This tool addresses common symptoms and symptom complexes. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or patient’s Primary Care Physician (PCP) may provide additional insight.

PERIPHERAL VASCULAR DISEASE IMAGING GUIDELINES
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MedSolutions, Inc. Clinical Decision Support Tool
for Advanced Diagnostic Imaging

Common symptoms and symptom complexes are addressed by this tool. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician may provide additional insight.

This version incorporates MSI accepted revisions prior to 11/30/06
ABBREVIATIONS for PERIPHERAL VASCULAR DISEASE GUIDELINES
(also see Cardiac Guidelines glossary)

AAA: Abdominal aortic aneurysm
ABI: Ankle brachial index (a noninvasive, non-imaging test for arterial insufficiency---see toe-brachial index below. This testing can also be done after exercise if resting results are normal).
CTA: computed tomography angiography
CTV: computed tomography venography
DLCO: diffusion capacity—defined as the volume of carbon monoxide transferred into the blood per minute per mmHg of carbon monoxide partial pressure
ENT: Ear, Nose, and Throat
MRA: magnetic resonance angiography
MRV: magnetic resonance venography
PAH: pulmonary artery hypertension
PFT: pulmonary function test
PVD: peripheral vascular disease
SVC: Superior vena cava
TIA: Transient ischemic attack
Claudication or Intermittent Claudication: Usually a painful cramping sensation of the legs with walking or severe leg fatigue
Toe-brachial index: useful in patients with noncompressible posterior tibial or dorsalis pedis arteries, which results in ABI above normal range
PVD-1~ GENERAL GUIDELINES

- The same general risk factors apply for coronary disease as for vascular disease in the non-coronary bed (see CD-2 Nuclear Cardiac Imaging Evidence Based Clinical Support section in the Cardiac guidelines).
- Diabetes is a particularly high risk factor for the development of vascular disease.
- The presence of vascular disease implies a substantially heightened risk for coronary artery disease and confirmed vascular disease may prompt cardiac imaging (see CD-2 Nuclear Cardiac Imaging in the Cardiac guidelines).
- Even patients less than age 50 with at least one risk factor are considered “at risk” for vascular disease.
- The presence of erectile dysfunction can be associated with vascular disease* (see PV-14 Impotence/Erectile Dysfunction in the Pelvic guidelines). If this is the only indication listed for advanced imaging, Medical Director review is needed.
  *Arch Int Med 2006;166:201-206
- Post angioplasty/reconstruction: Follow-up imaging is principally guided by symptoms
  - Also see AB-18 Abdominal Aortic Aneurysm in the Abdominal guidelines, AB-19 Endovascular Abdominal Aortic Aneurysm Repair in the Abdominal guidelines, and CH-22 Thoracic Aortic Dissection or Aneurysm in the Chest guidelines.
- Imaging Studies:
  - Carotid studies (neck MRA or CTA) capture the area from the top of the aortic arch (includes the origin of the innominate artery, common carotid artery, and subclavian artery, which gives off the vertebral artery) to the base of the skull.
  - CTA/ MRA abdomen images from the diaphragm to the umbilicus or iliac crest.
  - CTA/MRA chest images from the base of the neck to the dome of the liver.
  - Runoff studies image from the umbilicus to the feet.
- **Pediatric guidelines:** The Peripheral Vascular Disease guidelines are the same for both the pediatric population and the adult population, unless there are specific Pediatric guidelines (highlighted in yellow).

PVD-2~ CEREBROVASCULAR AND CAROTID DISEASE

- See also (in Head guidelines):
  - HD-18 Hyperacute Headache/Berry Aneurysm/Subarachnoid Hemorrhage
  - HD-30 General Stroke/TIA
  - HD-31 Special Stroke/TIA
  - HD-33 Cerebral Vasculitis
  - HD-40 Tinnitus
• Carotid intima-media thickness using duplex ultrasound imaging is being advocated as a screening test for vascular disease. This does not involve advanced imaging.
  o Outcomes data are currently lacking.
• In general, duplex ultrasound should be performed initially to evaluate possible carotid artery disease, prior to considering advanced imaging.
  o If ultrasound shows > 50% occlusion/stenosis, then neck MRA with contrast (CPT 70548) or CTA (CPT 70498) can be performed.
• In patients with typical symptoms of TIA/stroke or carotid dissection, carotid imaging with MRA (CPT 70548 for TIA/Stroke, or CPT 70549 for carotid dissection) or CTA (CPT 70498) can be performed initially.
  o Also see HD-30 General Stroke/TIA and HD-31Special Stroke/TIA in the Head guidelines.
• In patients with suspected vertebrobasilar pathology, brain MRI (CPT 70553) and brain MRA (CPT 70544) are generally appropriate.
  o Also see HD-31Special Stroke/TIA and HD-31 Evidence Based Clinical Support section in the Head guidelines.
  o Evaluation by a neurologist is helpful in determining the appropriate imaging pathway.
• Surveillance after intracranial hemorrhage: The preference of the neurosurgeon or neurologist following the patient should be honored. There is no precise schedule for follow-up imaging in these patients.

**PVD-3~ UPPER EXTREMITY PERIPHERAL VASCULAR DISEASE**

• MRA (or MRV) of the chest (CPT 71555) and/or upper extremities (CPT 73225) may be required when clinical evidence points to arterial or venous insufficiency.
  o Symptoms can include muscular limb pain, particularly with exertion, or otherwise unexplained swelling of the upper extremities.
• Superior vena cava syndrome: Chest MRV (CPT 71555) may be indicated when this syndrome is suspected. This syndrome is frequently associated with aggressive thoracic cancers or metastases.*
  o Also see CH-21 Superior Vena Cava Syndrome in the Chest guidelines.

**PVD-4~PULMONARY ARTERY HYPERTENSION**

• Pulmonary artery hypertension (PAH) comprises a spectrum of diseases characterized by elevated pulmonary artery pressure with a mean above 25 mmHg at rest or 30 mmHg with exercise, or systolic pulmonary artery pressure at rest > 39 mmHg.
• Types of pulmonary hypertension:
  o Pulmonary arterial hypertension
Includes idiopathic and PAH from e.g. collagen vascular disease, portal hypertension from cirrhosis, etc.

- **Pulmonary venous hypertension**
  - Due to cardiac disease
  - Stress echocardiogram or left heart catheterization is indicated.

- **Pulmonary hypertension associated with hypoxemia**
  - PAH secondary to lung disorders
  - PFT’s should be obtained; if restrictive disease is present and DLCO is decreased, high resolution chest CT (CPT 71250) should be obtained to rule out restrictive lung disorders such as idiopathic pulmonary fibrosis.

- **PAH secondary to chronic thromboembolic disease**
  - Only form of PAH that has potentially curative treatment.

- Reference:

- Chest CTA (CPT 71275) for evaluation of pulmonary hypertension is appropriate if the etiology is felt to be pulmonary embolism. Otherwise, requests should go for Medical Director review.

- Obstructive sleep apnea is associated with pulmonary hypertension and can be associated with right heart failure (cor pulmonale).
  - Cardiovascular advanced imaging is generally not indicated in the evaluation of obstructive sleep apnea.
  - ENT imaging in certain settings of nasopharyngeal abnormalities or deformities may be indicated for sleep apnea evaluation.

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**PVD-5~ AORTIC DISORDERS AND RENAL VASCULAR DISORDERS**

- See also (in Abdominal guidelines):
  - AB-18 Abdominal Aortic Aneurysm
  - AB-19 Endovascular Abdominal Aortic Aneurysm Repair
  - AB-35 Renovascular Hypertension

- Chest CT (CPT 71260 or 71270), chest CTA (CPT 71275), or chest MRA (CPT 71555) can be used for surveillance or follow-up of thoracic aortic abnormalities in patients with Loeys-Deitz syndrome, Marfan syndrome, Takayasu’s arteritis, or Kawasaki syndrome.*
  - Also see CH-22 Thoracic Aortic Dissection or Aneurysm in the Chest guidelines.


- Less lethal disorders such as Turner syndrome and tuberous sclerosis have also been associated with aortic dissection.*

- **Renal vascular disease:**
  - Also see AB-35 Renovascular Hypertension in the Abdominal guidelines.
  - The presence of an unexplained difference in kidney length or presence of an atrophic kidney can be an indication for advanced imaging of the renal
arteries (CTA—CPT 74175 or MRA—CPT 74185) in patients with or without hypertension.

- Unexplained renal dysfunction or sudden (“flash”) pulmonary edema can be an indication for CTA (CPT 74175) or MRA (CPT 74185) of the renal arteries.

- **Abdominal aortic abnormality:**
  - Also see AB-18 Abdominal Aortic Aneurysm and AB-19 Endovascular Abdominal Aortic Aneurysm Repair in the Abdominal guidelines.
  - Screening for abdominal aortic aneurysm (AAA) is appropriate in men over age 60, usually done by ultrasound.
  - Men and women over age 50 with a family history of AAA can also be screened by ultrasound.
  - General screening is not appropriate in females unless they have high cardiovascular risk and are over the age of 50.
  - Ultrasound should be performed initially in any patient with a pulsatile or expansile abdominal mass.
    - **Exception:** In circumstances in which ultrasound is technically difficult (e.g. obese body habitus), CTA (CPT 74175) [preferred] or MRA (CPT 74185) can be performed initially.
      - If suspicion of lower extremity vascular insufficiency is warranted (see PVD-6 Lower Extremity Assessment), aortoiliac femoral run-off studies from the abdomen to the extremities (CTA--CPT 75635, or MRA—CPT 74185, 73725, and 73725) can be performed.*
    
  - Certain forms of bacterial endocarditis/vasculitis, such as seen in *salmonella* infections, can result in both pseudoaneurysms and true aneurysms of the aorta and require advanced imaging to confirm their presence.
    - Outpatient assessment can be done in settings of suspected salmonellosis, but patients usually undergo inpatient assessment.

- **Mesenteric ischemia:**
  - Also see AB-10 Mesenteric/Colonic Ischemia in the Abdominal guidelines.
  - CTA of the abdomen (CPT 74175), unless contraindicated, is preferred over MRA (CPT 74185) for evaluation of mesenteric ischemia.
  - Conventional angiography is still favored by many specialists.

- **Aortic congenital vascular malformations** can be seen with chromosomal abnormalities such as Turner syndrome.
  - Malformations can include aortic coarctation (see CD-6 bullet 3 Cardiac MRI in the Cardiac guidelines) and aortic valve abnormalities.
  - Cardiac MRI (CPT 75554 and 71555), chest MRA (CPT 71555), chest CT (CPT 71260), or chest CTA (CPT 71275) may be needed for evaluation. Specialist input is helpful in determining the appropriate imaging pathway.
  - Coarctation is usually detected at younger ages with blood pressure substantially elevated in one or both upper extremities relative to lower extremity blood pressures. Plain chest x-ray in this syndrome may also demonstrate characteristic “rib notching.”
• If ankle brachial index (ABI) and post-exercise ABI are normal, no advanced imaging is indicated.
  o Normal ABI range is 0.9 to 1.3.
  o If ABI is greater than 1.3, this suggests severe peripheral vascular disease and arteries that are inelastic or “stiff.”
    ➢ Advanced imaging may be indicated in these patients, including CTA with run off (CPT 75635) or MRA of the aortoiliofemoral system (CPT 74185, 73725, and 73725).
  o A toe-brachial index may be used as further screening in patients with ABI’s greater than 1.3.
• ABI is the preferred initial test, but lower extremity duplex ultrasound and Doppler studies are adjuncts.*
  *Postgrad Med 2006;119(2):21-27
  *Radiology 2005;236:1083-1093 and 1094-1103
• When performing advanced imaging of the lower extremity vasculature, CTA is generally preferred over MRA, unless there are contraindications to CTA (e.g. renal insufficiency, contrast allergy, etc.).
• Advanced imaging is not medically indicated in patients who have claudication symptoms that are improving with medical therapy (walking exercise, rehabilitation and medications).
• Patients with evidence of potentially limb-threatening vascular disease, such as skin breakdown, ulceration, resting leg pain, or gangrene, can undergo advanced imaging (CTA—CPT 75635 or MRA—CPT 74185, 73725, and 73725).
• Pseudoclaudication:
  o See SP-4 Lumbar Spinal Stenosis in the Spine guidelines.
  o Post-exercise ABI is often one of the first tests ordered for suspected pseudoclaudication in order to delineate vascular vs nonvascular causes.
• Popliteal artery aneurysm:
  o Patients with this aneurysm are at risk for other types of aneurysm (e.g. aortic aneurysm).
  o Ultrasound should be the initial imaging study to assess for other aneurysms.
  o Advanced imaging (CTA—CPT 73706 or MRA—CPT 73725) is generally reserved as a preoperative study for patients with no plans for invasive angiography and/or who have technically limited or abnormal ultrasound results.

PVD-7~ LOWER EXTREMITY EDEMA

• Also see AB-16 Lower Extremity Edema in the Abdominal guidelines.
• The documented presence of chronic lower extremity edema due to chronic venous insufficiency generally will not respond to intervention, and advanced imaging is not routinely indicated.
- If there is documented need to exclude other more treatable causes such as thigh or abdominal/pelvic clot(s) or masses, MRV (or CTV) can be helpful.
- CT venography of the abdomen and pelvis (CPT 74175 and 72191) or MRV (CPT 74185 and 72198) may be appropriate if venous thrombosis is suggested but is indeterminant on other imaging tests, or if the extent of thrombosis needs more detailed assessment.
- Phlagmasia cerulea dolens can be evaluated by MRV, CTV or CTA with run off to assess the arterial system. MRA (CPT 74185, 73725, and 73725) may also be required for this problem, which can reflect both arterial and venous compromise and produce substantial lower extremity edema.
PVD-2~ CEREBROVASCULAR AND CAROTID DISEASE
Evidence Based Clinical Support

- The presence or absence of a carotid bruit is not particularly useful in estimating the presence or severity of carotid occlusive disease.
- Carotid artery surgery (endarterectomy) or angioplasty/stenting are acceptable forms of therapy for flow limiting carotid vascular disease.

PVD-3~ UPPER EXTREMITY PERIPHERAL VASCULAR DISEASE
Evidence Based Clinical Support

- Upper extremity claudication is rare and can be manifested as fatigue and cramping pain along with muscle weakness. Positional tests such as Adson’s maneuver can be done on physical examination and demonstrate pulse deficit in certain positions, which may suggest extravascular compromise (e.g. vascular thoracic outlet syndrome). Not all patients with a positive Adson test have thoracic outlet syndrome. Surgery or stenting of the arterial or venous segments is sometimes performed.
- Superior vena cava syndrome is usually manifested as facial and upper truncal and neck swelling, usually in the presence of a malignancy or blood clotting disorder, or in patients with central venous catheters which can cause clotting or scarring of veins.

PVD-4~ PULMONARY ARTERY HYPERTENSION
Evidence Based Clinical Support

- Primary pulmonary artery hypertension is more frequent in young females than males and can be manifested as dyspnea on exertion, chest pain, and less commonly, hemoptysis.
- Secondary pulmonary hypertension can be due to multiple or single large pulmonary emboli or obstructive sleep apnea.

PVD-5~ AORTIC DISORDERS AND RENAL VASCULAR DISORDERS
Evidence Based Clinical Support

- Patients with suspected acute aortic dissection should be evaluated in the Emergency Department or as inpatients. Asymptomatic (incidentally discovered) Debakey type III or Stanford type B dissections can be exceptions to this, as they are often managed medically.
PERIPHERAL VASCULAR DISEASE GUIDELINE REFERENCES

PVD-1~General Guidelines

PVD-3~Upper Extremity Peripheral Vascular Disease

PVD-4~Pulmonary Artery Hypertension

PVD-5~Aortic Disorders and Renal Vascular Disorders

PVD-6~Lower Extremity (Claudication) Assessment