PREAMBLE

The following is recommendation-only summary of the recently published Guidelines for the Management of Patients with Peripheral Arterial Disease (PAD), developed by the ACC/AHA Task Force on Practice Guidelines. Readers are referred to the full-text version (1) as well as the executive summary (2) of the original document that, due to length considerations, could not be presented in their entirety in this journal. The authors of the original full document are included following the title. Appendices detail the relationship with industry of the writing committee (Appendix I) and the peer reviewers (Appendix II).

It is important that the medical profession play a significant role in critically evaluating the use of diagnostic procedures and therapies as they are introduced and tested in the detection, management, or prevention of disease states. Rigorous and expert analysis of the available data documenting absolute and relative benefits and risks of those procedures and therapies can produce helpful guidelines that improve the effectiveness of care, optimize patient outcomes, and favorably affect the overall cost of care by focusing resources on the most effective strategies.

The American College of Cardiology Foundation (ACCF) and the American Heart Association (AHA) have jointly engaged in the production of such guidelines in the area of cardiovascular disease since 1980. The
ACC/AHA Task Force on Practice Guidelines, whose charge is to develop, update, or revise practice guidelines for important cardiovascular diseases and procedures, directs this effort. Writing committees are charged with the task of performing an assessment of the evidence and acting as an independent group of authors to develop or update written recommendations for clinical practice.

Experts in the subject under consideration have been selected from both organizations to examine subject-specific data and write guidelines. The process includes additional representatives from other medical practitioner and specialty groups when appropriate. Writing committees are specifically charged to perform a formal literature review, weigh the strength of evidence for or against a particular treatment or procedure, and include estimates of expected health outcomes where data exist. Patient-specific modifiers, comorbidities and issues of patient preference that might influence the choice of particular tests or therapies are considered as well as frequency of follow-up and cost effectiveness. When available, information from studies on cost will be considered; however, review of data on efficacy and clinical outcomes will constitute the primary basis for preparing recommendations in these guidelines.

The ACC/AHA Task Force on Practice Guidelines makes every effort to avoid any actual, potential, or perceived conflict of interest that might arise as a result of an industry relationship or personal interest of the writing committee. Specifically, all members of the writing committee, as well as peer reviewers of the document, were asked to provide disclosure statements of all such relationships that might be perceived as real or potential conflicts of interest. Writing committee members are also strongly encouraged to declare a previous relationship with industry that might be perceived as relevant to guideline development. If a writing committee member develops a new relationship with industry during their tenure, they are required to notify guideline staff in writing. The continued participation of the writing committee member will be reviewed. These statements are reviewed by the parent organization that a given procedure or treatment or procedure, and include estimates of expected health outcomes in the needs of most patients in most circumstances. These recommendations are designed to define practices that meet the needs of most patients in most circumstances. These guideline recommendations reflect a consensus of expert opinion after a thorough review of the available, current scientific evidence and are intended to improve patient care. If these guidelines are used as the basis for regulatory/payer decisions, the ultimate goal is quality of care and serving the patient’s best interests. The ultimate judgment regarding care of a particular patient must be made by the health care provider and the patient in light of all of the circumstances presented by that patient. There are circumstances in which deviations from these guidelines are appropriate.

The guidelines will be reviewed annually by the ACC/AHA Task Force on Practice Guidelines and will be considered current unless they are updated, revised, or withdrawn from distribution. The executive summary and recommendations are published in the March 21, 2006, issue of the Journal of the American College of Cardiology and March 21, 2006, issue of Circulation. The full-text guidelines are available online in the same issue of the journals noted above, as well as posted on the ACC (www.acc.org) and AHA (www.americanheart.org) World Wide Web sites. Copies of the full text and the executive summary are available from both organizations.

—Sidney C. Smith, Jr, MD, FACC, FAHA, Chair, ACC/AHA Task Force on Practice Guidelines

1. INTRODUCTION: DEFINITIONS

A. Classification of Recommendations

Class I: Conditions for which there is evidence for and/or general agreement that a given procedure or treatment is beneficial, useful, and effective.

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the useful-
ness/efficacy of a procedure or treatment.

Class IIA: weight of evidence/opinion is in favor of usefulness/efficacy.

Class IIIB: usefulness/efficacy is less well established by evidence/opinion.

Class III: Conditions for which there is evidence and/or general agreement that a procedure/treatment is not useful/effective and in some cases may be harmful.

B. Level of Evidence

- Level of evidence A: data derived from multiple randomized clinical trials or meta-analyses.
- Level of evidence B: data derived from a single randomized trial or non-randomized studies.
- Level of evidence C: only consensus opinion of experts, case studies, or standard of care.

C. Vascular History and Physical Examination

Class I
1. Individuals at risk for lower-extremity PAD (see Section 2.1.1, Table 2 in reference 1) should undergo a vascular review of symptoms to assess walking impairment, claudication, ischemic rest pain, and/or the presence of nonhealing wounds. (Level of evidence: C)

2. Individuals at risk for lower-extremity PAD (see Section 2.1.1) should undergo comprehensive pulse examination and inspection of the feet. (Level of evidence: C)

3. Individuals over 50 years of age should be asked if they have a family history of a first-order relative with an abdominal aortic aneurysm (AAA). (Level of evidence: C)

2. LOWER-EXTREMITY PAD

A. Lower-extremity PAD: General Recommendations for Diagnosis and Therapy by Clinical Presentation

1. Asymptomatic

Class I
1. A history of walking impairment, claudication, ischemic rest pain, and/or nonhealing wounds is recommended as a required component of a standard ROS for adults 50 years and older who have atherosclerosis risk factors and for adults 70 years and older. (Level of evidence: C)

2. Individuals with asymptomatic lower-extremity PAD should be identified by examination and/or measurement of the ABI so that therapeutic interventions known to diminish their increased risk of myocardial infarction (MI), stroke, and death may be offered. (Level of evidence: B)

3. Smoking cessation, lipid lowering, and diabetes and hypertension treatment according to current national treatment guidelines are recommended for individuals with asymptomatic lower-extremity PAD. (Level of evidence: B)

4. Antiplatelet therapy is indicated for individuals with asymptomatic lower-extremity PAD to reduce the risk of adverse cardiovascular ischemic events. (Level of evidence: C)

Class IIa
1. An exercise ABI measurement can be useful to diagnose lower-extremity PAD in individuals who are at risk for lower-extremity PAD (Table 2 in reference 1) who have a normal ABI (0.91–1.30), are without classic claudication symptoms, and have no other clinical evidence of atherosclerosis. (Level of evidence: C)

2. A toe-brachial index or pulse volume recording measurement can be useful to diagnose lower-extremity PAD in individuals who are at risk for lower-extremity PAD who have an ABI greater than 1.30 and no other clinical evidence of atherosclerosis. (Level of evidence: C)

Class IIb
Angiotensin-converting enzyme (ACE) inhibition may be considered for individuals with asymptomatic lower-extremity PAD for cardiovascular risk reduction. (Level of evidence: C)

2. Claudication

Class I
1. Patients with symptoms of intermittent claudication should undergo a vascular physical examination, including measurement of the ABI. (Level of evidence: B)

2. In patients with symptoms of intermittent claudication, the ABI should be measured after exercise if the resting index is normal. (Level of evidence: B)

3. Patients with intermittent claudication should have significant functional impairment with a reasonable likelihood of symptomatic improvement and absence of other disease that would comparably limit exercise even if the claudication was improved (eg, angina, heart failure, chronic respiratory disease, or orthopedic limitations) before undergoing an evaluation for revascularization. (Level of evidence: C)

4. Individuals with intermittent claudication who are offered the option of endovascular or surgical therapies should: (a) be provided information regarding supervised claudication exercise therapy and pharmacotherapy; (b) receive comprehensive risk factor modification and antiplatelet therapy; (c) have a significant disability, either being unable to perform normal work or having serious impairment of other activities important to the patient; and (d) have lower-extremity PAD lesion anatomy such that the revascularization procedure would have low risk and a high probability of initial and long-term success. (Level of evidence: C)

Class III
Arterial imaging is not indicated for patients with a normal postexercise ABI. This does not apply if other atherosclerotic causes (eg, entrapment syndromes or isolated internal iliac artery occlusive disease) are suspected. (Level of evidence: C)

3. Critical Limb Ischemia

Class I
1. Patients with critical limb ischemia (CLI) should undergo expedited evaluation and treatment of factors that are known to increase the risk of amputation (see text). (Level of evidence: C)

2. Patients with CLI in whom open surgical repair is anticipated should undergo assessment of cardiovascular risk. (Level of evidence: B)

3. Patients with a prior history of CLI or who have undergone successful treatment for CLI should be evaluated at least twice annually by a vascular specialist owing to the relatively high incidence of recurrence. (Level of evidence: C)

4. Patients at risk of CLI (ABI less than 0.4 in a nondiabetic individual, or any diabetic individual with known lower-extremity PAD) should undergo regular inspection of the feet to detect objective signs of CLI. (Level of evidence: B)

5. The feet should be examined di-
rectly, with shoes and socks removed, at regular intervals after successful treatment of CLI. (Level of evidence: C)

6. Patients with CLI and features to suggest atheroembolization should be evaluated for aneurysmal disease (eg, abdominal aortic, popliteal, or common femoral aneurysms). (Level of evidence: B)

7. Systemic antibiotics should be initiated promptly in patients with CLI, skin ulcerations, and evidence of limb infection. (Level of evidence: B)

8. Patients with CLI and skin breakdown should be referred to health care providers with specialized expertise in wound care. (Level of evidence: B)

9. Patients at risk for CLI (those with diabetes, neuropathy, chronic renal failure, or infection) who develop acute limb symptoms represent potential vascular emergencies and should be assessed immediately and treated by a specialist competent in treating vascular disease. (Level of evidence: C)

10. Patients at risk for or who have been treated for CLI should receive verbal and written instructions regarding self-surveillance for potential recurrence. (Level of evidence: C)

(4) Acute Limb Ischemia

Class I

Patients with acute limb ischemia and a salvageable extremity should undergo an emergent evaluation that defines the anatomic level of occlusion and that leads to prompt endovascular or surgical revascularization. (Level of evidence: B)

Class III

Patients with acute limb ischemia and a nonviable extremity should not undergo an evaluation to define vascular anatomy or efforts to attempt revascularization. (Level of evidence: B)

(5) Prior Limb Arterial Revascularization

Class I

Long-term patency of infrainguinal bypass grafts should be evaluated in a surveillance program, which should include an interval vascular history, resting ABIs, physical examination, and a duplex ultrasound (US) at regular intervals if a venous conduit has been used. (Level of evidence: B)

Class IIA

1. Long-term patency of infrainguinal bypass grafts may be considered for evaluation in a surveillance program, which may include conducting exercise ABIs and other arterial imaging studies at regular intervals (see duplex US recommendations, Section 2.5.5). (Level of evidence: B)

2. Long-term patency of endovascular sites may be evaluated in a surveillance program, which may include conducting exercise ABIs and other arterial imaging studies at regular intervals (see duplex US recommendations, Section 2.5.5). (Level of evidence: B)

B. Lower-extremity PAD: Diagnostic Methods

(1) Ankle- and Toe-Brachial Indexes, Segmental Pressure Examination

Class I

1. The resting ABI should be used to establish the lower-extremity PAD diagnosis in patients with suspected lower-extremity PAD, defined as individuals with exertional leg symptoms, with nonhealing wounds, who are 70 years and older or who are 50 years and older with a history of smoking or diabetes. (Level of evidence: C)

2. The ABI should be measured in both legs in all new patients with PAD of any severity to confirm the diagnosis of lower-extremity PAD and establish a baseline. (Level of evidence: B)

3. The toe-brachial index should be used to establish the lower-extremity PAD diagnosis in patients in whom lower-extremity PAD is clinically suspected but in whom the ABI test is not reliable due to noncompressible vessels (usually patients with long-standing diabetes or advanced age). (Level of evidence: B)

4. Leg segmental pressure measurements are useful to establish the lower-extremity PAD diagnosis when anatomic localization of lower-extremity PAD is required to create a therapeutic plan. (Level of evidence: B)

(2) Pulse Volume Recording

Class IIA

Pulse volume recordings are reasonable to establish the initial lower-extremity PAD diagnosis, assess localization and severity, and follow the status of lower extremity revascularization procedures. (Level of evidence: B)

(3) Continuous-wave Doppler US

Class I

Continuous-wave Doppler US blood flow measurements are useful to provide an accurate assessment of lower-extremity PAD location and severity, to follow lower-extremity PAD progression, and to provide quantitative follow-up after revascularization procedures. (Level of evidence: B)

(4) Treadmill Exercise Testing with and without ABI Assessments and 6-Minute Walk Test

Class I

1. Exercise treadmill tests are recommended to provide the most objective evidence of the magnitude of the functional limitation of claudication and to measure the response to therapy. (Level of evidence: B)

2. A standardized exercise protocol (either fixed or graded) with a motorized treadmill should be used to ensure reproducibility of measurements of pain-free walking distance and maximal walking distance. (Level of evidence: B)

3. Exercise treadmill tests with measurement of preexercise and postexercise ABI values are recommended to provide diagnostic data useful in differentiating arterial claudication from nonarterial claudication (“pseudoclaudication”). (Level of evidence: B)

4. Exercise treadmill tests should be performed in individuals with claudication who are to undergo exercise training (lower-extremity PAD rehabilitation) so as to determine functional capacity, assess nonvascular exercise limitations, and demonstrate the safety of exercise. (Level of evidence: B)

Class IIb

A 6-minute walk test may be reasonable to provide an objective assessment of the functional limitation of claudication and response to therapy in elderly individuals or others not amenable to treadmill testing. (Level of evidence: B)

(5) Duplex US

Class I

1. Duplex US of the extremities is useful to diagnose anatomic location and degree of stenosis of PAD. (Level of evidence: A)

2. Duplex US is recommended for routine surveillance after femoral-popliteal or femoral-tibialpedal bypass with a venous conduit. Minimum surveillance intervals are approximately 3, 6, and 12 months, and then yearly after graft placement. (Level of evidence: A)

Class II

1. Duplex US of the extremities can
be useful to select patients as candidates for endovascular intervention. (Level of evidence: B)

2. Duplex US can be useful to select patients as candidates for surgical bypass and to select the sites of surgical anastomosis. (Level of evidence: B)

Class Ib
1. The use of duplex US is not well established to assess long-term patency of percutaneous transluminal angioplasty. (Level of evidence: B)

2. Duplex US may be considered for routine surveillance after femoral-popliteal bypass with a synthetic conduit. (Level of evidence: B)

6) Computed Tomographic Angiography

Class Ib
1. Computed tomographic (CT) angiography of the extremities may be considered to diagnose anatomic location and presence of significant stenosis in patients with lower-extremity PAD. (Level of evidence: B)

2. CT angiography of the extremities may be considered as a substitute for magnetic resonance (MR) angiography for those patients with contraindications to MR angiography. (Level of evidence: B)

7) MR Angiography

Class I
1. MR angiography of the extremities is useful to diagnose anatomic location and degree of stenosis of PAD. (Level of evidence: A)

2. MR angiography of the extremities should be performed with gadolinium enhancement. (Level of evidence: B)

3. MR angiography of the extremities is useful in selecting patients with lower-extremity PAD as candidates for endovascular intervention. (Level of evidence: A)

Class Ib
1. MR angiography of the extremities may be considered to select patients with lower-extremity PAD as candidates for surgical bypass and to select the sites of surgical anastomosis. (Level of evidence: B)

2. MR angiography of the extremities may be considered for postvascularization (endovascular and surgical bypass) surveillance in patients with lower-extremity PAD. (Level of evidence: B)

8) Contrast Angiography

Class I
1. Contrast angiography provides detailed information about arterial anatomy and is recommended for evaluation of patients with lower-extremity PAD when revascularization is contemplated. (Level of evidence: B)

2. A history of contrast reaction should be documented before the performance of contrast angiography and appropriate pretreatment administered before contrast is given. (Level of evidence: B)

3. Decisions regarding the potential utility of invasive therapeutic interventions (percutaneous or surgical) in patients with lower-extremity PAD should be made with a complete anatomic assessment of the affected arterial territory, including imaging of the occlusive lesion, as well as arterial inflow and outflow with angiography or a combination of angiography and noninvasive vascular techniques. (Level of evidence: B)

4. Digital subtraction angiography is recommended for contrast angiographic studies because this technique allows for enhanced imaging capabilities compared with conventional unsubtracted contrast angiography. (Level of evidence: A)

5. Before performance of contrast angiography, a full history and complete vascular examination should be performed to optimize decisions regarding the access site, as well as to minimize contrast dose and catheter manipulation. (Level of evidence: C)

6. Selective or superselective catheter placement during lower-extremity angiography is indicated because this can enhance imaging, reduce contrast dose, and improve sensitivity and specificity of the procedure. (Level of evidence: C)

7. The diagnostic lower-extremity arteriogram should image the iliac, femoral, and tibial bifurcations in profile without vessel overlap. (Level of evidence: B)

8. When conducting a diagnostic lower-extremity arteriogram in which the significance of an obstructive lesion is ambiguous, transstenotic pressure gradients and supplementary angulated views should be obtained. (Level of evidence: B)

9. Patients with baseline renal insufficiency should receive hydration before undergoing contrast angiography. (Level of evidence: B)

10. Follow-up clinical evaluation, including a physical examination and measurement of renal function, is recommended within 2 weeks after contrast angiography to detect the presence of delayed adverse effects, such as atheroembolism, deterioration in renal function, or access site injury (eg, pseudoaneurysm or arteriovenous fistula). (Level of evidence: C)

Class IIa
1. Noninvasive imaging modalities, including MR angiography, CT angiography, and color flow duplex imaging, may be used in advance of invasive imaging to develop an individualized diagnostic strategic plan, including assistance in selection of access sites, identification of significant lesions, and determination of the need for invasive evaluation. (Level of evidence: B)

2. Treatment with n-acetylcysteine in advance of contrast angiography is suggested for patients with baseline renal insufficiency (creatinine greater than 2.0 mg/dL). (Level of evidence: B)

C. Lower-extremity PAD: Treatment

1) Cardiovascular Risk Reduction

(a) Lipid-lowering Drugs

Class I
Treatment with a hydroxymethyl glutaryl (HMG) coenzyme-A reductase inhibitor (statin) medication is indicated for all patients with PAD to achieve a target LDL cholesterol level of less than 100 mg/dL. (Level of evidence: B)

Class IIa
1. Treatment with an HMG coenzyme-A reductase inhibitor (statin) medication to achieve a target LDL cholesterol level of less than 70 mg/dL is reasonable for patients with lower-extremity PAD at very high risk of ischemic events. (Level of evidence: B)

2. Treatment with a fibric acid derivative can be useful for patients with PAD and low HDL cholesterol, normal LDL cholesterol, and elevated triglycerides. (Level of evidence: C)

(b) Antihypertensive Drugs

Class I
1. Antihypertensive therapy should be administered to hypertensive patients with lower-extremity PAD to achieve a goal of less than 140 mm Hg systolic over 90 mm Hg diastolic (non-diabetics) or less than 130 mm Hg sys-
tolic over 80 mm Hg diastolic (diabetics and individuals with chronic renal disease) to reduce the risk of MI, stroke, congestive heart failure, and cardiovascular death. (Level of evidence: A)

2. β-adrenergic blocking drugs are effective antihypertensive agents and are not contraindicated in patients with PAD. (Level of evidence: A)
   Class IIa
   The use of angiotensin-converting enzyme inhibitors is reasonable for symptomatic patients with lower-extremity PAD to reduce the risk of adverse cardiovascular events. (Level of evidence: B)
   Class IIb
   Angiotensin-converting enzyme inhibitors may be considered for patients with asymptomatic lower-extremity PAD to reduce the risk of adverse cardiovascular events. (Level of evidence: C)

(c) Diabetes Therapies
   Class I
   Proper foot care, including use of appropriate footwear, chiropody/podiatric medicine, daily foot inspection, skin cleansing, and use of topical moisturizing creams, should be encouraged and skin lesions and ulcers should be addressed urgently in all diabetic patients with lower-extremity PAD. (Level of evidence: B)
   Class IIa
   Treatment of diabetes in individuals with lower-extremity PAD by administration of glucose control therapies to reduce the hemoglobin A1C to less than 7% can be effective to reduce microvascular complications and potentially improve cardiovascular outcomes. (Level of evidence: C)

(d) Smoking Cessation
   Class I
   Individuals with lower-extremity PAD who smoke cigarettes or use other forms of tobacco should be advised by each of their clinicians to stop smoking and should be offered comprehensive smoking cessation interventions, including behavior modification therapy, nicotine replacement therapy, or bupropion. (Level of evidence: B)

(e) Homocysteine-Lowering Drugs
   Class IIb
   The effectiveness of the therapeutic use of folic acid and B12 vitamin supplements in individuals with lower-extremity PAD and homocysteine levels greater than 14 mol/L is not well established. (Level of evidence: C)

(f) Antiplatelet and Antithrombotic Drugs
   Class I
   1. Antiplatelet therapy is indicated to reduce the risk of MI, stroke, or vascular death in individuals with atherosclerotic lower-extremity PAD. (Level of evidence: A)
   2. Aspirin, in daily doses of 75–325 mg, is recommended as safe and effective antiplatelet therapy to reduce the risk of MI, stroke, or vascular death in individuals with atherosclerotic lower-extremity PAD. (Level of evidence: A)
   3. Clopidogrel (75 mg/d) is recommended as an effective alternative antiplatelet therapy to aspirin to reduce the risk of MI, stroke, or vascular death in individuals with atherosclerotic lower-extremity PAD. (Level of evidence: B)
   Class III
   Oral anticoagulation therapy with warfarin is not indicated to reduce the risk of adverse cardiovascular ischemic events in individuals with atherosclerotic lower-extremity PAD. (Level of evidence: C)

   (2) Claudication

(a) Exercise and Lower-extremity PAD Rehabilitation
   Class I
   1. A program of supervised exercise training is recommended as an initial treatment modality for patients with intermittent claudication. (Level of evidence: A)
   2. Supervised exercise training should be performed for a minimum of 30–45 minutes, in sessions performed at least three times per week for a minimum of 12 weeks. (Level of evidence: A)
   Class IIb
   The usefulness of unsupervised exercise programs is not well established as an effective initial treatment modality for patients with intermittent claudication. (Level of evidence: B)

(b) Medical and Pharmacologic Treatment for Claudication
   1. CILOSTAZOL
      Class I
      1. Cilostazol (100 mg orally two times per day) is indicated as an effective therapy to improve symptoms and increase walking distance in patients with lower-extremity PAD and intermittent claudication (in the absence of heart failure). (Level of evidence: A)
   2. A therapeutic trial of cilostazol should be considered in all patients with lifestyle-limiting claudication (in the absence of heart failure). (Level of evidence: A)
   2. PENTOXIFYLLINE
      Class IIb
      1. Pentoxifylline (400 mg three times per day) may be considered as second-line alternative therapy to cilostazol to improve walking distance in patients with intermittent claudication. (Level of evidence: A)
      2. The clinical effectiveness of pentoxifylline as therapy for claudication is marginal and not well established. (Level of evidence: C)
      3. OTHER PROPOSED MEDICAL THERAPIES
         Class IIb
         1. The effectiveness of L-arginine for patients with intermittent claudication is not well established. (Level of evidence: B)
         2. The effectiveness of propionyl-L-carnitine as a therapy to improve walking distance in patients with intermittent claudication is not well established. (Level of evidence: B)
         3. The effectiveness of ginkgo biloba to improve walking distance for patients with intermittent claudication is marginal and not well established. (Level of evidence: B)

   Class III
   1. Oral vasodilator prostaglandins such as beraprost and iloprost are not effective medications to improve walking distance in patients with intermittent claudication. (Level of evidence: A)
   2. Vitamin E is not recommended as a treatment for patients with intermittent claudication. (Level of evidence: C)
   3. Chelation (eg, ethylenedia-minetetraacetic acid) is not indicated for treatment of intermittent claudication and may have harmful adverse effects. (Level of evidence: A)
(c) Endovascular Treatment for Claudication

Class I
1. Endovascular procedures are indicated for individuals with a vocational or lifestyle-limiting disability due to intermittent claudication when clinical features suggest a reasonable likelihood of symptomatic improvement with endovascular intervention and (a) there has been an inadequate response to exercise or pharmacological therapy and/or (b) there is a very favorable risk-benefit ratio (e.g., focal aortoiliac occlusive disease). (Level of evidence: A)

2. Endovascular intervention is recommended as the preferred revascularization technique for TASC type A (see Tables 20 and 21 and Fig 8 in reference 1) iliac and femoropopliteal arterial lesions. (Level of evidence: B)

3. Translesional pressure gradients (with and without vasodilatation) should be obtained to evaluate the significance of angiographic iliac arterial stenoses of 50%–75% diameter before intervention. (Level of evidence: C)

4. Provisional stent placement is indicated for use in the iliac arteries as salvage therapy for a suboptimal or failed result from balloon dilation (e.g., persistent translesional gradient, residual diameter stenosis greater than 50%, or flow-limiting dissection). (Level of evidence: B)

5. Stenting is effective as primary therapy for common iliac artery stenosis and occlusions. (Level of evidence: C)

6. Stenting is effective as primary therapy in external iliac artery stenoses and occlusions. (Level of evidence: C)

Class IIa

Stents (and other adjunctive techniques such as lasers, cutting balloons, atherectomy devices, and thermal devices) can be useful in the femoral, popliteal, and tibial arteries as salvage therapy for a suboptimal or failed result from balloon dilation (e.g., persistent translesional gradient, residual diameter stenosis greater than 50%, or flow-limiting dissection). (Level of evidence: C)

Class IIb

1. The effectiveness of stents, atherectomy, cutting balloons, thermal devices, and lasers for the treatment of femoral-popliteal arterial lesions (except to salvage a suboptimal result from balloon dilation) is not well established. (Level of evidence: A)

2. The effectiveness of uncoated/uncovered stents, atherectomy, cutting balloons, thermal devices, and lasers for the treatment of infrapopliteal lesions (except to salvage a suboptimal result from balloon dilation) is not well established. (Level of evidence: C)

Class III

1. Endovascular intervention is not indicated if there is no significant pressure gradient across a stenosis despite flow augmentation with vasodilators. (Level of evidence: C)

2. Primary stent placement is not recommended in the femoral, popliteal, or tibial arteries. (Level of evidence: C)

3. Endovascular intervention is not indicated as prophylactic therapy in an asymptomatic patient with lower-extremity PAD. (Level of evidence: C)

(d) Surgery for Claudication

1. Indications

Class I
Surgical interventions are indicated for individuals with claudication symptoms who have a significant functional disability that is vocational or lifestyle limiting, who are unresponsive to exercise or pharmacotherapy, and who have a reasonable likelihood of symptomatic improvement. (Level of evidence: B)

Class IIb
Because the presence of more aggressive atherosclerotic occlusive disease is associated with less durable results in patients younger than 50 years of age, the effectiveness of surgical intervention in this population for intermittent claudication is unclear. (Level of evidence: B)

2. Preoperative Evaluation

Class I
A preoperative cardiovascular risk evaluation should be undertaken in those patients with lower-extremity PAD in whom a major vascular surgical intervention is planned. (Level of evidence: B)

Class IIb
1. Femoral-tibial artery bypasses constructed with autogenous vein may be considered for the treatment of claudication in rare instances for cer-
tain patients (see text). (Level of evidence: B)

2. Because their use is associated with reduced patency rates, the effectiveness of the use of synthetic grafts to the popliteal artery above the knee is not well established. (Level of evidence: B)

Class III

Femoral-tibial artery bypasses with synthetic graft material should not be used for the treatment of claudication. (Level of evidence: C)

5. Follow-up after Vascular Surgical Procedures

Class I

1. Patients who have undergone placement of aortobifemoral bypass grafts should be followed up with periodic evaluations that record any return or progression of claudication symptoms, the presence of femoral pulses, and ABIs at rest and after exercise. (Level of evidence: C)

2. Patients who have undergone placement of a lower-extremity bypass with autogenous vein should undergo periodic evaluations for at least 2 years that record any claudication symptoms; a physical examination and pulse examination of the proximal, graft, and outflow vessels; and duplex imaging of the entire length of the graft, with measurement of peak systolic velocities and calculation of velocity ratios across all lesions. (Level of evidence: C)

3. Patients who have undergone placement of a synthetic lower extremity bypass graft should, for at least 2 years after implantation, undergo periodic evaluations that record any return or progression of claudication symptoms; a physical examination and pulse examination of the proximal, graft, and outflow vessels; and assessment of ABIs at rest and after exercise. (Level of evidence: C)

(b) Endovascular Treatments for CLI

Class I

1. For individuals with combined inflow and outflow disease with CLI, inflow lesions should be addressed first. (Level of evidence: C)

2. For individuals with combined inflow and outflow disease in whom symptoms of CLI or infection persist after inflow revascularization, an outflow revascularization procedure should be performed. (Level of evidence: B)

3. If it is unclear whether hemodynamically significant inflow disease exists, intraarterial pressure measurements across suprainguinal lesions should be measured before and after the administration of a vasodilator. (Level of evidence: C)

(c) Thrombolysis for Acute and CLI

Class I

Catheter-based thrombolysis is an effective and beneficial therapy and is indicated for patients with acute limb ischemia (Rutherford categories I and IIa) of less than 14 days’ duration. (Level of evidence: A)

Class IIa

Mechanical thrombectomy devices can be used as adjunctive therapy for acute limb ischemia due to peripheral arterial occlusion. (Level of evidence: B)

Class IIb

Catheter-based thrombolysis or thrombectomy may be considered for patients with acute limb ischemia (Rutherford category IIb) of more than 14 days’ duration. (Level of evidence: B)

(d) Surgery for CLI

1. General Recommendations

Class I

1. For individuals with combined inflow and outflow disease with CLI, inflow lesions should be addressed first. (Level of evidence: B)

2. For individuals with combined inflow and outflow disease in whom symptoms of CLI or infection persist after inflow revascularization, an outflow revascularization procedure should be performed. (Level of evidence: B)

3. Patients who have significant necrosis of the weightbearing portions of the foot (in ambulatory patients), an uncorrectable flexion contracture, paraparesis of the extremity, refractory ischemic rest pain, sepsis, or a very limited life expectancy due to comorbid conditions should be evaluated for primary amputation of the leg. (Level of evidence: C)

Class III

Surgical and endovascular intervention is not indicated in patients with severe decrements in limb perfusion (e.g., ABI less than 0.4) in the absence of clinical symptoms of CLI. (Level of evidence: C)

2. Inflow Procedures: Aortoiliac Occlusive Disease

Class I

1. When surgery is to be undertaken, aortobifemoral bypass is recommended for patients with symptomatic, hemodynamically significant, aortoiliac disease requiring intervention. (Level of evidence: A)

2. Iliac endarterectomy, patch angioplasty, or aortoiliac or iliofemoral bypass in the setting of acceptable aortic inflow should be used for the treatment of unilateral disease or in conjunction with femoral-femoral bypass for the treatment of a patient with bilateral iliac artery occlusive disease if the patient is not a suitable candidate for aortobifemoral bypass grafting. (Level of evidence: B)

3. Axillofemoral-femoral bypass is indicated for the treatment of patients with CLI who have extensive aortoiliac disease and are not candidates for other types of intervention. (Level of evidence: B)

3. Outflow Procedures: Infrapopliteal Disease

Class I

1. Bypasses to the above-knee popliteal artery should be constructed
with autogenous saphenous vein when possible. (Level of evidence: A)

2. Bypasses to the below-knee popliteal artery should be constructed with autogenous vein when possible. (Level of evidence: A)

3. The most distal artery with continuous flow from above and without a stenosis greater than 20% should be used as the point of origin for a distal bypass. (Level of evidence: B)

4. The tibial or pedal artery that is capable of providing continuous and uncompromised outflow to the foot should be used as the site of distal anastomosis. (Level of evidence: B)

5. Femoral-tibial artery bypasses should be constructed with autogenous vein, including the ipsilateral greater saphenous vein, or if unavailable, other sources of vein from the leg or arm. (Level of evidence: B)

6. Composite sequential femoropopliteal-tibial bypass and bypass to an isolated popliteal arterial segment that has collateral outflow to the foot are both acceptable methods of revascularization and should be considered when no other form of bypass with adequate autogenous conduit is possible. (Level of evidence: B)

7. If no autogenous vein is available, a prosthetic femoral-tibial bypass, and possibly an adjunctive procedure, such as arteriovenous fistula or vein interposition or cuff, should be used when amputation is imminent. (Level of evidence: B)

3. If infection, ischemic ulcers, or gangrenous lesions persist and the ABI is less than 0.8 after correction of inflow, an outflow procedure should be performed that bypasses all major distal stenoses and occlusions. (Level of evidence: A)

4. Patients who have undergone placement of a lower extremity bypass with autogenous vein should undergo follow-up with periodic examinations that record any return or progression of ischemic symptoms; a physical examination, with concentration on pulse examination of the proximal, graft, and outflow vessels; and duplex imaging of the entire length of the graft, with measurement of peak systolic velocities and calculation of velocity ratios across all lesions. (Level of evidence: A)

5. Patients who have undergone placement of a synthetic lower extremity bypass graft should undergo periodic examinations that record any return of ischemic symptoms; a pulse examination of the proximal, graft, and outflow vessels; and assessment of ABIs at rest and after exercise for at least 2 years after implantation. (Level of evidence: A)

3. RENAL ARTERIAL DISEASE

A. Clinical Clues to the Diagnosis of Renal Artery Stenosis

Class I

1. The performance of diagnostic studies to identify clinically significant renal artery stenosis (RAS) is indicated in patients with the onset of hypertension before the age of 30 years. (Level of evidence: B)

2. The performance of diagnostic studies to identify clinically significant RAS is indicated in patients with the onset of severe hypertension (as defined in The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC-7 report [294]) after the age of 55 years. (Level of evidence: B)

3. The performance of diagnostic studies to identify clinically significant RAS is indicated in patients who are adhering to full doses of an appropriate three-drug regimen that includes a diuretic; or (c) malignant hypertension (hypertension with coexistent evidence of acute end-organ damage, ie, acute renal failure, acutely decompensated congestive heart failure, new visual or neurological disturbance, and/or advanced [grade III/IV] retinopathy). (Level of evidence: C)

4. The performance of diagnostic studies to identify clinically significant RAS is indicated in patients with new azotemia or worsening renal function after the administration of an ACE inhibitor or an angiotensin receptor blocking agent (see text). (Level of evidence: B)

5. The performance of diagnostic studies to identify clinically significant RAS is indicated in patients with unexplained atriope kidney or a discrepancy in size between the two kidneys of greater than 1.5 cm. (Level of evidence: B)

6. The performance of diagnostic studies to identify clinically significant RAS is indicated in patients with sudden, unexplained pulmonary edema (especially in azotemic patients). (Level of evidence: B)

Class IIa

The performance of diagnostic studies to identify clinically significant RAS is reasonable in patients with unexplained renal failure, including individuals starting renal replacement therapy (dialysis or renal transplantation). (Level of evidence: B)

Class IIb

1. The performance of arteriography to identify significant RAS may be reasonable in patients with multivesel coronary artery disease and none of the clinical clues (Fig 17 in reference 1) or PAD at the time of arteriography. (Level of evidence: B)

2. The performance of diagnostic studies to identify clinically significant RAS may be reasonable in patients with unexplained congestive heart failure or refractory angina (see Section 3.5.2.4). (Level of evidence: C)

B. RAS: Diagnostic Methods

Class I

1. Duplex US is recommended as a screening test to establish the diagnosis of RAS. (Level of evidence: B)

2. CT angiography (in individuals with normal renal function) is recom-
mended as a screening test to establish the diagnosis of RAS. (Level of evidence: B)

3. MR angiography is recommended as a screening test to establish the diagnosis of RAS. (Level of evidence: B)

4. When the clinical index of suspicion is high and the results of noninvasive tests are inconclusive, catheter angiography is recommended as a diagnostic test to establish the diagnosis of RAS. (Level of evidence: B)

C. Treatment of Renovascular Disease: RAS

(1) Medical Treatment

Class I

1. Angiotensin-converting enzyme inhibitors are effective medications for treatment of hypertension associated with unilateral RAS. (Level of evidence: A)

2. Angiotensin receptor blockers are effective medications for treatment of hypertension associated with unilateral RAS. (Level of evidence: B)

3. Calcium-channel blockers are effective medications for treatment of hypertension associated with unilateral RAS. (Level of evidence: A)

4. β-blockers are effective medications for treatment of hypertension associated with RAS. (Level of evidence: A)

(2) Indications for Revascularization

(a) Asymptomatic Stenosis

Class IIb

1. Percutaneous revascularization may be considered for treatment of an asymptomatic bilateral or solitary viable kidney with a hemodynamically significant RAS. (Level of evidence: C)

2. The usefulness of percutaneous revascularization of an asymptomatic unilateral hemodynamically significant RAS in a viable kidney is not well established and is presently clinically unproven. (Level of evidence: C)

(b) Hypertension

Class IIa

Percutaneous revascularization is reasonable for patients with hemodynamically significant RAS and accelerated hypertension, resistant hypertension, malignant hypertension, hypertension with an unexplained unilateral small kidney, and hypertension with intolerance to medication. (Level of evidence: B)

Class IIb

Percutaneous revascularization may be considered for patients with RAS and chronic renal insufficiency with unilateral RAS. (Level of evidence: C)

(d) Impact of RAS on Congestive Heart Failure and Unstable Angina

Class I

Percutaneous revascularization is indicated for patients with hemodynamically significant RAS and recurrent, unexplained congestive heart failure or sudden, unexplained pulmonary edema (see text). (Level of evidence: B)

Class IIa

Percutaneous revascularization is reasonable for patients with hemodynamically significant RAS and unstable angina (see text). (Level of evidence: B)

(3) Catheter-based Interventions for RAS

Class I

1. Renal stent placement is indicated for ostial atherosclerotic RAS lesions that meet the clinical criteria for intervention. (Level of evidence: B)

2. Balloon angioplasty with bailout stent placement if necessary is recommended for FMD lesions. (Level of evidence: B)

(4) Surgery for RAS

Class I

1. Vascular surgical reconstruction is indicated for patients with fibromuscular dysplastic RAS with clinical indications for interventions (same as for PTA), especially those exhibiting complex disease that extends into the segmental arteries and those having macroaneurysms. (Level of evidence: B)

2. Vascular surgical reconstruction is indicated for patients with atherosclerotic RAS and clinical indications for intervention, especially those with multiple small renal arteries or early primary branching of the main renal artery. (Level of evidence: B)

3. Vascular surgical reconstruction is indicated for patients with atherosclerotic RAS in combination with pararenal aortic reconstructions (in treatment of aortic aneurysms or severe aortoiliac occlusive disease). (Level of evidence: C)

4. MESENTERIC ARTERIAL DISEASE

A. Acute Intestinal Ischemia

(1) Acute Intestinal Ischemia Caused by Arterial Obstruction

(a) Diagnosis

Class I

1. Patients with acute abdominal pain out of proportion to physical findings and who have a history of cardiovascular disease should be suspected of having acute intestinal ischemia. (Level of evidence: B)

2. Patients who develop acute abdominal pain after arterial interventions in which catheters traverse the visceral aorta or any proximal arteries or who have arrhythmias (such as atrial fibrillation) or recent MI should be suspected of having acute intestinal ischemia. (Level of evidence: C)

Class III

In contrast to chronic intestinal ischemia, duplex sonography of the
abdomen is not an appropriate diagnostic tool for suspected acute intestinal ischemia. (Level of evidence: C)

(b) Surgical Treatment
Class I
Surgical treatment of acute obstructive intestinal ischemia includes revascularization, resection of necrotic bowel, and, when appropriate, a “second look” operation 24–48 hours after the revascularization. (Level of evidence: B)

(c) Endovascular Treatment
Class Ib
Percutaneous interventions (including transcatheter lytic therapy, balloon angioplasty, and stenting) are appropriate in selected patients with acute intestinal ischemia caused by arterial obstructions. Patients so treated may still require laparotomy. (Level of evidence: C)

(2) Acute Nonocclusive Intestinal Ischemia

(a) Etiology and Clinical Clues
Class I
1. Nonocclusive intestinal ischemia should be suspected in patients with low flow states or shock, especially cardiogenic shock, who develop abdominal pain. (Level of evidence: B)
2. Nonocclusive intestinal ischemia should be suspected in patients receiving vasoconstrictor substances and medications (eg, cocaine, ergots, vasoressin, or norepinephrine) who develop abdominal pain. (Level of evidence: B)
3. Nonocclusive intestinal ischemia should be suspected in patients who develop abdominal pain after coarctation repair or after surgical revascularization for intestinal ischemia caused by arterial obstruction. (Level of evidence: B)

(b) Diagnosis
Class I
Arteriography is indicated in patients suspected of having nonocclusive intestinal ischemia whose condition does not improve rapidly with treatment of their underlying disease. (Level of evidence: B)

(c) Treatment
Class I
1. Treatment of the underlying shock state is the most important initial step in treatment of nonocclusive intestinal ischemia. (Level of evidence: C)
2. Laparotomy and resection of nonviable bowel is indicated in patients with nonocclusive intestinal ischemia who have persistent symptoms despite treatment. (Level of evidence: B)
Class IIa
Transcatheter administration of vasodilator medications into the area of vasospasm is indicated in patients with nonocclusive intestinal ischemia who do not respond to systemic supportive treatment and in patients with intestinal ischemia due to cocaine or ergot poisoning. (Level of evidence: B)

B. Chronic Intestinal Ischemia

(1) Diagnosis
Class I
1. Chronic intestinal ischemia should be suspected in patients with abdominal pain and weight loss without other explanation, especially those with cardiovascular disease. (Level of evidence: B)
2. Duplex US, CT angiography, and gadolinium-enhanced MR angiography are useful initial tests for supporting the clinical diagnosis of chronic intestinal ischemia. (Level of evidence: B)
3. Diagnostic angiography, including lateral aortography, should be obtained in patients suspected of having chronic intestinal ischemia for whom noninvasive imaging is unavailable or indeterminate. (Level of evidence: B)

(2) Interventional Treatment
Class I
Percutaneous endovascular treatment of intestinal arterial stenosis is indicated in patients with chronic intestinal ischemia. (Level of evidence: B)

(3) Surgical Treatment
Class I
Surgical treatment of chronic intestinal ischemia is indicated in patients with chronic intestinal ischemia. (Level of evidence: B)
Class Ib
Revascularization of asymptomatic intestinal arterial obstructions may be considered for patients undergoing aortic/renal artery surgery for other indications. (Level of evidence: B)

Class III
Surgical revascularization is not indicated for patients with asymptomatic intestinal arterial obstructions, except in patients undergoing aortic/renal artery surgery for other indications. (Level of evidence: B)

5. ANEURYSMS OF THE ABDOMINAL AORTA, ITS BRANCH VESSELS, AND THE LOWER EXTREMITIES

A. Abdominal Aortic and Iliac Aneurysms

(1) Risk Factors
Class I
1. In patients with AAAs, blood pressure and fasting serum lipid values should be monitored and controlled as recommended for patients with atherosclerotic disease. (Level of evidence: C)
2. Patients with aneurysms or a family history of aneurysms should be advised to stop smoking and be offered smoking cessation interventions, including behavior modification, nicotine replacement, or bupropion. (Level of evidence: B)

(2) Aortic Aneurysm Rupture: General Recommendations
Class I
1. Patients with infrarenal or juxtarenal AAAs measuring 5.5 cm or larger should undergo repair to eliminate the risk of rupture. (Level of evidence: B)
2. Patients with infrarenal or juxtarenal AAAs measuring 4.0–5.4 cm in diameter should be monitored by US or CT scans every 6–12 months to detect expansion. (Level of evidence: A)
Class Ia
1. Repair can be beneficial in patients with infrarenal or juxtarenal AAAs measuring 5.0–5.4 cm in diameter. (Level of evidence: B)
2. Repair is probably indicated in patients with suprarenal or type IV thoracoabdominal aortic aneurysms larger than 5.5–6.0 cm. (Level of evidence: B)
3. In patients with AAAs smaller than 4.0 cm in diameter, monitoring by US examination every 2–3 years is reasonable. (Level of evidence: B)
Class III
Intervention is not recommended
for asymptomatic infrarenal or juxta-
renal AAAs if they measure less than
5.0 cm in diameter in men or less than
4.5 cm in diameter in women. (Level of evidence: A)

(3) Diagnosis of Aortic and Iliac An-
eurysms

(a) Symptomatic Aortic or Iliac
Aneurysms

Class I

1. In patients with the clinical triad
of abdominal and/or back pain, a
pulsatile abdominal mass, and hypo-
tension, immediate surgical evalua-
tion is indicated. (Level of evidence: B)

2. In patients with symptomatic
aortic aneurysms, repair is indicated
regardless of diameter. (Level of evi-
dence: C)

(b) Screening High-risk Populations

Class 1

Men 60 years of age or older who
are either the siblings or offspring of
patients with AAAs should undergo
physical examination and US screen-
ing for detection of aortic aneurysms.
(Level of evidence: B)

Class IIa

Men who are 65–75 years of age
who have ever smoked should un-
dergo a physical examination and one-
time US screening for detection of
AAAs. (Level of evidence: B)

(4) Observational Management or
Aortic and Iliac Aneurysms

(a) Blood Pressure Control and β-
Blockade

Class I

Perioperative administration of
β-adrenergic blocking agents, in the
absence of contraindications, is indi-
cated to reduce the risk of adverse car-
diac events and mortality in patients
with coronary artery disease undergo-
ing surgical repair of atherosclerotic
aortic aneurysms. (Level of evidence: A)

Class IIb

β-adrenergic blocking agents may be
considered to reduce the rate of
aneurysm expansion in patients with
aortic aneurysms. (Level of evidence: B)

(5) Prevention of Aortic Aneurysm
Rupture: Management Overview

Class I

1. Open repair of infrarenal AAAs
and/or common iliac aneurysms is in-
dicated in patients who are good or
average surgical candidates. (Level of
evidence: B)

2. Periodic long-term surveillance
imaging should be performed to mon-
itor for an endoleak, to document
shrinkage or stability of the excluded
aneurysm sac, and to determine the
need for further intervention in pa-
tients who have undergone endovas-
cular repair of infrarenal aortic and/or
iliac aneurysms. (Level of evidence: B)

Class IIa

Endovascular repair of infrarenal
aortic and/or common iliac aneu-
rysms is reasonable in patients at high
risk of complications from open opera-
tions because of cardiopulmonary or
other associated diseases. (Level of evi-
dence: B)

Class IIb

Endovascular repair of infrarenal
aortic and/or common iliac aneu-
rysms may be considered in patients
at low or average surgical risk. (Level
of evidence: B)

B. Visceral Artery Aneurysms

Class I

Open repair or catheter-based inter-
vention is indicated for visceral aneu-
rysms measuring 2.0 cm in diameter
larger in women beyond childbearing
age who are not pregnant and in pa-
tients of either gender undergoing
liver transplantation. (Level of evi-
dence: B)

Class IIa

Open repair or catheter-based inter-
vention is probably indicated for vis-
ceral aneurysms 2.0 cm in diameter
larger in women of childbearing
age and in men. (Level of evidence: B)

C. Lower-extremity Aneurysms

(1) Natural History of Lower-extrem-
ity Aneurysms

Class I

In patients with femoral or popli-
keletal artery aneurysms, US (or CR or MR)
imaging is recommended to exclude
controlateral femoral or popliteal aneu-
rysms and AAA. (Level of evidence: B)

(2) Management of Lower-extremity
Aneurysms

(a) Femoral and Popliteal Aneurysms

Class I

1. Patients with a palpable popliteal
mass should undergo an US examina-
tion to exclude popliteal aneurysm.
(Level of evidence: B)

2. Patients with popliteal aneu-
rysms 2.0 cm in diameter or larger
should undergo repair to reduce the
risk of thromboembolic complications
and limb loss. (Level of evidence: B)

3. Patients with anastomotic
pseudoaneurysms or symptomatic
femoral artery aneurysms should un-
dergo repair. (Level of evidence: A)

Class IIa

1. Surveillance by annual US imag-
ing is suggested for patients with
asymptomatic femoral artery true aneu-
rysms smaller than 3.0 cm in diam-
eter. (Level of evidence: C)

2. In patients with acute ischemia
and popliteal artery aneurysms and
absent runoff, catheter-directed
thrombolysis or mechanical thrombec-
tomy (or both) is suggested to restore
distal runoff and resolve emboli.
(Level of evidence: B)

3. In patients with asymptomatic
enlargement of the popliteal arteries
twice the normal diameter for age and
gender, annual US monitoring is rea-
sonable. (Level of evidence: C)

4. In patients with femoral or pop-
liteal artery aneurysms, administra-
tion of antiplatelet medication may be
beneficial. (Level of evidence: C)

(b) Catheter-related Femoral Artery
Pseudoaneurysms

Class I

1. Patients with suspected femoral
pseudoaneurysms should be evaluated
by duplex US. (Level of evidence: B)

2. Initial treatment with US-guided
compression or thrombin injection is
recommended in patients with large
and/or symptomatic femoral artery
pseudoaneurysms. (Level of evidence: B)

Class IIa

1. Surgical repair is reasonable in
patients with femoral artery pseudo-
aneurysms 2.0 cm in diameter or larger
that persist or recur after US-
guided compression or thrombin in-
jection. (Level of evidence: B)

2. Reevaluation by US 1 month after
the original injury can be useful in
patients with asymptomatic femoral
artery pseudoaneurysms smaller than
2.0 cm in diameter. (Level of evidence: B)
References
## Appendix I

### ACC/AHA Writing Committee to Develop Guidelines on PAD (Lower Extremity, Renal, Mesenteric, and Abdominal Aortic)

<table>
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<th>Committee Member</th>
<th>Research Grant</th>
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This table represents the relationships of committee members with industry that were disclosed at the initial writing committee meeting in November 2002 and that were updated in conjunction with all meetings and conference calls of the writing committee. It does not necessarily reflect relationships with industry at the time of publication.
### Appendix II

External Peer Reviewers for the ACC/AHA 2005 Guideline Update for PAD (Lower Extremity, Renal, Mesenteric, and Abdominal Aortic)*

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This table represents the relationships of peer reviewers with industry that were disclosed at the time of peer review of this guideline. It does not necessarily reflect relationships with industry at the time of publication. Participation in the peer review process does not imply endorsement of the document.

* Names are listed in alphabetical order.

ACCF = American College of Cardiology Foundation; ACP = American College of Physicians; AHA Diag and Interv Cardiac Cath Cmte = AHA Diagnostic and Interventional Cardiac Catheterization Committee; ASIM = American Society of Internal Medicine; BOG = Board of Governors; BOT = Board of Trustees; NHLBI = National Heart, Lung, and Blood Institute; PV = peripheral vein; PVD = peripheral vascular disease; SCAI = Society for Cardiovascular Angiography and Interventions; SVMB = Society of Vascular Medicine and Biology; SVN = Society for Vascular Nursing; TF on CECD = Task Force on Clinical Expert Consensus Documents; TF on PGL = Task Force on Practice Guidelines.
CME TEST QUESTIONS

Examination available at http://directory.sirweb.org/jvircme

1. Which of the following would **not** be recommended therapy for abdominal aortic aneurysm?
   a. Intervention for an asymptomatic 4.0-cm infrarenal abdominal aortic aneurysm in a 55-year-old man
   b. Intervention for a 4.8-cm infrarenal abdominal aortic aneurysm in a 55-year-old woman
   c. Perioperative administration of beta-adrenergic blocking agents (in the absence of contraindications) in a 55-year-old man undergoing surgical repair of abdominal aortic aneurysm
   d. Endovascular repair of infrarenal aortic aneurysm in a 55-year-old man with severe coronary artery disease

2. Which of the following is recommended with regard to pharmacologic therapy in patients with known lower extremity peripheral arterial disease?
   a. Beta-adrenergic blocking drugs are contraindicated for treatment of hypertension.
   b. Treatment with a hydroxymethyl glutaryl (HMG) coenzyme-A-reductase inhibitor (statin) medication is indicated to achieve a target LDL-cholesterol level of less than 100 mg/dL.
   c. Folic acid and B₁₂ vitamin supplements in patients with homocysteine levels greater than 14 µmol/L are highly recommended.
   d. Aspirin, in daily doses of 75–325 mg, has not proven to be effective in reducing the risk of myocardial infarction, stroke, or vascular death.

3. In which of the following scenarios is diagnostic testing to identify clinically significant renal artery stenosis **not** recommended?
   a. Patients with the onset of hypertension before the age of 30 years
   b. Patients with the onset of hypertension after the age of 55 years
   c. Patients with malignant hypertension (hypertension with coexistent evidence of acute end-organ damage)
   d. Patients who require three antihypertensive medications, including a diuretic, to achieve blood pressure control

4. In which of the following clinical scenarios should the diagnosis of acute nonocclusive intestinal ischemia be suspected?
   a. 50-year-old man who develops acute abdominal pain following a carotid angiogram performed via a right femoral artery puncture
   b. 62-year-old woman who has lost 30 lb over the last six months, who describes being afraid of eating large meals because she invariably develops abdominal pain shortly after eating
   c. 34-year-old woman taking birth control pills, with recent onset of abdominal ascites, who develops severe acute abdominal pain
   d. 35-year-old man with a history of cocaine abuse, who develops the abrupt onset of severe abdominal pain