Echocardiography may assist in making the diagnosis in uncertain cases but should not delay transfer for angiography. (Class of recommendation IIb, level of evidence C)

Relief of Pain, Breathlessness and Anxiety

Recommendations for Relief of Pain, Breathlessness and Anxiety

Titrated intravenous (i.v.) opioids are indicated to relieve pain. (Class of recommendation I, level of evidence C)

Oxygen is indicated in patients with hypoxia (saturated oxygen [\(\text{SaO}_2\] <95%), breathlessness, or acute heart failure. (Class of recommendation I, level of evidence C)

Tranquillizer may be considered in very anxious patients. (Class of recommendation IIa, level of evidence C)

Cardiac Arrest

Recommendations for Cardiac Arrest

All medical and paramedical personnel caring for a patient with suspected myocardial infarction must have access to defibrillation equipment and be trained in cardiac life support. (Class of recommendation I, level of evidence C)

It is recommended to initiate ECG monitoring at the point of FMC in all patients with suspected myocardial infarction. (Class of recommendation I, level of evidence C)

Therapeutic hypothermia is indicated early after resuscitation of cardiac arrest patients who are comatose or in deep sedation. (Class of recommendation I, level of evidence B) (Bernard et al., 2002; Hypothermia after Cardiac Arrest Study Group, 2002; Belliard et al., 2007)

Immediate angiography with a view to primary percutaneous coronary intervention (PCI) is recommended in patients with resuscitated cardiac arrest whose ECG shows STEMI. (Class of recommendation I, level of evidence B) (Spaulding et al., 1997; Kern & Rahman, 2010; Garot et al., 2007)

Immediate angiography with a view to primary PCI should be considered in survivors of cardiac arrest without diagnostic ECG ST-segment elevation but with a high suspicion of ongoing infarction. (Class of recommendation IIa, level of evidence B) (Spaulding et al., 1997; Garot et al., 2007)

Pre-hospital Logistics of Care

Recommendations for Logistics of Pre-hospital Care

Ambulance teams must be trained and equipped to identify STEMI (with use of ECG recorders and telemetry as necessary) and administer initial therapy, including thrombolysis where applicable. (Class of recommendation I, level of evidence B) (Welsh et al., 2005)
The prehospital management of STEMI patients must be based on regional networks designed to deliver reperfusion therapy expeditiously and effectively, with efforts made to make primary PCI available to as many patients as possible. (Class of recommendation I, level of evidence B) (Kalla et al., 2006)

Primary PCI-capable centres must deliver a 24/7 service and be able to start primary PCI as soon as possible but always within 60 min from the initial call. (Class of recommendation I, level of evidence B) (Widimsky et al., 2010; Knot et al., 2009; Nallamothu et al., 2007)

All hospitals and emergency medical systems (EMSs) participating in the care of patients with STEMI must record and monitor delay times and work to achieve and maintain the following quality targets:

- FMC to first ECG ≤10 min
- FMC to reperfusion therapy
- For fibrinolysis ≤30 min
- For primary PCI ≤90 min (≤60 min if the patient presents within 120 min of symptom onset or directly to a PCI-capable hospital)

(Class of recommendation I, level of evidence B) (Rathore et al., 2009; Nieset et al., 2011)

All EMSs, emergency departments, and coronary care units must have a written updated STEMI management protocol, preferably shared within geographic networks. (Class of recommendation I, level of evidence C)

Patients presenting to a non-PCI-capable hospital and awaiting transportation for primary or rescue PCI must be attended in an appropriately monitored area. (Class of recommendation I, level of evidence C)

Patients transferred to a PCI-capable centre for primary PCI should bypass the emergency department and be transferred directly to the catheterization laboratory. (Class of recommendation IIa, level of evidence B) (Pinto et al., 2006; Bradley et al., 2006; Steg et al., 2006)

Reperfusion Therapy

Recommendations for Reperfusion Therapy

Reperfusion therapy is indicated in all patients with symptoms of <12 h duration and persistent ST-segment elevation or (presumed) new left bundle branch block (LBBB). (Class of recommendation I, level of evidence A) (Boersma et al., 1996; Boersma & Primary Coronary Angioplasty vs. Thrombolysis Group, 2006)

Reperfusion therapy (preferably primary PCI) is indicated if there is evidence of ongoing ischaemia, even if symptoms may have started >12 h beforehand or if pain and ECG changes have been stuttering. (Class of recommendation I, level of evidence C) (Gierlotka et al., 2011)

Reperfusion therapy with primary PCI may be considered in stable patients presenting 12 to 24 h after symptom onset. (Class of recommendation IIb, level of evidence B) (Schomig et al., 2005; Ndrepepa et al., 2009)

Routine PCI of a totally occluded artery >24 h after symptom onset in stable patients without signs of ischaemia (regardless of whether fibrinolysis was given or not) is not recommended. (Class of recommendation III, level of evidence A) (Hochman et al., 2006; Ioannidis & Katritsis, 2007; Menon et al., 2009)

Primary PCI: Indications and Procedural Aspects

Indications for Primary PCI

Primary PCI is the recommended reperfusion therapy over fibrinolysis if performed by an experienced team within 120 min of FMC. (Class of recommendation I, level of evidence A) (Keeley, Boura, & Grines, 2003; Cucherat, Bonnefoy, & Tremeau, 2003)

Primary PCI is indicated for patients with severe acute heart failure or cardiogenic shock, unless the expected PCI related delay is excessive and the patient presents early after symptom onset. (Class of recommendation I, level of evidence B) (Hochman et al., 1999)

Procedural Aspects of Primary PCI

Stenting is recommended (over balloon angioplasty alone) for primary PCI. (Class of recommendation I, level of evidence A) (Nordmenn et al., 2004; Stone et al., 1999)

Primary PCI should be limited to the culprit vessel with the exception of cardiogenic shock and persistent ischaemia after PCI of the supposed culprit lesion. (Class of recommendation IIa, level of evidence B) (Widimsky & Holmes, 2011; Hannan et al., 2010; Torni et al., 2010; Vlaar et al., 2011)
If performed by an experienced radial operator, radial access should be preferred over femoral access. (Class of recommendation IIa, level of evidence B) (Jolly et al., 2011; Romagnoli et al., 2012)

If the patient has no contraindications to prolonged dual antiplatelet therapy (DAPT) (indication for oral anticoagulation, or estimated high long-term bleeding risk) and is likely to be compliant, drug-eluting stent (DES) should be preferred over bare-metal stent (BMS). (Class of recommendation IIa, level of evidence A) (Kastrati et al., 2007; Stone et al., 2011; Wijnbergen et al., 2012; De Luca et al., 2012)

Routine thrombus aspiration should be considered. (Class of recommendation IIa, level of evidence B) (Svilaas et al., 2008; Vlaar et al., 2008; Burzotta et al., 2009)

Routine use of distal protection devices is not recommended. (Class of recommendation III, level of evidence C) (Bavry, Kumbhani, & Bhatt, 2008; Kelbaek et al., 2008)

Routine use of intra-aortic balloon pump (IABP) (in patients without shock) is not recommended. (Class of recommendation III, level of evidence A) (Patel et al., 2011; Sjauw et al., 2009)

Periprocedural Antithrombotic Medication in Primary Percutaneous Coronary Intervention

**Antiplatelet Therapy**

Aspirin oral or i.v. (if unable to swallow) is recommended. (Class of recommendation I, level of evidence B) ("Randomised trial,"1988; Patrono et al., 2011)

An adenosine diphosphate (ADP)-receptor blocker is recommended in addition to aspirin. Options are (Class of recommendation I, level of evidence A) (Leon et al., 1998; Schomig et al., 1996):

- *Prasugrel* in clopidogrel-naive patients, if no history of prior stroke/transient ischaemic attack (TIA), age <75 years (Class of recommendation I, level of evidence B) (Wiviott et al., 2007)
- *Ticagrelor* (Class of recommendation I, level of evidence B) (Wallentin et al., 2009)
- *Clopidogrel*, preferably when prasugrel or ticagrelor are either not available or contraindicated (Class of recommendation I, level of evidence C)

Glycoprotein (GP) IIb/IIIa inhibitors should be considered for bailout therapy if there is angiographic evidence of massive thrombus, slow or no-reflow or a thrombotic complication. (Class of recommendation IIa, level of evidence C)

Routine use of a GP IIb/IIIa inhibitor as an adjunct to primary PCI performed with unfractionated heparin may be considered in patients without contraindications. (Class of recommendation IIb, level of evidence B) (De Luca et al., 2005; Zeymer et al., 2010; Akerblom et al., 2010; Van ‘t Hof et al., 2008; Valgimigli et al., "Tirofiban," 2010)

Upstream use of a GP IIb/IIIa inhibitor (vs. in-lab use) may be considered in high-risk patients undergoing transfer for primary PCI. (Class of recommendation IIb, level of evidence B) (Ellis et al., 2008; Herrmann et al., 2009; De Luca et al., 2005; De Luca et al., 2011)

Options for GP IIb/IIIa inhibitors are (with level of evidence [LoE] for each agent):

- *Abciximab* (Level of evidence A) (De Luca et al., 2005)
- *Eptifibatide* (with double bolus) (Level of evidence B) (Zeymer et al., 2010; Akerblom et al., 2010)
- *Tirofiban* (with a high bolus dose) (Level of evidence B) (Van’t Hof et al., 2008; Valgimigli et al., "Tirofiban," 2010)

**Anticoagulants**

An injectable anticoagulant must be used in primary PCI. (Class of recommendation I, level of evidence C)

Bivalirudin (with use of GP IIb/IIIa blocker restricted to bailout) is recommended over unfractionated heparin and a GP IIb/IIIa blocker. (Class of recommendation I, level of evidence B) (Stone et al., 2008)

Enoxaparin (with or without routine GP IIb/IIIa blocker) may be preferred over unfractionated heparin. (Class of recommendation IIb, level of evidence B) (Montalescot et al., 2011)

Unfractionated heparin with or without routine GP IIb/IIIa blocker must be used in patients not receiving bivalirudin or enoxaparin. (Class of recommendation I, level of evidence C) (Van de Werf et al., 2008)
Fondaparinux is not recommended for primary PCI. (Class of recommendation III, level of evidence B) (Yusuf et al., 2006)

The use of fibrinolysis before planned primary PCI is not recommended. (Class of recommendation III, level of evidence A) (Ellis et al., 2008; Assessment of the Safety and Efficacy of a New Treatment Strategy with Percutaneous Coronary Intervention [ASSENT-4 PCI] Investigators, 2006)

**Fibrinolytic Therapy**

Fibrinolytic therapy is recommended within 12 h of symptom onset in patients without contraindications if primary PCI cannot be performed by an experienced team within 120 min of FMC. (Class of recommendation I, level of evidence A) (Van de Werf et al., 2008; Pinto et al., 2006)

In patients presenting early (<2 h after symptom onset) with a large infarct and low bleeding risk, fibrinolysis should be considered if time from FMC to balloon inflation is >90 min. (Class of recommendation IIa, level of evidence B) (Steg et al., 2003; Pinto et al., 2006; Bonnefoy et al., 2002)

If possible, fibrinolysis should start in the prehospital setting. (Class of recommendation IIa, level of evidence A) (Morrison et al., 2000; Bonnefoy et al., 2002; Bjorklund et al., 2006)


Oral or i.v. aspirin must be administered. (Class of recommendation I, level of evidence B) ("Randomised trial," 1988)

Clopidogrel is indicated in addition to aspirin. (Class of recommendation I, level of evidence A) (Chen et al., "Addition of clopidogrel," 2005; Sabatine et al., 2005)

**Antithrombin Co-therapy with Fibrinolysis**

Anticoagulation is recommended in STEMI patients treated with lytics until revascularization (if performed) or for the duration of hospital stay up to 8 days. The anticoagulant can be (Class of recommendation I, level of evidence A) (Yusuf et al., 2006; "An international randomized trial," 1993; Assessment of the Safety and Efficacy of a New Thrombolytic Regimen [ASSENT]-3 Investigators, 2001; Wallentin et al., 2003; Giraldez et al., 2007; White et al., 2007; Ross et al., 2001; Antman et al., 2002; Peters et al., 2008):

- Enoxaparin i.v. followed by subcutaneous (s.c.) (using the regimen described below) (preferred over unfractionated heparin [UFH]) (Class of recommendation I, level of evidence A) (Assessment of the Safety and Efficacy of a New Thrombolytic Regimen [ASSENT]-3 Investigators, 2001; Wallentin et al., 2003; Giraldez et al., 2007; White et al., 2007; Ross et al., 2001; Antman et al., 2002)
- UFH given as a weight-adjusted i.v. bolus and infusion (Class of recommendation I, level of evidence C) ("An international randomized trial," 1993)

In patients treated with streptokinase, fondaparinux i.v. bolus followed by s.c. dose 24 h later. (Class of recommendation IIa, level of evidence B) (Yusuf et al., 2006; Peters et al., 2008)

**Transfer to a PCI-capable Centre Following Fibrinolysis**

Is indicated in all patients after fibrinolysis. (Class of recommendation I, level of evidence A) (Gershlick et al., 2005; Ellis et al., 1994; Hochman et al., 2001; Cantor et al., 2009; Di Mario et al., 2008; Bohmer et al., 2010; Fernandez-Aviles et al., 2004)

**Interventions Following Fibrinolysis**

Rescue PCI is indicated immediately when fibrinolysis has failed (<50% ST-segment resolution at 60 min). (Class of recommendation I, level of evidence A) (Gershlick et al., 2005; Ellis et al., 1994)

Emergency PCI is indicated in the case of recurrent ischaemia or evidence of reocclusion after initial successful fibrinolysis. (Class of recommendation I, level of evidence B) (Gershlick et al., 2005)

Emergency angiography with a view to revascularization is indicated in heart failure/shock patients. (Class of recommendation I, level of evidence A) (Hochman et al., 2001)

Angiography with a view to revascularization (of the infarct-related artery) is indicated after successful fibrinolysis. (Class of recommendation I, level of evidence A) (Cantor et al., 2009; Di Mario et al., 2008; Bohmer et al., 2010; Fernandez-Aviles et al., 2004)

Optimal timing of angiography for stable patients after successful lysis: 3–24 h. (Class of recommendation IIa, level of evidence A) (Borgia et al,
Both genders must be managed in a similar fashion. (Class of recommendation I, level of evidence C)

A high index of suspicion for myocardial infarction must be maintained in women, diabetics, and elderly patients with atypical symptoms. (Class of recommendation I, level of evidence B) (Brieger et al., 2009)

Special attention must be given to proper dosing of antithrombotics in elderly and renal failure patients. (Class of recommendation I, level of evidence B) (Alexander et al., 2005)

**Management of Hyperglycaemia in ST-segment Elevation Myocardial Infarction**

Measurement of glycaemia is indicated at initial evaluation in all patients, and should be repeated in patients with known diabetes or hyperglycaemia. (Class of recommendation I, level of evidence C)

Plans for optimal outpatient glucose control and secondary prevention must be determined in patients with diabetes before discharge. (Class of recommendation I, level of evidence C)

The goals of glucose control in the acute phase should be to maintain glucose concentrations ≤11.0 mmol/L (200 mg/dL) while avoiding fall of glycaemia <5 mmol/L (<90 mg/dL). In some patients, this may require a dose-adjusted insulin infusion with monitoring of glucose, as long as hypoglycaemia is avoided. (Class of recommendation IIa, level of evidence B) (De Caterina et al., 2010; NICE-SUGAR Study Investigators et al., 2009; Kosiborod & McGuire, 2010)

A measurement of fasting glucose and haemoglobin Alc (HbA1c) and, in some cases, a post-discharge oral glucose tolerance test should be considered in patients with hyperglycaemia but without a history of diabetes. (Class of recommendation IIa, level of evidence B) (Bartnik et al., 2004)

Routine glucose-insulin-potassium infusion is not indicated. (Class of recommendation III, level of evidence A) (Yusuf et al., 2006; Diaz et al., 2007)

**Management during Hospitalization and at Discharge**

**Coronary Care Unit Logistics and Monitoring**

**Logistical Issues for Hospital Stay**

All hospitals participating in the care of STEMI patients should have a coronary care unit equipped to provide all aspects of care for STEMI patients, including treatment of ischaemia, severe heart failure, arrhythmias and common comorbidities. (Class of recommendation I, level of evidence C)

**Length of Stay in the Coronary Care Unit**

Patients undergoing uncomplicated successful reperfusion therapy should be kept in the coronary care unit for a minimum of 24 h, after which they may be moved to a step-down monitored bed for another 24–48 h. (Class of recommendation I, level of evidence C)

**Transfer Back to a Referring Non-PCI Hospital**

Early transfer (same day) may be considered in selected, low-risk patients after successful primary PCI without observed arrhythmia. (Class of recommendation IIb, level of evidence C)

**Hospital Discharge**

Early discharge (after approximately 72 h) is reasonable in selected low-risk patients, if early rehabilitation and adequate follow-up are arranged. (Class of recommendation IIb, level of evidence B) (Grines et al., 1998; Newby et al., 2003; Kotowycz et al., 2010)

**Risk Assessment and Imaging**

**Summary of Indications for Imaging and Stress Testing**

**At Presentation**
In the acute phase, when diagnosis is uncertain, emergency echocardiography may be useful. However, if inconclusive or unavailable and persistent doubt, emergency angiography should be considered. (Class of recommendation I, level of evidence C)

**After the Acute Phase**

All patients should have an echocardiogram for assessment of infarct size and resting left ventricular (LV) function. (Class of recommendation I, level of evidence B) (Allman et al., 2002; St John Sutton et al., 1994)

If echocardiography is not feasible, magnetic resonance imaging (MRI) may be used as an alternative. (Class of recommendation IIb, level of evidence C)

**Before or after Discharge**

For patients with multivessel disease, or in whom revascularization of other vessels is considered, stress testing or imaging (e.g., using stress myocardial perfusion scintigraphy, stress echocardiography, positron emission tomography or MRI) for ischaemia and viability is indicated. (Class of recommendation I, level of evidence A) (Task Force on Myocardial Revascularization of the European Society of Cardiology [ESC] et al., 2010; Allman et al., 2002; Beanlands et al., 2007)

Computed tomography angiography has no role in the routine management of STEMI patients. (Class of recommendation III, level of evidence C)

**Long-term Therapies for ST-segment Elevation Myocardial Infarction**

**Routine Therapies in the Acute, Subacute and Long-term Phase of ST-segment Elevation Myocardial Infarction**

Active smokers with STEMI must receive counselling and be referred to a smoking cessation programme. (Class of recommendation I, level of evidence B) (Thomson & Rigotti, 2003)

Each hospital participating in the care of STEMI patients must have a smoking cessation protocol. (Class of recommendation I, level of evidence C)

Exercise-based rehabilitation is recommended. (Class of recommendation I, level of evidence B) (Lawler, Filion, & Eisenberg, 2011; Heran et al., 2011)

Antiplatelet therapy with low dose aspirin (75–100 mg) is indicated indefinitely after STEMI. (Class of recommendation I, level of evidence A) (Antithrombotic Trialists' [ATT] Collaboration et al., 2009)

In patients who are intolerant to aspirin, clopidogrel is indicated as an alternative to aspirin. (Class of recommendation I, level of evidence B) (CAPRIE Steering Committee, 1996)

DAPT with a combination of aspirin and prasugrel or aspirin and ticagrelor is recommended (over aspirin and clopidogrel) in patients treated with PCI. (Class of recommendation I, level of evidence A) (Wiviott et al., 2007; Wallentin et al., 2009)

DAPT with aspirin and an oral adenosine diphosphate (ADP) receptor antagonist must be continued for up to 12 months after STEMI, with a strict minimum of: (Class of recommendation I, level of evidence C)

- 1 month for patients receiving BMS (Class of recommendation I, level of evidence C)
- 6 months for patients receiving DES (Class of recommendation IIb, level of evidence B)

(Gwon et al., 2012; Park et al., 2010; Valgimigli et al., "Randomized comparison," 2010; Steinshlubl et al., 2002)

In patients with left ventricular thrombus, anticoagulation should be instituted for a minimum of 3 months. (Class of recommendation IIa, level of evidence B) (Reeder et al., 1981; Keeley & Hillis, 1996; Turpie et al., 1989)

In patients with a clear indication for oral anticoagulation (e.g., atrial fibrillation with CHA2DS2–VASc* Score ≥2 or mechanical valve prosthesis), oral anticoagulation must be implemented in addition to antiplatelet therapy. (Class of recommendation I, level of evidence C)

*Cardiac failure, Hypertension, Age ≥75 (Doubled), Diabetes, Stroke (Doubled) – VAScular disease, Age 65–74 and Sex category (Female)

If patients require triple antithrombotic therapy, combining DAPT and oral anticoagulation (OAC), e.g., because of stent placement and an obligatory indication for OAC, the duration of dual antiplatelet therapy should be minimized to reduce bleeding risk. (Class of recommendation I, level of evidence C)
In selected patients who receive aspirin and clopidogrel, low-dose rivaroxaban (2.5 mg twice daily) may be considered if the patient is at low bleeding risk. (Class of recommendation IIb, level of evidence B) (Mega et al., 2012)

DAPT should be used up to 1 year in patients with STEMI who did not receive a stent. (Class of recommendation IIa, level of evidence C)

Gastric protection with a proton pump inhibitor should be considered for the duration of DAPT therapy in patients at high risk of bleeding. (Class of recommendation IIa, level of evidence C) (Abraham et al., 2010)

Oral treatment with beta-blockers should be considered during hospital stay and continued thereafter in all STEMI patients without contraindications. (Class of recommendation IIa, level of evidence B) (Van de Werf et al., 2008; Chen et al., "Early intravenous," 2005)

Oral treatment with beta-blockers is indicated in patients with heart failure or LV dysfunction. (Class of recommendation I, level of evidence A) (Dickstein et al., 2008; Dargie, 2001; Packe et al., 2001; "The Cardiac Insufficiency Bisoprolol Study II [CIBIS-II]," 1999; Poole-Wilson et al., 2003)

Intravenous beta-blockers must be avoided in patients with hypotension or heart failure. (Class of recommendation III, level of evidence B) (Chen et al., "Early intravenous," 2005)

Intravenous beta-blockers should be considered at the time of presentation in patients without contraindications, with high blood pressure, tachycardia and no signs of heart failure. (Class of recommendation IIa, level of evidence B) (Chen et al., "Early intravenous," 2005)

A fasting lipid profile must be obtained in all STEMI patients, as soon as possible after presentation. (Class of recommendation I, level of evidence C)

It is recommended to initiate or continue high dose statins early after admission in all STEMI patients without contraindication or history of intolerance, regardless of initial cholesterol values. (Class of recommendation I, level of evidence A) (Baigent et al., 2005)

Reassessment of low-density lipoprotein (LDL)-cholesterol should be considered after 4–6 weeks to ensure that a target value of ≤1.8 mmol/L (70 mg/dL) has been reached. (Class of recommendation IIa, level of evidence C) (European Association for Cardiovascular Prevention & Rehabilitation et al., 2011)

Verapamil may be considered for secondary prevention in patients with absolute contraindications to beta-blockers and no heart failure. (Class of recommendation IIb, level of evidence B) ("Secondary prevention with verapamil," 1990)

Angiotensin-converting enzyme (ACE) inhibitors are indicated starting within the first 24 h of STEMI in patients with evidence of heart failure, LV systolic dysfunction, diabetes or an anterior infarct. (Class of recommendation I, level of evidence A) ("ISIS-4: a randomised factorial trial," 1995)

An angiotensin receptor blocker (ARB), preferably valsartan, is an alternative to ACE inhibitors in patients with heart failure or LV systolic dysfunction, particularly those who are intolerant to ACE inhibitors. (Class of recommendation I, level of evidence B) (Dickstein, Kjekshus & OPTIMALL Steering Committee of the OPTIMAAL Study Group, 2002; Pfeffer et al., 2003)

ACE inhibitors should be considered in all patients in the absence of contraindications. (Class of recommendation IIa, level of evidence A) (Fox, 2003; Yusuf et al., 2000)

Aldosterone antagonists, e.g., eplerenone, are indicated in patients with an ejection fraction ≤40% and heart failure or diabetes, provided no renal failure or hyperkalaemia. (Class of recommendation I, level of evidence B) (Pitt et al., 2003)

Complications following ST-segment Elevation Myocardial Infarction

Haemodynamic Disturbances

Treatment of Heart Failure and Left Ventricular Dysfunction

Treatment of Mild Heart Failure (Killip Class II)

Oxygen is indicated to maintain a saturation >95%. (Class of recommendation I, level of evidence C)

Loop diuretics, e.g., furosemide: 20–40 mg i.v., are recommended and should be repeated at 1–4 h intervals if necessary. (Class of recommendation I, level of evidence C)

Intravenous nitrates or sodium nitroprusside should be considered in patients with elevated systolic blood pressure. (Class of recommendation IIa, level of evidence C)
An ACE inhibitor is indicated in all patients with signs or symptoms of heart failure and/or evidence of LV dysfunction in the absence of hypotension, hypovolemia, or renal failure. (Class of recommendation I, level of evidence A) (McAlister et al., 2004; "Effect of ramipril," 1993; Pfeffer et al., 1992; Kober et al., 1995)

An ARB (valsartan) is an alternative to ACE inhibitors particularly if ACE inhibitors are not tolerated. (Class of recommendation I, level of evidence B) (Pfeffer et al., 2003)

An aldosterone antagonist (eplerenone) is recommended in all patients with signs or symptoms of heart failure and/or evidence of LV dysfunction provided no renal failure or hyperkalaemia. (Class of recommendation I, level of evidence B) (Pitt et al., 2003)

Hydralazine and isosorbide dinitrate should be considered if the patient is intolerant to both ACE inhibitors and ARBs. (Class of recommendation IIa, level of evidence C) (Taylor et al., 2004)

Treatment of Moderate Heart Failure (Killip Class III)

Oxygen is indicated. (Class of recommendation I, level of evidence C)

Ventilatory support should be instituted according to blood gasses. (Class of recommendation I, level of evidence C)

Loop diuretics, e.g., furosemide: 20–40 mg i.v., are recommended and should be repeated at 1–4 h intervals if necessary. (Class of recommendation I, level of evidence C)

Morphine is recommended. Respiration should be monitored. Nausea is common and an antiemetic may be required. Frequent low-dose therapy is advisable. (Class of recommendation I, level of evidence C)

Nitrites are recommended if there is no hypotension. (Class of recommendation I, level of evidence C)

Inotropic agents:

- Dopamine (Class of recommendation IIa, level of evidence C)
- Dobutamine (inotropic) (Class of recommendation IIa, level of evidence C)
- Levosimendan (inotropic/vasodilator) (Class of recommendation IIb, level of evidence C)

An aldosterone antagonist such as spironolactone or eplerenone must be used if left ventricular ejection fraction (LVEF) ≤40%. (Class of recommendation I, level of evidence B) (Pitt et al., 2003; Pitt et al., 1999)

Ultrafiltration should be considered. (Class of recommendation IIa, level of evidence B) (Costanzo et al., 2007)

Early revascularization must be considered if the patient has not been previously revascularized. (Class of recommendation I, level of evidence C)

Treatment of Cardiogenic Shock (Killip Class IV)

Oxygen/mechanical respiratory support is indicated according to blood gasses. (Class of recommendation I, level of evidence C)

Urgent echocardiography/Doppler must be performed to detect mechanical complications, assess systolic function and loading conditions. (Class of recommendation I, level of evidence C)

High-risk patients must be transferred early to tertiary centres. (Class of recommendation I, level of evidence C)

Emergency revascularization with either PCI or coronary artery bypass graft (CABG) in suitable patients must be considered. (Class of recommendation I, level of evidence B) (Hochman et al., 1999)

Fibrinolysis should be considered if revascularization is unavailable. (Class of recommendation IIa, level of evidence C)

Intra-aortic balloon pumping may be considered. (Class of recommendation IIb, level of evidence B) (Van de Werf et al., 2008; Sjauw et al., 2009; Bahkhar et al., 2012)

LV assist devices may be considered for circulatory support in patients in refractory shock. (Class of recommendation IIb, level of evidence C)

Haemodynamic assessment with balloon floating catheter may be considered. (Class of recommendation IIb, level of evidence B) (Shah et al., 2005)

Inotropic/vasopressor agents should be considered:
• Dopamine (Class of recommendation IIa, level of evidence C)
• Dobutamine (Class of recommendation IIa, level of evidence C)
• Norepinephrine (preferred over dopamine when blood pressure is low) (Class of recommendation IIb, level of evidence B) (De Backer et al., 2010; Levy et al., 2011)

Management of Atrial Fibrillation

Rhythm control should be considered in patients with atrial fibrillation secondary to a trigger or substrate that has been corrected (e.g., ischaemia). (Class of recommendation IIa, level of evidence C)

Acute Rate Control of Atrial Fibrillation

Intravenous beta-blockers or non-dihydropyridine calcium channel blockers (CCBs, e.g., diltiazem, verapamil) are indicated if there are no clinical signs of acute heart failure. (Class of recommendation I, level of evidence A) (Segal et al., 2000). (Note: Calcium antagonists should be used cautiously or avoided in patients with heart failure because of their negative inotropic effects.)

Amiodarone or i.v. digitals is indicated in case of rapid ventricular response in the presence of concomitant acute heart failure or hypotension. (Class of recommendation I, level of evidence B) (Hou et al., 1995)

Cardioversion

Immediate electrical cardioversion is indicated when adequate rate control cannot be achieved promptly with pharmacological agents in patients with atrial fibrillation and on-going ischaemia, severe haemodynamic compromise or heart failure. (Class of recommendation I, level of evidence C)

Intravenous amiodarone is indicated for conversion to sinus rhythm in stable patients with recent onset atrial fibrillation and structural heart disease. (Class of recommendation I, level of evidence A) (European Heart Rhythm Association et al., 2010)

Digoxin (level of evidence A), verapamil, sotalol, metoprolol (level of evidence B) and other beta-blocking agents (level of evidence C) are ineffective in converting recent onset atrial fibrillation to sinus rhythm and should not be used for rhythm control (although beta-blockers or digoxin may be used for rate control). (Class of recommendation III, level of evidence A, B, C) (European Heart Rhythm Association et al., 2010)

Management of Ventricular Arrhythmias and Conduction Disturbances in the Acute Phase

Direct current cardioversion is indicated for sustained ventricular tachycardia (VT) and ventricular fibrillation (VF). (Class of recommendation I, level of evidence C)

Sustained monomorphic VT that is recurrent or refractory to direct current cardioversion:

• Should be considered to be treated with i.v. amiodarone.* (Class of recommendation IIa, level of evidence C)
• May be treated with i.v. lidocaine or sotalol** (Class of recommendation IIb, level of evidence C)

Transvenous catheter pace termination should be considered if VT is refractory to cardioversion or frequently recurrent despite antiarrhythmic medication. (Class of recommendation IIa, level of evidence C)

Repetitive symptomatic salvos of non-sustained monomorphic VT should be considered for either conservative management (watchful waiting) or treated with i.v. beta-blocker,** or sotalol,** or amiodarone.* (Class of recommendation IIa, level of evidence C)

Polymorphic VT:

• Must be treated by i.v. beta-blocker** (Class of recommendation I, level of evidence B) (Piccini et al., 2008; Huikuri et al., 1989)
• Or i.v. amiodarone* (Class of recommendation I, level of evidence C)
• Urgent angiography must be performed when myocardial ischaemia cannot be excluded (Class of recommendation I, level of evidence C)
• May be treated with i.v. lidocaine (Class of recommendation IIb, level of evidence C) (Piccini et al., 2011)
• Must prompt assessment and correction of electrolyte disturbances, consider magnesium (Class of recommendation I, level of evidence C)
• Should be treated with overdrive pacing using a temporary transvenous right ventricular lead or isoproterenol infusion (Class of recommendation IIa, level of evidence C)

In cases of sinus bradycardia associated with hypotension, atrioventricular (AV) block II (Mobitz 2) or AV block III with bradycardia that causes hypotension or heart failure:

• Intravenous atropine is indicated (Class of recommendation I, level of evidence C)
- Temporary pacing is indicated in cases of failure to respond to atropine (Class of recommendation I, level of evidence C)
- Urgent angiography with a view to revascularization is indicated if the patient has not received prior reperfusion therapy (Class of recommendation I, level of evidence C)

*QT-prolonging agents should not be used if baseline QT is prolonged.
**Intravenous sotalol or other beta-blockers should not be given if ejection fraction is low.

Management of Ventricular Arrhythmias and Risk Evaluation for Sudden Death on Long Term

Specialized electrophysiological evaluation of implantable cardioverter defibrillator (ICD) implantation for secondary prevention of sudden cardiac death is indicated in patients with significant LV dysfunction, who suffer from haemodynamically unstable sustained VT or who are resuscitated from VF occurring beyond the initial acute phase. (Class of recommendation I, level of evidence A) (Lee et al., 2003)

Secondary preventive ICD therapy is indicated to reduce mortality in patients with significant LV dysfunction, and haemodynamically unstable sustained VT or survived VF, not occurring within the initial acute phase. (Class of recommendation I, level of evidence A) (Lee et al., 2003)

Risk evaluation for sudden cardiac death should be performed to assess indication for primary preventive ICD therapy by assessing LVEF (from echocardiography) at least 40 days after the acute event in patients with LVEF ≤40%. (Class of recommendation I, level of evidence A) (Lee et al., 2003)

Definitions:

Levels of Evidence

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Clinical Algorithm(s)

The following algorithms are provided in the original guideline document:

- Prehospital and in-hospital management, and reperfusion strategies within 24 h of first medical contact (FMC)
- Components of delay in ST-segment elevation myocardial infarction (STEMI) and ideal time intervals for intervention

Scope

Disease/Condition(s)
Guideline Category

Diagnosis
Management
Risk Assessment
Treatment

Clinical Specialty

Cardiology
Critical Care
Emergency Medicine
Family Practice
Geriatrics
Internal Medicine

Intended Users

Advanced Practice Nurses
Allied Health Personnel
Emergency Medical Technicians/Paramedics
Nurses
Physician Assistants
Physicians

Guideline Objective(s)

- To present updated recommendations on the management of acute myocardial infarction in patients presenting with ST-segment elevation
- To assist physicians in selecting the best management strategies for a typical patient, suffering from a given condition, taking into account the impact on outcome, as well as the risk/benefit ratio of particular diagnostic or therapeutic means

Target Population

Patients presenting with ischaemic symptoms and persistent ST-segment elevation on the electrocardiogram (ST-segment elevation myocardial infarction [STEMI])

Interventions and Practices Considered

Diagnosis
1. Initial diagnosis of ST-segment elevation myocardial infarction (STEMI)
   - Patient history (history of chest pain/discomfort)
   - 12-lead electrocardiogram (ECG) monitoring
   - Use of additional posterior chest wall leads (V7–V9 ≥0.05 mV)
   - Blood sampling for serum markers
   - Echocardiography

Management/Treatment

1. Management during emergency care
   - Relief of pain, breathlessness, and anxiety (intravenous opioids, oxygen, tranquilize)
   - Management of cardiac arrest
     - Medical/paramedical personnel access to defibrillation equipment and training in cardiac life support
     - ECG monitoring at the point of first-medical-contact
     - Use of therapeutic hypothermia
     - Immediate angiography
   - Pre-hospital logistics of care
     - Initial therapy, including thrombolysis, delivered by ambulance teams
     - Regional networks designed to deliver reperfusion therapy
     - Primary percutaneous coronary intervention (PCI)-capable centres for expeditious 24/7 service
     - Quality targets and written management protocols
   - Reperfusion therapy/procedural aspects of primary PCI
     - Timing and access points
     - Stenting versus balloon angioplasty alone
     - Drug-eluting versus bare-metal stents
   - Periprocedural antithrombotic medication in primary PCI
     - Antiplatelet therapy (aspirin, prasugrel, ticagrelor, clopidogrel, glycoprotein [GP] IIb/IIIa inhibitors)
     - Anticoagulants (bivalirudin, enoxaparin, unfractionated heparin, GP IIb/IIIa inhibitor) (fondaparinux not recommended)
   - Fibrinolytic therapy
     - Timing of fibrinolytic therapy
     - Use of fibrin-specific agent (tenecteplase, alteplase, reteplase)
     - Aspirin and clopidogrel
     - Anti-thrombin co-therapy with fibrinolysis
     - Transfer to a PCI-capable centre following fibrinolysis
     - Rescue or emergency PCI
     - Emergency angiography
     - Special considerations in women, diabetics, the elderly, and in renal failure
   - Management of hyperglycaemia

2. Management during hospitalization and at discharge
   - Logistical issues for hospital stay (length of stay, transfer back to non-PCI hospital, discharge)
   - Imaging and stress testing (echocardiography, emergency angiography, magnetic resonance imaging [MRI])
   - Routine therapies in the acute, subacute and long-term phase of STEMI
     - Smoking cessation programme
     - Exercise-based rehabilitation
     - Dual antiplatelet therapy (DAPT)
     - Anticoagulation
     - Gastric protection with a proton pump inhibitor
     - Beta-blockers (oral or intravenous)
     - Fasting lipid profile
     - Statin therapy
     - Verapamil
     - Angiotensin-converting enzyme inhibitors or angiotensin receptor blockers
     - Aldosterone antagonists

3. Management of complications following STEMI
   - Management of heart failure and left ventricular dysfunction
Major Outcomes Considered

- Time since onset of symptoms
- Complications of myocardial infarction
- Mortality (all-cause and cardiovascular)
- Risk of stroke
- Risk of re-infarction or re-occlusion
- Major bleeding rates

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

The PubMed, Medline, Scopus, EMBASE, and Cochrane databases were searched over the 10 previous years for the following terms: guidelines, acute myocardial infarction, ST-segment elevation, acute coronary syndromes, ischaemic heart disease, reperfusion therapy, primary percutaneous coronary intervention, antithrombotic therapy, secondary prevention.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

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Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence
A critical evaluation of diagnostic and therapeutic procedures was performed, including assessment of the risk–benefit ratio. Estimates of expected health outcomes for larger populations were included, where data exist. The levels of evidence and the strengths of recommendation of particular treatment options were weighed and graded according to predefined scales (see the "Rating Scheme for the Strength of the Evidence" and the "Rating Scheme for the Strength of the Recommendations" fields).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Members of this Task Force were selected by the European Society of Cardiology (ESC) to represent professionals involved with the medical care of patients with this pathology. Selected experts in the field undertook a comprehensive review of the published evidence for diagnosis, management, and/or prevention of a given condition according to ESC Committee for Practice Guidelines (CPG) policy.

Rating Scheme for the Strength of the Recommendations

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Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

The European Society of Cardiology (ESC) Guidelines undergo extensive review by the Committee for Practice Guidelines (CPG) and external experts. After appropriate revisions, it is approved by all the experts involved in the Task Force. The finalized document is approved by the CPG for publication in the *European Heart Journal*.

Evidence Supporting the Recommendations
References Supporting the Recommendations


Hou ZY, Chang MS, Chen CY, Tu MS, Lin SL, Chiang HT, Woosley RL. Acute treatment of recent-onset atrial fibrillation and flutter with a


Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations
Potential Benefits

Appropriate management of patients with acute myocardial infarction presenting with ST-segment elevation

Potential Harms

- Side effects of intravenous opioids include nausea and vomiting, hypotension with bradycardia, and respiratory depression.
- Fibrinolytic therapy is associated with a small but significant excess of strokes, with all of the excess hazard appearing on the first day after treatment. The early strokes are largely attributable to cerebral haemorrhage; later strokes are more frequently thrombotic or embolic. Advanced age, lower weight, female gender, prior cerebrovascular disease, and systolic and diastolic hypertension on admission are significant predictors of intracranial haemorrhage. In the latest trials, intracranial bleeding occurred in 0.9%–1.0% of the total population studied. Major non-cerebral bleeds (bleeding complications requiring blood transfusion or that are life-threatening) can occur in 4%–13% of the patients treated. Administration of streptokinase may be associated with hypotension, but severe allergic reactions are rare. Re-administration of streptokinase should be avoided because of antibodies, which can impair its activity, and because of the risk of allergic reactions.
- Adjunctive anticoagulant, antiplatelet and antithrombotic therapy is associated with a risk of bleeding complications, especially in elderly patients. In patients with severe renal insufficiency (glomerular filtration rate [GFR] <30 mL/min) the infusion dose of tirofiban should be reduced to 50%. In patients with moderate renal insufficiency (GFR 30–59 mL/min) a lower initial infusion rate of 1.4 mg/kg/h should be given.
- Calcium antagonists should be used cautiously or avoided in patients with heart failure because of their negative inotropic effects.
- Intravenous sotalol or other beta-blockers should not be given if ejection fraction (EF) is low.
- Ticagrelor may cause transient dyspnoea at the onset of therapy, which is not associated with morphological or functional lung abnormalities, and which rarely leads to discontinuation. Ticagrelor may also be associated with asymptomatic bradycardia in the first week of therapy. All adenosine diphosphate (ADP) receptor blockers should be used with caution in patients at high risk of bleeding or with significant anaemia.
- In one study, serious hyperkalaemia was more frequent in the group receiving eplerenone compared to placebo.
- There have been concerns about increased risks of very late stent thrombosis and reinfarction with drug-eluting stents (DES), compared with bare-metal stents (BMS). An issue with the routine use of DES in this setting is that it is often difficult to determine reliably the ability of patients to comply with or tolerate the protracted use of dual antiplatelet therapy (DAPT).

Contraindications

Contraindications

- Absolute contraindications to fibrinolytic therapy include previous intracranial haemorrhagic or stroke of unknown origin at any time; ischaemic stroke in preceding 6 months; central nervous system damage or neoplasms, or atrioventricular malformation; recent major trauma, surgery, or head injury (within the preceding 3 weeks); gastrointestinal bleeding within the past month; known bleeding disorders (excluding menses); aortic dissection; non-compressible punctures in the past 24 h (e.g., liver biopsy, lumbar puncture). Relative contraindications include transient ischaemic attack in the preceding 6 months, oral anticoagulant therapy, pregnancy or within 1 week post-partum, refractory hypertension (systolic blood pressure >180 mm Hg and/or diastolic blood pressure >110 mm Hg), advanced liver disease, infective endocarditis, active peptic ulcer, prolonged or traumatic resuscitation.
- Prior streptokinase or anistreplase therapy is a specific contraindication to streptokinase therapy.
- In patients with severe renal insufficiency (glomerular filtration rate [GFR] <30 mL/min) and in dialysis-dependent patients bivalirudin and eptifibatide are contraindicated.
- Beta-blockers are contraindicated in the presence of obstructive airway disease. Early intravenous use of beta-blockers is contraindicated in patients with clinical signs of hypotension or congestive heart failure.
- Intramuscular injections should be avoided.
- Calcium antagonists should be used cautiously or avoided in patients with heart failure because of their negative inotropic effects.
- Prasugrel is contraindicated in patients with prior stroke/transient ischaemic attack (TIA). Its use is generally not recommended in patients aged ≥75 years or in patients with lower body weight (<60 kg) as it was not associated with net clinical benefit in these subsets in one study.
Qualifying Statements

The European Society of Cardiology (ESC) Guidelines represent the views of the ESC and were arrived at after careful consideration of the available evidence at the time they were written. Health professionals are encouraged to take them fully into account when exercising their clinical judgement. The guidelines do not, however, override the individual responsibility of health professionals to make appropriate decisions in the circumstances of the individual patients, in consultation with that patient, and where appropriate and necessary the patient’s guardian or carer. It is also the health professional’s responsibility to verify the rules and regulations applicable to drugs and devices at the time of prescription.

Guidelines are not substitutes, but are complements, for textbooks and cover the ESC Core Curriculum topics. Guidelines and recommendations should help physicians to make decisions in their daily practice. However, the final decisions concerning an individual patient must be made by the responsible physician(s).

It must be recognized that even when excellent clinical trials have been undertaken, their results are open to interpretation, and that treatment options may be limited by resources. Indeed, cost-effectiveness is becoming an increasingly important issue when deciding upon therapeutic strategies.

Implementation of the Guideline

Description of Implementation Strategy

The task of developing European Society of Cardiology (ESC) Guidelines covers not only the integration of the most recent research, but also the creation of educational tools and implementation programmes for the recommendations. To implement the guidelines, condensed pocket guidelines versions, summary slides, booklets with essential messages, and an electronic version for digital applications (smartphones, etc.) are produced. These versions are abridged and, thus, if needed, one should always refer to the full text version which is freely available on the ESC website. The National Societies of the ESC are encouraged to endorse, translate, and implement the ESC Guidelines. Implementation programmes are needed because it has been shown that the outcome of disease may be favourably influenced by the thorough application of clinical recommendations.

Surveys and registries are needed to verify that real-life daily practice is in keeping with what is recommended in the guidelines, thus completing the loop between clinical research, writing of guidelines, and implementing them into clinical practice.

Implementation Tools

Clinical Algorithm
Foreign Language Translations
Mobile Device Resources
Pocket Guide/Reference Cards
Quick Reference Guides/Physician Guides
Slide Presentation
Staff Training/Competency Material

For information about availability, see the Availability of Companion Documents and Patient Resources fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories
IOM Care Need
Getting Better

IOM Domain
Effectiveness
Patient-centeredness
Timeliness

Identifying Information and Availability

Bibliographic Source(s)


Adaptation
Not applicable: The guideline was not adapted from another source.

Date Released
1996 (revised 2012 Oct)

Guideline Developer(s)
European Society of Cardiology - Medical Specialty Society

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The Task Force received its entire financial support from the European Society of Cardiology, without any involvement from the healthcare industry.

Guideline Committee
Task Force on the Management of ST-Segment Elevation Acute Myocardial Infarction

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

The experts of the writing and reviewing panels filled in declarations of interest forms of all relationships which might be perceived as real or potential sources of conflicts of interest. These forms were compiled into a single file and can be found on the European Society of Cardiology (ESC) Web site. Any changes in declarations of interest that arise during the writing period must be notified to the ESC and updated.

Guideline Endorser(s)

Association of Cardiologists of Kazakhstan - Professional Association

Belgian Society of Cardiology - Medical Specialty Society

Belorussian Scientific Society of Cardiologists - Medical Specialty Society

Cardiology Society of Serbia - Medical Specialty Society

Croatian Cardiac Society - Medical Specialty Society

Czech Society of Cardiology - Medical Specialty Society

Danish Society of Cardiology - Medical Specialty Society

Estonian Society of Cardiology - Medical Specialty Society

French Society of Cardiology - Medical Specialty Society

Hellenic Cardiological Society - Medical Specialty Society

Hungarian Society of Cardiology - Medical Specialty Society

Israel Heart Society - Medical Specialty Society

Lithuanian Society of Cardiology - Medical Specialty Society

Luxembourg Society of Cardiology - Medical Specialty Society

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Netherlands Society of Cardiology - Medical Specialty Society

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Guideline Status

This is the current release of the guideline.


Guideline Availability

Electronic copies: Available from the European Society of Cardiology (ESC) Web site. Also available in Polish from the ESC Web site.

Print copies: Available from Oxford University Press, Great Clarendon Street, Oxford, OX2 6DP, UK, Tel: +44 (0) 1865 353263, Fax: +44 (0) 1865 353774, Web site: http://www.eurheartj.org/.

Availability of Companion Documents

The following are available:


Print copies: Available from Oxford University Press, Great Clarendon Street, Oxford, OX2 6DP, UK, Tel: +44 (0) 1865 353263, Fax: +44 (0) 1865 353774, Web site: http://www.eurheartj.org/.

Additionally, continuing medication education (CME) credit is available online at the ESC Web site.

Patient Resources

None available
NGC Status

This summary was completed by ECRI on September 17, 2001. The information was verified by the guideline developer on September 27, 2001. This summary was updated by ECRI on April 16, 2003. This summary was updated by ECRI Institute on June 22, 2007 following the U.S. Food and Drug Administration (FDA) advisory on heparin sodium injection. This summary was updated by ECRI Institute on March 13, 2008 following the updated FDA advisory on heparin sodium injection. This summary was updated by ECRI Institute on August 1, 2011. This summary was updated by ECRI Institute on April 13, 2012 following the U.S. Food and Drug Administration advisories on Statin Drugs and Statins and HIV or Hepatitis C drugs. This summary was updated by ECRI Institute on April 30, 2013. The updated information was verified by the guideline developer on July 1, 2013. This summary was updated by ECRI Institute on March 10, 2014 following the U.S. Food and Drug Administration advisory on Low Molecular Weight Heparins. This summary was updated by ECRI Institute on June 2, 2016 following the U.S. Food and Drug Administration advisory on Opioid pain medicines. This summary was updated by ECRI Institute on October 21, 2016 following the U.S. Food and Drug Administration advisory on opioid pain and cough medicines combined with benzodiazepines.

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