The guidelines for secondary prevention of myocardial infarction (MI) in Japan were developed by the Joint Working Groups consisting of representatives of various academic societies in the field of cardiovascular diseases including the Japanese Circulation Society (JCS) and the Japanese College of Cardiology. The first edition of the guidelines were published in 2000 under the title of “Guidelines for the Diagnosis and Treatment of Cardiovascular Diseases (1998–1999 Joint Working Groups Report): Guidelines for Secondary Prevention of Myocardial Infarction (Chair: Masahiko Kinoshita)”. Later, the first update, “Guidelines for the Diagnosis and Treatment of Cardiovascular Diseases (2004–2005 Joint Working Groups Report): Guidelines for Secondary Prevention of Myocardial Infarction (JCS 2006) (Chair: Kinji Ishikawa)”, was prepared.2 The present version is the second update. We prepared this 2011 update to include evidences obtained in Japan as much as possible and to fit the current situation in Japan, where coronary intervention is a common procedure. We hope that these guidelines will be used widely in the clinical setting in Japan to improve the prognosis of patients with MI.
This document is a summary (Digest Version) of the Guidelines for the Diagnosis and Treatment of Cardiovascular Diseases (2010 Joint Working Groups Report): Guidelines for Secondary Prevention of Myocardial Infarction (JCS 2011). Please refer to the full-text guidelines for more details, and make correct use of them.

1. Purpose of These Guidelines

These guidelines are meant to provide specific measures for secondary prevention of MI based on a broad range of evidence collected by Joint Working Groups to contribute to secondary prevention of MI in Japan.

2. Definition of Secondary Prevention for Myocardial Infarction

Secondary prevention of MI generally means prevention of cardiovascular accidents in post-MI patients. Cardiac accidents denote cardiac death (i.e., fatal MI, sudden cardiac death, and death from heart failure) and nonfatal MI, whereas cardiovascular accidents include drug-resistant angina, hospitalization due to heart failure, and stroke. All-cause death (i.e., cardiac death and non-cardiac death) and coronary revascularization may be used as endpoints of studies.

3. Scope of the Guidelines

The present guidelines are applied mainly to patients with old MI. For patients who recently experienced MI or those who have unstable angina, the corresponding guidelines should be referred to.

4. Classification of Recommendations and Level of Evidence

In the present guidelines, recommendations on secondary prevention of MI are described using the following classification of recommendations on the basis of the level of evidence associated with each recommendation.

I. General Treatment

1. Diet Therapy

1. Blood Pressure Control4–9

Class I

1. Salt intake should be reduced to less than 6 g per day. (Level of Evidence: A)
2. Alcohol consumption should be restricted to less than 30 mL of pure alcohol per day. (Level of Evidence: A)
3. Regular moderate physical activity (at least 30 minutes per day) is useful for the treatment and prevention of hypertension. (Level of Evidence: A)

2. Lipid Management10–16

Class I

1. Body weight should be maintained within a body mass index (BMI) range of 18.5 to 24.9 kg/m². (Level of Evidence: B)
2. Potassium (K) and other minerals should be taken adequately. (Level of Evidence: B)
3. Fat intake should be limited to 25% or less of total calories. (Level of Evidence: A)
Table 1. Risk Associated With Exercise Therapy in Patients With Coronary Artery Disease

| Risk level | Clinical states |
|------------|-----------------|
| Low        | - No significant left ventricular dysfunction (EF: 50% or more). |
|            | - No resting or exercise-induced myocardial ischemia.* |
|            | - No resting or exercise-induced complex arrhythmias. |
|            | - Uncomplicated myocardial infarction, coronary artery bypass surgery, coronary intervention.* |
|            | - Functional capacity of 6 METs or more on graded exercise test 3 or more weeks after clinical event. |
| Intermediate| - Mild to moderately depressed left ventricular function (EF: 31 to 49%). |
|            | - Functional capacity of less than 5 or 6 METs or more on graded exercise test 3 or more weeks after clinical event. |
|            | - Failure to comply with exercise intensity prescription. |
|            | - Exercise-induced myocardial ischemia (0.1 to 0.2 mV ST-segment depression, echocardiogram or scintigram).* |
| High       | - Severely depressed left ventricular function (EF: 30% or less). |
|            | - Complex ventricular arrhythmias at rest or appearing or increasing with exercise. |
|            | - Decrease in systolic blood pressure of 15 mmHg or more during exercise or failure to rise with increasing exercise workloads. |
|            | - Survivors after cardiopulmonary resuscitation.* |
|            | - Myocardial infarction complicated by congestive heart failure, cardiogenic shock and/or complex ventricular arrhythmias. |
|            | - Severe coronary artery disease and marked exercise-induced myocardial ischemia (ST-segment depression of 0.2 mV or more).* |

EF, ejection fraction; METs, metabolic equivalents.
Adapted from U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research, National Heart, Lung and Blood Institute, Clinical Practice Guidelines No. 17: Cardiac Rehabilitation as Secondary Prevention. Rockville, MD, 1995. *Modified to fit the circumstances in Japan.

3. Saturated fatty acid intake should be limited to 7% or less of total calories. (Level of Evidence: A)
4. Intake of polyunsaturated fatty acids, particularly n-3 polyunsaturated fatty acids, should be increased. (Level of Evidence: A)
5. Cholesterol intake should be limited to 300 mg or less per day. (Level of Evidence: A)

3. Weight Management17–20

Class IIa
Patients should be instructed to maintain their body weight within a BMI range of 18.5 to 24.9 kg/m², taking into account the balance between calorie intake and energy consumption. (Level of Evidence: B)

4. Diabetes Management21–25

Class IIa
For patients with diabetes, healthcare professionals should determine appropriate calorie intake based on body size, activity level and other factors and should instruct them to keep the calorie intake within the recommended limit with a goal of hemoglobin A1c (HbA1c) less than 7.0% (international standard; less than 6.6% in Japan Diabetes Society [JDS] value). (Level of Evidence: B)

2. Exercise Therapy (Cardiac Rehabilitation)26–34

Class I
1. Based on the results of exercise test, patients should perform at least 30 minutes of aerobic exercise such as walking, running, and cycling, 3 or 4 times a week (every day, if possible). (Level of Evidence: A)
2. Patients should increase physical activities in daily living (e.g., walking to work, and doing household or outside work). (Level of Evidence: B)
3. Patients should perform rhythmic resistance exercise of about 10 to 15 repetition maximum (RM: 10 RM means the intensity that allows 10 repeated movements) in a frequency similar to that of aerobic exercise. (Level of Evidence: A)

4. Institutional exercise therapy is recommended for intermediate- and high-risk patients (Table 135). (Level of Evidence: B)

Class IIa
Non-supervised home exercise therapy is recommended for low-risk patients (Table 13) or those who have completed institutional exercise therapy. (Level of Evidence: C)

3. Smoking Cessation Counseling35–42

Class I
1. Patients should be asked about tobacco use status. (Level of Evidence: A)
2. Smoking patients (current, former) should be informed of the harmful effects of smoking and given smoking cessation counseling and support. The harmful effects of passive smoking should also be explained, and lifestyle modifications and behavioral therapy should be instructed. (Level of Evidence: B)

4. Positive Pressure Ventilation Therapy43–48

Class I
Continuous positive airway pressure (CPAP) therapy is effective for post-MI patients with sleep apnea syndrome. (Level of Evidence: B)

Class IIa
1. Home oxygen therapy (HOT) is recommended for the treatment of sleep apnea syndrome in patients with heart failure. (Level of Evidence: B)
2. Adaptive servo ventilator is useful for MI patients with heart failure, regardless of whether or not they have sleep apnea syndrome. (Level of Evidence: B)

5. Management of Alcohol Use

Class I
Heavy drinking should be avoided. (Level of Evidence: B)

6. Measures Against Depression, Anxiety Disorder, and Insomnia

Class I
Post-MI patients should be counseled about depression, anxiety disorder, and insomnia, and assessed for possible effects of their social and family environments. (Level of Evidence: B)

II Pharmacotherapy

1. Antiplatelet Agents and Anticoagulants

Class I
1. Aspirin (81 to 162 mg) should be administered indefinitely, if not contraindicated. (Level of Evidence: A)
2. Trapidil (300 mg) should be administered when aspirin is contraindicated. (Level of Evidence: B)
3. Warfarin (300 mg) should be administered when aspirin is contraindicated. (Level of Evidence: B)
4. Low-dose aspirin and thienopyridine antiplatelet agents should be used concomitantly in patients who have received coronary stents. (Level of Evidence: A)

Class IIa
1. Low-dose aspirin (81 mg) should be used concomitantly with either dipyridamole (150 mg) or ticlopidine (200 mg). (Level of Evidence: B)
2. Clopidogrel monotherapy should be used in patients with MI complicated by arteriosclerosis obliterans or cerebral infarction. (Level of Evidence: B)
3. Cilostazol should be used concomitantly in patients with MI complicated by arteriosclerosis obliterans. (Level of Evidence: B)
4. Clopidogrel should be administered when aspirin is contraindicated. (Level of Evidence: B)

Class IIb
1. Ticlopidine should be administered when aspirin is contraindicated. (Level of Evidence: C)
2. Cilostazol and sarpogrelate should be administered when aspirin and ticlopidine are contraindicated. (Level of Evidence: B)
3. Warfarin (international normalized ratio of prothrombin time [PT-INR]: 2.0 to 3.0) should be administered when aspirin is contraindicated or difficult to use. (Level of Evidence: B)

Class III
Dipyridamole monotherapy should be used. (Level of Evidence: B)

2. β-Blockers

Class I
1. β-blockers should be administered to patients who are not at low risk (Low-risk patients are defined as those in whom reperfusion therapy has been successful, and left ventricular function is normal or near-normal, and who do not have serious ventricular arrhythmia.) if not contraindicated. (Level of Evidence: A)
2. β-blockers should be administered to patients with moderate or severe left ventricular dysfunction, with gradual increments in dose. (Level of Evidence: B)

Class IIa
β-blockers should be administered to low-risk (Low-risk patients are defined as those in whom reperfusion therapy has been successful, and left ventricular function is normal or near-normal, and who do not have serious ventricular arrhythmia.) patients. (Level of Evidence: A)

Class III
β-blocker monotherapy should be used to patients in whom coronary spasm was considered responsible for MI. (Level of Evidence: B)

3. Lipid Metabolism-Improving Agents

Class I
1. Statins should be administered to patients with hyper-low density lipoprotein (LDL) cholesterolemia. (Level of Evidence: A)
2. The use of high-purity ethyl icosapentate (EPA) preparation in addition to statins should be considered in patients with hyper-LDL cholesterolemia. (Level of Evidence: B)

Class IIa
1. Statins should be administered to patients who have average LDL cholesterol levels. (Level of Evidence: A)
2. Fibrates should also be considered for patients with hypertriglyceridemia, particularly those complicated by hypo-high density lipoprotein (HDL) cholesterolemia. (Level of Evidence: B)
4. Anti-Diabetic Drugs

Class I
Adequate control of blood pressure and lipid levels should be aimed in diabetic patients with MI. (Level of Evidence A)

Class IIa
1. It should be ensured from the early stage that HbA1c be reduced to and maintained at a goal value of less than 7.0% (international standard; less than 6.6% in JDS). (Level of Evidence: B)
2. α-glucosidase inhibitors should be administered to patients with glucose intolerance. (Level of Evidence: B)
3. Pioglitazone therapy should be used in patients without heart failure whenever possible. (Level of Evidence: B)

Class IIb
Metformin should be administered to obese diabetic patients. (Level of Evidence: B)

5. Nitrates

Class I
Fast-acting nitrates such as nitroglycerin (i.e., sublingual tablet, nebulized spray or intravenous one-shot injection) should be used to treat anginal attacks. (Level of Evidence: C)

Class IIa
1. For patients with extensive infarction complicated by congestive heart failure, nitrates should be used for the purpose of treating heart failure. (Level of Evidence: B)
2. For patients with myocardial ischemia, long-acting nitrates should be used for the purpose of preventing anginal attacks. (Level of Evidence: C)

Class III
1. Nitrates should be administered to patients with serious hypotension or cardiogenic shock. (Level of Evidence: C)
2. Nitrates should be administered to patients receiving phosphodiesterase (PDE) 5 inhibitors. (Level of Evidence: C)

6. Nicorandil

Class I
1. Long-term administration of nicorandil should be used for patients with old MI complicated by stable angina. (Level of Evidence: B)
2. Nicorandil should be administered to improve the symptoms of post-infarction angina and myocardial ischemia. (Level of Evidence: B)

7. Calcium Channel Blockers

Class I
Long-acting calcium channel blockers should be used for MI patients with coronary spastic angina or those in whom coronary spasm was definitely considered to be the cause of MI, to prevent ischemic attacks. (Level of Evidence: C)

Class IIa
1. Long-acting dihydropyridine calcium channel blockers should be used for MI patients with angina or hypertension that is not adequately controlled by other drugs. (Level of Evidence: B)
2. Verapamil or diltiazem should be used for patients without left ventricular dysfunction, congestive heart failure, or atrioventricular block in whom β-blockers are contraindicated or poorly tolerated, to improve myocardial ischemia in post-MI or for pulse control of atrial fibrillation with tachycardia. (Level of Evidence: B)

Class III
1. Use of short-acting nifedipine in the early post-MI phase or routine use of short-acting nifedipine in MI patients should be given. (Level of Evidence: A)
2. Diltiazem or verapamil should be used in patients with acute MI complicated by left ventricular dysfunction, congestive heart failure, or atrioventricular block. (Level of Evidence: B)

8. Renin-Angiotensin-Aldosterone System Inhibitors

1. Angiotensin Converting Enzyme Inhibitors
Class I
1. Angiotensin converting enzyme (ACE) inhibitors should be administered within 24 hours after the onset of acute MI to high-risk patients who have left ventricular dysfunction (left ventricular ejection fraction [LVEF] of less than 40%) or heart failure. (Level of Evidence: A)
2. ACE inhibitors should be administered to patients with post-MI left ventricular dysfunction. (Level of Evidence: A)
3. ACE inhibitors should be administered to MI patients who do not have left ventricular dysfunction but have hypertension, diabetes, or moderate to high risk of cardiovascular accidents. (Level of Evidence: A)

Class IIa
1. ACE inhibitors should be administered within 24 hours after the onset of acute MI in all patients. (Level of Evidence: A)
2. ACE inhibitors should be administered to MI patients without cardiac dysfunction who have low risk of cardiovascular accidents. (Level of Evidence: B)

2. Angiotensin II Receptor Blockers

Class I
Angiotensin II receptor blocker (ARB) therapy should be initiated to patients in an acute phase of MI who have intolerance to ACE inhibitors and who have signs of heart failure or LVEF of 40% or less. (Level of Evidence: A)

Class IIb
1. ARBs should be used in combination with ACE inhibitors for MI patients who have left ventricular systolic dysfunction, but are unlikely to have deterioration of renal function. (Level of Evidence: B)
2. Administration of ARBs should be considered in patients with MI, regardless of whether or not they have signs of heart failure. (Level of Evidence: B)

3. Aldosterone Blockers

Class I
None.
Class IIa
Aldosterone blockers should be used in patients with moderate to severe heart failure without renal dysfunction or hyperkalemia. (Level of Evidence: A)

Class IIb
None.

Class III
None.

4. Direct Renin Inhibitors

Class I
None.

Class IIa
None.

Class IIb
1. Concomitant use of direct renin inhibitors with ACE inhibitors or ARBs during an acute phase should be used in all patients with acute MI. (Level of Evidence: B)
2. Monotherapy with direct renin inhibitors as alternatives to ACE inhibitors or ARBs during an acute phase should be used in all patients with acute MI. (Level of Evidence: B)

9. Antiarrhythmic Medications

1. Supraventricular Arrhythmia

Class I
1. Heart rate control by monotherapy or combination therapy with β-blockers, non-dihydropyridine calcium channel blockers, and/or digoxin should be performed in patients with atrial fibrillation not complicated by heart failure. (Level of Evidence: B)
2. Heart rate control by β-blockers with or without digoxin should be performed in patients with atrial fibrillation complicated by heart failure due to systolic dysfunction. (Level of Evidence: B)
3. Heart rate control by amiodarone should be performed in patients with atrial fibrillation complicated by heart failure due to systolic dysfunction in whom β-blockers are unusable. (Level of Evidence: C)

Class IIa
1. Administration of amiodarone to maintain sinus rhythm should be used in patients who have unstable hemodynamics due to episodes of atrial fibrillation or in whom heart rate control is difficult. (Level of Evidence: C)
2. Administration of amiodarone to maintain sinus rhythm should be used when there are severe symptoms during atrial fibrillation attacks in patients who have LVEF of 35% or less and a history of heart failure symptoms or hospitalization due to heart failure within the past 6 months. (Level of Evidence: C)

Class IIb
Administration of amiodarone to maintain sinus rhythm should be used in patients with atrial fibrillation. (Level of Evidence: B)

2. Ventricular Arrhythmia

Class I
β-blockers should be used for patients with premature ventricular contraction (PVC), nonsustained ventricular tachycardia, sustained ventricular tachycardia, or ventricular fibrillation (whenever possible, if not contraindicated). (Level of Evidence: A)

Class IIa
1. Amiodarone should be used for patients with symptomatic PVCs (more than 10 beats/hr for single PVCs or more than 2 runs/day for short-coupled PVCs) and patients with non-sustained ventricular tachycardia (LVEF of 40% or more). (Level of Evidence: B)
2. Amiodarone or dl-sotalol should be used for patients with sustained ventricular tachycardia with stable hemodynamics. (Level of Evidence: B)
3. Amiodarone should be used for patients in whom implantable cardioverter-defibrillator (ICD) therapy cannot be performed and who have sustained ventricular tachycardia resulting in ventricular fibrillation or hemodynamic collapse. (Level of Evidence: C)

Class IIb
Amiodarone or dl-sotalol should be used for patients with sustained ventricular tachycardia resulting in ventricular fibrillation or hemodynamic collapse. (Level of Evidence: B)

Class III
Class I drugs (not applicable to class Ib drugs) and class III drugs (excluding amiodarone and dl-sotalol) should be used for patients with PVC or nonsustained ventricular tachycardia. (Level of Evidence: A)

10. Digitalis

Class I
Digitalis should be administered to patients with heart failure complicated by atrial fibrillation with tachycardia. (Level of Evidence: B)

Class IIa
Digitalis should be administered to patients with heart failure and sinus rhythm (maintain the blood concentration at 0.8 ng/mL or less). (Level of Evidence: B)

11. Phosphodiesterase Inhibitors

Class I
None.

Class IIa
None.

Class IIb
None.

Class III
Long-term administration of PDE inhibitors should be given to asymptomatic patients. (Level of Evidence: C)
12. Influenza Vaccine\(^{189,190}\)

Class IIa
Inactivated influenza vaccine should be given to post-MI patients. \((\text{Level of Evidence: B})\)

III Invasive Procedure

1. Coronary Revascularization\(^{191–197}\)

1. Coronary Intervention for the Culprit Lesions of Acute Myocardial Infarction During the Period Between 24 Hours After Onset and Discharge

Class I
Patients with myocardial ischemia refractory to pharmacotherapy (including asymptomatic myocardial ischemia). \((\text{Level of Evidence: A})\)

Class IIa
Patients with significant stenosis (70% or more) who have demonstrable ischemia and viable myocardium in the infarcted area. \((\text{Level of Evidence: A})\)

Class IIb
Patients with significant stenosis (70% or more) who have no demonstrable ischemia and viable myocardium in the infarcted area. \((\text{Level of Evidence: C})\)

Class III
Patients with moderate stenosis (less than 70%) who have no demonstrable myocardial ischemia. \((\text{Level of Evidence: C})\)

2. Coronary Intervention for Non-Culprit Lesions of Acute Myocardial Infarction During the Period Between 24 Hours After Onset and Discharge\(^{198–204}\)

Class I
1. Patients with myocardial ischemia refractory to pharmacotherapy. \((\text{Level of Evidence: A})\)
2. Patients with significant cardiac dysfunction due to myocardial ischemia. \((\text{Level of Evidence: A})\)

Class IIa
1. Patients with significant stenosis (more than 70%) on coronary angiography and demonstrable myocardial ischemia. \((\text{Level of Evidence: B})\)
2. Patients with three-vessel disease or significant stenosis of the left main coronary artery. \((\text{Level of Evidence: C})\) (Revascularization by coronary artery bypass grafting should also be considered.)

Class IIb
Patients with significant stenosis (more than 70%) on coronary angiography without demonstrable myocardial ischemia. \((\text{Level of Evidence: C})\)

Class III
Patients with moderate stenosis (less than 70%) without demonstrable myocardial ischemia. \((\text{Level of Evidence: C})\)

2. Non-Pharmacotherapy of Arrhythmia

1. Catheter Ablation
Premature Ventricular Contraction/Ventricular Tachycardia
Refer to the Guidelines for Non-Pharmacotherapy of Cardiac Arrhythmias (JCS 2011)\(^{205}\) for more details.

Class I
1. Patients with unifocal PVC triggering ventricular tachycardia or ventricular fibrillation in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. \((\text{Level of Evidence: C})\)
2. Patients with frequent PVCs associated with significant decrease in quality of life (QOL) or heart failure in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. \((\text{Level of Evidence: C})\)
3. Patients in whom cardiac resynchronization therapy (CRT) is not effective due to ineffective pacing caused by frequent PVCs and pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. \((\text{Level of Evidence: C})\)
4. Patients with monomorphic ventricular tachycardia complicated by cardiac dysfunction or heart failure in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. \((\text{Level of Evidence: C})\)
5. Patients with frequent ICD discharges and in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. \((\text{Level of Evidence: C})\)
6. Patients in whom CRT is not effective due to ineffective pacing caused by monomorphic ventricular tachycardia and pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. \((\text{Level of Evidence: C})\)

Class IIa
Patients with frequent PVCs originating from ventricular outflow tract due to organic heart disease or complicated by cardiac dysfunction. \((\text{Level of Evidence: C})\)

2. Implantable Cardioverter-Defibrillator\(^{206–228}\)

Class I
1. Patients with clinically documented ventricular fibrillation. \((\text{Level of Evidence: A})\)
2. Patients with sustained ventricular tachycardia leading to hemodynamic collapse who meet one or more of the following conditions: \((\text{Level of Evidence: A})\)
   1) Patients with syncope during ventricular tachycardia.
   2) Patients with a blood pressure of 80 mmHg or less, symptoms of cerebral ischemia or chest pain during tachycardia.
   3) Patients with polymorphic ventricular tachycardia.
   4) Patients with hemodynamically stable monomorphic ventricular tachycardia in whom pharmacotherapy is ineffective, or cannot be continued due to adverse drug reac-
tions, or cannot be assessed for drug efficacy, or in whom catheter ablation is ineffective or impossible.

3. Patients with nonsustained ventricular tachycardia complicated by left ventricular dysfunction (LVEF of 35% or less) in whom sustained ventricular tachycardia/ventricular fibrillation leading to hemodynamic collapse is induced during electrophysiological study. (Level of Evidence: B)

4. Patients with New York Heart Association (NYHA) Class II or III symptoms of chronic heart failure despite appropriate pharmacotherapy, a LVEF of 35% or less, and nonsustained ventricular tachycardia. (Level of Evidence: B)

5. Patients with NYHA Class II or III symptoms of chronic heart failure despite appropriate pharmacotherapy, a LVEF of 35% or less, and syncope of unknown etiology. (Level of Evidence: B)

Class IIa

1. Patients whom sustained ventricular tachycardia is no longer induced after catheter ablation. (Level of Evidence: C)

2. Patients with sustained ventricular tachycardia for whom effective pharmacotherapy was established through the observation of clinical course and drug efficacy evaluation. (Level of Evidence: B)

3. Patients with chronic heart failure who are at least 40 days post-MI who have NYHA Class II or III symptoms despite sufficient pharmacotherapy and a LVEF of 35% or less. (Level of Evidence: A)

4. Patients with syncope of unknown etiology and moderate cardiac dysfunction (LVEF of 36 to 50% and NYHA Class I symptoms) in whom ventricular tachycardia/fibrillation is induced during electrophysiological study. (Level of Evidence: B)

Class IIb

1. Patients with NYHA Class I symptoms and severe left ventricular dysfunction (LVEF of 30% or less) who are at least 1 month after onset of MI or at least 3 months after coronary revascularization. (Level of Evidence: A)

2. Patients with ventricular tachycardia/fibrillation that is highly likely due to reversible causes (e.g., acute ischemia, electrolyte imbalance, and drugs) in whom there is a high risk of re-exposure to the cause despite sufficient treatment (e.g., ventricular fibrillation due to drug-resistant coronary spasm). (Level of Evidence: C)

Class III

1. Patients with ventricular tachycardia/fibrillation due to reversible causes (e.g., acute ischemia, electrolyte imbalance, and drugs) in whom recurrent ventricular tachycardia/fibrillation may be prevented by eliminating the cause. (Level of Evidence: C)

2. Patients with frequent ventricular tachycardia/fibrillation that cannot be controlled with antiarrhythmic drugs and/or catheter ablation. (Level of Evidence: C)

3. Patients whose life expectancy is less than 12 months. (Level of Evidence: C)

4. Patients who cannot express consent or cooperate with treatment due to mental disorder or other reasons. (Level of Evidence: C)

5. Patients with severe drug-resistant congestive heart failure and NYHA Class IV symptoms who are not indicated for heart transplantation or CRT. (Level of Evidence: C)

3. Cardiac Resynchronization Therapy\textsuperscript{229–231}

1) Cardiac Resynchronization Therapy-Pacemaker; CRT-P\textsuperscript{229,230,232,233}

Class I

Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and sinus rhythm. (Level of Evidence: A)

Class IIa

1. Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and atrial fibrillation. (Level of Evidence: B)

2. Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, and who have received or are planned to receive permanent pacemaker implantation, and have depended on or are expected to require ventricular pacing frequently. (Level of Evidence: C)

Class IIb

Patients with NYHA Class II symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, and who are planned to receive permanent pacemaker implantation and are expected to require ventricular pacing frequently. (Level of Evidence: C)

Class III

1. Asymptomatic patients with low LVEF who are not indicated for permanent pacing or ICD. (Level of Evidence: C)

2. Patients whose physical function is limited by chronic conditions other than heart failure, or patients whose life expectancy is less than 12 months. (Level of Evidence: C)

2) Cardiac Resynchronization Therapy Device That Incorporates Both Pacing and Defibrillation Capabilities; CRT-D\textsuperscript{234–237}

Class I

Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and sinus rhythm, and who are indicated for ICD therapy. (Level of Evidence: A)

Class IIa

1. Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and atrial fibrillation, and who are indicated for ICD therapy. (Level of Evidence: B)

2. Patients with NYHA Class II symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 30% or less, a QRS duration of 150 msec or more, and sinus rhythm, and who are indicated for ICD therapy. (Level of Evidence: B)

3. Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, and who have received or are planned to receive ICD therapy, and have depended on or are expected to require ventricular pacing frequently. (Level of Evidence: B)

Class IIb

Patients with NYHA Class II symptoms of chronic heart fail-
### General treatment

#### Diet therapy
1. Blood pressure control
   - Salt intake should be reduced to less than 6 g per day.
   - Alcohol consumption should be restricted to less than 30 mL of pure alcohol per day.
   - Regular moderate physical activity (at least 30 minutes per day) is useful for the treatment and prevention of hypertension.

2. Lipid management
   - Body weight should be maintained at an appropriate level (standard body weight = height [m] × height [m] × 22).
   - Fat intake should be limited to 25% or less of total calories.
   - Saturated fatty acid intake should be limited to 7% or less of total calories.
   - Intake of polyunsaturated fatty acids, particularly n-3 polyunsaturated fatty acids, should be increased.
   - Cholesterol intake should be limited to 300 mg or less per day.

3. Weight management
   - Patients should be instructed to maintain their body weight within a BMI range of 18.5 to 24.9 kg/m².

4. Diabetes management
   - For patients with diabetes, healthcare professionals should determine appropriate calorie intake based on body size, activity level and other factors and should instruct them to keep the calorie intake within the recommended limit with a goal of HbA1c less than 7.0% (international standard; less than 6.6% in JDS value). [IIa]

#### Exercise therapy (Cardiac rehabilitation)
- Based on the results of exercise test, patients should perform at least 30 minutes of aerobic exercise such as walking, running, and cycling, 3 or 4 times a week (every day, if possible).
- Patients should increase physical activities in daily living (e.g., walking to work, and doing household or outside work).
- Patients should perform rhythmic resistance exercise of about 10 to 15 RM in a frequency similar to that of aerobic exercise.
- Institutional exercise therapy is recommended for intermediate- and high-risk patients. 

#### Smoking cessation counseling
- Patients should be asked about tobacco use status.
- Smoking patients (current, former) should be informed of the harmful effects of smoking and given smoking cessation counseling and support. The harmful effects of passive smoking should also be explained, and lifestyle modification and behavioral therapy should be instructed.

### Pharmacotherapy

#### Antiplatelet agents and anticoagulants
- Aspirin (81 to 162 mg) should be administered indefinitely, if not contraindicated.
- Trapidil (300 mg) should be administered when aspirin is contraindicated.
- Warfarin should be used concomitantly in MI patients with left ventricular or atrial thrombus, severe heart failure, left ventricular aneurysm, paroxysmal or chronic atrial fibrillation, pulmonary artery thromboembolism, or prosthetic heart valve.
- Low-dose aspirin and thienopyridine antiplatelet agents should be used concomitantly in patients who have received coronary stents.

#### β-blockers
- β-blockers should be administered to patients who are not at low risk, if not contraindicated.
- β-blockers should be administered to patients with moderate or severe left ventricular dysfunction, with gradual increments in dose.

#### Lipid metabolism-improving agents
- Statins should be administered to patients with hyper-LDL cholesterolemia.
- The use of high-purity EPA preparation in addition to statins should be considered in patients with hyper-LDL cholesterolemia.

#### Anti-diabetic drugs
- Adequate control of blood pressure and lipid levels should be aimed in diabetic patients with MI.

#### Nitrates
- Fast-acting nitrates such as nitroglycerin (i.e., sublingual tablet, nebulized spray or intravenous one-shot injection) should be used to treat anginal attacks.

#### Nicorandil
- Long-term administration of nicorandil should be used for patients with old MI complicated by stable angina.
- Nicorandil should be administered to improve the symptoms of post-infarction angina and myocardial ischemia.

#### Calcium channel blockers
- Long-acting calcium channel blockers should be used for MI patients with coronary spastic angina or those in whom coronary spasm was definitely considered to be the cause of MI, to prevent ischemic attacks.

#### Renin-angiotensin-aldosterone system inhibitors
1. ACE inhibitors
   - ACE inhibitors should be administered within 24 hours after the onset of acute MI to high-risk patients who have left ventricular dysfunction (LVEF of less than 40%) or heart failure.

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(Table 2 continued on the next page.)
### 2. ARBs
- ARB therapy should be initiated to patients in an acute phase of MI who have intolerance to ACE inhibitors and who have signs of heart failure or LVEF of 40% or less.

### 3. Aldosterone blockers
- Aldosterone blockers should be used in patients with moderate to severe heart failure without renal dysfunction or hyperkalemia. [IIa]

### 4. Direct renin inhibitors
- None.

#### Antiarrhythmic medications

| Supraventricular arrhythmia | Ventricular arrhythmia |
|----------------------------|------------------------|
| - Heart rate control by monotherapy or combination therapy with β-blockers, non-dihydropyridine calcium channel blockers, and/or digoxin should be performed in patients with atrial fibrillation not complicated by heart failure. | - β-blockers should be used for patients with PVC, nonsustained ventricular tachycardia, sustained ventricular tachycardia, or ventricular fibrillation (whenever possible, if not contraindicated). |
| - Heart rate control by β-blockers with or without digoxin should be performed in patients with atrial fibrillation complicated by heart failure due to systolic dysfunction. | - Patients with significant cardiac dysfunction due to myocardial ischemia. |
| - Heart rate control by amiodarone should be performed in patients with atrial fibrillation complicated by heart failure due to systolic dysfunction in whom β-blockers are unusable. | - Patients with myocardial ischemia refractory to pharmacotherapy (including asymptomatic myocardial ischemia). |

#### Digitalis
- Digitalis should be administered to patients with heart failure complicated by atrial fibrillation with tachycardia.

#### PDE Inhibitors
- None.

#### Influenza vaccine
- Inactivated influenza vaccine should be given to post-MI patients. [IIa]

#### Coronary intervention (during the period between 24 hours after onset and discharge)

| Indications for coronary intervention for culprit lesions of acute MI | Indications for coronary intervention for non-culprit lesions of acute MI |
|---------------------------------------------------------------------|---------------------------------------------------------------------|
| - Patients with myocardial ischemia refractory to pharmacotherapy. | - Patients with multiple risk factors. |
| - Patients with frequent PVCs associated with significant decrease in QOL or heart failure in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with significant cardiac dysfunction due to myocardial ischemia. |
| - Patients in whom CRT is not effective due to ineffective pacing caused by frequent PVCs and pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with sustained ventricular tachycardia leading to hemodynamic collapse who meet one or more of the following conditions; |
| - Patients with monomorphic ventricular tachycardia complicated by cardiac dysfunction or heart failure in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with syncope during ventricular tachycardia. |
| - Patients with frequent ICD discharges and in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with a blood pressure of 60 mmHg or less, symptoms of cerebral ischemia or chest pain during tachycardia. |

#### Non-pharmacotherapy of arrhythmia

| Catheter ablation (PVC/Ventricular tachycardia) | ICD |
|------------------------------------------------|-----|
| - Patients with unifocal PVC triggering ventricular tachycardia or ventricular fibrillation in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with sustained ventricular tachycardia leading to hemodynamic collapse who meet one or more of the following conditions; |
| - Patients with frequent PVCs associated with significant decrease in QOL or heart failure in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with syncope during ventricular tachycardia. |
| - Patients in whom CRT is not effective due to ineffective pacing caused by frequent PVCs and pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | - Patients with a blood pressure of 60 mmHg or less, symptoms of cerebral ischemia or chest pain during tachycardia. |
| - Patients with monomorphic ventricular tachycardia complicated by cardiac dysfunction or heart failure in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | Patients with polymorphic ventricular tachycardia. |
| - Patients with frequent ICD discharges and in whom pharmacotherapy is ineffective or cannot be continued due to adverse drug reactions. | Patients with hemodynamically stable monomorphic ventricular tachycardia in whom pharmacotherapy is ineffective, or cannot be continued due to adverse drug reactions, or cannot be assessed for drug efficacy, or in whom catheter ablation is ineffective or impossible. |
| - Patients with unifocal PVC triggering ventricular tachycardia. | Patients with nonsustained ventricular tachycardia complicated by left ventricular dysfunction (LVEF of 35% or less) in whom sustained ventricular tachycardia/ventricular fibrillation leading to hemodynamic collapse is induced due to electrophysiological study. |
| - Patients with low cardiac output and heart failure. | Patients with NYHA Class II or III symptoms of chronic heart failure despite appropriate pharmacotherapy, a LVEF of 35% or less, and nonsustained ventricular tachycardia. |
| - Patients with syncope associated with ventricular tachycardia. | Patients with NYHA Class II or III symptoms of chronic heart failure despite appropriate pharmacotherapy, a LVEF of 35% or less, and syncope of unknown etiology. |
| - Patients with hemodynamically stable monomorphic ventricular tachycardia in whom pharmacotherapy is ineffective, or cannot be continued due to adverse drug reactions, or cannot be assessed for drug efficacy, or in whom catheter ablation is ineffective or impossible. | Patients with NYHA Class II or III symptoms of chronic heart failure despite appropriate pharmacotherapy, a LVEF of 35% or less, and syncope of unknown etiology. |
| - Patients with nonsustained ventricular tachycardia complicated by left ventricular dysfunction (LVEF of 35% or less) in whom sustained ventricular tachycardia/ventricular fibrillation leading to hemodynamic collapse is induced due to electrophysiological study. | Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and sinus rhythm. |
| - Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and sinus rhythm, and who are indicated for ICD therapy. | Patients with NYHA Class III or ambulatory Class IV symptoms of chronic heart failure despite optimal pharmacotherapy, a LVEF of 35% or less, a QRS duration of 120 msec or more, and sinus rhythm. |

(Table 2’s footnote is on the next page.)
ure despite optimal pharmacotherapy, a LVEF of 35% or less, and who are planned to receive ICD therapy and are expected to require ventricular pacing frequently. (Level of Evidence: B)

Class III
1. Asymptomatic patients with low LVEF who are not indicated for ICD therapy. (Level of Evidence: C)
2. Patients whose physical function is limited by chronic conditions other than heart failure, or patients whose life expectancy is less than 12 months. (Level of Evidence: C)

Table 2 summarizes Class I recommendations (plus some Class IIa recommendations) that are frequently used in the clinical setting.

[Note]
The present guidelines provide standard practices developed on the basis of substantial evidence. Since each patient has his or her unique characteristics, physicians should use these guidelines with sufficient attention given to individual circumstances, and treatment plan should always be at physician’s discretion and according to clinical symptoms. The present guidelines provide no grounds for argument in case of legal prosecution and this guideline document is not provided as a peer-reviewed article or research report.

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Circulation Journal Vol.77, Jan 2013

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