



CLINICAL GUIDELINES

Peripheral Vascular Disease (PVD) Imaging Guidelines

Version 1.0

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eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

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Abbreviations and Glossary for the PVD Imaging Guidelines

(See also: [Cardiac Imaging 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.
Claudication	or Intermittent claudication : usually a painful cramping sensation of the legs with walking or severe leg fatigue
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
DVT	deep venous thrombosis
ECG	Electrocardiogram
ENT	Ears, Nose, Throat
HbA1C	hemoglobin A1C: test used to determine blood sugar control for patients with diabetes
MRA	magnetic resonance angiography
MRV	magnetic resonance venography
PAD	peripheral artery disease
PAH	pulmonary artery hypertension
PFT	pulmonary function tests
PVD	peripheral vascular disease
SVC	superior vena cava
TIA	transient ischemic attack
TTE	transthoracic echocardiogram
Toe-Brachial Index	useful in patients with ABI above the normal range due to non-compressible posterior tibial or dorsalis pedis arteries
V/Q Scan	ventilation and perfusion scan

PVD-1: General Guidelines

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PVD-1.0: General Guidelines

- A current clinical evaluation (within 60 days), including medical treatments, are required prior to considering advanced imaging, which includes:
 - ◆ Relevant history and physical examination including:
 - The palpation of pulses
 - Evaluation of lower extremities for the presence of non-healing wounds or gangrene
 - Associated skin changes such as thickened nails, absence of hair in the feet or calves, cool extremities
 - Evaluation for the presence of arterial bruits
 - Appropriate laboratory studies
 - Non-advanced imaging modalities, such as recent ABIs (within 60 days) after symptoms started or worsened
 - ◆ Other meaningful contact (telephone call, electronic mail, or messaging) by an established patient can substitute for a face-to-face clinical evaluation
- ABI should be measured first:
 - ◆ If normal, then further vascular studies are generally not indicated
 - ◆ If clinical suspicion for PAD remains high with normal ABI's, exercise ABI's (CPT® 93924) can be performed on a treadmill to elicit ischemia
 - ◆ The TBI (toe-brachial index) is used to establish the diagnosis of PAD in the setting of non-compressible arteries (ABI >1.40) and may also be used to assess perfusion in patients with suspected CLI (rest pain and/or non-healing wound)
- If a prior imaging study (Ultrasound, MRA, CTA, Catheter angiogram, etc.) has been completed for a condition, a follow-up, additional, or repeat study for the same condition is generally not indicated unless there has been a change in the patient's condition, previous imaging showed an indeterminate finding, or eviCore healthcare guidelines support routine follow-up imaging.
- Runoff studies (CPT® 75635 for CTA or CPT® 74185, CPT® 73725, and CPT® 73725 for MRA) image from the umbilicus to the feet
 - CTA Abdomen and lower extremities should be reported as CPT® 75635, rather than using the individual CPT® codes for the abdomen, pelvis, and legs
 - MRA Abdomen, MRA Pelvis and MRA Lower extremities should be reported as CPT® 74185, CPT® 73725, and CPT® 73725. The CPT® code for MRA Pelvis (CPT® 72198) should not be included in this circumstance

PVD-1.1: General Information

- Risk factors for vascular disease include:
 - ◆ Diabetes
 - ◆ Cigarette smoking
 - ◆ Hypertension
 - ◆ Hyperlipidemia
 - ◆ Age > 50, with at least one risk factor, are considered "at risk" for vascular disease

- ◆ See also: PV-17: Impotence/Erectile Dysfunction in the Pelvis Imaging Guidelines
- Signs and symptoms of peripheral arterial disease
 - ◆ Claudication (Cramping pain in the legs, most notably back of the calves but can involve hips or thighs, after walking which is relieved with rest but recurs at a predictable distance)
 - Symptoms that are not consistent with claudication include
 - Generalized leg pain
 - Nocturnal cramps
 - Pain that is not easily relieved after a few minutes of rest
 - Burning pain in feet
 - ◆ Critical limb ischemia
 - Rest pain: Pain in the foot (not leg) at rest, particularly at night when the leg is elevated. Pain is relieved by dangling the leg off the bed or moving to an upright position
 - Non healing wounds. Wounds present for >2 weeks with little to no evidence of healing
 - ◆ Erectile dysfunction can be associated with vascular disease
- Claudication and critical limb ischemia have different natural histories. Claudication generally follows a benign indolent course. 70% of patients with claudication will have the same symptoms after five years with no progression. Critical limb ischemia, on the other hand, is associated with a high rate of limb loss (25%) and death (35%) one year after presentation
- Simultaneous venous and arterial systems evaluation are unusual but are occasionally needed
- Post angioplasty/reconstruction: follow-up imaging is principally guided by symptoms. See also:
 - ◆ **PVD-7.3: Post-Procedure Surveillance Studies**
 - ◆ **PVD-6.8: Post Aortic Intervention Surveillance Studies**

PVD-1.2: Procedure Coding

Non-Invasive Physiologic Studies of Extremity Arteries	CPT®
<ul style="list-style-type: none"> ➤ Limited bilateral noninvasive physiologic studies of upper or lower extremity arteries. ➤ Non-invasive physiologic studies of upper or lower extremity arteries, single level, bilateral (e.g., ankle/brachial indices, Doppler waveform analysis, volume plethysmography, transcutaneous oxygen tension measurement). 	93922
<ul style="list-style-type: none"> ➤ Complete bilateral noninvasive physiologic studies of upper or lower extremity arteries, 3 or more levels. ➤ Non-invasive physiologic studies of upper or lower extremity arteries, multiple levels or with provocative functional maneuvers, complete bilateral study (e.g., segmental blood pressure measurements, segmental Doppler waveform analysis, segmental volume plethysmography, segmental transcutaneous oxygen tension measurements, measurements with postural provocative tests, measurements with reactive hyperemia). 	93923

Peripheral Vascular Disease (PVD)

- CPT® 93922 and CPT® 93923 can be requested and reported only once for the upper extremities and once for the lower extremities.
- CPT® 93922 and CPT® 93923 should not be ordered on the same request nor billed together for the same date of service.
- CPT® 93924 and CPT® 93922 and/or CPT® 93923 should not be ordered on the same request and should not be billed together for the same date of service.
- ABI studies performed with handheld dopplers, where there is no hard copy output for evaluation of bidirectional blood flow, are not reportable by these codes.

Non-Invasive Physiologic Studies of Extremity Arteries	CPT®
Non-invasive physiologic studies of lower extremity arteries, at rest and following treadmill stress testing, complete bilateral study.	93924

Arterial Duplex – Upper and Lower Extremities	CPT®
Duplex scan of lower extremity arteries or arterial bypass grafts; complete bilateral.	93925
<ul style="list-style-type: none"> ➤ A complete duplex scan of the lower extremity arteries includes examination of the full length of the common femoral, superficial femoral and popliteal arteries. ➤ The iliac, deep femoral, and tibioperoneal arteries may also be examined. 	
Duplex scan of lower extremity arteries or arterial bypass grafts; unilateral or limited study.	93926
<ul style="list-style-type: none"> ➤ The limited study is reported when only one extremity is examined or when less than a full examination is performed (e.g. only one or two vessels or follow-up). 	
Duplex scan of upper extremity arteries or arterial bypass grafts; complete bilateral.	93930
<ul style="list-style-type: none"> ➤ A complete duplex of the upper extremity arteries includes examination of the subclavian, axillary, and brachial arteries. ➤ The radial and ulnar arteries may also be included. 	
Duplex scan of upper extremity arteries or arterial bypass grafts; unilateral or limited study.	93931
<ul style="list-style-type: none"> ➤ The limited study is reported when only one extremity is examined or when less than a full examination is performed (e.g. only one or two vessels or follow-up). 	

Cerebrovascular Artery Studies	CPT®
Duplex scan of extracranial arteries; complete bilateral study.	93880
Duplex scan of extracranial arteries; unilateral or limited study.	93882
<ul style="list-style-type: none"> ➤ This study is often referred to as a “carotid ultrasound” or “carotid duplex”. ➤ Typically, it includes evaluation of the common, internal, and external carotid arteries. 	

Transcranial Doppler Studies	CPT®
Transcranial Doppler study of the intracranial arteries; complete study	93886
Transcranial Doppler study of the intracranial arteries; limited study	93888
Transcranial Doppler vasoreactivity study	93890
Transcranial Doppler study of the intracranial arteries; emboli detection without intravenous microbubble injection	93892
Transcranial Doppler study of the intracranial arteries; emboli detection with intravenous microbubble injection	93893

Venous Studies - Extremities	CPT®
Non-invasive physiologic studies of extremity veins, complete bilateral study (e.g. Doppler waveform analysis with responses to compression and other maneuvers, phleboreography, impedance plethysmography). This study is rarely performed.	93965
Duplex scan of extremity veins, including responses to compression and other maneuvers; complete bilateral study.	93970
Duplex scan of extremity veins, including responses to compression and other maneuvers; unilateral or limited study.	93971
<ul style="list-style-type: none"> ➤ These codes are used to report studies of lower <i>or</i> upper extremity veins. ➤ A complete bilateral study of the lower extremity veins includes examination of the common femoral, proximal deep femoral, great saphenous and popliteal veins. Calf veins may also be included. ➤ A complete bilateral study of upper extremity veins includes examination of the subclavian, jugular, axillary, brachial, basilica, and cephalic veins. Forearm veins may also be included. 	

Visceral Vascular Studies	CPT®
Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; complete study.	93975
Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; limited study	93976
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; complete study	93978
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; unilateral or limited study	93979

Duplex for Hemodialysis Access	CPT®
Duplex scan of hemodialysis access (including arterial inflow, body of access and venous outflow).	93990
Duplex scan of arterial inflow and venous outflow for preoperative vessel assessment prior to creation of hemodialysis access; complete bilateral study	93985
Duplex scan of arterial inflow and venous outflow for preoperative vessel assessment prior to creation of hemodialysis access; complete unilateral study	93986

PVD-1.3: General Guidelines – Imaging

- Imaging Studies:
 - ◆ Carotid studies (MRA Neck or CTA Neck) 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 (CPT® 74175/ CPT® 74185) images from the diaphragm to the umbilicus or iliac crest
 - ◆ CTA or MRA Chest (CPT® 71275/ CPT® 71555) images from the base of the neck to the dome of the liver
 - ◆ Runoff studies (CPT® 75635 for CTA or CPT® 74185, CPT® 73725, and CPT® 73725 for MRA) image from the umbilicus to the feet
 - CTA Abdomen and lower extremities should be reported as CPT® 75635, rather than using the individual CPT® codes for the abdomen, pelvis, and legs

- MRA Abdomen, MRA Pelvis and MRA Lower extremities should be reported as CPT® 74185, CPT® 73725, and CPT® 73725. The CPT® code for MRA Pelvis (CPT® 72198) should not be included in this circumstance

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PVD-2: Screening for Suspected Peripheral Artery Disease/Aneurysmal Disease

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PVD-2.1: Asymptomatic Screening

- Routine screening of asymptomatic patients for PAD is not advised. Those with CVD risk factors should be placed on best medical management and should be questioned on symptoms of PAD at annual physicals
- Resting ABI's may be appropriate in patients with abnormal pulse exams
- Currently, there is no evidence to demonstrate that screening all patients with PAD for asymptomatic atherosclerosis in other arterial beds improves clinical outcome

PVD-2.2: Screening for Vascular related genetic connective tissue Disorders (Familial Aneurysm Syndromes/ Fibromuscular Dysplasia/Spontaneous Coronary Artery Dissection (SCAD)/Ehlers-Danlos/Marfan/Loeys-Dietz)

- Screening for Familial Syndromes in patients with a positive family history (1st degree relative with dissection/TAA) but no known genetic syndrome/mutation, otherwise known as **Suspected Familial Aneurysm syndrome**.
 - ◆ ECHO (CPT® 93306, CPT® 93307, or CPT® 93308) and chest x-ray for all First-degree relatives (parents, siblings, children) of patients with TAA and/or dissection.
 - ◆ Any imaging listed can be performed if these studies identify a TAA or are equivocal or do not visualize the ascending aorta adequately.
 - ◆ Studies can be repeated at 2 year intervals if negative
- Initial imaging for patients with documented SCAD/fibromuscular dysplasia/Marfan/Loeys-Dietz/Ehlers-Danlos type IV:
 - ◆ On initial diagnosis full vascular imaging should be performed from head to pelvis with:
 - CTA head
 - carotid duplex
 - CTA chest or CT chest with contrast
 - abdominal duplex
 - ◆ If there are no identified aneurysms or dissections, repeat imaging can be obtained at 2 year intervals
- Surveillance imaging
 - ◆ If an aneurysm is identified in patients with fibromuscular dysplasia, then the aneurysm can be surveilled per the typical timeframe as described in **PVD-6.2: Thoracic Aortic Aneurysm**, **PVD-6.3: Abdominal Aortic Aneurysm** and **PVD-6.4: Iliac Artery Aneurysm** and **PVD-6.5: Visceral Artery Aneurysm**.
 - ◆ Follow-Up of aneurysms in patients with documented SCAD/Marfan's/Loeys-Dietz/Ehlers-Danlos type IV.
 - Imaging can be performed every 6 months once an aneurysm has been identified until a decision has been made to repair.
 - Intracranial aneurysm – CTA or MRA head (CPT® 70496 or 70544)
 - Aneurysm of a cervical artery – Carotid duplex or CTA neck if unable to fully visualize with carotid duplex

- Thoracic aorta – CTA chest (CPT® 71275) or CT chest with (CPT® 71260) or without (CPT® 71250)
- Abdominal aneurysm – Abdominal duplex (CPT® 93975/93976/76770/76775)
- Visceral aneurysm – These can be difficult to visualize on duplex. If not visible on duplex, can obtain a CTA Abdomen (CPT® 74175).

PVD-2.3: Screening for TAA in patients with bicuspid aortic valves

- Screening in patients with bicuspid aortic valve:
 - ◆ Screening, any requested imaging from the “[Table of Thoracic Aorta Imaging Options](#)” in **PVD-6.2: Thoracic Aortic Aneurysm and/or ECHO (CPT® 93306, CPT® 93307, or CPT® 93308)**.
 - Additional imaging such as MRI Cardiac, CT Cardiac, or CCTA is NOT generally indicated.
 - There is no evidence-based data to support screening relatives of patients with bicuspid aortic valve for TAA except with echocardiogram.
 - ◆ Follow-up per TAA Follow-Up guidelines in **PVD-6.2: Thoracic Aortic Aneurysm (TAA)**
- If no dilatation of the aortic root or ascending thoracic aorta is found, there is no evidence-based data to support continued surveillance imaging.

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PVD-3: Cerebrovascular and Carotid Disease

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PVD-3.1: Initial Imaging

- Prior to considering advanced imaging, duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) should generally be used to evaluate possible carotid artery disease when any of the following apply:
 - ◆ Hemispheric neurologic symptoms including stroke, TIA, or amaurosis fugax.
 - ◆ Known or suspected retinal arterial emboli or Hollenhorst plaque
 - ◆ Suspected carotid dissection
 - ◆ Pulsatile neck masses
 - ◆ Carotid or cervical bruit
 - ◆ Abnormal findings on physical exam of the carotid arteries (e.g. aneurysm or absent carotid pulses)
 - ◆ Preoperative evaluation of patients with evidence of severe diffuse atherosclerosis, scheduled for major cardiovascular surgical procedures
 - ◆ Preoperative evaluation of patients prior to elective coronary artery bypass graft (CABG) surgery in patients older than 65 years of age and in those with peripheral artery disease, history of cigarette smoking, history of stroke or TIA, or carotid bruit
 - ◆ Suspected Subclavian Steal Syndrome
 - See also: **CH-27: Subclavian Steal Syndrome** in the **Chest Imaging Guidelines**
 - ◆ Blunt neck trauma
 - ◆ Neurologic complaints after chiropractic neck manipulation
 - ◆ Vasculitis potentially involving carotid arteries, i.e., Takayasu's arteritis and fibromuscular dysplasia (FMD)
- Carotid ultrasound screening in asymptomatic individuals due only to risk factors is not indicated
- New signs and symptoms consistent with carotid artery disease (e.g. TIA, amaurosis fugax, change in nature of a carotid bruit) are an indication to re-image the cervical vessels (regardless of when the previous carotid imaging was performed) using any of the following:
 - ◆ Duplex ultrasound (CPT® 93880 bilateral study or CPT® 93882 unilateral study),
 - ◆ MRA Neck with or without and with contrast (CPT® 70548 or 70549)
 - ◆ CTA Neck (CPT® 70498)
- For Typical Symptoms of TIA/Stroke or Carotid Dissection:
 - ◆ See also: HD-21: Stroke/TIA
- For Suspected Vertebrobasilar Pathology:
 - ◆ Symptoms include:
 - Vertigo associated with nausea and vomiting
 - Diplopia
 - Loss of vision in one or both eyes
 - Dysarthria
 - Bifacial numbness
 - Bilateral extremity weakness and/or numbness
 - Acute changes in mental status

- Loss of consciousness
 - Ataxia
- ◆ Mechanisms of injury for concern of arterial dissection including, but not exclusive to:
 - Chiropractic manipulation of neck
 - Whiplash injury
 - Fibromuscular dysplasia
 - Stroke in the young (age ≤ 50)
- ◆ Initial Imaging
 - Carotid duplex-Note: carotid duplex provides limited information on vertebral disease
 - If clinical suspicion is high
 - CTA neck/MRA neck can be considered medically necessary.
 - Evaluation of posterior circulation disease requires **both** neck and head MRA/CTA to visualize the entire vertebral-basilar system. See **HD-1.5: General Guidelines – CT and MR Angiography**
 - See also: **HD-21: Stroke/TIA**
- ◆ Surveillance imaging post-stenting or known vertebrobasilar disease interval determined by Vascular Specialist, Neurologist, or Neurosurgeon or any provider in consultation with a vascular specialist, neurologist, or neurosurgeon for ANY of the following:
 - Asymptomatic
 - Unchanged symptoms
 - New or worsening symptoms
- **After Intracranial Hemorrhage:**
 - ◆ Initial Imaging see also: **HD-13.1: Head Trauma**
 - ◆ Surveillance Imaging
 - Interval determined by neurosurgeon or neurologist or any provider in consultation with a neurologist or neurosurgeon.
- For Suspected Subclavian Steal Syndrome:
 - ◆ Initial imaging should be a carotid duplex
 - If initial duplex demonstrates high grade stenosis or occlusion of the subclavian artery, advanced imaging is NOT indicated unless the patient is symptomatic with arm claudication or signs of hypo-perfusion of the vertebral artery with recurrent dizziness
 - ◆ Surveillance of subclavian arterial disease is NOT indicated if there has not been any intervention such as a carotid-subclavian bypass or subclavian stent
Advanced imaging, see also: CH-27: Subclavian Steal Syndrome – General

PVD-3.2: Surveillance Imaging with NO History of Carotid Surgery or Intervention

- Surveillance imaging is appropriate once a year for patients with fibromuscular dysplasia of the extracranial carotid arteries.
- Reporting standards for carotid stenosis varies widely. The most commonly used criteria, however, is noted in the chart below published by the Society of Radiology in 2003

Degree of Stenosis (%)	Primary Parameters		Additional Parameters	
	ICA PSV (cm/sec)	Plaque Estimate (%)*	ICA/CCA PSV Ratio	ICA EDV (cm/sec)
Normal	<125	None	<2.0	<40
<50	<125	<50	<2.0	<40
50–69	125–230	≥50	2.0–4.0	40–100
≥70 but less than near occlusion	>230	≥50	>4.0	>100
Near occlusion	High, low, or undetectable	Visible	Variable	Variable
Total occlusion	Undetectable	Visible, no detectable lumen	Not applicable	Not applicable

- If normal study, no routine follow-up imaging is indicated
- If <50% carotid stenosis
 - ◆ Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) can be performed every **two** years
- Between 50% and 70% carotid stenosis
 - ◆ Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) can be performed annually.
 - ◆ A repeat duplex (CPT® 93880 bilateral or CPT® 93882 unilateral) may be performed in three to six months until stability is reached when one of the following occurs:
 - A change in the character of the bruit
 - Duplex demonstrates rapid progression, including:
 - doubling of peak systolic velocities
 - increase of the ICA/CCA ratio
 - heavy calcification
 - thrombus
 - ulcerated plaque
 - echolucent plaque
- Carotid stenosis ≥70% or ICA/CCA ratio >4
 - ◆ Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) or MRA Neck with contrast (CPT® 70548) or CTA Neck (CPT® 70498) can be performed at the following intervals:

- Every 6 months until one of the following occurs:
 - Intervention is performed
 - Decision is made to not intervene
- If duplex Ultrasound shows $\geq 70\%$ occlusion/stenosis of the internal carotid artery or the ICA/CCA ratio is >4.0 even with a lower percentage of stenosis, then MRA Neck with contrast (CPT® 70548) or CTA Neck (CPT® 70498) can be performed
 - ◆ If carotid stent is planned
 - MRA Head (CPT® 70544, or CPT® 70545, or CPT® 70546) or CTA Head (CPT® 70496) can be added

PVD-3.3: Surveillance Imaging WITH History of Carotid Surgery or Intervention

- Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) can be performed post carotid surgery or intervention at the following intervals:
 - 1 month after procedure
 - Every 6 months for 2 years after procedure
 - Then annually
- If $\geq 70\%$ residual carotid stenosis is seen on duplex at 1 month after procedure
 - ◆ Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) or CTA Neck (CPT® 70498) can be performed at the following intervals:
 - Every 3-6 months for one year
 - Then annually or until decision is made to re-intervene.
- If $\geq 70\%$ residual carotid stenosis is seen on duplex at any time post procedure, then
 - ◆ CTA Neck (CPT® 70498) can be performed for further evaluation and at six month intervals until decision is made to re-intervene.

Practice Notes

- Carotid intima-media thickness using duplex ultrasound imaging (Category III code 0126T) is not recommended in clinical practice for risk assessment for a first ASCVD event. Although outcomes data are lacking, Texas has adopted this method in Texas Heart Attack Preventive Screening Bill (HR 1290)
- Texas Heart Attack Preventive Screening Law (HR 1290) mandates that insurers in Texas cover either a calcium scoring study (CPT® 75571 or HCPCS S8092) or a carotid intima-media thickness study (ultrasound—Category III code 0126T) every five years for certain populations. To qualify, the following must apply:
 - ◆ Must be a member of a fully-insured Texas health plan.
 - ◆ Must be male sex assigned at birth age 45 to 75 or female sex assigned at birth age 55 to 75.
 - ◆ Must have either diabetes or a Framingham cardiac risk score of intermediate or higher.
 - ◆ Must not have had a calcium scoring study or a carotid intima-media thickness study within the past 5 years

- If ultrasound is technically difficult or confirmation of the degree of stenosis on ultrasound is needed because an interventional procedure is being considered, then MRA Neck (CPT® 70548) or CTA Neck (CPT® 70498) may be performed.

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PVD-4: Upper Extremity Peripheral Vascular Disease
PVD-4.1: Upper Extremity PVD – Imaging

PVD-4.1: Upper Extremity PVD – Imaging

- Signs and symptoms of arterial insufficiency include but are not limited to:
 - ◆ Arm or hand claudication, cramping or fatigue of the unilateral extremity with use or with raising limb overhead that is relieved with rest and is reproducible. See **CH-27: Subclavian Steal Syndrome**
 - ◆ Systolic blood pressure differential between arms of <15mmHg. See **CH-27: Subclavian Steal Syndrome**
 - ◆ Bluish discoloration of the hand or fingers
 - ◆ Unilateral cold painful pulseless hand
 - ◆ Non healing wound (>2 weeks with no healing or evidence of healing) or frank gangrene
- For signs and symptoms of arterial insufficiency, appropriate studies include:
 - ◆ Arterial ultrasound of the upper extremities (CPT® 93930 or CPT® 93931) or
 - ◆ CTA of Upper extremity (CPT® 73206) or MRA of Upper extremity (CPT® 73225) and/or
 - ◆ CTA Chest (CPT® 71275) or MRA Chest (CPT® 71555)
- For suspected Fibromuscular Dysplasia of the brachial artery, appropriate studies include:
 - ◆ MRA of Upper extremity (CPT® 73225)
 - ◆ CTA of Upper extremity (CPT® 73206)
 - ◆ Arterial Ultrasound (CPT® 93930 bilateral study or CPT® 93931 unilateral study)
- Arterial Duplex (CPT® 93931) can be obtained following upper extremity arterial revascularization at:
 - ◆ Baseline (within one month)
 - ◆ 6 months
 - ◆ Then annually if stable
 - ◆ Anytime for new or worsening symptoms
- For symptoms of venous insufficiency including but not limited to unilateral pain and swelling of the upper extremity
 - ◆ Venous duplex of the upper extremities (CPT® 93970 or CPT® 93971) should be performed initially
 - ◆ If duplex ultrasound is non-diagnostic:
 - MRV Upper extremity (CPT® 73225) and/or MRV Chest (CPT® 71555), or
 - CTV Upper extremity (CPT® 73206) and/or CTV Chest (CPT® 71275)
 - If there is a history of exertion with the limb such as with weight lifting or in the presence of central venous access (port, PICC line, to name a few) with a negative venous duplex, a CTV of Upper extremity (CPT® 73206) or MRV of Upper extremity (CPT® 73225), and/or CTV Chest (CPT® 71275) or MRV Chest (CPT® 71555) can be performed. See **CH-31.1: Thoracic Outlet Syndrome**
- For Superior Vena Cava Syndrome (upper extremity and facial symptoms):
 - ◆ CT Chest with contrast (CPT® 71260)
 - ◆ MRV (CPT® 71555) or CTV (CPT® 71275) Chest may be considered when stenting of the SVC is being considered

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PVD-5: Pulmonary Artery Hypertension

PVD-5.1: Pulmonary Artery Hypertension – Imaging

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PVD-5.1: Pulmonary Artery Hypertension – Imaging

- Pulmonary artery hypertension (PAH) comprises a spectrum of diseases which will need direct evaluation, including ECG (right ventricular hypertrophy with/without strain, right atrial dilatation); chest x-ray; arterial blood gas, PFT's or V/Q scan. Imaging is based on suspected etiology.
- Transthoracic echocardiogram (TTE) (CPT® 93306) should be performed initially and may be accompanied by:
 - ◆ Pulmonary venous hypertension - Stress echocardiogram (CPT® 93350 or CPT® 93351) or left and/or right heart catheterization
 - ◆ Pulmonary hypertension associated with hypoxemia - High-resolution CT Chest (CPT® 71250) to rule out restrictive lung disorders such as idiopathic pulmonary fibrosis
- Acute or chronic pulmonary embolism – CTA Chest (CPT® 71275);
- See also in specific subsections:
 - ◆ CD-2.2: Transthoracic Echocardiogram (TTE)-Indications, CD-7.4: Right Heart Catheterization (RHC), CD-11.3.12: Severe Pulmonary artery hypertension (PHT) and Eisenmenger syndrome in the cardiac imaging guidelines
 - ◆ PEDCD-2.3: Congenital Heart Disease Modality Considerations, PEDCD-7: Pediatric Pulmonary Hypertension - General in the pediatric cardiac imaging guidelines
 - ◆ CH-25: Pulmonary Embolism (PE) in the Chest Imaging Guidelines.

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PVD-6: Aortic Disorders, Renal Vascular Disorders and Visceral Artery Aneurysms

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PVD-6.1: Aortic Disorders General Information

Duplex ultrasound for visceral vascular studies	CPT®
Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; complete study.	93975
Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; limited study.	93976
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; complete study.	93978
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; unilateral or limited study.	93979
Ultrasound, abdominal aorta, real time, with image documentation, screening study for abdominal aortic aneurysm (AAA) for AAA screening	76706

- In clinical practice, CT, CTA, MRA are usually preferred to evaluate for stenosis of these vessels rather than ultrasound which can be difficult to perform (Exception: Duplex ultrasound is appropriate to rule out testicular or ovarian torsion or to evaluate an abdominal bruit or a pulsatile abdominal mass).
- Mesenteric Ischemia
 - ◆ See also: AB-6: Mesenteric/Colonic Ischemia in the Abdomen Imaging Guidelines.

PVD-6.2: Thoracic Aortic Aneurysm (TAA)

- The thoracic aorta is generally divided into two segments: the ascending aorta which includes the aortic root, aortic arch and ends just distal to the left subclavian artery and the descending aorta which starts just distal to the left subclavian artery to the level of the diaphragm.
- Advanced imaging with a CT or MR is preferred imaging for this diagnosis. Given the diversity of studies, pathology and provider preference, approved thoracic imaging for this indication can be ONE of the following studies listed in the table below:

Table of Thoracic Aorta Imaging Options	CPT®
CT Chest, and/or Abdomen, and/or Pelvis	71260 74177 74160 72193
CTA Chest, and/or Abdomen, and/or Pelvis	71275 74175 72191 74174
MRA Chest, and/or Abdomen, and/or Pelvis	71555 74185 72198

- For suspected TAA, any requested imaging from the “Table of Thoracic Aorta Imaging Options” above:
 - ◆ Abnormalities identified on chest x-ray (abnormality including widened mediastinum, suspicious calcifications) or other imaging studies (fluoroscopy, MRI Spine, etc.) abnormality.
- For known TAA accompanied with chest pain or back pain and suspicion of rupture, any requested imaging from the “Table of Thoracic Aorta Imaging Options” above.
- For planning for pre–thoracic endovascular repair (TEVAR) of thoracic aorta disease.
 - ◆ CTA Chest, and/or Abdomen, and/or Pelvis (CPT® 71275, CPT® 74175, CPT® 72191, CPT® 74174); or
 - ◆ MRA Chest, and/or Abdomen, and/or Pelvis (CPT® 71555, CPT® 74185, CPT® 72198).
- For follow-up of ascending aortic aneurysms CTA Chest (CPT® 71275) or CT Chest (CPT® 71250 or 71260)
 - ◆ Operative treatment is reasonable for asymptomatic patients when the diameter of the arch exceeds 5.5 cm.
 - ◆ For patients with ascending aortic aneurysms < 4.0 cm in diameter
 - Repeat imaging annually
 - ◆ For patients with ascending aortic aneurysms ≥ 4.0 cm
 - Repeat imaging 6 months.
- For follow-up of descending aortic aneurysms, any requested imaging from the “Table of Thoracic Aorta Imaging Options” above for the following:

- ◆ “Medically” treated/observation.
 - 3.5 to 4.4 cm TAA can be followed annually.
 - ≥4.5 cm TAA can be followed every 6 months.
 - ≥3.0 cm TAA when there is concern for growth can have a one-time 3-month interval advanced imaging.
- Screening in the presence of other aortic aneurysms.
 - ◆ In a patient with a known TAA, screening for AAA is appropriate with an abdominal duplex. See **PVD-6.3: Abdominal Aortic Aneurysm (AAA)**.
 - ◆ In a patient with a known AAA, screening for TAA is not supported by sufficient evidence.
- Screening in patients with bicuspid aortic valve or familial TAA syndromes. See **PVD-2.3: Screening for TAA in patients with bicuspid aortic valve**. See **PVD-2.2: Screening for Vascular related genetic connective tissue Disorders (Familial Aneurysm Syndromes/Spontaneous Coronary Artery Dissection (SCAD)/Fibromuscular Dysplasia/Ehlers-Danlos/Marfan/Loeys-Dietz)**

PVD-6.3: Abdominal Aortic Aneurysm (AAA)

- Ultrasound abdominal aorta with any of the studies from the table of **Duplex ultrasound for visceral vascular studies** in **PVD-6.1: Aortic Disorders General Information** is the preferred imaging study to:
 - ◆ Screen for AAA and
 - ◆ Survey known AAA or
 - ◆ To evaluate a pulsatile abdominal mass
- **Obese Individual (BMI ≥ 35)**: CT Abdomen and Pelvis with contrast (CPT® 74177) or without contrast (CPT® 74176) can be substituted for US using the same timeline as a non-obese individual. Ultrasound of the abdominal aorta should ideally first be attempted to see if the image quality is adequate
- Screening
 - ◆ One-time screening recommendations for AAA (Ultrasound CPT® 76706)
 - Individuals 65 to 75 years of age with a history of tobacco use
 - Individuals older than 75 years with a history of tobacco use and in otherwise good health who have not previously received a screening ultrasound examination
 - All first-degree relatives of individuals who present with an AAA and are between 65 and 75, or in those older than 75 in good health
 - ◆ Medicare covers a one-time AAA screening ultrasound (CPT® 76706) if there are at least **one** of the following risk factors
 - Family history of AAA
 - An individual with **all** of the following:
 - Male sex assigned at birth
 - Age is 65 to 75
 - Lifetime smoking history of at least 100 cigarettes
 - ◆ If there is a documented thoracic aortic aneurysm, AAA screening is reasonable with ultrasound (CPT® 76706 or 93978); however, there is insufficient evidence

to support the use of advanced imaging to screen for a thoracic aortic aneurysm in individuals with known abdominal aortic aneurysm.

- Surveillance recommendations for AAA (CPT® 76706 or 93978)
 - ◆ > 2.5 cm but < 3.0 cm: 10 years
 - ◆ 3.0 cm to 3.9 cm: 3 year intervals
 - ◆ 4.0 cm to 4.9 cm: every 12 months
 - ◆ 5.0 cm to 5.4 cm: every 6 months
 - ◆ > 5.4 cm or aortic diameter has increased in size by 0.7 cm in six months, or at least 1 cm in a year may undergo more frequent monitoring and should be evaluated by a Vascular Specialist
- Additional Imaging
 - ◆ CT of the Abdomen and Pelvis with contrast (CPT® 74177), CT of the Abdomen and Pelvis without and with contrast (CPT® 74178), or CTA Abdomen and Pelvis (CPT® 74174), or CTA Abdomen (CPT® 74175), or CTA Pelvis (CPT® 72191).
 - Individuals suspected to have AAA presenting with recent-onset abdominal or back pain, particularly in the presence of a pulsatile epigastric mass or significant risk factors for AAA
 - Pre-operative imaging for AAA repair

PVD-6.4: Iliac Artery Aneurysm (IAA)

- Evaluation of a suspected IAA should begin with ultrasound (CPT® 76882 or CPT® 93925)
 - ◆ If ultrasound is equivocal, CT Pelvis with contrast (CPT® 72193) may be performed.
 - ◆ Follow-up imaging studies can be performed annually with an ultrasound if an aneurysm is > 2cm
- Additional Imaging
 - ◆ CT of the Abdomen and Pelvis with contrast (CPT® 74177), CT of the Abdomen and Pelvis without and with contrast (CPT® 74178), or CTA Abdomen and Pelvis (CPT® 74174) for preoperative imaging if endovascular or open repair is being considered

Practice Notes

- Isolated IAA's are rare and are typically associated with AAA
- Approximately one third to one half of isolated IAA's are bilateral at time of presentation
- Abdominal Aortic aneurysm rupture usually occurs at a diameter of 5 cm or larger, whereas common iliac aneurysms that are less than 3 cm in diameter almost never rupture.

PVD-6.5: Visceral Artery Aneurysm

- Splenic artery aneurysms, the most common (60%), tend to exhibit very slow rates of growth, while the other visceral artery aneurysms are more unpredictable in their rate of growth with a greater tendency to rupture
- Treatment is generally indicated for aneurysm >2cm
- Workup for suspected visceral artery aneurysm (spleen, kidney, liver or intestines) if calcifications seen on plain film imaging can include:
 - ◆ Ultrasound (CPT® 76700, CPT® 76705, CPT® 93978, or CPT® 93976), or
 - ◆ CTA Abdomen (CPT® 74175), or
 - ◆ CT Abdomen with contrast (CPT® 74160).
- Further monitoring can be with Ultrasound (CPT® 76700, CPT® 76705, CPT® 93978, or CPT® 93976) **or** CTA Abdomen (CPT® 74175) **or** CT Abdomen with contrast (CPT® 74160) based on the intervals below or as determined by a vascular specialist or any provider in consultation with a vascular specialist:
 - ◆ Splenic artery aneurysms:
 - <20mm can be imaged every three years
 - If >25mm, they should be referred for treatment, either stent, excision or splenectomy
 - ◆ For all other visceral artery aneurysms:
 - Initial evaluation with six-month follow-up for one year
 - Further follow-up annually if no significant enlargement is seen
- CTA Abdomen (CPT® 74175), MRA Abdomen (CPT® 74185), or CT Abdomen with contrast (CPT® 74160) are indicated following stent placement at:
 - ◆ 1 month
 - ◆ 6 months
 - ◆ 12 months
 - ◆ Then every year

Practice Notes

- Visceral Artery Aneurysms are defined by an increase of more than 50% of the original arterial diameter
- Vascular specialty consultation is beneficial in order to determine the time frame to intervention

PVD-6.6: Renovascular Hypertension/Renal Artery Stenosis

- Renal artery revascularization has NOT been shown to be more effective than medical therapy in most situations and should not be pursued except in extreme cases, or if there is concern for Takayasu arteritis or fibromuscular dysplasia
- MRA without or with contrast (CPT® 74185) or CTA with contrast (CPT® 74175) of the Abdomen if:
 - ◆ The individual is adherent to full doses of three blood pressure medications (including a diuretic) yet has still not achieved goal

- ◆ Sudden and persistent worsening of previously controlled hypertension
 - ◆ Onset of hypertension younger than 30 years of age
 - ◆ Malignant hypertension with coexistent evidence of acute end-organ damage (acute renal failure, new visual or neurological disturbance and/or advanced retinopathy) or flash pulmonary edema
 - ◆ Individuals who develop hypertension ($\geq 140/90$) within the first 20 weeks of pregnancy when hypertension persists >12 weeks post-partum
 - ◆ New or worsening renal function/increasing creatinine (especially after the administration of an ACE inhibitor or with angiotensin receptor blocking agent)
 - ◆ Unexplained atrophic kidney or discrepancy in size between kidneys of greater than 1.5 cm
- Gadolinium agents may be contraindicated in patients with severe renal disease or on dialysis due to the risk of developing nephrogenic systemic sclerosis
 - US kidney retroperitoneal (CPT® 76775) and/or Doppler (CPT® 93975 or CPT® 93976) if expertise is available
 - In individuals with documented or highly suspicious renal artery stenosis due to fibromuscular dysplasia (mostly women between 15 and 50 years of age), a screening carotid duplex (CPT® 93880) is reasonable to assess for carotid involvement. Hypertensive patient with documented cervicocephalic fibromuscular dysplasia should be screened for renovascular fibromuscular dysplasia with CTA Abdomen (CPT® 74175) or MRA Abdomen (CPT® 74185). The assessment of other vascular beds should be considered if supported by suggestive symptoms or medical history.

PVD-6.7: Aortic Dissection and Other Aortic Conditions

Imaging for Aortic conditions	CPT®
CT Chest, and/or Abdomen, and/or Pelvis	71260 74177 74160 72193
CTA Chest, and/or Abdomen, and/or Pelvis	71275 74175 72191 74174
MRA Chest, and/or Abdomen, and/or Pelvis	71555 74185 72198

- Classic symptoms of sharp, severe acute onset of retrosternal or interscapular chest pain is seen in 96% and is best adapted to the emergent setting. Chest x-ray is imprecise; any suspicion should be considered since up to 10% of patients with aortic dissection present without classic symptoms.

- CTA or MRA of the entire aorta (including arch branches) and extending through the femoral arteries for suspected aortic dissection. **Any** of the following studies can be used if acute dissection is suspected:
 - ◆ CT Chest (CPT® 71260 or CPT® 71270) and/or one of the following:
 - CT Abdomen (CPT® 74160 or CPT® 74170) with or without and with contrast
 - CT Pelvis (CPT® 72193 or CPT® 72194) with or without and with contrast
 - CT Abdomen and Pelvis (CPT® 74177 or CPT® 74178) with or without and with contrast
 - ◆ CTA Chest (CPT® 71275) and/or **one** of the following:
 - CTA Abdomen (CPT® 74175)
 - CTA Pelvis (CPT® 72191)
 - CTA Abdomen and Pelvis (CPT® 74174)
 - ◆ MRA Chest and/or Abdomen and/or Pelvis (CPT® 71555 and/or CPT® 74185 and/or CPT® 72198)
- Chronic Aortic Dissections- 1/3 of patients with chronic type B dissections that were not treated via open or endovascular repair will go on to develop aneurysmal disease requiring subsequent intervention.
 - ◆ Advanced imaging of the affected segment of the aorta with any of the studies in above table **Imaging for Aortic conditions** can be performed as follows:
 - In patients with a persistent false lumen or initial aortic diameter of >4cm:
 - Every 6 months for two years until stability has been reached
 - Then annually
 - In patients with initial aortic diameter of <4cm and/or a thrombosed false lumen:
 - Annually
 - Any time if the individual is symptomatic with chest pain, back pain or has any evidence of end organ ischemia: renal dysfunction, mesenteric ischemia or acute limb ischemia
- In patients with Marfan syndrome/Loeys-Dietz/Ehlers-Danlos
 - ◆ As aneurysmal expansion within a dissection can occur rapidly, post-dissection imaging in these individuals is indicated as follows:
 - 1 month
 - 3 months
 - 6 months
 - 12 months
 - yearly thereafter
 - ◆ Depending on the location of the dissection the following may be approved:
 - CTA or MRA head (CPT® 70496 or 70544)
 - Carotid duplex or CTA or MRA neck (CPT® 93980, 70498, or 70547)
 - CTA or MRA chest– CTA chest (CPT® 71275 or 71555)
 - CTA abdomen/pelvis (CPT® 74174); or CTA or MRA abdomen (CPT® 74175 or 74185); or CTA or MRA pelvis (CPT® 72191 or 72198)

PVD-6.8: Post Aortic Endovascular/Open Surgery Surveillance Studies

- Aortic root/ascending aortic aneurysm repair post-operative echocardiography (TEE/TTE) can be obtained
 - ◆ Every three months for the first year
 - ◆ Every six months during the second year
 - ◆ Annually thereafter
- For patients who have had open descending thoracic aortic aneurysm repair, one of the following, CT chest w contrast (CPT® 71260), CT chest without contrast (CPT® 71250) or CTA chest (CPT® 71275), can be obtained
 - ◆ 3-6 months postoperatively
 - ◆ 12 months postoperatively
 - ◆ And then every two years thereafter
- Open Aortic Abdominal Aneurysm Repair
 - ◆ Non-contrast enhanced CT of the entire aorta at 5-year intervals (CPT®74176).
 - ◆ Imaging as requested to assess for suspected infection of the graft

PVD-6.8.1: Post-operative surveillance after TEVAR for any indication

Imaging for post-operative abdominal EVAR	CPT®
CT Chest, and/or Abdomen, and/or Pelvis	71260 74177 74160 72193
CTA Chest, and/or Abdomen, and/or Pelvis	71275 74175 72191 74174
MRA Chest, and/or Abdomen, and/or Pelvis	71555 74185 72198

- Any of the above studies listed in the table can be performed at one month, six months, twelve months and then annually
- Abdomen/pelvis imaging is indicated if TEVAR performed for a dissection that extends into the abdomen or pelvis

PVD-6.8.2: Post-operative surveillance after abdominal EVAR (endovascular aneurysm repair)

Imaging for post-operative abdominal EVAR	CPT®
CT of the Abdomen and/or Pelvis with contrast	74160 72193 74177
CT of the Abdomen and/or Pelvis without and with contrast	74170 72194 74178
CTA of the Abdomen and/or Pelvis	74175 72191 74174
MRA of the Abdomen and/or Pelvis	74185 72198

- CT as per above coding as requested and color duplex ultrasound (CPT® 93975 or CPT® 93976) one month after EVAR
- If no endoleak, or sac enlargement, repeat **either** preferred CT or duplex ultrasound (**but not both**) at 12 months
- If a type II endoleak is observed 1 month after EVAR, may approve **BOTH at 6 months**:
 - ◆ any of the above CT with contrast
 - ◆ color duplex US
- If no endoleak or AAA enlargement is detected at 1 year after EVAR annual surveillance with:
 - ◆ Color duplex US
 - ◆ If DGUS is not available, any of the above CT can be performed
- If a type II endoleak is associated with an aneurysm sac that is shrinking or stable in size:
 - ◆ Continue surveillance with color duplex US every 6 months for 2 years
 - ◆ Then annually thereafter.
- If US detects a new endoleak, graft migration, or aneurysm sac growth > 5mm:
 - ◆ Any of the above CT scan as requested.
 - ◆ Non-contrast CT of the entire aorta at 5-year intervals (CPT®74176)

PVD-6.8.3: Endovascular (Stent) Iliac Repair

Imaging for endovascular iliac repair (stent)	CPT®
CT Pelvis	72193 72194
CTA Pelvis	72191
MRA Pelvis	72198

- One of the above studies can be performed for endovascular iliac repair (stent):
- If performed in conjunction with EVAR, surveillance can follow the same schedule as EVAR.
- For isolated iliac artery aneurysm repair, surveillance can be performed with an arterial duplex (CPT® 93975 or 93976) or CT or MR as above if duplex unavailable:
 - ◆ Post-operatively within the first month
 - ◆ 6 months after endovascular treatment
 - ◆ Then annually

PVD-6.9: Large Vessel Vasculitis

- Large vessel vasculitis is generally sub-grouped into three areas
 - ◆ Aortitis (Inflammatory Aortitis)
 - ◆ Giant Cell Vasculitis
 - ◆ Takayasu Arteritis

PVD-6.9.1: Inflammatory Aortitis

Imaging for Inflammatory Aortitis	CPT®
CTA Chest	71275
MRA Chest	71555
CTA Pelvis	72191
MRA Pelvis	72198
CTA Abdomen and Pelvis	74174
CTA Abdomen	74175
MRA Abdomen	74185

- Initial imaging with CTA or MRA of the affected body region is considered medically necessary after the following workup:
 - ◆ Lab studies: CBC, CMP, elevated inflammatory markers such as ESR or CRP
 - ◆ Clinical history suggestive of disease listed below in practice notes
- Follow up imaging with CTA or MRA of the affected body region is considered medically necessary for:
 - ◆ Change in signs/symptoms
 - ◆ Known aneurysm monitoring
 - See also **HD-12: Aneurysm and AVM**
 - See also **PVD-6.2: Thoracic Aortic Aneurysms**
 - See also **PVD-6.3: Abdominal Aortic Aneurysms**

Practice Notes

Aortitis may be congenital (Marfan's, Hypermobility Syndromes, others) or acquired, including traumatic, atherosclerotic (dissecting aneurism, other), infectious (syphilis, tuberculosis, other), neoplastic or inflammatory (Ankylosing Spondylitis, Giant Cell Arteritis, Cogan's, Relapsing Polychondritis, Behcet's Syndrome, Polyarteritis Nodosa, Granulomatous Polyangiitis, Lupoid, idiopathic, other).

PVD-6.9.2: Giant Cell Arteritis

- Most commonly encountered vasculitis in adults. Although classically thought of as a disease of the temporal arteries, aortic arch involvement is now recognized as a frequent complication (up to 50% of patients) and responsible for many of the more serious morbidities encountered such as blindness.
- GCA may be subdivided into two basic types; Cranial and Extra-cranial
 - ◆ **Cranial GCA** is the more common type with temporal artery involvement. For predominantly Cranial GCA:
 - US (CPT® 93880 or 93882) of the temporal (and or axillary) arteries is the preferred modality. Ultrasound should be considered prior to advanced imaging.
 - MRA Head and/or MRA Neck (CPT® 70544, or 70545, or 70547, or 70548) may be considered when:
 - Vascular trained ultrasonography is not available
 - US is negative or equivocal with a clinical suspicion of GCA
 - For symptoms of stroke or TIA, see **HD-21: Stroke/TIA**
 - CT and PET are **not** currently recommended for the assessment of inflammation of cranial arteries.
 - ◆ **Extra-cranial GCA**: less commonly encountered. None of the “classic” clinical signs or symptoms of cranial GCA are present initially but may develop later.
 - Extra-cranial GCA is characterized by at least two or more of the following:
 - Jaw and/or upper extremity claudication
 - Fever/weight loss or “FUO” symptoms
 - New murmurs
 - Pulse asymmetry
 - Abdominal pain
 - Pulsatile mass
 - High inflammatory markers such as CRP or ESR > 50 mm/h
 - Imaging for aortic root, arch or abdomen involvement:
 - MRA Chest (CPT® 71555), Neck (CPT® 70547), Abdomen (CPT® 74185), CTA Chest (CPT® 71275), CTA Neck (CPT® 70498) or CTA Abdomen (CPT® 74175)
 - PET may be appropriate if MRA or CTA are non-diagnostic and there is still suspicion for aortic root, arch or abdomen involvement
- Follow up imaging is considered medically necessary for:
 - ◆ One-time documentation of remission or disease control
 - ◆ Change in signs/symptoms suggesting progression of disease

- ◆ Although patients with GCA can develop aortic aneurysms over time screening in the absence of signs or symptoms is not medically necessary
- ◆ In patients with known thoracic or abdominal aortic aneurysm:
 - See **PVD-6.2: Thoracic Aortic Aneurysm (TAA)** for thoracic aneurysm surveillance
 - See **PVD-6.3: Abdominal Aortic Aneurysm (AAA)** for abdominal aneurysm surveillance.
- Follow up imaging is not routinely recommended for patients in clinical and biochemical remission or without aneurysm/complication.

PVD-6.9.3: Takayasu Arteritis

Imaging for Takayasu Arteritis	CPT®
CTA Chest	71275
CTA Pelvis	72191
CTA Abdomen and Pelvis	74174
CTA Abdomen	74175
MRA Chest	71555
MRA Pelvis	72198
MRA Abdomen	74185

- Initial imaging is considered medically necessary for signs and symptoms suggestive of disease such as absent radial pulse, difficulty obtaining BP in one arm, or unexplained hypertension.
- Any of the following modalities may be indicated for evaluation of Takayasu arteritis:
 - ◆ MRA of the affected body area(s) (contrast as requested)
 - ◆ CTA of the affected body area(s) (contrast as requested)
 - ◆ Ultrasound with Doppler of the affected body area(s)
- For follow-up imaging, See **PEDPVD-3.2: Large Vessel Vasculitis** in the **pediatric peripheral vascular disease imaging guidelines**.

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PVD-7: Lower Extremity Peripheral Vascular Disease

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PVD-7.1: Claudication

- Initial evaluation for suspected PAD should be with a resting ABI. This can be accomplished at the bedside as part of the physical examination or requested as CPT® 93922 (limited Doppler ultrasound) or CPT® 93923 (multi-level complete Doppler ultrasound)
 - ◆ CPT® 93923 may be performed once
 - ◆ Follow-up studies may be performed with CPT® 93922
 - ◆ If the resting ABI is > 0.89 and PAD is still highly suspected clinically, then a post-exercise ABI (CPT® 93924) can be performed
- History and physical suggestive of PAD include:
 - ◆ History
 - Claudication- reproducible calf or thigh cramping with exertion that is relieved completely with rest
 - Critical limb ischemia
 - Rest pain suggestive of ischemia-pain in the ball of foot when the leg is in an elevated position particularly at night
 - Distal non-healing wound or punched out ulcer with sharply demarcated edges present for >2 weeks with no evidence of healing, i.e. presence of granulation tissue
 - ◆ Physical Examination
 - Abnormal lower extremity pulse examination
 - Vascular bruit
 - Non-healing lower extremity wound
 - Lower extremity gangrene
 - Other suggestive lower extremity physical findings (e.g., elevation pallor/dependent rubor)
 - Atrophic nails, hair loss, shiny skin
- If resting ABI (CPT® 93922) is normal (0.9 to 1.3) and disease is still suspected:
 - ◆ Differentiate from “pseudoclaudication”. See also: **SP-9: Lumbar Spinal Stenosis** in the **Spine Imaging Guidelines**
 - ◆ Re-measure ABI after exercise (CPT® 93924)
 - ◆ A toe-brachial index may be used as further screening in patients with ABI’s greater than 1.3
 - ◆ Advanced imaging is necessary only if there is consideration for invasive therapy not to confirm diagnosis
- Duplex ultrasound (CPT® 93925 bilateral study or CPT® 93926 unilateral study) and Doppler studies are adjuncts to abnormal ABI that may be used to identify location and extent of disease once there has been a decision for revascularization:
- MRA Aorta and Pelvic vessels, and Lower extremities (CPT® 74185, CPT® 73725 and CPT® 73725), **or** CTA with run-off (CPT® 75635) to further evaluate the lower extremity arteries for the purpose of preoperative planning for any of the following:
 - ◆ Intermittent claudication (i.e. non-limb threatening ischemia) **AND** either:
 - Failed 3 months’ conservative medical therapy (physician supervised walking/exercise program plus medical therapy), **or**

- Functional disability (e.g. exercise impairment sufficient to threaten the patient's employment or to require significant alterations in the patient's lifestyle)
- ◆ Potentially limb-threatening vascular disease evidenced by:
 - Skin breakdown
 - Non-healing ischemic ulcers
 - Resting leg pain
 - Gangrene
- ◆ Blue Toe Syndrome:
 - Emboli from aortic plaque or mural thrombus
 - Hyperviscosity syndrome
 - Hypercoagulable states
 - Vasculitis
- ◆ Note: MRA Pelvis (CPT® 72198) should not be requested/billed with CPT® 74185, CPT® 73725 and CPT® 73725

Practice Notes

Claudication symptoms usually remain stable (70% to 80% of patients) and do not worsen or improve at rapid rates.⁹ Repeat studies to assess the efficacy of medical therapy are not indicated unless there is a negative change in clinical status for the purpose of preoperative planning for the purpose of preoperative planning such as worsening claudication or progression to critical limb ischemia

PVD-7.2: Popliteal Artery Entrapment Syndrome

- Diagnosis of popliteal artery stenosis or occlusion due to compression by adjacent muscle and tendons seen in young men (ages 20 to 40).
 - ◆ Ultrasound (CPT® 93926 unilateral study), CTA Lower extremity (CPT® 73706), or MRA Lower extremity (CPT® 73725).
 - ◆ CT or MRI of the lower extremity (contrast as requested) if requested by the operating surgeon

PVD-7.3: Post-Procedure Surveillance Studies

- Scheduled Interval
 - ◆ ABI (CPT® 93922) is generally appropriate following any revascularization procedure
 - ABI (CPT® 93922) or Duplex ultrasound (CPT® 93926 unilateral study) at each routine follow up is appropriate generally after a history/physical has been performed
 - Further imaging studies such as CTA or MRA are indicated for worsening symptoms, an abnormal duplex or a significant reduction (>0.15) in the ABI

Indication	Imaging
<ul style="list-style-type: none"> ➤ Suprainguinal Revascularization Both Open and Endovascular Therapy including Aortobifem/iliofem/fem-fem bypass/iliac angioplasty/stent 	<ul style="list-style-type: none"> ➤ Clinical examination and ABI with arterial duplex at: <ul style="list-style-type: none"> ◆ 1 month ◆ 6 months ◆ 12 months ◆ Then annually
<ul style="list-style-type: none"> ➤ Infringuinal Open Revascularization (Femoral-popliteal, femoral-tibial, femoral-distal bypass) 	
<ul style="list-style-type: none"> ◆ With vein or autologous conduit 	<ul style="list-style-type: none"> ➤ Clinical exam and ABI with arterial duplex <ul style="list-style-type: none"> ◆ Post-operatively ◆ 3 months ◆ 6 months ◆ 12 months ◆ Then annually
<ul style="list-style-type: none"> ◆ With Prosthetic conduit (PTFE/Dacron) 	<ul style="list-style-type: none"> ➤ Clinical exam and ABI with arterial duplex <ul style="list-style-type: none"> ◆ Post-operatively ◆ 6 months ◆ 12 months ◆ Then annually
<ul style="list-style-type: none"> ➤ Infringuinal Endovascular Revascularization Femoropopliteal angioplasty/stent 	<ul style="list-style-type: none"> ➤ Clinical exam and ABI with arterial duplex <ul style="list-style-type: none"> ◆ 1 month ◆ 3 month ◆ Every 6 months for two years ◆ Then annually

PVD-7.3.1: For suprainguinal disease

- Arterial duplex, CTA abdomen/pelvis, CT Abdomen/pelvis with contrast, CTA Aorta with lower extremity runoff, MRI Abdomen/Pelvis, MRA Abdomen/Pelvis, MRA Aorta with lower extremity runoff can be approved for:
 - ◆ Worsening signs or symptoms
 - ◆ Reduction of ABI >0.15
 - ◆ Peak systolic velocities or PSV ratio suggestive of high grade stenosis or in-stent re-stenosis

PVD-7.3.2: For infrainguinal bypass

- Advanced imaging CTA lower extremity or MRA lower extremity can be approved for:
 - ◆ Worsening signs or symptoms
 - ◆ Reduction of ABI >0.15
 - ◆ Duplex suggestive of threatened graft
- If intervention was performed for a non-healing wound and wound has gone on to heal, no additional imaging is recommended for surveillance. Repeat arterial duplex imaging can be obtained for worsening clinical signs and symptoms such as the presence of a new wound or rest pain

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PVD-7.4: Lower Extremity Artery Aneurysms

- For Iliac artery aneurysm see also: **PVD-6.4: Iliac Artery Aneurysm (IAA)**
- Femoral artery aneurysm
 - ◆ Initial imaging
 - Ultrasound (CPT® 93925 bilateral study or CPT® 93926 unilateral study).
 - ◆ Surveillance imaging
 - Symptomatic true femoral aneurysms smaller than 2.5 cm in diameter
 - Ultrasound (CPT® 93926 unilateral study) annually
 - Symptomatic true femoral aneurysms larger than 2.5 cm
 - Ultrasound (CPT® 93926 unilateral study) every 6 months
 - ◆ Other imaging
 - CTA Lower extremity or MRA Lower extremity without or with contrast can be performed when:
 - Preoperative study for patients with no plans for invasive angiography
 - Technically limited or abnormal ultrasound results
- Popliteal artery aneurysm
 - ◆ Initial imaging
 - Ultrasound (CPT® 93925 bilateral study or CPT® 93926 unilateral study) and Ultrasound to assess for a contralateral popliteal aneurysm and abdominal aortic aneurysm (CPT® 76770 or CPT® 76775)
 - ◆ Surveillance imaging
 - Ultrasound (CPT® 93926 unilateral study) annually
 - Post-interventional functional testing (ABI) (CPT® 93922) may be useful as clinically indicated
 - ◆ Other imaging
 - CTA or MRA can be performed for:
 - Preoperative study for patients with no plans for invasive angiography
 - Technically limited or abnormal ultrasound results

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PVD-7.5: Arterial Imaging for Free Flaps in Reconstructive Surgery

- For breast reconstruction preoperative planning. **See BR-3: Breast reconstruction in the breast imaging guidelines**
- For head and neck reconstruction, CTA or MRA lower extremity (CPT® 73706 or 73725) may be approved for evaluation of perforator anatomy for planned fibular flap

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PVD-8: Imaging for Hemodialysis Access

PVD-8.1: Preoperative Arterial Evaluation and Venous Mapping Prior to AV Fistula Creation

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PVD-8.1: Preoperative Arterial Evaluation and Venous Mapping Prior to AV Fistula Creation

- For vessel mapping prior to AV fistula creation CPT® 93985 or 93986
- In some instances, MRA Upper Extremity may be needed (CPT® 73225) if duplex imaging is equivocal
- Arterial evaluation to assess arterial suitability (size, degree of stenosis and calcification) prior to AV fistula creation may be appropriate
 - ◆ CPT® 93930 or CPT® 93931 can be used to report upper extremity arterial evaluation
 - ◆ Venous mapping to assess venous suitability prior to AV fistula creation may be appropriate
 - CPT® 93970 or CPT® 93971 can be used to report venous mapping
- Indications for Duplex ultrasound (CPT® 93990) of hemodialysis access include but are not limited to:
 - ◆ Patients with decreased flow rates during hemodialysis.
 - ◆ Development of arm swelling or discomfort after access placement surgery or a hemodialysis session.
 - ◆ Prolonged immaturity of a surgically created AV fistula.
 - ◆ Suspected pseudoaneurysm.
 - ◆ Suspected AV fistula or graft stenosis.
 - ◆ Known or suspected fluid collection adjacent to an AV fistula or graft.
 - ◆ Though it is, generally, not needed, one Duplex US (CPT® 93990) can be performed after a surgically created AV fistula for assessment.
- Central venous stenosis can cause new dialysis access to fail to mature or cause the premature failure of existing fistulas/grafts.
 - ◆ Signs and symptoms of central venous stenosis include
 - arm swelling,
 - presence of numerous collateral veins or
 - prolonged bleeding from dialysis puncture sites.
 - ◆ In patients with a history of pacemaker placement or previous tunneled dialysis graft, central venous stenosis can also develop in the absence of above signs and symptoms.
 - ◆ Advanced imaging with CT chest with contrast (CPT®71260), CTA chest (CPT® 71275), MRA chest (CPT®72159) can be approved.

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PVD-9: Arteriovenous Malformations (AVMs)

PVD-9.1: Arteriovenous Malformations (AVMs)

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PVD-9.1: Arteriovenous Malformations (AVMs)

Arteriovenous malformations are characterized by a network of multiple abnormal vascular channels interposed between enlarged feeding arteries and draining veins. The arteriovenous fistula has a single communication interposed between a feeding artery and a draining vein. The normal capillary bed is absent in both lesions. Both lesions may have an aggressive clinical course and are characterized by a reddish pulsatile mass which has a thrill or bruit. Though often recognized at birth, these lesions may grow and present near adolescence.

- See: **PEDPVD-2.5: Arteriovenous Malformations (AVMs) and Fistulas** in the **pediatric peripheral vascular disease imaging guidelines**
- Ultrasound with Doppler is indicated as an initial examination for superficial lesions.
 - ◆ Large lesion characterization may be limited by ultrasound imaging window.
 - ◆ Ultrasound is also limited in evaluating AVM relationship to airway or bony structures.
- MRI without contrast or without and with contrast of the affected body part is also indicated for evaluation of AVMs, and is useful in evaluating the extent of AVMs and their relationship to normal structures.
- MRA (contrast as requested) of the affected body part can be approved for evaluation and surveillance of known AVMs.
- It is unusual for both MRI and MRA to be necessary for routine treatment response or surveillance imaging of AVMs, but both may be approved for preoperative planning.
- CT and CTA can also be used to characterize AVMs and their relationship to normal structures, but is generally not better than MRI and has associated radiation risks.
 - ◆ CT with contrast and/or CTA (contrast as requested) of the affected body part can be approved when MRI and/or MRA is inconclusive or contraindicated.

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PVD-10: Nuclear Medicine

PVD-10.1: Nuclear Medicine Imaging indications

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PVD-10.1: Nuclear Medicine Imaging indications

- Nuclear medicine studies are rarely used in the evaluation of peripheral vascular disorders, but are indicated in the following circumstances:
 - ◆ Lymphoscintigraphy (CPT® 78195) is indicated for evaluation of lower extremity lymphedema when a recent Doppler ultrasound is negative for valvular insufficiency.
 - ◆ Vascular flow imaging (CPT® 78445) is an obsolete study that has been replaced by MRA, CTA, or Duplex ultrasonography, and is not supported for any indication at this time.
 - ◆ Venous thrombosis imaging (CPT® 78456, CPT® 78457, and CPT® 75458) are obsolete studies that have been replaced by MRA, CTA, or Duplex ultrasonography, and are not supported for any indication at this time.
 - ◆ Indium 111 (¹¹¹In)–labeled white blood cell (WBC) or Gallium-67 citrate studies (CPT® 78800, CPT® 78801, CPT® 78802, or CPT® 78803) can be approved for evaluation of the following:
 - Mycotic aneurysms.
 - Vascular graft infection.
 - Infection of central venous catheter or other indwelling device.

PVD-11: Venous Imaging General Information

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PVD-11.1: Abbreviations and glossary

Abbreviation	Definition
CTV	Computed Tomography Venography
DVT	Deep Venous Thrombosis
EVA	Endovenous ablation – a minimally invasive procedure using heat to obliterate the saphenous vein for the treatment of venous reflux
IVC	Inferior vena cava
May-Thurner's	Syndrome of compression of the left iliac vein via an overlying right common iliac artery. The pulsations of the artery into the vein against the 5 th lumbar vertebrae can predispose to DVT
MRV	Magnetic Resonance Venography
Phlebectomy	Removal of a vein usually through a small incision
Post thrombotic syndrome	Constellation of symptoms including chronic edema and pain that develops after a DVT
Sclerotherapy	Injection of an irritant into a vein to obliterate it
SEPS	Sub-fascial endoscopic perforator surgery
SVT	Superficial venous thrombosis
VVI	Venous Valvular Insufficiency – a study utilizing ultrasound to assess for the presence of reflux within the superficial and deep veins of the lower extremity.

PVD-11.2: Background Information

- A current clinical evaluation (within 60 days), including medical treatments, are required prior to considering advanced imaging, which includes:
 - ◆ Relevant history and physical examination including:
 - The affected limb(s), the extent of the edema (calf and/or thigh), pitting or non-pitting. With regard to venous insufficiency, presence or absence of hyperpigmentation or other skin changes, ulcerations if applicable, size of varicosities if present as well as distribution
 - Arterial examination to rule out phlegmasia alba/cerulea dolens which is comprised arterial flow secondary to extensive DVT if applicable
 - Appropriate laboratory studies, for example d-dimer, if applicable
 - Non-advanced imaging modalities, such as a venous duplex or venous valvular insufficiency study (VVI) after symptoms started or worsened
 - ◆ Other meaningful contact (telephone call, electronic mail or messaging) by an established patient can substitute for a face-to-face clinical evaluation.
- Venous disease can be classified into three categories:
 - ◆ Venous-occlusive disease
 - ◆ Venous insufficiency
 - ◆ Venous malformations

Veno-occlusive disease

- Types of thrombotic disease:
 - ◆ Superficial venous thrombosis
 - ◆ Deep venous thrombosis
 - ◆ Iliac vein obstruction, unilateral or bilateral
 - ◆ May-Thurner's syndrome
- Signs/Symptoms of veno-occlusive disease is generally sudden onset of pain and edema in the limb.
- Risk factors include age>40, obesity, pregnancy, prolonged immobility, post-surgery, and malignancy among others.
- Procedures related to veno-occlusive disease include:
 - ◆ Thrombolysis
 - ◆ Thrombectomy
 - ◆ Post iliac vein stent/angioplasty See **PVD-17: Post iliac vein stent/angioplasty**

Venous insufficiency

- Types of venous insufficiency:
 - ◆ Superficial and deep venous reflux
 - ◆ Varicose veins
 - ◆ Reticular and spider veins
- Signs/symptoms of venous insufficiency include:
 - ◆ Chronic swelling in the leg that is relieved with elevation
 - ◆ Chronic swelling in the leg that is worse in the evenings
 - ◆ Aching or sense of heaviness in the leg
 - ◆ Hyperpigmentation of the calf particularly around the ankle
 - ◆ Itchy skin on legs and feet
 - ◆ Leather appearance of the skin of the calves
 - ◆ Skin ulcers in the calf particularly around the medial malleolus
 - ◆ Varicose veins
 - ◆ Spider veins/reticular veins/telangiectasias
- Procedures related to the venous insufficiency include:
 - ◆ Endovenous laser ablation utilizing either chemical, laser or radio-frequency
 - ◆ Saphenous vein high ligation and stripping
 - ◆ Phlebectomy, stab or powered
 - ◆ Sclerotherapy, liquid or foam

Venous malformations

- Types of venous malformations include
 - ◆ Arterio-venous malformations which can occur throughout the body
 - ◆ See CH-24: Pulmonary AVM in the Chest imaging guidelines
 - ◆ See HD-12: Aneurysm and AVM in the Head imaging guidelines
 - ◆ See PV-11: Pelvic pain/dyspareunia in the Pelvic imaging guidelines

- ◆ Klippel-Trenaunay which affects primarily the lower extremity venous circulation and is characterized by varicose veins, limb size discrepancies, and port-wine stains.
- Treatment includes:
 - ◆ Primarily embolization
 - ◆ Sclerotherapy
 - Klippel-Trenaunay: treatment can include phlebectomy and sclerotherapy of symptomatic varicose veins provided they meet the criteria for intervention.

PVD-11.3: Procedure Coding

Venous Studies – Extremities	CPT®
CTV Abdomen/Pelvis involves obtaining images from the diaphragm to just below the inguinal ligament after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	74174
CTV pelvis involves obtaining images from the top of the pelvic brim to the upper thighs or just below the inguinal ligament. The venogram portion is performed by obtaining images after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	72191
MRV Abdomen/Pelvis involves taking images from the diaphragm to just below the inguinal ligament after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	74185
MRV pelvis involves obtaining images from the top of the pelvic brim to the upper thighs or just below the inguinal ligament. The venogram portion is performed by obtaining images after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	72198
Non-invasive physiologic studies of extremity veins, complete bilateral study (e.g. Doppler waveform analysis with responses to compression and other maneuvers, phleborheography, impedance plethysmography). This study is rarely performed.	93965
Duplex scan of extremity veins, including responses to compression and other maneuvers; complete bilateral study.	93970
Duplex scan of extremity veins, including responses to compression and other maneuvers; unilateral or limited study.	93971
<ul style="list-style-type: none"> ➤ These codes are used to report studies of lower or upper extremity veins. ➤ A complete bilateral study of the lower extremity veins includes examination of the external iliac veins, common femoral, proximal deep femoral, great saphenous and popliteal veins. Calf veins may also be included. ➤ A complete bilateral study of upper extremity veins includes examination of the subclavian, jugular, axillary, brachial, basilic, and cephalic veins. Forearm veins may also be included. 	
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; complete study	93978
Duplex scan of extremity veins, including responses to compression and other maneuvers; unilateral or limited study.	93979

PVD-11.4: General Guidelines-Imaging

- Venous duplex (CPT® 93970, 93971) of the limb is the initial imaging of choice
 - ◆ Follow-up duplex imaging (CPT® 93970, 93971) is not generally indicated to document resolution and should only be obtained for new signs/symptoms or for concerns of propagation of thrombus when the treatment plan would change (Insertion of IVC filter, change of anticoagulation, etc.)
- Imaging studies
 - ◆ Venous duplex (CPT® 93970, 93971) should visualize the veins, with demonstration of the presence or absence of compressibility and venous flow.
 - ◆ Venous valvular insufficiency studies (CPT® 93970, 93971) visualize the veins of the lower extremity, assess for reflux (reversal of venous antegrade flow after valve closure) and measure its duration.
 - ◆ CTV or MRV of the abdomen/pelvis images with contrast involves taking images from the diaphragm to just below the inguinal ligament after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.

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PVD-12: Acute Limb Swelling

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PVD-12.1: Superficial venous thrombosis (SVT)

- Superficial venous thrombosis (SVT) refers to acute or chronic thrombosis of the superficial veins in both the upper (cephalic and basilic veins) and lower extremities (greater [great] saphenous vein, lesser [small] saphenous vein, gastrocnemius and soleal veins). Treatment: Elevation and warm compresses until pain and swelling subsides.
- The diagnosis of superficial venous thrombosis is generally made on the basis of physical examination.
 - ◆ Duplex ultrasound (CPT® 93970, 93971) is the initial imaging if the diagnosis is equivocal
 - ◆ Follow-up duplex ultrasound (CPT® 93970, 93971) is indicated only if thrombus in the superficial systems is encroaching onto the deep venous system (saphenofemoral or saphenopopliteal junction)

PVD-12.2: Acute deep venous thrombosis (DVT)

- Deep venous thrombosis is characterized by thrombosis of a deep vein in either the upper (brachial, axillary, subclavian veins) or the lower extremity (peroneal, posterior tibial, popliteal, femoral or iliac veins).
- Duplex ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is the initial imaging study for any suspected DVT
 - ◆ Deep venous thrombosis can present as
 - Symptomatic
 - Swelling
 - Pain
 - Warmth
 - Erythema
 - Pain with dorsiflexion of the foot (Homan's Sign)
 - Or with progression, such as phlegmasia cerulea dolens
 - Risk factors for DVT include age >40, obesity, malignancy, prolonged immobilization, hypercoagulability as well as those outlined in **CH-25: Pulmonary Embolism (PE)** in Chest Imaging Guidelines.
- CTA/CTV Abdomen and pelvis with contrast can be performed to rule out IVC thrombus secondary to the filter when there is acute bilateral lower extremity swelling in a patient with a history of an IVC filter in place.
- When there is concern for proximal DVT (iliofemoral):
 - ◆ Focused abdominal duplex can generally visualize the iliac veins and IVC to determine the absence or presence of iliac vein thrombus in a patient. If the results are equivocal or indeterminate:
 - CTV or MRV abdomen and pelvis with contrast (CPT® 74174 or 74185) can be performed.
- For proximal DVT's (iliac vein DVT's or in cases of phlegmasia (extensive DVT compromising arterial inflow), thrombectomy (rarely performed) or thrombolysis can be performed.

- If the cause of the DVT is found to be due to May-Thurner, iliac vein angioplasty followed by stenting of the left iliac vein is generally performed. See **PVD-13.3: May-Thurner Syndrome**

PVD-12.3: Follow-up imaging of known DVT

- Duplex ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) can be repeated in order to rule out proximal extension of a calf vein DVT in those individuals who cannot be anticoagulated, most commonly after recent surgery. Time interval for follow-up study includes
 - ◆ One week after the initial diagnosis.
 - ◆ Serial imaging (up to 3 studies) over the first three weeks if calf DVT is not treated.
- Imaging during or to terminate long-term anticoagulation therapy to determine venous recanalization is not supported by evidence. Repeat imaging to make decisions on whether or not to continue or terminate anticoagulation is not indicated.

PVD-12.4: Follow-up imaging after venous surgery

- Venous duplex (CPT® 93971 unilateral study) can be obtained of the treated limb to rule out a DVT within seven days of endovenous ablation.
- Follow-up routine imaging is not indicated after other venous procedures including:
 - ◆ Saphenous vein ligation and stripping
 - ◆ Phlebectomy
 - ◆ Sclerotherapy

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PVD-13: Chronic limb swelling due to chronic deep venous thrombosis/May Thurner's syndrome

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PVD-13.3: May-Thurner syndrome general information	64

PVD-13.1: Chronic deep venous thrombosis general information

- Chronic deep venous thrombosis is defined as an acute DVT that is greater than 14 days old.
- Patient with incompletely lysed or residual DVT can develop post-thrombotic syndrome that can be characterized as chronic edema, venous stasis changes, pain and in advanced cases venous stasis ulceration.
 - ◆ Incompletely lysed DVT can cause luminal narrowing of the vein restricting venous outflow leading to stenosis or occlusion and /or can lead to valve dysfunction resulting in reflux of venous blood retrograde towards gravity. Both pathologies ultimately lead to chronic edema which can cause chronic pain and venous stasis disease.
 - Imaging for post-thrombotic syndrome is not indicated unless there are signs and symptoms suggestive of a new acute DVT or for preoperative planning for iliac vein/stenting for suspected iliac vein stenosis or occlusion.
 - The mainstay of treatment for chronic deep venous thrombosis is compression stockings.
 - ◆ In patients with a history of proximal (iliofemoral) DVT who have subsequently developed post thrombotic syndrome, imaging can be performed to evaluate for iliac venous obstruction which can result from incompletely lysed thrombus.
 - Initial imaging should be duplex (CPT® 93970 bilateral study or CPT® 93971 unilateral study) followed by either a CT or MR venogram of the abdomen/pelvis, or CT or MR venogram of the pelvis, or venography for treatment planning purposes.
 - Selected patients may be a candidate for iliac vein angioplasty/stenting.

PVD-13.2: Post thrombotic syndrome

- Imaging for post-thrombotic syndrome is indicated when:
 - ◆ There are signs and symptoms suggestive of a new acute DVT and NOT for chronic swelling that has not changed in severity or character
 - ◆ For preoperative planning for iliac vein/stenting in the setting of known iliac venous obstruction in those with a history of a proximal (iliofemoral) DVT. See **PVD-3.1: Chronic deep venous thrombosis general information**
- See **PVD-13.3: May-Thurner syndrome**
- See **PVD-15: Venous Stasis Ulceration**

PVD-13.3: May-Thurner syndrome general information

- In approximately 25% of people, the right iliac artery overlies the left iliac vein over the fifth lumbar vertebrae and its pulsations can compress the vein increasing the risk of DVT in the left extremity.
 - ◆ Duplex (CPT® 93970 bilateral study or CPT® 93971 unilateral study) will confirm the presence of a left common iliac vein DVT but diagnosis is made with advanced imaging such as CT or MRV abdomen/pelvis (CPT® code 74175, 74185), venography or peri-procedural intravascular ultrasound demonstrating compression of the vein.
 - ◆ Treatment is with iliac vein angioplasty/stenting for both acute and chronic left-sided DVT
 - ◆ Prophylactic treatment of May-Thurner's syndrome in the absence of acute or chronic DVT **OR** chronic left lower extremity edema and its sequelae such as varicose veins or venous stasis ulcers is **NOT** considered medically necessary.

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PVD-14: Chronic limb swelling due to venous insufficiency/Venous stasis changes/Varicose veins

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PVD-14.1: Venous insufficiency - General

- Venous insufficiency is characterized by failure of the venous blood to flow in its normal antegrade path of flow and instead reflux backwards by the force of gravity usually secondary to malfunction of the venous valves.
- Risk factors include previous DVT, obesity, female sex assigned at birth, hereditary, and environmental factors such as prolonged standing on a hard surface.
- Venous insufficiency loosely includes the diagnosis of venous reflux, varicose veins, venous stasis ulcers and spider/reticular veins.

PVD-14.2: Venous Reflux

- Diagnosis is made with a venous valvular insufficiency study (CPT® 93970 bilateral study or CPT® 93971 unilateral study) which documents the presence of reflux (>500ms) in the greater saphenous vein as well as the size of the refluxing vein (3-15mm).
- Symptoms of venous reflux include chronic edema, pain, and venous stasis ulcerations. Symptoms of venous reflux can be ameliorated with compression therapy with graded compression stockings, elevation, avoidance of prolonged standing and weight loss. Venous reflux can be seen in both the deep and superficial venous systems. Reflux within the deep system is not amenable to intervention.
 - ◆ Treatment of deep venous reflux is via active compression with compression stocks, pneumatic pumps or specialized dressings such as Unna boots.
 - ◆ Treatment of superficial venous reflux is amenable to intervention in selected patients who are symptomatic and have failed conservative therapy. A duplex ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) demonstrating the presence of pathologic reflux within the greater and lesser saphenous veins should be undertaken within the last six months. Vein size should be documented.
 - ◆ Treatment of symptomatic superficial venous reflux is via endovenous laser radiofrequency ablation of the greater or lesser saphenous vein resulting in closure of the vein allowing for venous blood to be rerouted to the deep venous system.
 - ◆ Treatment of symptomatic superficial venous reflux can also be treated via saphenous vein ligation and stripping which has fallen out of favor but can be performed for a tortuous or enlarged (>15mm) greater or lesser saphenous vein. One complication of endovenous ablation is deep venous thrombosis.
 - ◆ A post ablation venous ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is indicated within seven days post procedure. If thrombus is noted within the saphenofemoral junction, repeat imaging can be performed within seven days to assess for propagation into the deep system.
 - ◆ Ultrasound mapping or monitoring techniques are considered medically necessary only to initially determine the extent and configuration of symptomatic varicosities or valvular insufficiency. Post procedure assessment by imaging techniques is inappropriate to confirm efficacy or outcome of the procedure.

PVD-14.3: Varicose Veins

- Varicose veins are defined as enlarged, tortuous veins visible under the skin. Symptoms associated with varicose veins include achiness and heaviness of the legs and pain/discomfort over the varicosities. Varicose veins can exist both in the absence and presence of venous reflux.
- Treatment involves conservative therapy such as compression stockings, avoidance of prolonged standing, intermittent elevation, weight loss (if applicable) and exercise which relieves the distention of the varicose veins ameliorating the symptoms.
- If the varicosities remain symptomatic despite conservative therapy, varicose veins are treated with sclerotherapy or phlebectomy generally on the basis of size.

PVD-14.4: Spider veins/reticular veins

- Spider veins are formed by the dilation of a cluster of blood vessels within the dermis – generally <3mm in diameter. Diagnosis is via physical examination. Spider veins are usually asymptomatic but can cause aching, burning and tenderness in the area overlying the abnormal veins. Spider veins can exist in the absence or presence of venous reflux. The presence of spider veins should not be an indication for treatment of venous reflux.
- Treatment of spider veins is generally cosmetic except in certain cases and can be treated with sclerotherapy.

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PVD-15: Venous stasis ulceration

PVD-15.1: Venous stasis ulcers - General	70
PVD-15.2: Venous stasis ulcers - Treatment	70

PVD-15.1: Venous stasis ulcers - General

- Venous stasis ulcers can arise from maceration of the skin in patients with venous insufficiency often with minimal trauma. The area over the medial malleolus is usually the most commonly affected area. The presence of chronic edema from either venous reflux, post-thrombotic syndrome or either etiology predisposes to the formation of venous stasis ulcerations.

PVD-15.2: Venous stasis ulcers - Treatment

- The mainstay of treatment is a sterile dressing +/- adjunctive wound care salves coupled with compression with either stockings or wraps to reduce edema.
- In select patients with venous stasis ulcers felt to be due to superficial venous reflux, incompetent perforators, and/or significant varicosities, the following may be indicated:
 - ◆ Endovenous ablation with RF or with laser for treatment of saphenous vein reflux and incompetent perforators
 - ◆ Saphenous vein ligation and stripping for treatment of saphenous vein reflux and varicose veins
 - ◆ Phlebectomy for treatment of varicose veins
 - ◆ Sclerotherapy for treatment of incompetent perforators and varicose veins

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PVD-16: IVC filters

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PVD-16.2: IVC filters - Treatment	72

PVD-16.1: IVC filters - General

- IVC filters are placed in patients with known DVT that cannot be anti-coagulated, patients with poor pulmonary reserve and high risk for DVT, or prophylaxis in trauma and surgical patients.
- Most IVC filters inserted are retrievable and should be removed as soon as clinically feasible. After 12 months, removal of IVC filters can become technically more difficult.

PVD-16.2: IVC filters - Treatment

- IVC filter insertion
 - ◆ An initial venous duplex can be performed to assess for the presence of thrombus in the femoral vein which would affect the approach (transjugular or transfemoral)
 - ◆ Advanced imaging is not indicated
- Advanced imaging (CT Abdomen and Pelvis CPT® 74176) can be considered for ANY of the following:
 - ◆ A KUB demonstrates tilting of the filter or malposition of one of the filter thongs
 - ◆ New **bilateral** lower extremity swelling (venous duplex should be performed first)
 - ◆ Filter present for >12 months, with documentation stating intent to remove

PVD-17: Post iliac vein stent/angioplasty

PVD-17.1: Post iliac vein stenting/angioplasty

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PVD-17.1: Post iliac vein stenting/angioplasty

- Iliac venous stents can be placed after thrombolysis for DVT associated with May-Thurner's syndrome, DVT associated with extrinsic compression or for post thrombotic iliac obstruction.
 - ◆ Surveillance of iliac venous stents with an arterial duplex (CPT® 93975) can be obtained
 - ◆ For worsening signs or symptoms including increased edema when stent malfunction is suspected
 - ◆ Postoperatively within the first month, at six months, twelve months and then annually
- Advanced imaging CTV or MRV Abdomen and Pelvis can be obtained for an abnormal or indeterminate duplex

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