Stable Ischemic Heart Disease

CME Objective: To review current evidence for diagnosis, treatment, and practice improvement of stable ischemic heart disease.

The information contained herein should never be used as a substitute for clinical judgment.

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stable ischemic heart disease (SIHD) affects many millions of Americans, with associated annual costs measured in tens of billions of dollars. It is a leading cause of death in the United States. SIHD occurs when coronary artery disease (CAD) reduces the blood supply to the heart and typically causes recurrent chest pain or pressure known as angina. The angina is exacerbated by activity or stress, lasts for minutes not seconds or hours, and goes away with rest or medication. Timely diagnosis and optimal treatment can reduce complications and mortality from SIHD.

Recent clinical guidelines are designed to improve clinical care for SIHD. For example, in 2011, the U.K. National Institute of Clinical Excellence released new guidance on the management of stable angina (www.nice.org.uk/guidance/CG126). Also, in 2012, a collaboration of professional organizations in the United States released new guidelines for diagnosis and management (1-3).

**Diagnosis**

**Why is it important to differentiate patients with SIHD from patients with unstable angina?**

Stable angina is typically brought on by exertion or emotion. In contrast, unstable angina symptoms are more random and unpredictable and often occur without an apparent trigger (see the Box: Principal Presentations of Unstable Angina). Patients with low-risk unstable angina can be managed the same way as patients with SIHD. However, patients with high-risk or intermediate-risk unstable angina should be managed more aggressively than described in these materials (4).

**What other diseases might be confused with SIHD?**

Some patients with symptoms suggesting SIHD have an overall clinical picture that suggests another diagnosis (see the Box: Alternative Diagnoses to Angina for Patients With Chest Pain).

**Why is it important to estimate the probability of disease separately from the mortality risk when evaluating people with suspected SIHD?**

It is important to identify patients with a probability of CAD low enough (< 5%) that they can benefit from studies looking for causes of chest pain other than CAD. The clinician should start this process using the patient’s age, sex, and type of angina (Table 1 and the Box: Clinical Classification of Chest Pain). Smoking history, hyperlipidemia, and diabetes mellitus increase the likelihood of CAD for each type of patient, with diabetes having the greatest influence.

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**Table 1. Pretest Likelihood of Coronary Artery Disease in Symptomatic Patients According to Age and Sex**

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Nonangina Chest Pain, %†</th>
<th>Atypical Angina, %†</th>
<th>Typical Angina, %‡</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>30–39</td>
<td>4</td>
<td>2</td>
<td>34</td>
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<td>40–49</td>
<td>13</td>
<td>3</td>
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<td>50–59</td>
<td>20</td>
<td>7</td>
<td>65</td>
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<tr>
<td>60–69</td>
<td>27</td>
<td>14</td>
<td>72</td>
</tr>
</tbody>
</table>

*From reference 42.
†See the Box: Clinical Classification of Chest Pain.
**How should information from the physical examination be used to evaluate people with suspected SIHD?**

The physical examination is often normal or nonspecific in patients with stable angina. It may, however, reveal related conditions, such as heart failure, valvular heart disease, or hypertrophic cardiomyopathy. Signs that suggest CAD when they are present during chest pain and disappear with resolution of angina include an S3 or S4 gallop, mitral regurgitant murmur, bibasilar rales, paradoxically split S2, or chest wall heave.

Signs of congestive heart failure include jugular venous pulsation, S3 gallop, mitral regurgitation murmur, displaced apical impulse, pulmonary crackles, diminished breath sounds, or dullness to percussion, abdominal pulsations, and lower extremity edema. Signs of noncoronary atherosclerotic vascular disease that increase the probability of CAD include carotid bruit, diminished or absent pedal pulses, or an abdominal aneurysm [6]. Xanthelasmas and xanthommas (yellow patches or plaques on the skin caused by lipid deposits) are signs of hyperlipidemias.

**What other preliminary tests should be used to evaluate people with suspected SIHD?**

**Electrocardiogram**

All patients with suspected SIHD should have a resting electrocardiogram (ECG). Most patients with SIHD have a normal resting ECG, but pathologic Q-waves indicate a prior myocardial infarction (MI). Also, left bundle branch block and some other ECG abnormalities help determine which stress test to select for patients who need stress testing.

**Chest x-ray**

All patients without an obvious non-cardiac cause of angina should have a chest x-ray. Chest x-rays are frequently normal in patients with stable angina, but they may find evidence of CHF, which worsens the prognosis, and they may suggest causes of chest pain other than angina.

**Echocardiography**

Rest echocardiography is not recommended for most patients with suspected angina. The clinician should consider rest echocardiography when patients have signs or symptoms suggesting heart failure or cardiac valvular lesions, a pathologic Q-wave on the ECG, or ECG findings of complex ventricular arrhythmias.

**Which diagnostic test should follow the preliminary assessment?**

The next diagnostic test should establish or rule out the diagnosis of CAD and at the same time estimate the patient’s mortality risk, because information on mortality risk is necessary to choose among possible therapies. For most patients the next diagnostic test should be a standard exercise ECG using as the diagnostic endpoint for ischemia ≥ 1 mm horizontal or down-sloping ST-segment depression at 80 ms after the J point during peak exercise. Once the diagnosis is established, the Duke Treadmill Score, which is based on the standard exercise ECG, accurately predicts the mortality risk (see the Box: Duke Treadmill Score). Patients with low-risk exercise treadmill scores (≥ + 5) have an estimated cardiac mortality rate of ≥ 1% per year and usually do not require further risk assessment. Patients with intermediate exercise treadmill scores (< + 5 and ≥ − 10) may be stratified into low-risk (appropriate for medical management) and high-risk (consider for revascularization) groups using follow-up stress imaging or coronary angiography [7]. Patients with high-risk exercise treadmill scores (< − 10) have an annual mortality of ≥ 3% and should be considered for revascularization.

Some patients have an ECG that cannot be interpreted during exercise because of left bundle branch block,
ventricular pacing, or some other ECG abnormality. A patient whose ECG is not interpretable during exercise because of left bundle branch block should have a pharmacologic stress test using imaging during the test to replace ECG monitoring, with imaging based either on radionuclide perfusion of the myocardium or echocardiography. A patient whose ECG is not interpretable during exercise because of abnormalities other than left bundle branch block should have an exercise stress test with imaging, using either radionuclide perfusion of the myocardium or echocardiography.

Some patients cannot exercise or cannot exercise strenuously enough to generate a valid test result. These patients should have a pharmacologic stress test with imaging, using either radionuclide perfusion of the myocardium or echocardiography. Although a low coronary artery calcium score reliably identifies people without CAD, a high score is less reliable in ruling in CAD, which is why the role of this technology in evaluating patients with suspected SIHD remains uncertain. Some experts recommend it for patients with atypical symptoms who are at low risk for CAD because a low score might help rule out CAD. Other experts recommend it for patients with an intermediate risk after initial stress testing because it might help decide next steps for assessing risk.

Other noninvasive tests are being used at some institutions, including cardiac computed tomography angiography and stress with cardiac magnetic resonance imaging. These tests are not generally available, and most observers believe we need to know more about them before recommending widespread use.

**When should clinicians refer patients with suspected SIHD to specialists?**

Clinicians should consider consulting a cardiologist for patients with an uncertain diagnosis after noninvasive testing and for patients in whom noninvasive testing is contraindicated.

**When should coronary angiography be used as the initial test to evaluate people with suspected SIHD?**

Some patients should have coronary angiography instead of noninvasive tests to establish the diagnosis of CAD and to assess its mortality risk. Included are patients who have survived sudden cardiac death or a life-threatening ventricular arrhythmia, patients who have a high likelihood of severe CAD, patients in whom coronary artery spasm is strongly suspected, and some patients with heart failure. For other patients, such as airplane pilots, firefighters, and police officers, the employer may require coronary angiography before allowing a return to work, regardless of the results from noninvasive testing.

**DIAGNOSIS...** The most useful preliminary predictors of clinically significant CAD are the patient’s age, sex, and type of chest pain, but smoking history, hyperlipidemia, and diabetes mellitus are also useful. Information from the physical examination can identify cardiac disease other than CAD and comorbid diseases that exacerbate angina. All patients should have a resting ECG, and nearly all patients should have a chest x-ray. Most patients should have a standard exercise ECG test as the initial noninvasive test for measuring the probability of CAD and estimating the mortality risk. The clinician should consider coronary angiography instead of noninvasive testing for a specific and limited subset of patients. The clinician should consider consulting a cardiologist for patients with an uncertain diagnosis after noninvasive testing and for patients in whom noninvasive testing is contraindicated.

**CLINICAL BOTTOM LINE**

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Duke Treadmill Score*

Duke Treadmill Score = Minutes of exercise – (5 x maximal mm of ST deviation) – (0 for no chest pain, 4 for angina with exertion, or 8 if angina is the reason for stopping the test).

*From reference 8.
What are the goals of treatment?
The main goals are minimizing the likelihood of death while maximizing health and function. More specifically, these goals include reducing premature cardiovascular death while preventing complications of SIHD that impair patients’ functional well-being, including acute MI and heart failure; eliminating ischemic symptoms to the extent possible; and maintaining or restoring a level of activity and quality of life that is satisfactory to the patient. This approach acknowledges that some treatments are intended more to improve survival while others are intended more to reduce symptoms, although many treatments help achieve both goals at the same time (see the Box: Strategies for Achieving Treatment Goals).

What is “guideline-directed medical therapy” for patients with SIHD?
A specific combination of treatments that is appropriate for most patients is called “guideline-directed medical therapy” (Figure 1) (3) and should be instituted regardless of whether revascularization occurs.

What is the role of patient education?
Patient education plays a crucial role in reducing risk factors and improving medication adherence in patients with SIHD. It should include information about the underlying disease process and therapeutic options, including the anticipated risks, costs, and outcomes.

Individualized patient education tends to improve adherence to medical therapy and patient satisfaction. It should focus on reviewing individual prognosis, important risk factors and lifestyle modifications, behavioral approaches, and medications that reduce these risk factors. It should include a review of the benefits and potential side effects of medications and the proper method of administering medications. Any limitations on physical activity, including sexual activity, should be addressed.

Patients should be instructed on when to seek medical help. In particular, they should know the warning signs and symptoms of MI and when to use aspirin and nitroglycerin. They should know how to contact emergency medical personnel and where to find the nearest hospital with 24-hour emergency cardiovascular services. Consider advising CPR training for family members.

Patients may also benefit from group education, which is often behaviorally oriented. It may involve motivational reminders for lifestyle change received on their mobile telephone and recommendations to access health information Web sites. Home blood pressure (BP), blood glucose monitoring, and other self-monitoring techniques can support lifestyle change.

Factors that may complicate patient education include low literacy, emotional disorders, social isolation, cultural beliefs, environmental factors, poverty, advanced age, and complex comorbid conditions. These factors may impair a patient’s ability to adhere to recommended medical therapies and lifestyle changes.

Which risk factors should be modified?
About half of the decline in cardiovascular mortality observed during the past 40 years has been due to interventions directed at risk factors. According to 1 analysis, lowering total cholesterol accounted for approximately 24% of the observed mortality reduction, lowering systolic BP for 20%, reducing smoking for 12%, and increasing physical activity for 5% (9).

| Strategies for Achieving Treatment Goals |
| Patient education | Lifestyle modification | Medical therapy |
| Revascularization (coronary artery bypass grafting or percutaneous coronary intervention) |

Therefore, reducing risk factors should be pursued as intensively as is reasonable, and initial patient management should focus on eliminating unhealthy behaviors and on promoting weight loss, physical activity, and a heart-healthy diet (2).

**Smoking cessation**

Smoking increases cardiovascular disease mortality by 50% (10). Among nondrug therapies, smoking cessation confers the greatest possibility of risk reduction. Physicians should systematically identify all tobacco users and recommend smoking cessation at each

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**Figure 1.** Guideline-directed medical therapy for patients with stable ischemic heart disease. ACCF = American College of Cardiology Foundation; ACEI = angiotensin-converting enzyme inhibitor; AHA = American Heart Association; ARB = angiotensin-receptor blocker; ASA = aspirin; ATP III = Adult Treatment Panel III; BP = blood pressure; CCB = calcium-channel blocker; CKD = chronic kidney disease; JNC VII = Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; LV = left ventricular; MI = myocardial infarction; NHLBI = National Heart, Lung, and Blood Institute; NTG = nitroglycerin. From reference 3. Reprinted with permission from the American College of Physicians.

* The use of bile acid sequestrant is relatively contraindicated when triglyceride levels are 200 mg/dL or greater and is contraindicated when triglyceride levels are 500 mg/dL or greater.

† Dietary supplement niacin must not be used as a substitute for prescription niacin.
Physical activity

Regular exercise reduces coronary heart disease mortality and may reduce angina and improve functional capacity. Physicians should encourage patients with chronic stable angina to incorporate moderate aerobic physical activity, such as 30 minutes of brisk walking, at least 5 days a week. Resistance therapy is also well-tolerated and associated with improvements in quality of life, strength, and endurance when added to a program of regular aerobic exercise, although it has not been extensively evaluated in patients with SIHD. Patients at high risk for cardiac complications should participate in a medically supervised program for 8 to 12 weeks to establish the safety of the prescribed exercise regimen.

Dietary modification

An unhealthy diet contributes to dyslipidemia, hypertension, obesity, and diabetes mellitus. In contrast, consuming a diet that is low in saturated fat, cholesterol, trans-fatty acids, and sodium and rich in fresh fruits, vegetables, and whole grains can reduce serum cholesterol and cardiovascular risk. Consumption of omega-3 fatty acids in the form of fish (3 servings per week) or in capsule form (1 g/day [2 to 4 g/day for treatment of elevated triglycerides]) can also reduce risk in patients with SIHD. Plant stanols/sterols (2 g/day) can lower low-density lipoprotein (LDL) cholesterol by 5% to 15%, and the addition of viscous fiber (> 10 g/day) can reduce LDL cholesterol by 3% to 5% (13-16). If alcohol is part of the diet, consumption should be moderate.

Lipid management

A combination of therapeutic lifestyle interventions, such as dietary modification with increased exercise activity, along with HMG-CoA reductase inhibitors (statins) should be used for lipid management, unless contraindicated or adverse events occur. Although previous guidelines recommended titrating statin doses to target levels for LDL cholesterol, current guidelines recommend standard doses of statins for patients in specific risk categories. For example, in patients with stable angina, the guidelines recommend high-intensity statin therapy (atorvastatin 80 mg or rosuvastatin 20 mg) for patients ≤ 75 y and moderate-intensity statin therapy (atorvastatin 10 mg, rosuvastatin 10 mg, and other doses for other statins) for patients > 75 y (17).

For patients who do not tolerate statins, ezetimibe, plant stanols/sterols, and omega-3 fatty acids may be considered, although they have not been shown to improve clinical outcomes.

BP control

Hypertension is an important independent risk factor for coronary heart disease events. Various studies have demonstrated a continuous and graded relationship between BP and cardiovascular risk.

A meta-analysis of prospective studies of nearly 1 million adults without preexisting vascular disease found that risk for vascular death increased linearly over the BP range of 115/75 mm Hg to 185/115 mm Hg, without a threshold effect. Each increment of 20 mm Hg in systolic BP or 10 mm Hg in diastolic BP was associated with a doubling of risk (18).

An overview of 17 placebo-controlled trials showed that a reduction of 5 to 6 mm Hg in diastolic BP (or an estimated 10 to 20 mm Hg in systolic BP) was associated with a significant reduction in vascular mortality.
with an approximately 40% reduction in stroke and 20% reduction in coronary events (19).

In many patients, therapy with antihypertensive medications is required to lower BP. There is no established optimal threshold of benefit with regard to reduction in BP levels (3). There are, however, reasons for caution in intensive BP lowering in patients with SIHD because excessive reduction in diastolic BP may compromise coronary perfusion.

Psychological well-being

Interventions to reduce psychological stress may improve clinical outcomes in patients with SIHD (19). Clinicians may recommend that patients seek counseling or stress management interventions, like meditation, to reduce risks and improve well-being.

Which medical therapies can prevent MI or death?

Antiplatelet therapy

Because platelet aggregation is a key element of the thrombotic response to plaque disruption, platelet inhibition is recommended in patients with SIHD.

Among 2920 patients with SIHD, a meta-analysis associated aspirin use with a 33% reduction in the risk for serious vascular events, including a 46% decrease in the risk for unstable angina and a 53% decrease in the risk for requiring coronary angioplasty (20).

A meta-analysis of 145 randomized trials found an association between medium-dose aspirin (75 to 325 mg/d) and a 27% reduction in the odds ratio for major cardiovascular events over 5 years in patients with known coronary or vascular disease (21).

Meta-analysis from the U.S. Preventive Services Task Forces concluded that aspirin reduces cardiovascular disease in patients, with men having fewer MIs and women having fewer ischemic strokes (22).

Therefore, in the absence of contraindications, all patients with SIHD should receive aspirin therapy and continue it indefinitely. A dose of 75 to 162 mg daily is as effective as higher doses and is associated with a lower risk for bleeding. When aspirin is contraindicated, patients can be treated with clopidogrel 75 mg daily.

Influenza vaccine

Patients with SIHD should receive an annual influenza vaccine (23).

ACE inhibitors

Angiotensin-converting enzyme (ACE) inhibitors should be prescribed for patients with SIHD who also have hypertension, diabetes, left ventricular (LV) systolic dysfunction (ejection fraction < 40%) or chronic kidney disease. For example, ACE inhibitors reduce mortality, composite cardiovascular events, MI, and stroke in patients with LV ejection fraction < 35% or diabetes and ≥ 1 additional cardiovascular risk factor.

In the CONSENSUS trial, enalapril titrated to 40 mg/d in patients with class IV CHF reduced mortality by 18% at 6 months (NNT = 5.5) (24).

In the SOLVD treatment trial, enalapril titrated to 20 mg/d in patients with class II and III CHF reduced mortality by 4.5% at 3 years (NNT = 22) (25).

In the SOLVD prevention trial, enalapril titrated to 20 mg/d in patients with asymptomatic LV dysfunction reduced death from CHF, hospitalization for CHF, and the composite outcome of death or development of CHF (26).

In the HOPE trial, patients with vascular disease or diabetes and ≥ 1 additional cardiovascular risk factor who were treated with ramipril, 10 mg/d for an average of 4.5 years, had significantly reduced risk for cardiovascular events (27).

Angiotensin–receptor blockers

When ACE inhibitors are contraindicated, angiotensin–receptor blockers should be prescribed for patients with SIHD who also have hypertension, diabetes, LV systolic dysfunction (ejection fraction < 40%), or chronic kidney disease (28).
β-blocker therapy
Metoprolol succinate, carvedilol, or bisoprolol should be prescribed for patients with LV systolic dysfunction (ejection fraction < 40%) and heart failure or prior MI (29-31).

Alternative therapies
Vitamins and mineral supplements are not recommended for preventing CAD events (32, 33).

Which medical therapies relieve symptoms?
A range of drugs are available that are effective at reducing symptoms, including β-blockers, calcium-channel blockers, and nitrates. All of the classes of agents seem to be relatively similar in antianginal efficacy and have acceptable safety and tolerability profiles. Comparative trials among these medications are relatively few and for the most part small. Because β-blockers have been shown to improve survival in patients after acute MI and have a long history of clinical use, they are considered first-line drugs for treating angina. In patients who do not tolerate or adequately respond to β-blockers, calcium-channel blockers or long-acting nitrates may be substituted or added (34).

Short-acting nitrates
Sublingual nitroglycerin or nitroglycerin spray should be used for immediate relief of angina.

β-blocker therapy
β-blockers should be prescribed as initial therapy for relief of symptoms. Expert panels recommend titrating β-blockers to a resting heart rate of 55 to 60 beats/min.

Calcium-channel blockers and long-acting nitrates
Calcium-channel blockers or long-acting nitrates can be prescribed when β-blockers are contraindicated or produce unacceptable side effects. When β-blockers are ineffective, calcium-channel blockers or long-acting nitrates can be prescribed in addition to or instead of β-blockers (35).

Ranolazine
Ranolazine is a recently approved drug that shares characteristics with calcium-channel blockers but seems to act via different mechanisms. Consider using ranolazine when β-blockers are contraindicated or produce unacceptable side effects. Consider using ranolazine combined or instead of β-blockers if β-blockers are ineffective (36, 37).

Alternative therapies
Alternative therapies, including spinal cord stimulation, enhanced external counterpulsation, and transmyocardial revascularization, may be considered for relief of refractory angina in patients with SIHD (1).

Which patients are candidates for revascularization with either coronary artery bypass graft surgery (CABG) or percutaneous coronary intervention (PCI)?
Consider revascularization to improve survival in patients with SIHD who are at high risk for mortality, and consider revascularization to relieve persistent symptoms despite an adequate trial of guideline-directed medical therapy (Figures 1 and 2).

When patients are candidates for revascularization to improve survival, which patients should have CABG, and which patients should have PCI?
Patients with SIHD at high risk for mortality are candidates for revascularization to improve survival and should have coronary angiography. Revascularization should not be done to improve survival if coronary angiography reveals stenoses that are not anatomically or functionally significant, involve only the left circumflex artery or right coronary artery, or affect only a small area of viable myocardium. If coronary angiography finds left main CAD or complex CAD, the decision between either

type of revascularization should involve the patient, a cardiac surgeon, and an interventional cardiologist. CABG is recommended when the patient has stenosis of the left main coronary artery that is ≥50% of the lumen diameter or stenosis of ≥70% in 3 major coronary arteries or stenosis of ≥70% in the proximal left anterior descending artery and 1 other major coronary artery. Either method can be used for survivors of sudden cardiac death with presumed ischemia-mediated ventricular tachycardia caused by ≥70% stenosis in a major artery.  

When patients are candidates for revascularization to relieve symptoms, which patients should have CABG and which patients should have PCI?  
Patients who have persistent symptoms despite an adequate trial of guideline-directed medical therapy (Figure 2) are candidates for revascularization to relieve symptoms and should have coronary angiography. When the patient has the types of stenosis described previously that are likely to affect survival, the same recommendations apply. Either CABG or PCI is recommended for other patients who have ≥70% stenosis in 1 or more coronary arteries.  

Are there special considerations for women, older adults, or patients with diabetes mellitus, chronic kidney disease, or other conditions?  
Special considerations for diagnosis and therapy may be warranted in patients with certain clinical features.  

Women  
Women generally have a lower incidence of SIHD than men until older age but outcomes after MI are worse. Microvascular disease and coronary spasm are more common in women, and obstructing epicardial CAD is less prevalent. Stable angina is the most common initial manifestation of SIHD in women, as opposed to acute MI and sudden death in men. Atypical chest pain and angina-equivalent symptoms, such as dyspnea, are more common in women, although the patterns, duration, and frequency of symptoms in women are similar to those in men.  

Such differences in presentation and testing may account, in part, for discrepancies in care between men and women with coronary disease. Women receive aspirin and other antithrombotics less frequently than men and are less likely to have revascularization.  

Older adults  
In adults older than 75 years, coronary stenoses tend to be more diffuse and severe, with a higher prevalence of 3-vessel and left main disease. Common coexisting conditions of the pulmonary, gastrointestinal, and musculoskeletal systems can cause chest pain, making diagnosis more difficult, even in patients with documented SIHD. Stress testing is more difficult due to physiologic changes associated with aging, including alterations in cardiac output, muscle loss, neuropathies, lung disease, and degenerative joint disease. Baseline ECG changes, arrhythmias, and LV hypertrophy, which are more common in older adults who have accumulated cardiac comorbid conditions, limit the value of stress testing. The higher prevalence of SIHD in older adults causes more false-negative results, although stress testing still provides useful information for management.  

Several studies have shown less frequent use of evidence-based therapies in older adults. This may be because pharmacotherapy is more difficult in older adults. A more conservative approach to coronary angiography is often appropriate given the higher risk for contrast-induced side effects. Morbidity and mortality from CABG are increased in older adults.
Persistent symptoms despite adequate trial of guideline-directed medical therapy

Consider revascularization to improve symptoms

Potential revascularization procedure warranted on the basis of assessment of coexisting cardiac and noncardiac factors and patient preferences?

Yes

Perform coronary angiography

Heart team concludes that anatomy and clinical factors indicate revascularization may improve symptoms

Yes

Lesions correlated with evidence of ischemia

No

Determine optimal method of revascularization on the basis of patient preferences, anatomy, other clinical factors, and local resources and expertise

CABG preferred

See text for indications

PCI preferred

See text for indications

Guideline-Directed Medical Therapy continued in all patients

No

Continue guideline-directed medical therapy with careful monitoring

No

Figure 2. Revascularization to improve symptoms of patients with stable ischemic heart disease. CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention.
Diabetes mellitus

Type 1 and type 2 diabetes mellitus increase risk for SIHD and magnify the effects of other risk factors, such as hypercholesterolemia. Mortality risk for SIHD among diabetics is equivalent to that of persons with previous MI. Intensive and early diagnosis and management are important, as is a focus on achievement and maintenance of optimal blood sugar control, lipid management, and attention to other risk factors.

Among patients with CAD, concomitant diabetes increases the risk for adverse events with both medical therapy and revascularization. CABG may be preferable to PCI in these patients, but the data are evolving.

Chronic kidney disease

Chronic kidney disease confers greater risk for SIHD, for progression of SIHD, and for poor outcomes after interventions for AMI. To avoid these complications, physicians should consider creatinine clearance when choosing and dosing drugs, risk scores for predicting contrast-induced nephropathy, and renal protective strategies during angiography.

Survival may be longer in patients with chronic kidney disease after CABG than PCI; however, the data are inconclusive.

How should patients with treated SIHD be followed?

Follow-up visits should be scheduled periodically according to the stability of clinical status and the establishment of consistent communication with patients and other physicians involved in the care of the patient. Appointments should be scheduled every 4 to 6 months during the first year of treatment and every 4 to 12 months thereafter, as long as angina remains stable and treatment is otherwise successful. Visits may be more frequent after changes in medical management.

During each visit, obtain detailed information on angina (see the Box: Questions for Follow-up Visits). If symptoms increase in frequency or severity, inquire about the exacerbating and alleviating conditions. If the symptoms have worsened or the patient has decreased his or her physical activity to avoid angina, evaluate and treat according to either the unstable angina or chronic stable angina guideline. Changes in angina severity or frequency may indicate worsening CAD, changes in comorbid conditions, or changes in social factors (e.g., personal finance) that may affect disease severity.

Assess the patient for adherence to therapy, which may decline over time, and adverse drug effects. Attention to modifiable risk factors, such as smoking, at each visit increases the likelihood of successful risk reduction. Physicians should continue to encourage patients to engage in regular physical activity and recommend a balanced diet.

Laboratory evaluation should be used to monitor modifiable risk factors. Perform a fasting lipid panel 6 to 8 weeks after initiating lipid-lowering therapy, then less frequently during the first year of therapy. Measure creatine phosphokinase in patients receiving statins who have muscle weakness or pain, and monitor glycosylated hemoglobin at least annually in patients with stable,
treated diabetes mellitus. Perform echocardiography or radionuclide imaging only in patients with new or worsening heart failure or evidence of an intervening MI. Perform a stress test only in patients with new or worsening symptoms that are not consistent with unstable angina.

TREATMENT... The main goals of treating patients with SIHD are to minimize the likelihood of death while maximizing health and function. Risk factors like smoking, hyperlipidemia, diabetes, and high BP should be reduced as intensively as is reasonable with lifestyle modifications and medical therapy. Education is critical to ensuring that the patient understands the underlying disease process, can make informed decisions about treatment options, and knows the warning signs and symptoms of MI. All patients should have guideline-directed medical therapy to reduce the risk for mortality and relieve symptoms. Consider revascularization for patients at high risk for mortality and for those with persistent symptoms despite guideline-directed medical therapy. Follow-up should address angina, medication use, and modifiable cardiac risk factors, and follow-up testing should be directed by changes in symptoms.

CLINICAL BOTTOM LINE


Based on this clinical guideline, the American College of Physicians published 28 recommendations addressing the initial diagnosis of the patient who might have SIHD, cardiac stress testing to assess the risk for death or MI in SIHD, and coronary angiography for risk assessment. ACP also published 48 recommendations on management of SIHD that addresses patient education, management of risk factors, medical therapy to prevent MI and death and to relieve symptoms, revascularization to improve survival and symptoms, and patient follow-up.

Guidelines on management of SIHD were released in 2011 from the U.K. National Institute of Clinical Excellence. The guideline includes an emphasis on offering optimal drug treatment for managing patients with SIHD and revascularization when symptoms are not controlled with optimal drug treatment.

Some noteworthy trials on choosing between CABG and PCI were published since these guidelines were written. The Future Revascularization Evaluation in Patients with Diabetes Mellitus: Optimal Management of Multivessel Disease (FREEDOM) trial found that CABG resulted in lower rates of mortality, MI and stroke compared with PCI (18.7% vs. 26.6% overall at 5 years follow up) (38). Meanwhile, the FAME II trial showed that in stable patients with a functionally significant coronary lesion, PCI reduced the need for urgent revascularization more than medical therapy alone (the trial was stopped early).

In the Clinic

Tool Kit

Stable Ischemic Heart Disease

ACP Smart Medicine Module
http://smartmedicine.acponline.org/content.aspx?gbsId=33&resultClick=3&ClientActionType=SOLR%20Direct%20to%20Content&ClientActionData=Module%20Link%20%20Click

Access the American College of Physicians Smart Medicine modules on stable coronary heart disease and coronary artery disease in women. ACP Smart Medicine modules provide evidence-based, updated information on current diagnosis and treatment in an electronic format designed for rapid access at the point of care.

Patient Information
www.nlm.nih.gov/medlineplus/ency/patientinstructions/000088.htm

Information on coronary artery disease and on angina from the National Institutes of Health MedlinePlus.

www.nhlbi.nih.gov/health/topics/topics/angina/
www.nhlbi.nih.gov/health-spanish/topics/angina/

Information for patients on angina, in English and in Spanish from the National Heart, Lung, and Blood Institute.

Clinical Guidelines
http://eurheartj.oxfordjournals.org/content/34/38/2949.short

Evidence-based guidelines for the management of stable coronary artery disease from the European Society of Cardiology in 2013.

http://content.onlinejacc.org/article.aspx?articleid=1391404


http://guidance.nice.org.uk/CG126


Diagnostic Tests and Criteria
http://smartmedicine.acponline.org/content.aspx?gbsId=33&resultClick=3&ClientActionType=SOLR%20Direct%20to%20Content&ClientActionData=Module%20Link%20%20Click

List of laboratory and other studies for diagnosis and risk stratification of patients with angina from ACP Smart Medicine.

http://smartmedicine.acponline.org/content.aspx?gbsId=33&resultClick=3&ClientActionType=SOLR%20Direct%20to%20Content&ClientActionData=Module%20Link%20%20Click

Table showing the posttest probabilities of significant coronary artery disease based on exercise electrocardiogram results from ACP Smart Medicine.

Quality-of-Care Guidelines
http://guidance.nice.org.uk/CG821

Quality standards on stable angina from the United Kingdom's National Institute of Health and Care Excellence in 2012.


Self-assessment quiz to identify physician knowledge gaps in chronic CAD and SIHD from the American College of Cardiology.
WHAT YOU SHOULD KNOW ABOUT STABLE ISCHEMIC HEART DISEASE

What is a stable ischemic heart disease?

- Stable ischemic heart disease occurs due to poor blood flow through the blood vessels in the heart.
- During times of activity or stress when the heart muscle works harder and needs more oxygen, it can cause pain or pressure in your chest.
- You may also feel angina in your shoulders, arms, neck, jaw, or back.
- The pain or pressure lasts for minutes, not seconds or hours, and goes away with rest or medication.
- Early diagnosis and treatment are important to reduce the risk for more serious complications.
- The most common cause is coronary heart disease, which results from the buildup of plaque in the arteries to your heart.

How is it diagnosed?

- Your doctor will perform a thorough history and physical examination and order blood tests to learn more about your condition.
- You may undergo painless tests to show how your heart is working, including an electrocardiogram, which measures the electrical activity of the heart muscle, and an echocardiogram, which creates moving pictures of how your heart is functioning.
- You may take a stress test, which provides information on how exercise affects angina symptoms and overall heart functioning.
- Other tests may be needed, such as cardiac catheterization or coronary angiography to study the arteries and heart functioning.

How is it treated?

- Your doctor may prescribe medications to help control high blood pressure and blood cholesterol levels, to help prevent heart attacks, and to help you live longer.
- A medication called nitroglycerin can reduce angina symptoms when they occur.
- If your arteries are clogged, your doctor may perform a nonsurgical procedure called percutaneous coronary intervention to widen them.
- Blockages that cannot be treated with percutaneous coronary intervention may need heart bypass surgery.

Can complications be prevented?

- Stop smoking.
- Make heart-healthy changes to your diet.
- Practice stress reduction.
- Exercise moderately on a regular basis.
- Take your medications.

For More Information

www.cardiosmart.org/Heart-Conditions/Coronary-Artery-Disease
www.cardiosmart.org/Heart-Conditions/Angina
www.cardiosmart.org/Heart-Conditions/Angina/Questions-to-Ask-Your-Doctor
Patient information on coronary artery disease and angina from the American College of Cardiology, including questions to ask your doctor.

www.heart.org/HEARTORG/Conditions/HeartAttack/SymptomsDiagnosisofHeartAttack/Angina-Pectoris-Stable-Angina_UCM_437515_Article.jsp
www.heart.org/HEARTORG/Conditions/HeartAttack/WarningSignsofAHeartAttack/Angina-in-Women-Can-Be-Different-Than-Men_UCM_448902_Article.jsp
Information on stable angina and on angina in women from the American Heart Association.

www.cdc.gov/heartdisease/
www.cdc.gov/heartdisease/materials_for_patients.htm
Information about heart disease from the U.S. Centers for Disease Control and Prevention, including educational materials for patients.
1. A 70-year-old woman is seen for an evaluation. Medical history is significant for ischemic cardiomyopathy and hypertension. She had an implantable cardioverter-defibrillator placed 5 years ago. She has good functional capacity and is able to walk 3 blocks without limitations. Medications are lisinopril, carvedilol, aspirin, and pravastatin. On physical examination, she is afebrile, blood pressure is 137/70 mm Hg, pulse rate is 82/min, and respiration rate is 18/min. BMI is 23. The remainder of the examination is normal. Laboratory studies reveal the following: Hemoglobin A1c, 6.9%; total cholesterol, 115 mg/dL (2.98 mmol/L); LDL cholesterol, 53 mg/dL (1.37 mmol/L); HDL cholesterol, 40 mg/dL (1.04 mmol/L); and triglycerides, 112 mg/dL (1.27 mmol/L).

Which of the following clinical measures is most important to target in this patient to reduce her risk for a cardiovascular event?
A. Blood pressure  
B. Hemoglobin A1c  
C. LDL cholesterol level  
D. Triglyceride level

2. A 67-year-old woman is evaluated for a 3-week history of intermittent exertional chest pain. She walks several days per week. She has type 2 diabetes mellitus and hypertension. Her father had a myocardial infarction at age 54 years. Medications are aspirin, metformin, glyburide, and lisinopril. On physical examination, she is afebrile, blood pressure is 128/90 mm Hg, pulse rate is 83/min, and respiration rate is 18/min. BMI is 35. Cardiac sounds are distant but otherwise unremarkable, without extra sounds or murmur. Figure 1 is the patient’s electrocardiogram (ECG).

Which is the most appropriate diagnostic test to perform next?
A. Cardiovascular magnetic resonance imaging with gadolinium enhancement  
B. Exercise ECG stress test  
C. Exercise stress echocardiography  
D. Pharmacologic perfusion imaging study

3. A 68-year-old woman is evaluated during a routine examination. She went through menopause 16 years ago. She is obese. Family history is significant for a paternal aunt with ovarian cancer at age 64 years. She takes no medications. Blood pressure is 148/90 mm Hg, pulse rate is 83/min, and respiration rate is 18/min. BMI is 35. Waist measurement is 100 cm (39.3 in).

Which disease poses the greatest risk for death in this patient?
A. Breast cancer  
B. Coronary artery disease  
C. Diabetes mellitus  
D. Ovarian cancer

4. A 35-year-old woman is evaluated during a follow-up examination. She has had recurrent episodes of presyncope and syncope over the past few months. She continues to have an episode every 3 to 4 weeks, with no discernible pattern or trigger. She reports becoming light-headed and feeling faint, without other associated symptoms, followed by transient loss of consciousness for several seconds followed by spontaneous recovery without residual symptoms. On previous evaluation, an electrocardiogram (ECG) and echocardiogram were normal. Results of 24-hour continuous ambulatory ECG monitoring were unremarkable, and a cardiac event recorder showed no arrhythmia associated with presyncopal symptoms. History is significant for anxiety and intermittent insomnia; the patient takes no medications for these conditions. There is no history of prior head trauma. She does not use drugs or alcohol.

On physical examination, temperature is normal. Blood pressure is 122/68 mm Hg and pulse rate is 72/min while supine. After three minutes of standing, blood pressure is 112/84 mm Hg and pulse rate is 88/min, without reproduction of syncope or symptoms. The remainder of the examination is normal. Serum electrolytes, kidney function, and thyroid function studies are normal.

Which is the most appropriate next step in the evaluation of this patient?
A. Electroencephalograph  
B. Exercise cardiac stress test  
C. Signal-averaged electrocardiogram  
D. Tilt-table testing

Figure 1.