### VASCULAR

#### Medical Knowledge

<table>
<thead>
<tr>
<th>Goals and Objectives</th>
<th>PF</th>
<th>EF</th>
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<th>Aspirational</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Know the anatomy of the normal aorta</td>
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<tr>
<td>• Know the function of the normal aorta</td>
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<tr>
<td>• Know the effect of aging on the aorta</td>
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<tr>
<td>• Know the elements of the physical examination of the aorta</td>
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<tr>
<td>• Know the classification of aortic aneurysms</td>
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<tr>
<td>• Know the epidemiology of abdominal aortic aneurysms</td>
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<tr>
<td>• Know the etiology and pathogenesis of abdominal aortic aneurysms</td>
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<tr>
<td>• Know the symptoms associated with abdominal aortic aneurysm rupture</td>
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<tr>
<td>• Know the abnormalities on physical examination associated with abdominal aortic aneurysm</td>
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<tbody>
<tr>
<td>• Know the methods used to diagnose and size abdominal aortic aneurysms</td>
<td></td>
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<tr>
<td>• Know the role of ultrasound, CT angiography, magnetic resonance angiography, and invasive contrast aortography in the diagnosis of abdominal aortic aneurysms; know the diagnostic features for each imaging modality</td>
<td></td>
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<tr>
<td>• Know the natural history of abdominal aortic aneurysms</td>
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<tr>
<td>• Know the indications for and methods of screening for abdominal aortic aneurysms</td>
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<tr>
<td>• Know the personnel and facility requirements for a non-invasive vascular laboratory and for office ankle brachial index (ABI) testing</td>
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<tr>
<td>• Know the indications for surgical or percutaneous interventions in patients with abdominal aortic aneurysms</td>
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<tr>
<td>• Know the recommended methods for follow-up of abdominal aortic aneurysms including the follow-up intervals</td>
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<tr>
<td>• Know the key elements of surgical repair of abdominal aortic aneurysm and endovascular aortic repair (EVAR) including stent-grafting of abdominal aortic aneurysms. Know the criteria for choosing one procedure vs. the other</td>
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<tr>
<td>• Know the criteria for assessing operative risk</td>
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<tr>
<td>• Know the post-operative complications of surgical and percutaneous treatment of abdominal aortic aneurysms</td>
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<tbody>
<tr>
<td>• Know the components of medical therapy of abdominal aortic aneurysms before and after surgical or percutaneous intervention including the role of beta-blockers, statins and treatment of systemic hypertension</td>
<td></td>
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<tr>
<td>• Know the long-term prognosis after successful repair of abdominal aortic aneurysms</td>
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<tr>
<td>• Know the etiology and pathogenesis of thoracic aortic aneurysms</td>
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<tr>
<td>• Know the differences among thoracic aortic aneurysms associated with atherosclerosis, syphilis and infectious aortitis</td>
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<tr>
<td>• Know the clinical manifestations of thoracic aortic aneurysms including those associated with rupture</td>
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<tr>
<td>• Know the methods used for diagnosing thoracic aortic aneurysms including the chest X-ray; CT angiography, magnetic resonance angiography, invasive contrast aortography, transthoracic echocardiography and transesophageal echocardiography; know the diagnostic criteria associated with each method</td>
<td>X</td>
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<tr>
<td>• Know the natural history of thoracic aortic aneurysms including the relationship of aortic morphology to natural history</td>
<td></td>
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<tr>
<td>• Know the indications for surgical intervention in patients with thoracic aortic aneurysms</td>
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<tr>
<td>• Know the surgical options for thoracic aortic aneurysms including the mortality and morbidity risks of each</td>
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<tr>
<td>• Know the long-term prognosis after surgical repair of thoracic aortic aneurysms</td>
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<tr>
<td>• Know the definition of aortic dissection</td>
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<tr>
<td>• Know the classifications of aortic dissection</td>
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<tr>
<td>• Know the difference between acute and chronic aortic dissection</td>
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<tr>
<td>• Know the etiology and pathogenesis of aortic dissection including the role of cystic medical necrosis</td>
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<td>• Know the risk factors for aortic dissection</td>
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<tr>
<td>• Know the prognosis of untreated aortic dissection</td>
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<tr>
<td>• Know the symptoms of aortic dissection with special reference to chest pain, pulse and blood pressure abnormalities aortic regurgitation, neurological syndromes, symptoms with pathologic abnormalities associated with aortic dissection</td>
<td></td>
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<tr>
<td>• Know the signs of aortic dissection including those related to pulse abnormalities, blood pressure abnormalities, aortic regurgitation and neurological abnormalities</td>
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<tr>
<td>• Know the general laboratory abnormalities associated with aortic dissection including the CBC, blood chemistries and the ECG and biomarkers</td>
<td></td>
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<tr>
<td>• Know the spectrum of chest X-ray abnormalities associated with aortic dissection</td>
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<tr>
<td>• Know the imaging abnormalities associated with aortic dissection on invasive aortography, CT angiography, magnetic resonance angiography, transthoracic echocardiography and transesophageal echocardiography. Know the sensitivity and specificity of each modality and the selection criteria in the setting of suspected aortic dissection. Also know the role of coronary arteriography in this setting</td>
<td></td>
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<tr>
<td>• Know the early management options (predominantly drug therapy) for blood pressure reduction in aortic dissection; know blood pressure targets</td>
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<tr>
<td>• Know the management of cardiac tamponade due to aortic dissection</td>
<td></td>
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<tr>
<td>• Know the comparative prognoses of types A and B aortic dissection treated with medical therapy alone</td>
<td></td>
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<tr>
<td>• Know the criteria and rationale for definitive therapy of aortic dissection (surgical vs. medical)</td>
<td></td>
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<tr>
<td>• Know the surgical techniques used to treat aortic dissection</td>
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<tr>
<td>• Know the criteria for surgical treatment of type B dissection</td>
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<tr>
<td>• Know the components of medical therapy of aortic dissection including blood pressure control</td>
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<tr>
<td>• Know the guidelines for treatment of chronic aortic dissection, including medications</td>
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<tr>
<td>• Know the criteria for surgical or percutaneous intervention in patients with chronic aortic dissection</td>
<td>X</td>
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<tr>
<td>• Know follow up imaging recommendations for surgically and medically-treated aortic dissection</td>
<td>X</td>
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<tr>
<td>• Know guidelines for long-term medical therapy of aortic dissection following surgery or in patients treated with medical therapy as primary therapy</td>
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<tr>
<td>• Know the etiology, pathogenesis, clinical manifestation, diagnostic imaging features, early medical therapy and definitive therapy of atypical aortic dissection including intramural hematoma and penetrating atherosclerotic ulcer</td>
<td>X</td>
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<tr>
<td>• Know the etiology, pathogenesis, clinical manifestations, natural history, diagnostic imaging findings and recommended management of acute aortic occlusion, bacterial infections of the aorta and primary tumors of the aorta</td>
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<tbody>
<tr>
<td>• Know the etiologies, clinical manifestations, natural history diagnostic imaging abnormalities and management of aortic atheroembolic disease</td>
<td></td>
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<tr>
<td>• Know the epidemiology of peripheral arterial disease of the lower extremities</td>
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<tr>
<td>• Know risk factors for peripheral arterial disease of the lower extremities</td>
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<tr>
<td>• Know the pathophysiology of peripheral arterial disease of the lower extremities including factors regulating blood supply and skeletal muscle structure and metabolic function</td>
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<tr>
<td>• Know the symptoms of peripheral arterial disease of the lower extremities including Rose claudication and its variants</td>
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<tr>
<td>• Know the differential diagnosis of exertional leg pain (vascular and non-vascular)</td>
<td>X</td>
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<tr>
<td>• Know the physical examination findings of peripheral arterial disease of the lower extremities</td>
<td>X</td>
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<tr>
<td>• Know the Fontaine classification of peripheral arterial disease and the clinical categories of chronic limb ischemia</td>
<td>X</td>
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<tr>
<td>• Know the clinical manifestations of acute limb ischemia</td>
<td>X</td>
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<tr>
<td>• Know which laboratory tests are used in the diagnosis of peripheral arterial disease of the lower extremities</td>
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<tr>
<td>Know the components of the following tests and the ways in which they are used to diagnose peripheral arterial disease of the lower extremities including ankle brachial index (ABI), segmental ABI, pulse volume recording, Doppler-ultrasonography and duplex ultrasound imaging, CT angiography, magnetic resonance angiography, invasive contrast angiography and treadmill exercise testing</td>
<td>X</td>
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<tr>
<td>Know the prognosis of peripheral arterial disease of the lower extremities with respect to limb complications and cardiovascular morbidity and mortality</td>
<td>X</td>
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<tr>
<td>Know the elements of and results of risk factor modification in patients with peripheral arterial disease of the lower extremities including smoking cessation, treatment of diabetes mellitus and blood pressure control</td>
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<td>• Know the effects of antiplatelet therapy on prognosis in patients with peripheral arterial disease of the lower extremities</td>
<td></td>
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<tr>
<td>• Know the role of pharmacotherapy of peripheral arterial disease of the lower extremities including the results of such therapy</td>
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<tr>
<td>• Know the effects of exercise rehabilitation on functional capacity in peripheral arterial disease of lower extremities</td>
<td></td>
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<tr>
<td>• Know the specific types of peripheral arterial interventions including their indications/and outcomes in patients with peripheral arterial disease</td>
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<tr>
<td>• Know the elements of the algorithm on treatment of symptomatic peripheral arterial disease of the lower extremities</td>
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<td>• Know the etiology, pathogenesis clinical manifestations, methods of diagnosis,</td>
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<tr>
<td>diagnostic criteria, prognosis and treatments of renal artery stenosis and</td>
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<td>mesenteric ischemia (pharmacologic, non-pharmacologic, catheter-based, surgical)</td>
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<tr>
<td>• Know the etiologies pathophysiology, clinical manifestations, diagnostic criteria,</td>
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<tr>
<td>imaging alterations, and treatment options for carotid atherosclerosis</td>
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<tr>
<td>• Know the etiologies, pathophysiology clinical manifestations, diagnostic criteria,</td>
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<tr>
<td>imaging abnormalities prognosis and treatment of various forms of vasculitis</td>
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<tr>
<td>• Know the pathology and pathogenesis, clinical manifestations, diagnostic criteria,</td>
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<td>complications, and treatment of vasospastic disorders including Raynaud’s</td>
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<td>phenomenon/disease and thromboangitis obliterans</td>
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<td>• Know the etiologies, pathogenesis, clinical manifestations, diagnostic criteria, prognosis and treatment of atheroembolism.</td>
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<td>Know the role of thrombolysis in such patients</td>
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<tr>
<td>• Know the etiologies, pathogenesis, clinical manifestations, diagnostic criteria, prognosis, complications and treatment of</td>
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</tr>
<tr>
<td>acute thrombophlebitis, the post-phlebitic syndrome, chronic venous insufficiency and phlegmasia cerulea or alba dolens</td>
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<tr>
<td>• Know the imaging methods used to diagnose the aforementioned venous disorders including ultrasound/Doppler and venography.</td>
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<tr>
<td>Know the diagnostic features of these studies for the aforementioned venous disorders</td>
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<tr>
<td>• Know the indications for DVT prophylaxis and know guidelines for DVT prophylaxis</td>
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</table>
# VASCULAR

## Patient Care

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</thead>
<tbody>
<tr>
<td>Be able to:</td>
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<tr>
<td>• Perform an examination of the abdominal aorta and recognize signs of abdominal aortic aneurysms</td>
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<tr>
<td>• Interpret the result of ultrasound of the abdominal aorta, CT angiography of the abdominal aorta and magnetic resonance angiography of the abdominal aorta; recognize and be able to quantify abdominal aortic aneurysms</td>
<td></td>
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<tr>
<td>• Establish appropriate medical therapy of abdominal aortic aneurysms</td>
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</tr>
<tr>
<td>• Establish regular follow-up of abdominal aortic aneurysms with appropriate imaging</td>
<td></td>
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</tr>
<tr>
<td>• Recognize when to refer patients with abdominal aortic aneurysms for intervention</td>
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<tbody>
<tr>
<td>• Manage patients medically and establish follow-up imaging after endovascular or</td>
<td></td>
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<tr>
<td>surgical repair of abdominal aortic aneurysms</td>
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</tr>
<tr>
<td>• Recognize the clinical features of a ruptured abdominal aortic aneurysms</td>
<td></td>
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</tr>
<tr>
<td>• Recognize possible thoracic aortic aneurysms based on chest X-ray or echocardiographic findings</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Establish a definitive diagnosis of thoracic aortic aneurysms based on imaging</td>
<td></td>
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</tr>
<tr>
<td>studies. Establish the etiology of the aneurysm. Be able to diagnose and size</td>
<td></td>
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<tr>
<td>thoracic aortic aneurysms</td>
<td></td>
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<tr>
<td>• Establish medical therapy of thoracic aortic aneurysms including blood pressure</td>
<td></td>
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<td></td>
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<tr>
<td>control</td>
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<tbody>
<tr>
<td>• Recognize when to refer patients with thoracic aortic aneurysms for surgical intervention.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Establish appropriate post-operative follow-up of thoracic aortic aneurysms with imaging</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Recognize possible aortic dissection based on the history and physical examination</td>
<td></td>
<td></td>
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<td>X</td>
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</tr>
<tr>
<td>• Promptly initiate appropriate medical therapy of aortic dissection and appropriate imaging to confirm the diagnosis</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Select appropriate definitive therapy of aortic dissection based on clinical factors and imaging findings</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Recognize imaging findings of aortic dissection on all imaging modalities</td>
<td></td>
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<tr>
<td>• Effectively manage cardiac tamponade associated with aortic dissection</td>
<td></td>
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<tr>
<td>• Establish appropriate long-term medical therapy of aortic dissection after initial medical or surgical/percutaneous intervention</td>
<td></td>
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</tr>
<tr>
<td>• Establish long-term follow-up of aortic dissection with imaging</td>
<td></td>
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</tr>
<tr>
<td>• Recognize chronic and atypical aortic dissection clinically and on aortic imaging</td>
<td></td>
<td></td>
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<tr>
<td>• Diagnosis acute aortic occlusion based on clinical presentation and aortic imaging</td>
<td></td>
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</tr>
<tr>
<td>• Recognize bacterial infections of the aorta based on clinical presentation, baderriology and imaging of the aorta</td>
<td></td>
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<tr>
<td>• Recognize aortitis based on clinical features, laboratory studies and imaging of the aorta</td>
<td></td>
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<tr>
<td>• Recognize primary tumors of the aorta on imaging studies</td>
<td></td>
<td>X</td>
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<tr>
<td>• Treat reversible risk factors for peripheral arterial disease</td>
<td></td>
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<tr>
<td>• Recognize peripheral arterial disease of the extremities, renal arteries, sphlanic arteries and carotid arteries based on history and physical examination abnormalities</td>
<td></td>
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<tr>
<td>• Categorize peripheral arterial disease</td>
<td></td>
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<tr>
<td>• Recognize the clinical features of chronic and acute limb ischemia</td>
<td></td>
<td></td>
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<tr>
<td>• Interpret ABI results</td>
<td></td>
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<tr>
<td>• Utilize treadmill exercise to evaluate lower extremity peripheral arterial disease.</td>
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<tbody>
<tr>
<td>• Recognize peripheral arterial disease on invasive contrast angiography, CT angiography and magnetic resonance angiography</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Establish an exercise program when appropriate for patients with peripheral arterial disease of the lower extremities</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Initiate therapy with anti-platelet therapy in patients with peripheral arterial disease of the lower extremities</td>
<td></td>
<td></td>
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<tr>
<td>• Initiate pharmacotherapy (eg, cilostazol in patients with claudication)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Initiate appropriate medical therapy for acute limb ischemia and refer for definitive revascularization therapy</td>
<td></td>
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</tr>
<tr>
<td>• Recognize when to refer patients for percutaneous or surgical revascularization of peripheral arterial disease</td>
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<tbody>
<tr>
<td>• Select appropriate imaging studies to evaluate</td>
<td></td>
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<tr>
<td>for renal artery stenosis, mesenteric artery stenosis and carotid stenosis</td>
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<tr>
<td>• Recognize when to refer patients with renal</td>
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<tr>
<td>artery stenosis, mesenteric ischemia and</td>
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<tr>
<td>carotid stenosis for percutaneous or surgical intervention</td>
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<tr>
<td>• Recognize the relative values of angioplasty, stent placement, renal denervation</td>
<td></td>
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<tr>
<td>using radio-frequency energy and surgical revascularization in patients with renal</td>
<td></td>
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<tr>
<td>artery stenosis</td>
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<tr>
<td>• Recognize Raynaud’s phenomenon/disease,</td>
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<tr>
<td>vasculitis and athero-embolism based on</td>
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<tr>
<td>clinical presentation and pertinent laboratory and imaging studies. Initiate</td>
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<tr>
<td>appropriate therapy of each</td>
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Systems-based Practice

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<tbody>
<tr>
<td>• Be able to establish non-invasive screening for peripheral arterial disease in the office or clinic setting</td>
<td></td>
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<tr>
<td>• Be aware of community programs featuring screening for vascular disease (eg, ultrasound of the abdominal aorta, ABI’s carotid ultrasound)</td>
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<tr>
<td>• Consider consolidating non-invasive vascular testing with echocardiography in the hospital or office setting</td>
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### Practice-based Learning and Improvement

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<tbody>
<tr>
<td>• Utilize the results of the in-service examination and board review modules to identify gaps in knowledge about vascular disease</td>
<td></td>
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<tr>
<td>• Solicit feedback from faculty and technicians concerning knowledge and skills related to diagnosis and treatment of vascular disease</td>
<td></td>
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</tr>
<tr>
<td>• Consider performing an interpreting a sufficient number of non-invasive vascular studies to receive certification</td>
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## Interpersonal and Communication Skills

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<tbody>
<tr>
<td>• Educate patients and their families about the reasons that you have selected a specific vascular study for diagnosis, including risks and benefits</td>
<td>X</td>
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## Professionalism

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<tr>
<td>• Educate referring providers with information concerning as to why you selected a particular vascular procedure for diagnosis or treatment</td>
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<tr>
<td>• Take patient preferences into consideration when considering vascular studies</td>
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<tr>
<td>• Provide interpreting physicians with sufficient clinical information to ensure that the patient receives the vascular study that is most likely to answer the clinical question</td>
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