



CLINICAL GUIDELINES

Peripheral Vascular Disease (PVD) Imaging Guidelines

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VERSION 2.0.2026



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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General Information

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Abbreviations and Glossary for the PVD Imaging Guidelines

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(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
CLI	Critical Limb Ischemia
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
EVAR	Endovascular Aneurysm Repair
HbA1C	Hemoglobin A1C: test used to determine blood sugar control for individuals 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
PSV ratio	Peak systolic velocities
SVC	Superior vena cava
TEVAR	Thoracic Endovascular Aortic Repair
TIA	Transient ischemic attack
TTE	Transthoracic echocardiogram
Toe-Brachial Index	Useful in individuals with ABI above the normal range due to non-compressible posterior tibial or dorsalis pedis arteries
V/Q Scan	Ventilation and perfusion scan

General Guidelines (PVD-1.0)

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General Guidelines

- Prior to considering advanced imaging, a pertinent clinical evaluation or meaningful technological contact performed since the symptoms began or worsened is required describing any relevant medical treatments and a vascular history and physical that includes (when applicable):
 - Palpation of pulses
 - Evaluation of lower extremities for 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, venous duplex or venous valvular insufficiency study (VVI) performed after symptoms started or worsened
 - 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 compromised arterial flow secondary to extensive DVT if applicable
 - Appropriate laboratory studies, for example d-dimer, if applicable
- Arterial- 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 ($ABI \geq 1.40$) and may also be used to assess perfusion in individuals 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 medically necessary unless there has been a change in the individual's condition, previous imaging showed an indeterminate finding, or condition specific sections in these 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.
- CTA Head and Neck should be reported as CPT® 70471, rather than using the individual codes for the CTA Head and CTA Neck.
- Venous-imaging
 - Venous duplex (CPT® 93970, CPT® 93971) of the limb is the initial imaging of choice.
 - Follow-up duplex imaging is not medically necessary 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.)

Evidence Discussion

Venous duplex should visualize the veins, with demonstration of the presence or absence of compressibility and venous flow. Venous valvular insufficiency studies 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 Abdomen and 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.

Venous disease can be classified into three categories:

- Venous-occlusive disease
 - Types of thrombotic disease
 - Superficial venous thrombosis
 - Deep venous thrombosis
 - Iliac vein obstruction, unilateral or bilateral
 - May-Thurner syndrome
 - Signs/Symptoms of venous-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 venous-occlusive disease include:
 - Thrombolysis
 - Thrombectomy

- 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 **Pulmonary AVM (CH-24)** in the Chest imaging guidelines
 - See **Aneurysm and AVM (HD-12)** in the Head imaging guidelines
 - See **Pelvic Pain/Dyspareunia (PV-11)** 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.

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: **Impotence/Erectile Dysfunction (PV-17)** 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 individuals 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:
 - **Post Aortic Endovascular/Open Surgery Surveillance Studies (PVD-6.8)**
 - **Post-procedure Surveillance Studies (PVD-7.3)**

General Guidelines – Imaging

- Imaging Studies:
 - Carotid studies MRA Neck (CPT® 70543) or CTA Neck (CPT® 70491) 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 or MRA Abdomen (CPT® 74175 or CPT® 74185) images from the diaphragm to the umbilicus or iliac crest
 - CTA or MRA Chest (CPT® 71275 or 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

Quantification of plaque morphology

CPT® 0710T, CPT® 0711T, CPT® 0712T, CPT® 0713T

There is insufficient evidence to support the routine use of data from non-coronary computed tomography angiography (CTA) to quantify plaque morphology in noncoronary vessels. These studies are considered experimental, investigational, or unproven.¹

Procedure Coding

Non-invasive Physiologic Studies of Extremity Arteries	CPT®
• 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

¹ Guo Z, Liu Y, Xu J, et al. A deep learning model for carotid plaques detection based on CTA images: a two stepwise early-stage clinical validation study. Front Neurol. 2025;15:1480792. doi:10.3389/fneur.2024.1480792.

Non-invasive Physiologic Studies of Extremity Arteries	CPT®
- 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

- 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 doppler, where there is no hard copy output for evaluation of bidirectional blood flow, is 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
- 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
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).	

Arterial Duplex – Upper and Lower Extremities	CPT®
Duplex scan of upper extremity arteries or arterial bypass grafts; complete bilateral.	93930
• 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
• 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
• 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®
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
• 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 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 for Hemodialysis Access	CPT®
Duplex scan of arterial inflow and venous outflow for preoperative vessel assessment prior to creation of hemodialysis access; complete unilateral study	93986

Nuclear Medicine Imaging Indications

- Nuclear medicine studies are rarely used in the evaluation of peripheral vascular disorders but are considered medically necessary in the following circumstances:
 - Lymphoscintigraphy (CPT® 78195) for evaluation of lower extremity lymphedema when recent Doppler ultrasound of the lower extremity and abdomen are negative for valvular insufficiency.
 - Indium 111 (¹¹¹In)–labeled white blood cell (WBC) or Gallium-67 citrate studies (CPT® 78800, CPT® 78801, CPT® 78802, or CPT® 78803) for evaluation of **any** of the following:
 - Mycotic aneurysms.
 - Vascular graft infection.
 - Infection of central venous catheter or other indwelling device.
 - PET/CT (CPT® 78815) for clinical suspicion of aortic infection (graft or native aorta) when **both** of the following apply:
 - CT-angiogram is equivocal/indeterminate AND
 - Indium-111 or Gallium-67 studies have not been performed **and** are not available or not technically feasible.

Non-indications

Evidence does not support routine use of these studies for peripheral vascular evaluation. MRA, CTA, and duplex ultrasonography provide superior diagnostic value more likely to impact clinical management. Therefore, these studies are considered not medically necessary for any peripheral vascular imaging indication:

- Venous thrombosis imaging (CPT® 78456, CPT® 78457, and CPT® 75458)
- Vascular flow imaging (CPT® 78445)

Health Equity Considerations

Health equity is the highest level of health for all individuals; health inequity is the avoidable difference in health status or distribution of health resources due to the social conditions in which individuals are born, grow, live, work, and age. Social determinants

of health are the conditions in the environment that affect a wide range of health, functioning, and quality of life outcomes and risks. Examples include the following: safe housing, transportation, and neighborhoods; racism, discrimination, and violence; education, job opportunities, and income; access to nutritious foods and physical activity opportunities; access to clean air and water; and language and literacy skills.

References

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1. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC Guideline on the management of patients with lower extremity peripheral artery disease. *J Am Coll Cardiol*. 2017 Mar 69 (11):1467-1508.
2. Conte MS, Pomposelli FB, et al. Society for Vascular Surgery practice guidelines for atherosclerotic occlusive disease of the lower extremities: management of asymptomatic disease and claudication [published correction appears in *J Vasc Surg*. 2015 May;61(5):1382]. *J Vasc Surg*. 2015;61(3 Suppl):2S-41S. doi:10.1016/j.jvs.2014.12.009.
3. Aboyans V, Criqui MH, Abraham P, et al. Measurement and interpretation of the ankle-brachial index: a scientific statement from the American Heart Association [published correction appears in *Circulation*. 2013 Jan 1;127(1):e264]. *Circulation*. 2012;126(24):2890-2909.
4. Drachman DE, Beckman JA. The Exercise Ankle-Brachial Index: A Leap Forward in Noninvasive Diagnosis and Prognosis. *JACC Cardiovasc Interv*. 2015;8(9):1245-1247. doi:10.1016/j.jcin.2015.06.006.
5. Herraiz-Adillo Á, Cavero-Redondo I, Álvarez-Bueno C, Pozuelo-Carrascosa DP, Solera-Martínez M. The accuracy of toe brachial index and ankle brachial index in the diagnosis of lower limb peripheral arterial disease: A systematic review and meta-analysis. *Atherosclerosis*. 2020;315:81-92. doi:10.1016/j.atherosclerosis.2020.09.026.
6. Lucinian YA, Lamarche, Y, Demers P, Martineau P, Harel F, Pelletier-Galarneau M. FDG-PET/CT for the Detection of Infection Following Aortic Root Replacement Surgery. *JACC: Cardiovascular Imaging*. 2020; 13: 1447-1448.
7. Keidar Z, Engel A, Hoffman A, Israel O, Nitecki S. Prosthetic Vascular Graft Infection: The Role of 18F-FDG PET/CT. *J Nucl Med*. 2007; 48:1230–1236.
8. Wassélius J, Malmstedt J, Kalin B, Larsson S, Sundin A, Hedin U, and Jacobsson H. High 18F-FDG Uptake in Synthetic Aortic Vascular Grafts on PET/CT in Symptomatic and Asymptomatic Patients. *J Nucl Med*. 2008; 49:1601–1605.
9. Fukuchi K, Ishida Y, Higashi M, Tsunekawa T, Ogino H, Minatoya K, et al. Detection of aortic graft infection by fluorodeoxyglucose positron emission tomography: Comparison with computed tomographic findings. *J Vasc Surg*. 2005;42:919-925.
10. Dibble EH, Yoo DC, Baird GL, Noto RB. FDG PET/CT of Infection: Should It Replace Labeled Leukocyte Scintigraphy of Inpatients? *AJR*. 2019; 213:1358–1365.
11. Lauri C, Iezzi R, Rossi M, Tinelli G, Sica S, Signore A et al. Imaging Modalities for the Diagnosis of Vascular Graft Infections: A Consensus Paper amongst Different Specialists. *J Clin Med*. 2020, 9, 1510; doi:10.3390/jcm9051510.
12. Chakfé N, Diener H, Lejay A, et al. Editor's Choice – European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections. *Eur J Vasc Endovasc Surg*. 2020; 59: 339-384.
13. Reinders Folmer EI, Von Meijenfildt GCI, Van der Laan MJ, Glaudemans AWJM, Slart RHJA, Saleem BR, Zeebregts CJ. Diagnostic Imaging in Vascular Graft Infection: A Systematic Review and Meta-Analysis. *Eur J Vasc Endovasc Surg*. 2018; 56:719-729.
14. Puges M, Bérard X, Ruiz JB, Debordeaux F, Desclaux A, Stecken L, Pereyre S et al. Retrospective Study Comparing WBC scan and 18F-FDG PET/CT in Patients with Suspected Prosthetic Vascular Graft Infection. *Eur J Vasc Endovasc Surg*. 2019; 57: 876-884.
15. Saleem BR, Berger P, Vaartjes I, et al. Modest utility of quantitative measures in 18F-fluorodeoxyglucose positron emission tomography scanning for the diagnosis of aortic prosthetic graft infection. *J Vasc Surg*. 2015;61:965-971.
16. Reinders Folmer EI, von Meijenfildt GCI, Te Riet Ook Genaamd Scholten RS, et al. A systematic review and meta-analysis of ¹⁸F-fluoro-d-deoxyglucose positron emission tomography interpretation methods in vascular graft and endograft infection. *J Vasc Surg*. 2020;72(6):2174-2185.e2. doi:10.1016/j.jvs.2020.05.065.

17. Kim SJ, Lee SW, Jeong SY, Pak K, Kim Y. A systematic review and meta-analysis of 18F-fluorodeoxyglucose positron emission tomography or positron emission tomography/computed tomography for detection of infected prosthetic vascular grafts. *J Vasc Surg.* 2019;70:307-13.
18. Buckler AJ, Gotto AM Jr, Rajeev A, et al. Atherosclerosis risk classification with computed tomography angiography: A radiologic-pathologic validation study. *Atherosclerosis.* 2023;366:42-48. doi:10.1016/j.atherosclerosis.2022.11.013.
19. Pakizer D, Taffé P, Kozel J, et al. Non-invasive imaging of individual histological carotid plaque characteristics: A diagnostic accuracy meta-analysis. *Atherosclerosis.* Published online June 2, 2025. doi:10.1016/j.atherosclerosis.2025.120391.
20. Guo Z, Liu Y, Xu J, et al. A deep learning model for carotid plaques detection based on CTA images: a two stepwise early-stage clinical validation study. *Front Neurol.* 2025;15:1480792. doi:10.3389/fneur.2024.1480792.

Genetic Predisposition to Arterial Disease

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Screening for Peripheral Artery / Aneurysmal Disease (PVD-2)

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Asymptomatic Screening (PVD-2.1)

- Routine screening of asymptomatic individuals for PAD is not medically necessary. Those with CVD risk factors should be placed on best medical management and should be questioned on symptoms of PAD at annual physicals.
- Currently, there is no evidence to demonstrate that screening all individuals with PAD for asymptomatic atherosclerosis in other arterial beds improves clinical outcome.
- Resting ABI's may be medically necessary in individuals with abnormal pulse exams.
- Screening in the presence of aortic aneurysms:
 - In an individual with a known TAA, screening for AAA is medically necessary with an abdominal duplex. See **Abdominal Aortic Aneurysm (AAA) (PVD-6.3)**
 - In an individual with a known AAA, screening for TAA is not supported by sufficient evidence and is not considered medically necessary.

Evidence Discussion

Screening for Suspected Peripheral Artery Disease/Aneurysmal Disease

Generally, routine screening for peripheral arterial disease in asymptomatic patients is not cost-effective and has not been shown to improve patient outcomes. There are some familial and genetic conditions that may predispose individuals to aneurysmal disease and dissection. In these cases, surveillance imaging has been shown to improve early detection and intervention when indicated. Conditions that may have an elevated risk for vascular disease include:

- Familial Aneurysm Syndromes
- Fibromuscular Dysplasia
- Spontaneous Coronary Artery Dissection (SCAD)
- Ehlers-Danlos
- Marfan
- Loeys-Dietz

In the case of aneurysms detected in patients with SCAD, Marfan, Loeys-Dietz and Ehlers-Danlos Type IV syndromes, a more frequent surveillance pattern along with additional anatomic region imaging may be indicated as these syndromes

demonstrate a higher incidence of aneurysm development and degeneration. Intervention recommendations follow general guidelines for thoracic aortic, abdominal aortic and visceral artery aneurysms once detected.

While duplex imaging remains an effective modality for abdominal aortic surveillance, these conditions often involve the thoracic aorta as well as cerebrovascular and visceral vessel abnormalities that may be technically limited with this approach. Due to the high incidence of aneurysm development in multiple anatomic locations, CT/MR imaging is recommended for surveillance in this population for cases with indeterminate ultrasound imaging.

There is an association between bicuspid aortic valve and thoracic aneurysm development. Individuals diagnosed with this condition should undergo screening and follow standard surveillance patterns using CT/MR of the chest as well as echocardiography should a thoracic aortic aneurysm be detected. The addition of cardiac-specific CT/MR has not shown benefit in these cases as the pathology is usually noted within the aorta.

Multisystemic Smooth Muscle Syndrome [MSMS], Smooth Muscle Dysfunction Syndrome [SMDS] and ACATA2 mutations have a high incidence of aneurysm development early in life and should undergo screening and routine surveillance after genetic confirmation. To minimize radiation exposure in this pediatric population, MR and ultrasound imaging are recommended when possible.

Screening for Vascular related genetic connective tissue Disorders (PVD-2.2)

Vascular related genetic connective tissue Disorders include:

- Familial Aneurysm Syndromes
- Fibromuscular Dysplasia
- Spontaneous Coronary Artery Dissection (SCAD)
- Ehlers-Danlos
- Marfan
- Loeys-Dietz

Table of Thoracic Aorta Imaging Options

CPT®	Description
71250	Computed tomography, thorax, diagnostic; without contrast material
71260	Computed tomography, thorax, diagnostic; with contrast material(s)

CPT®	Description
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s), including noncontrast images, if performed, and image postprocessing
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)
93306	Transthoracic echocardiogram

Description	CPT®
70496	Computed tomographic angiography, head, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70498	Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70471	Computed tomographic angiography (CTA), head and neck, with contrast material(s), including noncontrast images, when performed, and image postprocessing
72198	Magnetic resonance angiography, pelvis, with or without contrast material(s)
74174	Computed tomographic angiography, abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74185	Magnetic resonance angiography, abdomen, with or without contrast material(s)
70544	Magnetic resonance angiography, head; without contrast material(s)
70545	Magnetic resonance angiography, head; with contrast material(s)
70546	Magnetic resonance angiography, head; without contrast material(s), followed by contrast material(s) and further sequences
70548	Magnetic resonance angiography, neck; with contrast material(s)
70549	Magnetic resonance angiography, neck; without contrast material(s), followed by contrast material(s) and further sequences

Screening and initial diagnosis

- Screening for Familial Syndromes is medically necessary in individuals with a positive family history (1st degree relative with dissection/TAA) but no known genetic

syndrome/mutation, otherwise known as Suspected Familial Aneurysm Syndrome as follows:

- ECHO (CPT® 93306, CPT® 93307, or CPT® 93308) and chest x-ray for all First-degree relatives (parents, siblings, children) of individuals with TAA and/or dissection.
- Any imaging listed in the **Table of Thoracic Aorta Imaging Options** is medically necessary if these studies identify a TAA or are equivocal or do not visualize the ascending or descending aorta adequately.
- Studies can be repeated at 2 year intervals if prior results are negative
- Initial imaging for individuals with documented SCAD/fibromuscular dysplasia/Marfan/Loeys-Dietz/Ehlers-Danlos type IV is medically necessary as follows:
 - On initial diagnosis of Ehlers-Danlos, Loeys-Dietz, Marfan, SCAD, or suspicion of fibromuscular dysplasia, full vascular imaging from head to pelvis with:
 - CTA or MRA Head (and/or MRA Neck or CTA Head and Neck or CTA Head or CTA Neck
 - CTA or MRA Chest or CT Chest with contrast
 - CTA Abdomen/Pelvis or MRA Abdomen/Pelvis or (
 - If there are no identified aneurysms or dissections, repeat imaging can be obtained at two-year intervals

Surveillance

Surveillance imaging

- If an aneurysm is identified in individuals with fibromuscular dysplasia, then the aneurysm can be surveilled per the typical time-frame as described in **Thoracic Aortic Aneurysm (TAA) (PVD-6.2)**, **Abdominal Aortic Aneurysm (AAA) (PVD-6.3)**, **Iliac Artery Aneurysm (IAA) (PVD-6.4)**, and **Visceral Artery Aneurysm (PVD-6.5)**.
- Follow-up of aneurysms in individuals with documented SCAD/Marfan/Loeys-Dietz/Ehlers-Danlos type IV
 - Imaging is medically necessary every 6 months once an aneurysm has been identified until a decision has been made to repair.
 - Intracranial aneurysm – CTA or MRA Head (
 - Aneurysm of a cervical artery – Carotid duplex or CTA or MRA neck if unable to fully visualize with carotid duplex
 - Thoracic aorta – CTA Chest or CT Chest with contrast or without , MRA chest
 - Abdominal aneurysm – Abdominal duplex (CPT® 93975/93976/93978/93979/76770/76775)
 - Visceral aneurysm – These can be difficult to visualize on duplex. If not visible on duplex, can obtain a CTA or MRA Abdomen and Pelvis.

Background and Supporting Information

Fibromuscular dysplasia and spontaneous coronary artery dissection is diagnosed radiographically. Loeys-Dietz, Marfan, Ehlers-Danlos type IV are diagnosed with genetic testing.

Evidence Discussion

Screening for Vascular Related Genetic Connective Tissue Disorders

Generally, routine screening for peripheral arterial disease in asymptomatic patients is not cost-effective and has not been shown to improve patient outcomes. There are some familial and genetic conditions that may predispose individuals to aneurysmal disease and dissection. In these cases, surveillance imaging has been shown to improve early detection and intervention when indicated. Conditions that may have an elevated risk for vascular disease include:

- Familial Aneurysm Syndromes
- Fibromuscular Dysplasia
- Spontaneous Coronary Artery Dissection (SCAD)
- Ehlers-Danlos
- Marfan
- Loeys-Dietz

In the case of aneurysms detected in patients with SCAD, Marfan, Loeys-Dietz and Ehlers-Danlos Type IV syndromes, a more frequent surveillance pattern along with additional anatomic region imaging may be indicated as these syndromes demonstrate a higher incidence of aneurysm development and degeneration.^{4,5} Intervention recommendations follow general guidelines for thoracic aortic, abdominal aortic and visceral artery aneurysms once detected.

While duplex imaging remains an effective modality for abdominal aortic surveillance, these conditions often involve the thoracic aorta as well as cerebrovascular and visceral vessel abnormalities that may be technically limited with this approach. Due to the high incidence of aneurysm development in multiple anatomic locations, CT/MR imaging is recommended for surveillance in this population for cases with indeterminate ultrasound imaging.

Screening for TAA with bicuspid aortic valves (PVD-2.3)

Table of Thoracic Aorta Imaging Options

CPT®	Description
71250	Computed tomography, thorax, diagnostic; without contrast material
71260	Computed tomography, thorax, diagnostic; with contrast material(s)
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s), including noncontrast images, if performed, and image postprocessing
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)
93306	Transthoracic echocardiogram

Indications

Screening

- Screening is medically necessary in individuals with bicuspid aortic valve:
 - Screening, any requested imaging from the **Table of Thoracic Aorta Imaging Options** and/or ECHO (CPT® 93306, CPT® 93307, or CPT® 93308).
 - There is no evidence-based data to support screening relatives of individuals with bicuspid aortic valve for TAA except with echocardiogram.
 - Follow-up per TAA Follow-up guidelines in **Thoracic Aortic Aneurysm (TAA) (PVD-6.2)**

Surveillance

If no dilatation of the aortic root or ascending thoracic aorta is found, there is no evidence-based data to support the medical necessity of continued surveillance imaging

Evidence Discussion

Screening for TAA with Bicuspid Aortic Valves

There is an association between bicuspid aortic valve and thoracic aneurysm development. Individuals diagnosed with this condition should undergo screening and follow standard surveillance patterns using CT/MR of the chest as well as echocardiography should a thoracic aortic aneurysm be detected. The addition of cardiac-specific CT/MR has not shown benefit in these cases as the pathology is usually noted within the aorta. If negative for bicuspid valve pathology, additional surveillance imaging is not been supported.

Screening for Vascular Related Disorders in ACTA2 Mutations (PVD 2.4)

Screening for Vascular Related Disorders in Multisystemic Smooth Muscle Syndrome (MSMS)/Smooth Muscle Dysfunction Syndrome (SMDS)/ACTA2 Mutations

Initial imaging

Upon initial genetic confirmation, all of the following studies are medically necessary:

- Transthoracic echocardiogram (TTE)
- MRA Chest or CTA Chest and CT Chest with contrast
- MRA Abdomen and Pelvis (CPT® 74185 and 72198) or CTA Abdomen and Pelvis (CPT® 74174)
- MRI Perfusion study Brain CPT® 70553
- MRA Head and Neck (CPT® 70544 or 70545 AND 70548)
- Ultrasound Upper extremity(ies) (CPT® 93930 or 93931) or CTA Upper extremity (CPT® 73206) or MRA Upper extremity (CPT® 73225)

Repeat testing

Repeat testing with any of the studies listed under initial imaging is medically necessary when there is documentation of new signs or symptoms.

Surveillance imaging

Surveillance imaging with any of the studies listed in initial imaging is medically necessary according to the following:

- Transthoracic echocardiogram repeat every 6 months
- Chest imaging can be repeated every 12 months starting at age 10
- Abdomen and pelvis imaging can be repeated every 12 months starting age 10
- Upper extremity imaging can be repeated every 12 months starting age 10
- MRI perfusion study Brain see **Dysfunction Syndrome (SMDS)/ACTA2 Mutations (PEDHD-12.8)**
- MRA Head and Neck see **Dysfunction Syndrome (SMDS)/ACTA2 Mutations (PEDHD-12.8)**

Background and Supporting Information

Smooth Muscle Dysfunction Syndrome presents as congenital mydriasis, a patent ductus arteriosus (PDA), pulmonary arterial hypertension (PAH) during infancy. Patients go on to developed aortic, peripheral arterial, and cerebrovascular disorders in childhood.

- Caused by heterozygous mutation of ACTA2. P.Arg179His
- Cases mostly due to de novo mutations, so imaging screening based on family history without genetic confirmation is not supported.
- Because radiation is a known risk factor for moyamoya disease. MRI/MRA Head is recommended instead of Computed Tomography (CT)/CTA

Evidence Discussion

Screening for Vascular Related Disorders in Multisystemic Smooth Muscle Syndrome (MSMS)/Smooth Muscle Dysfunction Syndrome (SMDS)/ACTA2 Mutations

Multisystemic Smooth Muscle Syndrome [MSMS], Smooth Muscle Dysfunction Syndrome [SMDS] and ACATA2 mutations have a high incidence of aneurysm development early in life and should undergo screening and routine surveillance after genetic confirmation. To minimize radiation exposure in this pediatric population, MR and ultrasound imaging are recommended when possible.

References

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1. Andras A, Ferket B. Screening for peripheral arterial disease. *Cochrane Database Syst Rev*. 2014; (4):CD010835. Published 2014 Apr 7. doi:10.1002/14651858.CD010835.pub2
2. Firnhaber JM, Powell CS. Lower Extremity Peripheral Artery Disease: Diagnosis and Treatment [published correction appears in *Am Fam Physician*. 2019 Jul 15;100(2):74]. *Am Fam Physician*. 2019;99(6):362-369
3. US Preventive Services Task Force, Curry SJ, Krist AH, et al. Screening for Peripheral Artery Disease and Cardiovascular Disease Risk Assessment with the Ankle-Brachial Index:US Preventive Services Task Force Recommendation Statement. *JAMA*. 2018;320(2):177. doi:10.1001/jama.2018.8357.
4. Schoenhoff F, Schmidli J, Czerny M, Carrel TP. Management of aortic aneurysms in patients with connective tissue disease. *J Cardiovasc Surg (Torino)*. 2013;54(1 Suppl 1):125-134.
5. Andras A, Ferket B. Screening for peripheral arterial disease. *Cochrane Database Syst Rev*. 2014; (4):CD010835. Published 2014 Apr 7. doi:10.1002/14651858.CD010835.pub2.
6. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM guidelines for the diagnosis and management of patients with thoracic aortic disease. *J Am Coll Cardiol*. 2010; 55: e27-e129.
7. Hayes SN, Kim ES, Saw J, et al. Spontaneous Coronary Artery Dissection: Current State of the Science: A Scientific Statement from the American Heart Association. *Circulation*. 2018;137(19). doi:10.1161/cir.0000000000000564.
8. MacCarrick G, Black J, Bowdin S, et al. Loeys–Dietz syndrome: a primer for diagnosis and management. *Genet Med* (2014).16:576–587 doi:10.1038/gim.2014.11.
9. Gornik HL, Persu A, Adlam D, et al. First International Consensus on the diagnosis and management of fibromuscular dysplasia [published correction appears in *Vasc Med*. 2019 Oct;24(5):475. *Vasc Med*. 2019;24(2):164-189. doi:10.1177/1358863X18821816.
10. Persu A, Niepen PVD, Touzé E, et al. Revisiting Fibromuscular Dysplasia. *Hypertension*. 2016;68(4):832-839. doi:10.1161/hypertensionaha.116.07543.
11. Olin JW, Gornik HL, Bacharach JM, et al. Fibromuscular Dysplasia: State of the Science and Critical Unanswered Questions. *Circulation*. 2014;129(9):1048-1078. doi:10.1161/01.cir.0000442577.96802.8c.
12. Demo E, Rigelsky C, Rideout AL, et al. Genetics and Precision Medicine: Heritable Thoracic Aortic Disease. *Med Clin North Am*. 2019;103(6):1005-1019. doi:10.1016/j.mcna.2019.08.001.
13. Regalado ES, Mellor-Crummey L, De Backer J, et al. Clinical history and management recommendations of the smooth muscle dysfunction syndrome due to ACTA2 arginine 179 alterations. *Genet Med*. 2018;20(10):1206-1215. doi:10.1038/gim.2017.245.
14. Isselbacher EM, Preventza O, Hamilton Black J III, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2022;80(24):e223-e393. doi:10.1016/j.jacc.2022.08.750.

Cerebrovascular Imaging

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Cerebrovascular and Carotid Disease - Initial Imaging (PVD-3.1)

PVD.CV.0003.1.A

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Description	CPT®
70471	Computed tomographic angiography (CTA), head and neck, with contrast material(s), including noncontrast images, when performed, and image postprocessing
70496	Computed tomographic angiography, head, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70498	Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70546	Magnetic resonance angiography, head; without contrast material(s), followed by contrast material(s) and further sequences
70547	Magnetic resonance angiography, neck; without contrast material(s)
70548	Magnetic resonance angiography, neck; with contrast material(s)
70549	Magnetic resonance angiography, neck; without contrast material(s), followed by contrast material(s) and further sequences
70544	Magnetic resonance angiography, head; without contrast material(s)
70545	Magnetic resonance angiography, head; with contrast material(s)

- Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) is medically necessary to evaluate possible carotid artery disease, prior to considering advanced imaging, when ANY of the following apply:
 - Known or suspected retinal arterial emboli or Hollenhorst plaque
 - Pulsatile neck masses
 - Carotid or cervical bruit
 - Abnormal findings on physical exam of the carotid arteries (e.g., absent carotid pulses)
 - Preoperative evaluation of individuals with evidence of severe diffuse atherosclerosis, scheduled for major cardiovascular surgical procedures
 - Preoperative evaluation of individuals prior to elective cardiovascular surgery in individuals 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 for additional imaging see **Upper Extremity PVD – Imaging (PVD-4.1)**
- Blunt neck trauma in the absence of focal neurological symptoms
- Neurologic complaints after chiropractic neck manipulation
- Vasculitis potentially involving carotid arteries, such as Takayasu's arteritis and fibromuscular dysplasia (FMD)
- Remote history of stroke or TIA (Greater than one month).
- CTA or MRA Neck is medically necessary to evaluate suspected internal carotid artery dissection, in individuals with **any** of the following mechanisms of injury or risk factors for arterial dissection:
 - Chiropractic manipulation of neck
 - Whiplash injury
 - Fibromuscular dysplasia/Marfan
 - Stroke in the young (age ≤50)
- CTA or MRA Neck is medically necessary to evaluate 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
 - MRA or CTA of **both** Neck and Head are required to visualize the entire vertebral-basilar system for evaluation of posterior circulation disease.
 - 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 **Head Trauma (HD-13.1)** in the Head Imaging Guidelines
 - Surveillance Imaging

- Interval determined by neurosurgeon or neurologist or any provider in consultation with a neurologist or neurosurgeon.
- Carotid ultrasound screening in asymptomatic individuals due only to risk factors is **not** indicated.
- Repeat imaging of the cervical vessels (regardless of when the previous carotid imaging was performed) is medically necessary for new signs and symptoms consistent with carotid artery disease (e.g., TIA, amaurosis fugax, change in nature of a carotid bruit) using one of the following:
 - Duplex ultrasound (CPT® 93880 bilateral study or CPT® 93882 unilateral study)
 - MRA Neck with contrast or without and with contrast
 - CTA Neck

Evidence Discussion

Cerebrovascular and Carotid Disease- Initial Imaging

Indications for carotid artery imaging are suspicion for carotid stenosis, aneurysm, dissection or vasculitis. The signs and symptoms generally accepted for carotid imaging are listed in the guideline.

Standard first line imaging is the Duplex ultrasound (DU). This study obtains gray-scale pictures, as well as velocity and direction of blood flow in the vessels. The combination of B mode and Doppler techniques allows for detection of all of the above mentioned pathologies. DU has limitations in evaluation of the vertebral artery origins as well as extent of carotid dissection. Therefore, if there is concern for either vertebrobasilar insufficiency or carotid dissection, CT angiography (CTA) or MR angiography (MRA) is supported.

However, DU has become the first-line imaging modality for identifying patients with internal carotid artery stenosis. In part, this is because consensus ultrasound criteria have been developed to standardize carotid ultrasound examinations and categorize carotid artery stenosis severity. The rationale for use of DU is its low cost, availability, and high sensitivity and specificity. It avoids exposure to radiation and intravenous contrast agents as well.

CTA and MRA have more limited use for screening due to the risks associated with them. CTA risks include intravenous contrast and radiation exposure. Contrast complications include allergy and contrast induced nephropathy. MRA risk is related to use of gadolinium contrast, which confers the risk of nephrogenic systemic fibrosis in patients with renal insufficiency. MRA also is contraindicated in patients with metallic implants. Additionally, both CTA and MRA are not appropriate for screening purposes, due to their considerable costs.

It is well established that for carotid stenosis 70-99% in an asymptomatic patient, or 50-99% stenosis in a symptomatic patient, there is a role for carotid intervention for stroke prevention. Once duplex identifies this degree of stenosis, CTA/MRA is medically necessary for pre-procedure planning. Additionally, CTA/MRA is medically necessary for patients undergoing evaluation for carotid artery stenting (CAS) as delineation of relevant anatomy is necessary for procedural success.

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

PVD.CV.0003.2.A

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- Surveillance imaging is medically necessary once a year for individuals with fibromuscular dysplasia of the extracranial internal 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

Primary parameters			Additional Parameters	
% Stenosis	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 lesion	Not applicable	Not applicable

CPT®	Description
70471	Computed tomographic angiography (CTA), head and neck, with contrast material(s), including noncontrast images, when performed, and image postprocessing

CPT®	Description
70496	Computed tomographic angiography, head, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70498	Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing
93880	Duplex Ultrasound, bilateral
93882	Duplex Ultrasound, unilateral
70544	Magnetic resonance angiography, head; without contrast material(s)
70545	Magnetic resonance angiography, head; with contrast material(s)
70546	Magnetic resonance angiography, head; without contrast material(s), followed by contrast material(s) and further sequences
70547	Magnetic resonance angiography, neck; without contrast material(s)
70548	Magnetic resonance angiography, neck; with contrast material(s)
70549	Magnetic resonance angiography, neck; without contrast material(s), followed by contrast material(s) and further sequences

- If normal study, no routine follow-up imaging is medically necessary
- If <50% internal carotid stenosis
 - Duplex ultrasound is medically necessary every **two** years
- Between 50% and 70% internal carotid stenosis
 - Duplex ultrasound is medically necessary annually.
 - A repeat duplex is medically necessary in three to six months until stability is reached when **one** of the following occurs:
 - Change in the character of the bruit
 - Duplex demonstrates rapid progression, including:
 - Doubling of peak systolic velocities in the internal carotid arteries
 - Increase of the ICA/CCA ratio
 - Heavy calcification in the internal carotid arteries
 - Thrombus in the internal carotid arteries
 - Ulcerated plaque in the internal carotid arteries
 - Echolucent plaque in the internal carotid arteries
 - A one-time CTA Neck (CPT® 70498) or MRA Neck is medically necessary to confirm degree of stenosis in individuals with ulcerated plaque or heavy calcification of the internal carotid artery seen on duplex.
- Internal carotid stenosis ≥70% or ICA/CCA ratio >4

- Duplex ultrasound or MRA Neck with contrast or CTA Neck is medically necessary at the following intervals:
 - Every 6 months until one of the following occurs:
 - Intervention is performed
 - Decision is made to not intervene
- MRA Neck with contrast or CTA Neck is medically necessary 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.
 - If carotid stent is planned MRA Head or CTA Head can be added.

Evidence Discussion

Surveillance Imaging with NO History of Carotid Surgery or Intervention

DU is established as the primary diagnostic test for carotid surveillance imaging. Consensus statements have established the appropriate time intervals for repeat imaging. If however, there are new symptoms or physical findings, repeat duplex imaging is supported, regardless of time interval. If at any time there is $>70\%$ re-stenosis, CTA or MRA is indicated.

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

PVD.CV.0003.3.A

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- Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) is medically necessary 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 internal 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) or MRA Neck (CPT® 70548) is medically necessary 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 internal carotid stenosis is seen on duplex at any time post-procedure, then
 - CTA Neck (CPT® 70498) or MRA Neck (CPT® 70548) is medically necessary for further evaluation and at six-month intervals until decision is made to re-intervene.

Background and Supporting Information

- MRA Neck (CPT® 70548) or CTA Neck (CPT® 70498) may be medically necessary if ultrasound is technically difficult or confirmation of the degree of stenosis on ultrasound is needed because an interventional procedure is being considered

Evidence Discussion

Surveillance Imaging with WITH History of Carotid Surgery or Intervention

As described in PVD 3.1, Duplex Ultrasound is established as the primary diagnostic test for carotid surveillance imaging. Consensus statements have established the appropriate time intervals for repeat imaging. If however, there are new symptoms or physical findings, repeat duplex imaging is supported, regardless of time interval. If at any time there is $>70\%$ re-stenosis, CTA or MRA is indicated.

References

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1. Grant EG, Benson CB, et al. Carotid artery stenosis: gray-scale and Doppler US diagnosis--Society of Radiologists in Ultrasound Consensus Conference. *Radiology*. 2003 Nov;229(2):340-6.
2. Wardlaw JM, Chappell FM, Stevenson M, et al. Accurate, practical and cost-effective assessment of carotid stenosis in the UK. *Health Technol Assess*. 2006;10(30).
3. AbuRahma AF, Efthymios D, et al. Society for Vascular Surgery clinical practice guidelines for management of extracranial cerebrovascular disease. *J Vasc Surg*. 2022 Jan;75(1S):4S-22S.
4. Ricotta J, AbuRahma A, Ascher E, et al. Updated Society for Vascular Surgery guidelines for management of extracranial carotid disease. *J Vasc Surg*. 2011;54(3):e1-e31.
5. AbuRahma AF, Srivastava M, Stone PA, et al. Critical appraisal of the Carotid Duplex Consensus criteria in the diagnosis of carotid artery stenosis. *J Vasc Surg*. 2011;53:53-60

Aortic Imaging

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Aortic Disorders General Information (PVD-6.1)

PVD.AD.0006.1.A

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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 medically necessary to evaluate for stenosis of these vessels rather than ultrasound (Exception: Duplex ultrasound is medically necessary to rule out testicular or ovarian torsion or to evaluate an abdominal bruit or a pulsatile abdominal mass).
- Mesenteric Ischemia
 - See **Mesenteric/Colonic Ischemia (AB-6)** in the Abdomen Imaging Guidelines.

References

PVD.AD.0006.1.A

v2.0.2026

1. Bonci G, Steigner ML, et al. ACR Appropriateness Criteria® Thoracic Aorta Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2017;14(11S):S570-S583. doi:10.1016/j.jacr.2017.08.042.
2. Kalva SP, Dill KE, et al. ACR Appropriateness Criteria® nontraumatic aortic disease. *J Thorac Imaging*. 2014;29(5):W85-W88. doi:10.1097/RTI.000000000000107.
3. Albornoz G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82(4):1400-1405. doi:10.1016/j.athoracsur.2006.04.098.
4. Anderson JL, Halperin JL, Albert N, et al. Management of Patients with Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations). *J Am Coll Cardiol*. 2013;61(14):1555-1570. doi:10.1016/j.jacc.2013.01.004.
5. Bennett SJ, Dill KE, Hanley M, et al. ACR Appropriateness Criteria® Suspected Thoracic Aortic Aneurysm. *J Am Coll Radiol*. 2018;15(5). doi:10.1016/j.jacr.2018.03.031.
6. Chaikof EL, Dalman RL, Eskandari MK, et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg*. 2018;67(1). doi:10.1016/j.jvs.2017.10.044.
7. Elefteriades JA. Natural history of thoracic aortic aneurysms: indications for surgery, and surgical versus nonsurgical risks. *Ann Thorac Surg* 2002; 74: S1877-S1880.
8. Erben Y, Brownstein AJ, Rajaei S. Natural History of and Management of Splanchnic Artery Aneurysms in a Single Tertiary Referral Center. *J Vasc Surg* 2018 Oct; 68(4): 1079-1087.
9. Chaer RA, Abularrage CJ, Coleman DM, et al. The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms. *J Vasc Surg*. 2020;72(1S):3S-39S. doi:10.1016/j.jvs.2020.01.039.
10. Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® Acute Chest Pain-- Suspected Aortic Dissection. *American College of Radiology (ACR)*; 2014.
11. Collard M, Sutphin PD, Kalva SP, et al. Expert Panel on Vascular Imaging. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm Follow-up (without Repair). *J Am Coll Radiol*. 2019;16(5S):S2-S6. doi:10.1016/j.jacr.2019.02.005.
12. Corey MR, Ergul EA, Cambria RP. The Natural History of Splanchnic Aneurysms and Outcome after Operative Intervention. *J Vasc Surg*. 2016 April 63 (4):949-57.
13. Dejaco C, Ramiro S, Duftner C, et al. EULAR recommendations for the use of imaging in large vessel vasculitis in clinical practice. *Annals of the Rheumatic Diseases*. 2018;77(5):636-643. doi:10.1136/annrheumdis-2017-212649.
14. Diercks D, Promes S, Schuur J, et al. American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. *Ann Emerg Med*. 2015 Jan; 65 (1):32-42.
15. Francois CJ, Skulborstad EP, Majdalany BS, et al. Expert Panels on Vascular Imaging and Interventional Radiology. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm: Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2018;15(5S):S2-S12. doi:10.1016/j.jacr.2018.03.008.
16. Harvin HJ, Verma N, Nikolaidis P, et al. ACR Appropriateness Criteria® Renovascular Hypertension. *J Am Coll Radiol*. 2017;14(11). doi:10.1016/j.jacr.2017.08.040.
17. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine [published correction appears in *J Am Coll Cardiol*. 2013 Sep 10;62(11):1039-40]. *J Am Coll Cardiol*. 2010;55(14):e27-e129. doi:10.1016/j.jacc.2010.02.015.

18. Kallianos KG, Burris NS. Imaging Thoracic Aortic Aneurysm. *Radiol Clin North Am.* 2020;58(4):721-731. doi:10.1016/j.rcl.2020.02.009.
19. Loren F, Hiratzka MD, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients with Thoracic Aortic Disease. *Circulation* 2010; 121: e266-e369.
20. Masuda Y1, Yamada Z, Morooka N, Watanabe S, Inagaki Y. Prognosis of patients with medically treated aortic dissections. *Circulation.* 1991 Nov;84(5 Suppl):III7-13.
21. Moser M, Setaro JF. Resistant or Difficult-to-Control Hypertension. *New England Journal of Medicine.* 2006;355(4):385-392. doi:10.1056/nejmcp041698.
22. Persu A, Giavarini A, Touzé E, et al. European consensus on the diagnosis and management of fibromuscular dysplasia. *Journal of Hypertension.* 2014;32(7):1367-1378. doi:10.1097/hjh.0000000000000213.
23. Sakamoto I, Sueyoshi E, Hazama S, et al. Endovascular treatment of iliac artery aneurysms. *Radiographics* October 2005;25:S213-S227.
24. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic Accuracy of Transesophageal Echocardiography, Helical Computed Tomography, and Magnetic Resonance Imaging for Suspected Thoracic Aortic Dissection: Systematic Review and Meta-analysis. *Arch Intern Med* 2006; 166 (13): 1350-1356.
25. Alcantara S, Yang CK, Sasson J, et al. The evidence for nonoperative management of visceral artery dissections: a single-center experience. *Ann Vasc Surg.* 2015;29(1):103-108. doi:10.1016/j.avsg.2014.09.004.
26. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *American Journal of Roentgenology.* 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
27. Tadros TM, Klein MD, Shapira OM. Ascending aortic dilatation associated with bicuspid aortic valve. *Circulation* 2009; 119: 880-890.
28. Taimen K, Salomäki SP, Hohenthal U, et al. The Clinical Impact of Using 18F-FDG-PET/CT in the Diagnosis of Suspected Vasculitis: The Effect of Dose and Timing of Glucocorticoid Treatment. *Contrast Media & Molecular Imaging.* 2019;2019:1-8. doi:10.1155/2019/9157637.
29. van Bogerijen GH, Tolenaar JL, Rampoldi V, et al. Predictors of aortic growth in uncomplicated type B aortic dissection. *J Vasc Surg.* 2014 Apr;59(4):1134-43. doi: 10.1016/j.jvs.2014.01.042.
30. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension.* 2018;71(6). doi:10.1161/hyp.0000000000000065.
31. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg.* 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
32. Salim S, Machin M, Patterson BO, Bicknell C. The Management of Penetrating Aortic Ulcer. *Hearts.* 2020;1(1):5-13. doi:10.3390/hearts1010003.
33. Eric M. Isselbacher, MD, Ourania Preventza, MD, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation.* 2022;146:e334–e482. doi: 10.1161/CIR.0000000000001106.
34. Nicolaou G, Ismail M, Cheng D. Thoracic endovascular aortic repair: update on indications and guidelines. *Anesthesiol Clin.* 2013 Jun;31(2):451-78. doi: 10.1016/j.andclin.2013.01.001.
35. Isselbacher EM, Preventza O, Black JH, et al. ACC/AHA Clinical Practice Guideline: 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/ American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation* (2022); 146:e334-e482. DOI: 10.1161/CIR.0000000000001106.
36. Wanhainen A, Van Herzele I, Goncalves FB, et al. Clinical Practice Guideline Document: Editor's Choice – European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg* (2024); 67:192-331.
37. Olukorode JO, Onwuzo CN, Otabor EO, et al. Aortic Size Index Versus Aortic Diameter in the Prediction of Rupture in Women With Abdominal Aortic Aneurysm. *Cureus.* 2024;16(4):e58673. Published 2024 Apr 21. doi:10.7759/cureus.58673.

Thoracic Aortic Aneurysm (TAA)

(PVD-6.2)

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TAA Imaging Indications

Table of Thoracic Aorta Imaging Options

CPT®	Description
71250	Computed tomography, thorax, diagnostic; without contrast material
71260	Computed tomography, thorax, diagnostic; with contrast material(s)
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s), including noncontrast images, if performed, and image postprocessing
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)
93306	Transthoracic echocardiogram

Imaging of the thoracic aorta listed in the table above is considered medically necessary as follows:

- For suspected TAA, any requested imaging from the **Table of Thoracic Aorta Imaging Options** above is medically necessary for the following:
 - Abnormalities identified on chest x-ray (abnormality including widened mediastinum, suspicious calcification) or other imaging studies (fluoroscopy, MRI Spine, etc.) abnormality
- Imaging for known thoracic aortic aneurysm can be chosen from the Table of Thoracic Aorta Imaging Options above
- For screening of TAA, see **Screening for Vascular related genetic connective tissue Disorders (PVD-2.2)**
- For TAA associated with a dissection see **Aortic and Arterial Dissection and Other Aortic Conditions (PVD-6.7)**
- 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 thoracic endovascular aortic repair (TEVAR) of thoracic aorta disease either of the following is medically necessary:
 - CTA Chest, and/or Abdomen, and/or Pelvis (CPT® 71275, CPT® 74175, CPT® 72191, CPT® 74174)
 - MRA Chest, and/or Abdomen, and/or Pelvis (CPT® 71555, CPT® 74185, CPT® 72198)
- For follow-up of ascending aortic aneurysms, any requested imaging from the Table of Thoracic Aorta Imaging Options above is medically necessary for the following:
 - For individuals with ascending aortic aneurysms <4.0 cm in diameter
 - Repeat imaging annually
 - For individuals with ascending aortic aneurysms ≥4.0 cm
 - Repeat imaging 6 months.
 - TEE is medically necessary **only** when imaging with CT or MR is contraindicated
- 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.
 - 3.5cm 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.
 - TEE is medically necessary **only** when imaging with CT or MR is contraindicated
- Screening in the presence of other aortic aneurysms.
 - In an individual with a known TAA, screening for AAA is medically necessary with an abdominal duplex. See **Abdominal Aortic Aneurysm (AAA) (PVD-6.3)**.
 - In an individual with a known AAA, screening for TAA is not supported by sufficient evidence and is not medically necessary.
- Screening in individuals with bicuspid aortic valve or familial TAA syndromes. See **Screening for TAA with bicuspid aortic valves (PVD-2.3)**. See **Screening for Vascular related genetic connective tissue Disorders (PVD-2.2)**

Evidence Discussion

Thoracic aortic aneurysms may enlarge over time. Once an aneurysm meets specific size criteria, its risk of rupture as well as the high mortality risk associated with rupture exceeds the risk of surgical intervention. Operative treatment is reasonable for asymptomatic individuals when the diameter of the arch exceeds 5.5 cm. Surveillance recommendations for ascending and descending thoracic aortic aneurysms have been addressed in several major studies.

The location of the thoracic aorta within the chest cavity limits the ability of noninvasive ultrasound to monitor aneurysm size. American College of Radiology recommendations

are for CT/MR imaging to monitor the thoracic aorta diameter to determine when surgical intervention is needed. Additionally, the American Heart Association also supports the use of transthoracic echocardiography to monitor the thoracic aortic diameter. In select patients with a difficult echocardiographic imaging window, transesophageal echocardiography is an alternative.

Thoracic aortic aneurysms may be isolated; however, they may extend below the diaphragm to include portions of the abdominal aorta. Abdominal aortic aneurysms should be followed according to their designated guidelines but may be included with thoracic imaging for certain planned interventions. Certain genetic and familial aneurysm syndromes may have a higher risk of TAA incidence and may warrant additional imaging for detection and surveillance. Additionally, most surgical approaches for thoracic aortic repair require CT/MR imaging for preoperative planning.

References

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1. Upchurch GR, Escobar GA, Azizzadeh A, et al. Society for Vascular Surgery clinical practice guidelines of thoracic endovascular aortic repair for descending thoracic aortic aneurysms. *J Vasc Surg*. 2021;73(1). doi:10.1016/j.jvs.2020.05.076.
2. Nicolaou G, Ismail M, Cheng D. Thoracic endovascular aortic repair: update on indications and guidelines. *Anesthesiol Clin*. 2013 Jun;31(2):451-78. doi: 10.1016/j.anclin.2013.01.001.
3. Bonci G, Steigner ML, et al. ACR Appropriateness Criteria® Thoracic Aorta Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2017;14(11S):S570-S583. doi:10.1016/j.jacr.2017.08.042.
4. Kalva SP, Dill KE, et al. ACR Appropriateness Criteria® nontraumatic aortic disease. *J Thorac Imaging*. 2014;29(5):W85-W88. doi:10.1097/RTI.000000000000107.
5. Alborno G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82(4):1400-1405. doi:10.1016/j.athoracsur.2006.04.098.
6. Bennett SJ, Dill KE, Hanley M, et al. ACR Appropriateness Criteria® Suspected Thoracic Aortic Aneurysm. *J Am Coll Radiol*. 2018;15(5). doi:10.1016/j.jacr.2018.03.031.
7. Elefteriades JA. Natural history of thoracic aortic aneurysms: indications for surgery, and surgical versus nonsurgical risks. *Ann Thorac Surg* 2002; 74: S1877-S1880.
8. Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® Acute Chest Pain -- Suspected Aortic Dissection. *American College of Radiology (ACR)*; 2014.
9. Diercks D, Promes S, Schuur J, et al. American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. *Ann Emerg Med*. 2015 Jan; 65 (1) :32-42.
10. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine [published correction appears in *J Am Coll Cardiol*. 2013 Sep 10;62(11):1039-40]. *J Am Coll Cardiol*. 2010;55(14):e27-e129. doi:10.1016/j.jacc.2010.02.015.
11. Kallianos KG, Burris NS. Imaging Thoracic Aortic Aneurysm. *Radiol Clin North Am*. 2020;58(4):721-731. doi:10.1016/j.rcl.2020.02.009.
12. Loren F, Hiratzka MD, et al, 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients with Thoracic Aortic Disease. *Circulation* 2010; 121: e266-e369.
13. Masuda Y1, Yamada Z, Morooka N, Watanabe S, Inagaki Y. Prognosis of patients with medically treated aortic dissections. *Circulation*. 1991 Nov;84(5 Suppl):III7-13.
14. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic Accuracy of Transesophageal Echocardiography, Helical Computed Tomography, and Magnetic Resonance Imaging for Suspected Thoracic Aortic Dissection: Systematic Review and Meta-analysis. *Arch Intern Med* 2006; 166 (13): 1350-1356.
15. Tadros TM, Klein MD, Shapira OM. Ascending aortic dilatation associated with bicuspid aortic valve. *Circulation* 2009; 119: 880-890.
16. van Bogaerjen GH, Tolenaar JL, Rampoldi V, et al. Predictors of aortic growth in uncomplicated type B aortic dissection. *J Vasc Surg*. 2014 Apr;59(4):1134-43. doi: 10.1016/j.jvs.2014.01.042.
17. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg* . 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
18. Eric M. Isselbacher, MD, Ourania Preventza, MD, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of

Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation*. 2022;146:e334–e482. doi: 10.1161/CIR.0000000000001106.

Abdominal Aortic Aneurysm (AAA) (PVD-6.3)

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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

Screen for AAA

Ultrasound abdominal aorta with any of the studies from the table of Duplex ultrasound for visceral vascular studies is medically necessary to screen for AAA as follows:

- 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.
- AAA screening is considered medically necessary with ultrasound (CPT® 76706, 93975, 93976, 93978, or 93979) when there is a documented thoracic aortic aneurysm

- There is insufficient evidence to support the use of ultrasound or advanced imaging to screen for a thoracic aortic aneurysm in individuals with known abdominal aortic aneurysm.

Survey known AAA

Ultrasound abdominal aorta with any of the studies from the table of duplex ultrasound for visceral vascular studies is medically necessary to survey known AAA as follows:

- Surveillance of AAA with duplex ultrasound (CPT® 76706, 93975, 93976, 93978, 93979)
 - >2.5 cm but <3.0 cm: 5 years
 - 3.0 cm to 3.9 cm: 3 year intervals
 - 4.0 cm to 4.9 cm in a male: every 12 months OR 4.0-4.4cm in a female: every 12 months
 - ≥5.0 cm in a male OR ≥4.5cm in a female: every 6 months
 - >5.4 cm (or aortic diameter has increased in size by 0.5 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 is considered medically necessary as follows:
 - CT Abdomen and Pelvis with contrast (CPT® 74177), CT Abdomen and Pelvis without contrast (CPT® 74176), or CTA Abdomen and Pelvis (CPT® 74174), or CTA Abdomen (CPT® 74175), or CTA Pelvis (CPT® 72191).
 - Suspected or known AAA 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
- A one-time CTA Chest (CPT® 71275) or CT Chest with contrast (CPT® 71260) is considered medically necessary prior to planned treatment of AAA.

Evaluate a pulsatile abdominal mass

Ultrasound abdominal aorta with any of the studies from the table of Duplex ultrasound for visceral vascular studies is medically necessary to evaluate a pulsatile abdominal mass:

- Additional Imaging with CT Abdomen and Pelvis with contrast (CPT® 74177), CT Abdomen and Pelvis without contrast (CPT® 74176), or CTA Abdomen and Pelvis (CPT® 74174), or CTA Abdomen (CPT® 74175), or CTA Pelvis (CPT® 72191) for either:
 - Suspected or known AAA 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

Obese Individual (BMI ≥35)

- CT Abdomen and Pelvis with contrast (CPT® 74177) or without contrast (CPT® 74176) is medically necessary in an obese individual in place of US, or after an uninterpretable US, using the same timeline as a non-obese individual. Ultrasound abdominal aorta should ideally first be attempted to see if the image quality is adequate.

Evidence Discussion

Abdominal Aortic Aneurysm (AAA) Abdominal aortic aneurysmal disease is usually asymptomatic and discovered incidentally. Symptomatic aortic aneurysms are at high risk for rupture with a significant mortality risk and should be treated emergently with imaging and intervention as indicated. Screening for AAA has some benefit for high risk populations including some long-term tobacco users, individuals with known thoracic or other aneurysms and individuals with certain genetic or familial syndromes. Individuals found to have a pulsatile mass on abdominal exam may also warrant imaging for suspected aneurysmal disease.

For chronic aneurysms, several major studies have been performed with recommendations on surveillance frequency based on rupture risk. Once the rupture risk of an aneurysm meets or exceeds the risk of surgical repair, intervention is recommended. Most repair approaches use endovascular techniques that require preoperative imaging with CT/MR to determine specific anatomic data for appropriate device selection.

The anatomic location of abdominal aortic aneurysms allows ultrasound to be used as a primary imaging modality in most cases for surveillance. Ultrasound uses no radiation or contrast, can be performed in an outpatient setting and is cost-effective. CT/MR imaging is usually reserved for intervention planning or for cases where ultrasound has been found to have technical limitations related to body habitus or other structural issues.

For surgical planning, CT/MR imaging is frequently used to determine anatomic parameters. As many abdominal procedures may require instrument placement within the thoracic aorta, preoperative chest imaging is often a necessary component to surgical planning.²

Time between surveillance US in individuals with non-aneurysmal, but dilated aortic diameters, has been shortened, because there is increasing evidence that a significant portion of these individuals will progress to a AAA diameter that may require repair. In addition, because female patients were found to have a significantly higher risk of

² Wanhainen A, Van Herzele I, Goncalves FB, et al. Clinical Practice Guideline Document: Editor's Choice – European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg* (2024); 67:192-331

rupture, more frequent surveillance imaging is justified at AAA diameter of 4 cm and larger.³

National guidelines support repair of asymptomatic abdominal aortic aneurysm of ≥ 5.5 cm in males and ≥ 5.0 cm in females. Evidence shows sex related variations in aortic size contributing to a higher risk for rupture at a given aortic diameter in females.⁴

³ Wanhainen A, Van Herzele I, Bastos Goncalves F, et al. Editor's Choice-European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg*. 2024;67(2):192-331. doi:10.1016/j.ejvs.2023.11.002

⁴ Olukorode JO, Onwuzo CN, Otabor EO, et al. Aortic Size Index Versus Aortic Diameter in the Prediction of Rupture in Women With Abdominal Aortic Aneurysm. *Cureus*. 2024;16(4):e58673. Published 2024 Apr 21. doi:10.7759/cureus.58673.

References

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v2.0.2026

1. Bonci G, Steigner ML, et al. ACR Appropriateness Criteria® Thoracic Aorta Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2017;14(11S):S570-S583. doi:10.1016/j.jacr.2017.08.042.
2. Kalva SP, Dill KE, et al. ACR Appropriateness Criteria® nontraumatic aortic disease. *J Thorac Imaging*. 2014;29(5):W85-W88. doi:10.1097/RTI.000000000000107.
3. Albornoz G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82(4):1400-1405. doi:10.1016/j.athoracsur.2006.04.098.
4. Anderson JL, Halperin JL, Albert N, et al. Management of Patients with Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations). *J Am Coll Cardiol*. 2013;61(14):1555-1570. doi:10.1016/j.jacc.2013.01.004.
5. Bennett SJ, Dill KE, Hanley M, et al. ACR Appropriateness Criteria® Suspected Thoracic Aortic Aneurysm. *J Am Coll Radiol*. 2018;15(5). doi:10.1016/j.jacr.2018.03.031.
6. Chaikof EL, Dalman RL, Eskandari MK, et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg*. 2018;67(1). doi:10.1016/j.jvs.2017.10.044.
7. Elefteriades JA. Natural history of thoracic aortic aneurysms: indications for surgery, and surgical versus nonsurgical risks. *Ann Thorac Surg* 2002; 74: S1877-S1880.
8. Erben Y, Brownstein AJ, Rajaei S. Natural History of and Management of Splanchnic Artery Aneurysms in a Single Tertiary Referral Center. *J Vasc Surg* 2018 Oct; 68(4): 1079-1087.
9. Chaer RA, Abularrage CJ, Coleman DM, et al. The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms. *J Vasc Surg*. 2020;72(1S):3S-39S. doi:10.1016/j.jvs.2020.01.039.
10. Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® Acute Chest Pain-- Suspected Aortic Dissection. *American College of Radiology (ACR)*; 2014.
11. Collard M, Sutphin PD, Kalva SP, et al. Expert Panel on Vascular Imaging. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm Follow-up (without Repair). *J Am Coll Radiol*. 2019;16(5S):S2-S6. doi:10.1016/j.jacr.2019.02.005.
12. Corey MR, Ergul EA, Cambria RP. The Natural History of Splanchnic Aneurysms and Outcome after Operative Intervention. *J Vasc Surg*. 2016 April 63 (4):949-57.
13. Dejaco C, Ramiro S, Duftner C, et al. EULAR recommendations for the use of imaging in large vessel vasculitis in clinical practice. *Annals of the Rheumatic Diseases*. 2018;77(5):636-643. doi:10.1136/annrheumdis-2017-212649.
14. Diercks D, Promes S, Schuur J, et al. American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. *Ann Emerg Med*. 2015 Jan; 65 (1):32-42.
15. Francois CJ, Skulborstad EP, Majdalany BS, et al. Expert Panels on Vascular Imaging and Interventional Radiology. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm: Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2018;15(5S):S2-S12. doi:10.1016/j.jacr.2018.03.008.
16. Harvin HJ, Verma N, Nikolaidis P, et al. ACR Appropriateness Criteria® Renovascular Hypertension. *J Am Coll Radiol*. 2017;14(11). doi:10.1016/j.jacr.2017.08.040.
17. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine [published correction appears in *J Am Coll Cardiol*. 2013 Sep 10;62(11):1039-40]. *J Am Coll Cardiol*. 2010;55(14):e27-e129. doi:10.1016/j.jacc.2010.02.015.

18. Kallianos KG, Burris NS. Imaging Thoracic Aortic Aneurysm. *Radiol Clin North Am.* 2020;58(4):721-731. doi:10.1016/j.rcl.2020.02.009.
19. Loren F, Hiratzka MD, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients with Thoracic Aortic Disease. *Circulation* 2010; 121: e266-e369.
20. Masuda Y1, Yamada Z, Morooka N, Watanabe S, Inagaki Y. Prognosis of patients with medically treated aortic dissections. *Circulation.* 1991 Nov;84(5 Suppl):III7-13.
21. Moser M, Setaro JF. Resistant or Difficult-to-Control Hypertension. *New England Journal of Medicine.* 2006;355(4):385-392. doi:10.1056/nejmcp041698.
22. Persu A, Giavarini A, Touzé E, et al. European consensus on the diagnosis and management of fibromuscular dysplasia. *Journal of Hypertension.* 2014;32(7):1367-1378. doi:10.1097/hjh.0000000000000213.
23. Sakamoto I, Sueyoshi E, Hazama S, et al. Endovascular treatment of iliac artery aneurysms. *Radiographics* October 2005;25:S213-S227.
24. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic Accuracy of Transesophageal Echocardiography, Helical Computed Tomography, and Magnetic Resonance Imaging for Suspected Thoracic Aortic Dissection: Systematic Review and Meta-analysis. *Arch Intern Med* 2006; 166 (13): 1350-1356.
25. Alcantara S, Yang CK, Sasson J, et al. The evidence for nonoperative management of visceral artery dissections: a single-center experience. *Ann Vasc Surg.* 2015;29(1):103-108. doi:10.1016/j.avsg.2014.09.004.
26. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *American Journal of Roentgenology.* 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
27. Tadros TM, Klein MD, Shapira OM. Ascending aortic dilatation associated with bicuspid aortic valve. *Circulation* 2009; 119: 880-890.
28. Taimen K, Salomäki SP, Hohenthal U, et al. The Clinical Impact of Using 18F-FDG-PET/CT in the Diagnosis of Suspected Vasculitis: The Effect of Dose and Timing of Glucocorticoid Treatment. *Contrast Media & Molecular Imaging.* 2019;2019:1-8. doi:10.1155/2019/9157637.
29. van Bogerijen GH, Tolenaar JL, Rampoldi V, et al. Predictors of aortic growth in uncomplicated type B aortic dissection. *J Vasc Surg.* 2014 Apr;59(4):1134-43. doi: 10.1016/j.jvs.2014.01.042.
30. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension.* 2018;71(6). doi:10.1161/hyp.0000000000000065.
31. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg.* 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
32. Salim S, Machin M, Patterson BO, Bicknell C. The Management of Penetrating Aortic Ulcer. *Hearts.* 2020;1(1):5-13. doi:10.3390/hearts1010003.
33. Eric M. Isselbacher, MD, Ourania Preventza, MD, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation.* 2022;146:e334–e482. doi: 10.1161/CIR.0000000000001106.
34. Nicolaou G, Ismail M, Cheng D. Thoracic endovascular aortic repair: update on indications and guidelines. *Anesthesiol Clin.* 2013 Jun;31(2):451-78. doi: 10.1016/j.andclin.2013.01.001.
35. Isselbacher EM, Preventza O, Black JH, et al. ACC/AHA Clinical Practice Guideline: 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/ American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation* (2022); 146:e334-e482. DOI: 10.1161/CIR.0000000000001106.
36. Wanhainen A, Van Herzele I, Goncalves FB, et al. Clinical Practice Guideline Document: Editor's Choice – European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg* (2024); 67:192-331.
37. Olukorode JO, Onwuzo CN, Otabor EO, et al. Aortic Size Index Versus Aortic Diameter in the Prediction of Rupture in Women With Abdominal Aortic Aneurysm. *Cureus.* 2024;16(4):e58673. Published 2024 Apr 21. doi:10.7759/cureus.58673.

Dissection

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Aortic and Arterial Dissection and Other Aortic Conditions (PVD-6.7)

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Coding

CPT®	Imaging for Aortic conditions
93980	Carotid duplex
70471	Computed tomographic angiography (CTA), head and neck, with contrast material(s), including noncontrast images, when performed, and image postprocessing
70496	Computed tomographic angiography, head, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70498	Computed tomographic angiography, neck, with contrast material(s), including noncontrast images, if performed, and image postprocessing
70544	Magnetic resonance angiography, head; without contrast material(s)
70545	Magnetic resonance angiography, head; with contrast material(s)
70546	Magnetic resonance angiography, head; without contrast material(s), followed by contrast material(s) and further sequences
70547	Magnetic resonance angiography, neck; without contrast material(s)
70548	Magnetic resonance angiography, neck; with contrast material(s)
70549	Magnetic resonance angiography, neck; without contrast material(s), followed by contrast material(s) and further sequences
71260	Computed tomography, thorax, diagnostic; with contrast material(s)
71270	Computed tomography, thorax, diagnostic; without contrast material, followed by contrast material(s) and further sections
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s), including noncontrast images, if performed, and image postprocessing
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)

CPT®	Imaging for Aortic conditions
74160	Computed tomography, abdomen; with contrast material(s)
74170	Computed tomography, abdomen; without contrast material, followed by contrast material(s) and further sections
74178	Computed tomography, abdomen and pelvis; without contrast material in one or both body regions, followed by contrast material(s) and further sections in one or both body regions
72193	Computed tomography, pelvis; with contrast material(s)
72194	Computed tomography, pelvis; without contrast material, followed by contrast material(s) and further sections
74174	Computed tomographic angiography, abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74175	Computed tomographic angiography, abdomen, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74185	Magnetic resonance angiography, abdomen, with or without contrast material(s)
72191	Computed tomographic angiography, pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
72198	Magnetic resonance angiography, pelvis, with or without contrast material(s)

CTA or MRA of the entire aorta (including arch branches) and extending through the femoral arteries is medically necessary for suspected acute aortic dissection with any of the following study combinations:

- CT Chest **and/or one of the following:**
 - CT Abdomen with or without and with contrast
 - CT Pelvis with or without and with contrast
 - CT Abdomen and Pelvis with or without and with contrast
- CTA Chest and/or **one** of the following:
 - CTA Abdomen
 - CTA Pelvis
 - CTA Abdomen and Pelvis

- MRA Chest and/or Abdomen and/or Pelvis

Surveillance

Any aortic dissection, regardless of treatment modality (medical or surgical), imaging of the chest, abdomen and pelvis (according to the Imaging for Aortic Conditions table above) is medically necessary at the following intervals:

- 1 month
- 6 months
- 12 months
- If stable, annually

In individuals with Marfan syndrome/Loeys-Dietz/Ehlers-Danlos and an aortic dissection, post-dissection imaging of the chest, abdomen and pelvis (according to the Imaging for Aortic Conditions table above) is medically necessary as follows:

- 1 month
- 3 months
- 6 months
- 12 months
- yearly thereafter

If the dissection extends into the head or neck, any of the following imaging is also medically necessary at the same intervals:

- MRA Head and/or MRA Neck or
- Carotid duplex CPT or
- CTA Neck or
- CTA Head or
- CTA Head and Neck

Imaging of asymptomatic and/or incidentally found arterial dissections that do not affect the aorta (such as, iliac arteries, visceral arteries, extracranial arteries) is medically necessary according to the general schedule as follows:

- Within one month of discovery
- Six months
- 12 months
- No further imaging after 12 months if noted to be stable

Imaging of asymptomatic penetrating aortic ulcers treated medically is medically necessary according to the following time intervals as follows:

- One month after diagnosis
- If stable, every 6 months for 2 years

- Then at appropriate intervals thereafter (depending on patient age and PAU characteristics) as determined by the provider managing the condition

Evidence Discussion

Aortic and arterial dissection is usually a result of vessel wall damage due to uncontrolled hypertension or physical trauma. Some connective tissue and genetic disorders also carry a higher risk for vessel dissection. Emergent cases usually present with symptoms of impending vessel rupture, organ malperfusion or hemodynamic instability. For these cases, advanced imaging is required for surgical planning. Additional imaging of anatomic regions with suspected involvement are considered necessary in these cases. Acute dissection cases without these features may be observed with medical management until stable.

A chronic arterial dissection will often degenerate into an aneurysm over time. The risk is related to the dissected area of aorta, as well as non-dissected native aortic segments because of underlying medial degeneration. Multiple major studies have been conducted to recommend criteria for intervention based on size and anatomic considerations. Individuals with certain genetic syndromes including Marfan, Loeys-Dietz and Ehlers-Danlos Type IV may be at risk for accelerated vessel degeneration and should undergo more frequent surveillance.

Due to the complex anatomy associated with arterial dissection, CT/MR imaging is recommended over duplex imaging for thoracic, abdominal and visceral artery dissections. Duplex imaging may still be useful for carotid monitoring depending on the extent of vessel involvement.

Asymptomatic arterial dissections not associated with the aorta should undergo regular surveillance for the first year after detection. No further imaging has found to be of benefit if findings remain stable.

Penetrating aortic ulcers are frequently found in the setting of severe aortic atherosclerosis and may carry a significant rupture risk. Frequent surveillance for the first year after detection is medically necessary to determine if intervention is necessary. If the penetrating aortic ulcer remains stable after twelve months, the frequency of imaging may be reduced to annually until intervention is indicated.

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 individuals with aortic dissection present without classic symptoms.

References

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1. Bonci G, Steigner ML, et al. ACR Appropriateness Criteria® Thoracic Aorta Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2017;14(11S):S570-S583. doi:10.1016/j.jacr.2017.08.042.
2. Kalva SP, Dill KE, et al. ACR Appropriateness Criteria® nontraumatic aortic disease. *J Thorac Imaging*. 2014;29(5):W85-W88. doi:10.1097/RTI.000000000000107.
3. Alborno G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82(4):1400-1405. doi:10.1016/j.athoracsur.2006.04.098.
4. Anderson JL, Halperin JL, Albert N, et al. Management of Patients with Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations). *J Am Coll Cardiol*. 2013;61(14):1555-1570. doi:10.1016/j.jacc.2013.01.004.
5. Bennett SJ, Dill KE, Hanley M, et al. ACR Appropriateness Criteria® Suspected Thoracic Aortic Aneurysm. *J Am Coll Radiol*. 2018;15(5). doi:10.1016/j.jacr.2018.03.031.
6. Chaikof EL, Dalman RL, Eskandari MK, et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg*. 2018;67(1). doi:10.1016/j.jvs.2017.10.044.
7. Elefteriades JA. Natural history of thoracic aortic aneurysms: indications for surgery, and surgical versus nonsurgical risks. *Ann Thorac Surg* 2002; 74: S1877-S1880.
8. Erben Y, Brownstein AJ, Rajae S. Natural History of and Management of Splanchnic Artery Aneurysms in a Single Tertiary Referral Center. *J Vasc Surg* 2018 Oct; 68(4): 1079-1087.
9. Chaer RA, Abularrage CJ, Coleman DM, et al. The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms. *J Vasc Surg*. 2020;72(1S):3S-39S. doi:10.1016/j.jvs.2020.01.039.
10. Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® Acute Chest Pain-- Suspected Aortic Dissection. *American College of Radiology (ACR)*; 2014.
11. Collard M, Sutphin PD, Kalva SP, et al. Expert Panel on Vascular Imaging. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm Follow-up (without Repair). *J Am Coll Radiol*. 2019;16(5S):S2-S6. doi:10.1016/j.jacr.2019.02.005.
12. Corey MR, Ergul EA, Cambria RP. The Natural History of Splanchnic Aneurysms and Outcome after Operative Intervention. *J Vasc Surg*. 2016 April 63 (4):949-57.
13. Dejaco C, Ramiro S, Duftner C, et al. EULAR recommendations for the use of imaging in large vessel vasculitis in clinical practice. *Annals of the Rheumatic Diseases*. 2018;77(5):636-643. doi:10.1136/annrheumdis-2017-212649.
14. Diercks D, Promes S, Schuur J, et al. American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. *Ann Emerg Med*. 2015 Jan; 65 (1):32-42.
15. Francois CJ, Skulborstad EP, Majdalany BS, et al. Expert Panels on Vascular Imaging and Interventional Radiology. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm: Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2018;15(5S):S2-S12. doi:10.1016/j.jacr.2018.03.008.
16. Harvin HJ, Verma N, Nikolaidis P, et al. ACR Appropriateness Criteria® Renovascular Hypertension. *J Am Coll Radiol*. 2017;14(11). doi:10.1016/j.jacr.2017.08.040.
17. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine [published correction appears in *J Am Coll Cardiol*. 2013 Sep 10;62(11):1039-40]. *J Am Coll Cardiol*. 2010;55(14):e27-e129. doi:10.1016/j.jacc.2010.02.015.

18. Kallianos KG, Burris NS. Imaging Thoracic Aortic Aneurysm. *Radiol Clin North Am.* 2020;58(4):721-731. doi:10.1016/j.rcl.2020.02.009.
19. Loren F, Hiratzka MD, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients with Thoracic Aortic Disease. *Circulation* 2010; 121: e266-e369.
20. Masuda Y1, Yamada Z, Morooka N, Watanabe S, Inagaki Y. Prognosis of patients with medically treated aortic dissections. *Circulation.* 1991 Nov;84(5 Suppl):III7-13.
21. Moser M, Setaro JF. Resistant or Difficult-to-Control Hypertension. *New England Journal of Medicine.* 2006;355(4):385-392. doi:10.1056/nejmcp041698.
22. Persu A, Giavarini A, Touzé E, et al. European consensus on the diagnosis and management of fibromuscular dysplasia. *Journal of Hypertension.* 2014;32(7):1367-1378. doi:10.1097/hjh.0000000000000213.
23. Sakamoto I, Sueyoshi E, Hazama S, et al. Endovascular treatment of iliac artery aneurysms. *Radiographics* October 2005;25:S213-S227.
24. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic Accuracy of Transesophageal Echocardiography, Helical Computed Tomography, and Magnetic Resonance Imaging for Suspected Thoracic Aortic Dissection: Systematic Review and Meta-analysis. *Arch Intern Med* 2006; 166 (13): 1350-1356.
25. Alcantara S, Yang CK, Sasson J, et al. The evidence for nonoperative management of visceral artery dissections: a single-center experience. *Ann Vasc Surg.* 2015;29(1):103-108. doi:10.1016/j.avsg.2014.09.004.
26. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *American Journal of Roentgenology.* 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
27. Tadros TM, Klein MD, Shapira OM. Ascending aortic dilatation associated with bicuspid aortic valve. *Circulation* 2009; 119: 880-890.
28. Taimen K, Salomäki SP, Hohenthal U, et al. The Clinical Impact of Using 18F-FDG-PET/CT in the Diagnosis of Suspected Vasculitis: The Effect of Dose and Timing of Glucocorticoid Treatment. *Contrast Media & Molecular Imaging.* 2019;2019:1-8. doi:10.1155/2019/9157637.
29. van Bogerijen GH, Tolenaar JL, Rampoldi V, et al. Predictors of aortic growth in uncomplicated type B aortic dissection. *J Vasc Surg.* 2014 Apr;59(4):1134-43. doi: 10.1016/j.jvs.2014.01.042.
30. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension.* 2018;71(6). doi:10.1161/hyp.0000000000000065.
31. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg.* 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
32. Salim S, Machin M, Patterson BO, Bicknell C. The Management of Penetrating Aortic Ulcer. *Hearts.* 2020;1(1):5-13. doi:10.3390/hearts1010003.
33. Eric M. Isselbacher, MD, Ourania Preventza, MD, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation.* 2022;146:e334–e482. doi: 10.1161/CIR.0000000000001106.
34. Nicolaou G, Ismail M, Cheng D. Thoracic endovascular aortic repair: update on indications and guidelines. *Anesthesiol Clin.* 2013 Jun;31(2):451-78. doi: 10.1016/j.andclin.2013.01.001.
35. Isselbacher EM, Preventza O, Black JH, et al. ACC/AHA Clinical Practice Guideline: 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/ American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation* (2022); 146:e334-e482. DOI: 10.1161/CIR.0000000000001106.
36. Wanhainen A, Van Herzele I, Goncalves FB, et al. Clinical Practice Guideline Document: Editor's Choice – European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg* (2024); 67:192-331.
37. Olukorode JO, Onwuzo CN, Otabor EO, et al. Aortic Size Index Versus Aortic Diameter in the Prediction of Rupture in Women With Abdominal Aortic Aneurysm. *Cureus.* 2024;16(4):e58673. Published 2024 Apr 21. doi:10.7759/cureus.58673.

Post-operative Imaging

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Post Aortic Endovascular/Open Surgery Surveillance Studies (PVD-6.8)

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Open Procedures

- Aortic root/ascending aortic procedures for aneurysm/dissection (ex: aortic root repair, arch/hemi-arch repair, Elephant trunk repair). One of the following post-operative studies [Echocardiography or CT Chest with contrast (CPT® 71260) or CT Chest without contrast (CPT® 71250) or CTA Chest (CPT® 71275)], is medically necessary as follows:
 - Within 1 year post-operative
 - Then every 5 years
- Open descending thoracic aortic aneurysm repair- **One** of the following post-operative studies [CT Chest with contrast (CPT® 71260) **or** CT Chest without contrast (CPT® 71250) **or** CTA Chest (CPT® 71275)], is medically necessary as follows:
 - Within 1 year post-operative
 - Then every 5 years
- Open Aortic Abdominal Aneurysm Repair - contrast and non-contrast enhanced CT of the entire aorta (CPT® 74176, CPT® 74177, CPT® 74174) is medically necessary as follows:
 - Within 1 year post-operative
 - Then every 5-years
 - As requested to assess for suspected infection of the graft (see **Vascular Graft Infection (PVD-21)** for additional imaging in vascular graft infection).

Endovascular procedures

Post-operative surveillance after TEVAR for any indication (PVD-6.8.1)

Imaging for post-operative TEVAR	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

Note:

Abdomen and Pelvis imaging is medically necessary only if TEVAR performed for a dissection that extends into the abdomen or pelvis

- **Any** of the studies listed in the table above are medically necessary for post-operative surveillance imaging after TEVAR as follows:
 - One month
 - Twelve months
 - Then annually for life
- If an endoleak is identified at the 1-month study, more frequent imaging is considered medically necessary as requested.

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

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

Post-operative surveillance after abdominal EVAR is medically necessary as follows:

- CT (any contrast level) or CTA of the entire aorta at 5-year intervals (CPT® 74176)
- CT as per above coding as requested and color duplex ultrasound (CPT® 93975, CPT® 93976, CPT® 93978, or CPT® 93979) 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 sac 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

- Annually thereafter.
- If US detects a new endoleak, graft migration, or aneurysm sac growth > 5mm:
 - Any of the above CT scan as requested

Post-endoleak intervention surveillance imaging

Surveillance imaging after EVAR, or any subsequent endoleak intervention, is based on the most recent intervention.

For any subsequent interventions for endoleak repair, imaging is medically necessary at 1 month with CT and then follow protocol as above.

Surveillance following Complex EVAR (i.e., a branched/fenestrated graft)

CT as per above coding as requested and/or color duplex ultrasound (CPT® 93975, CPT® 93976, CPT® 93978, or CPT® 93979) is medically necessary at 1-month post-operative, 6 months post-operative, 12 months post-operative, and annually thereafter.

A 3 month follow-up study is considered medically necessary if endoleak or aneurysm enlargement is identified at 1-month post-operative.

Endovascular (Stent) Iliac Repair (PVD-6.8.3)

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

- One of the above studies is medically necessary for endovascular iliac repair (stent)
- If performed in conjunction with EVAR, surveillance will follow the same schedule as EVAR.
- For isolated iliac artery aneurysm repair, surveillance is medically necessary with an arterial duplex (CPT® 93975, CPT® 93976, CPT® 93978, or CPT® 93979) or CT or MR as above if duplex unavailable:
 - Post-cooperatively within the first month
 - 6 months after endovascular treatment
 - Annually

Evidence Discussion

Post Aortic Endovascular/Open Surgery Surveillance Studies

Surgical approaches to aortic repair have evolved over the past several decades. Open repair is still common for treatment of ascending aortic pathology as well as some thoracic/abdominal aortic disease with complex anatomy. In recent years, however, advances in endovascular technology have made this modality preferred for descending thoracic, abdominal and iliac artery repairs.

Multiple studies have been performed with several recommendations for aortic graft surveillance depending on anatomic location and repair type. Open repair surveillance tends to use longer frequency intervals due to the durability of the repair approach. While less invasive, endovascular repairs require more frequent monitoring as the graft components have a higher risk of technical complication with a need for repeat intervention.

When an endovascular graft system becomes displaced or does not adhere properly to the native vessel wall, an endoleak may develop. An endoleak increases the risk of rupture within a previously repaired aneurysm sac and may require repeat intervention. Some endoleak types may be monitored with regular surveillance if the aneurysm sac diameter remains stable. However, if the aneurysm sac increases in size or if a high risk endoleak type is detected, repeat intervention with preoperative imaging is medically necessary to prevent rupture. Post-endoleak repairs also require regular surveillance as these may also be at risk for technical failure over time.

Thoracic aortic surveillance imaging is usually performed with CT/MR due to the anatomic limitations of duplex in this region. Abdominal aortic surveillance after endovascular repair is initially performed with CT/MR to ensure proper alignment of all graft components. Once this has been established, surveillance with duplex ultrasound is medically necessary unless technical limitations are noted. If an endoleak is detected or if additional pathology such as graft infection is suspected, CT/MR imaging would be appropriate to provide additional anatomic detail. Similarly, if there is concern for repeat intervention, preoperative imaging with CT/MR is indicated.

Complex endovascular aneurysm repair refers to techniques that address branch vessels with branches, stents, or fenestration. These techniques allow for minimally invasive repair of complicated anatomy but need for secondary intervention is relatively high. While duplex ultrasound may be useful for surveillance in these cases, CT scan allows for more detailed imaging and may be useful in some cases.

References

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1. Bonci G, Steigner ML, et al. ACR Appropriateness Criteria® Thoracic Aorta Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2017;14(11S):S570-S583. doi:10.1016/j.jacr.2017.08.042.
2. Kalva SP, Dill KE, et al. ACR Appropriateness Criteria® nontraumatic aortic disease. *J Thorac Imaging*. 2014;29(5):W85-W88. doi:10.1097/RTI.000000000000107.
3. Albornoz G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82(4):1400-1405. doi:10.1016/j.athoracsur.2006.04.098.
4. Bennett SJ, Dill KE, Hanley M, et al. ACR Appropriateness Criteria® Suspected Thoracic Aortic Aneurysm. *J Am Coll Radiol*. 2018;15(5). doi:10.1016/j.jacr.2018.03.031.
5. Chaikof EL, Dalman RL, Eskandari MK, et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg*. 2018;67(1). doi:10.1016/j.jvs.2017.10.044.
6. Diercks D, Promes S, Schuur J, et al. American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. *Ann Emerg Med*. 2015 Jan; 65 (1):32-42.
7. Francois CJ, Skulborstad EP, Majdalany BS, et al. Expert Panels on Vascular Imaging and Interventional Radiology. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm: Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2018;15(5S):S2-S12. doi:10.1016/j.jacr.2018.03.008.
8. Kallianos KG, Burris NS. Imaging Thoracic Aortic Aneurysm. *Radiol Clin North Am*. 2020;58(4):721-731. doi:10.1016/j.rcl.2020.02.009.
9. Loren F, Hiratzka MD, et al, 2010 ACCF/AHA/AATS/ACR/ASA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients with Thoracic Aortic Disease. *Circulation* 2010; 121: e266-e369.
10. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic Accuracy of Transesophageal Echocardiography, Helical Computed Tomography, and Magnetic Resonance Imaging for Suspected Thoracic Aortic Dissection: Systematic Review and Meta-analysis. *Arch Intern Med* 2006; 166 (13): 1350-1356.
11. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *American Journal of Roentgenology*. 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
12. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg* . 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
13. Gilbert R, Upchurch Jr, MD, Guillermo A. Escobar, MD, et al. Society for Vascular Surgery clinical practice guidelines of thoracic endovascular aortic repair for descending thoracic aortic aneurysms. *J Vasc Surg* 2021;73:55S-83S.
14. Isselbacher, MD, Ourania Preventza, MD, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation*. 2022;146:e334-e482. doi:10.1161/CIR.0000000000001106.
15. Wanhainen A, Van Herzele I, Goncalves FB, Montoya SB, Berard X, Boyle JR, et al. Clinical Practice Guideline Document: Editor's Choice – European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg* (2024); 67:192-331.
16. Zenith Fenestrated AAA Endovascular Graft. Instructions for Use. *Cook Medical*. IFU-FU-V005, August 2023.
17. Gore Excluder Thoracoabdominal Branch Endoprosthesis Instructions for Use. WL Gore and Associates, Inc. March 2024.
18. Instructions for Use For: Gore Excluder Iliac Branch Endoprosthesis. US English. WL Gore and Associates, Inc. January 2022.
19. Oderich GS, Farber MA, Schneider D, Makaroun M, Sanchez LA, Schanzer A, et al. Final 5-year results of the United States Zenith fenestrated prospective multicenter study for juxtarenal abdominal aortic aneurysms. *J Vasc Surg* 2021;73:1128-38.

20. Farber MA, Han S, Makaroun MS, Matsumura JS, Mendes BC, Oderich GS, et al. One-year outcomes from the pivotal trial of a four-branch off-the-shelf solution to treat pararenal and extent IV thoracoabdominal aortic aneurysms. *J Vasc Surg* 2025; In Press Corrected Proof, Published online: June 4, 2025.

Post-procedure Surveillance Studies (PVD-7.3)

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

Indication	Imaging
Suprainguinal Revascularization, both open and endovascular therapy, including Aortobifem/iliofem/fem-fem bypass/iliac angioplasty/stent	• Clinical examination and ABI (CPT® 93922) with arterial duplex (CPT® 93925 or CPT® 93926) is medically necessary at: ◦ Within 1 month ◦ 6 months ◦ 12 months ◦ Then annually
Infrainguinal Open Revascularization (Femoral-popliteal, femoral-tibial, femoral-distal bypass)	
• With vein or autologous conduit	• Clinical exam and ABI (CPT® 93922) with arterial duplex (CPT® 93925 or CPT® 93926) is medically necessary at: ◦ Post-operatively ◦ 3 months ◦ 6 months ◦ 12 months ◦ Then annually

Indication	Imaging
With Prosthetic conduit (PTFE/Dacron)	- Clinical exam and ABI (CPT® 93922) with arterial duplex (CPT® 93925 or CPT® 93926) is medically necessary at: - Post-operatively 6 months 12 months - Then annually
Infrainguinal Endovascular Revascularization Femoropopliteal angioplasty/stent	- Clinical exam and ABI (CPT® 93922) with arterial duplex (CPT® 93925 or CPT® 93926) is medically necessary at: - Within 1 month 3 month - Every 6 months for two years - Then annually

After suprainguinal intervention (PVD-7.3.1)

- One of the following studies: Arterial duplex, CTA Abdomen and Pelvis, CT Abdomen and Pelvis with contrast, CTA Aorta with lower extremity runoff, MRI Abdomen and Pelvis, MRA Abdomen and Pelvis, or MRA Aorta with lower extremity runoff is medically necessary for any **one** of the following:
 - 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

After infrainguinal intervention (PVD-7.3.2)

- CTA Lower Extremity (CPT® 73706) or MRA Lower Extremity (CPT® 73725) or CTA aorta with lower extremity runoff CPT® 75635) is medically necessary for any **one** of the following:
 - 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, additional imaging is **not** medically necessary 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

Evidence Discussion

Post-procedure Surveillance Studies

Once an intervention (open or endovascular) has been performed, surveillance imaging is supported. The rationale for this is to maintain patency of the treated lesions to avoid further symptoms and/or amputation. Surveillance imaging with ABI and duplex is supported at various intervals depending on the type of intervention, stent vs. bypass, and by bypass material.

References

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1. Dick F, Ricco J-B, Davies A.H, Cao P, et. al. Chapter VI: Follow-up after Revascularization. *European Journal of Vascular and Endovascular Surgery*, Volume 42, Supplement 2, 2011 pp.S75-90.
2. Lane TRA et al. Post-Operative Surveillance after Open Peripheral Arterial Surgery. *Eur J Vasc Endovasc Surg*. Volume 42, Issue 1, July 2011. Pages 59-77.
3. Brooke BS, Beck AW, Kraiss LW, et al. Association of Quality Improvement Registry Participation with Appropriate Follow-up after Vascular Procedures. *JAMA Surgery*. 2018;153(3):216. doi:10.1001/jamasurg.2017.3942.
4. Rooke TW, Hirsch AT, Misra S, Sidawy AN, et al. 2011 ACCF/AHA focused update of the guideline for the management of patients with peripheral artery disease (updating the 2005 guideline): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines: developed in collaboration with the Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society for Vascular Medicine, and Society for Vascular Surgery. American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society for Vascular Medicine, Society for Vascular Surgery. *J Vasc Surg*. 2011 Nov; 54(5):e32-58
5. Conte MS, Pomposelli FB, and Clair DG. Society for Vascular Surgery practice guidelines for atherosclerotic occlusive disease of the lower extremities: Management of asymptomatic disease and claudication. *J Vasc Surg*. March 2015;61(3):2S-41S.e1
6. Bui TD, Mills JL Sr, Inhnat DM et al. The natural history of duplex-detected stenosis after femoropopliteal endovascular therapy suggests questionable clinical utility of routine duplex surveillance. *J Vasc Surg*. 2012 Feb 55:2:346-352
7. Troutman DA, Madden NJ, Dougherty MJ, et al. Duplex Ultrasound Diagnosis of Failing Stent Grafts Placed for Occlusive Disease. *J Vasc Surg* 2014;70:1–5.
8. Humphries MD, Pevec WC, Laird JR, et.al. Early Duplex Scanning after Infrainguinal Endovascular Therapy. *J Vasc Surg* 2011; 53:353–8.
9. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. 2018 Jul;68(1):256-284. doi: 10.1016/j.jvs.2018.04.018.
10. Cooper K, Majdalany BS, Kalva SP, et al. ACR Appropriateness Criteria® Lower Extremity Arterial Revascularization—Post-Therapy Imaging. *J Am Coll Radiol*. 2018;15:S104-S115.
11. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC Guideline on the management of patients with lower extremity peripheral artery disease: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2017; 135: e726-e779.
12. Ahmed O, Hanley M, Bennett SJ, et al. ACR Appropriateness Criteria® Vascular claudication -Assessment for Revascularization. *J Am Coll Radiol*. 2017 May;14(5S):S372-S379. doi: 10.1016/j.jacr.2017.02.037.
13. Macedo TA, Johnson M, Hallett Jr JW, and Breen JF. Popliteal artery entrapment syndrome: role of imaging in the diagnosis. *AJR Am J Roentgen*. 2003 Nov;181(5):1259-1265. doi:10.2214/ajr.181.5.1811259.
14. Sigvant B, Lundin F, Wahlberg E. The risk of disease progression in peripheral arterial disease is higher than expected: a meta-analysis of mortality and disease progression in peripheral arterial disease. *Eur J Vasc Endovasc Surg*.2016;51(3):395–403.
15. Criqui MH, Langer RD, Fronek A, et al. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med* 1992;326:381-6.
16. Watson L, Ellis B, Leng GC. Exercise for intermittent claudication. *Cochrane Database Syst Rev* 2008; (4):CD000990.
17. Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FG. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg* 2007;45(Suppl S):S5-67.

18. Collins R, Burch J, Cranny G, et al. Duplex ultrasound, magnetic resonance angiography, and computed tomography angiography for the diagnosis and assessment of symptomatic, lower limb peripheral disease: systematic review. *BMJ*. 2007;334:1257.
19. Conte MS, Pomposelli FB, et al. Society for Vascular Surgery practice guidelines for atherosclerotic occlusive disease of the lower extremities: Management of asymptomatic disease and claudication. *J Vasc Surg* 2015;61:2S-41S.
20. Hirsch AT, Haskal ZJ, et al. ACC/AHA Guidelines for the Management of Patients with Peripheral Arterial Disease. *J Vasc Interv Radiol* 2006; 17:1383–1398.
21. Conte MS, Bradbury AW, et al. Global vascular guidelines on the management of chronic limb-threatening ischemia. *JVS*, June 2019. 69:6 3S-125S

Vasculitis

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Large Vessel Vasculitis (PVD-6.9)

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Inflammatory Aortitis (PVD-6.9.1)

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

- Initial imaging with CTA or MRA of the affected body region is considered medically necessary when clinical evaluation leads to the suspicion of inflammatory aortitis.

Repeat imaging

- 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 **Cerebral Aneurysm and AVM (HD-12)** in the Head Imaging Guidelines
 - See **TAA Imaging Indications**
 - See **Abdominal Aortic Aneurysm (AAA) (PVD-6.3)**

Giant Cell Arteritis (GCA) (PVD-6.9.2)

CPT®	Imaging for Giant Cell Arteritis
70544	Magnetic resonance angiography, head; without contrast material(s)
70545	Magnetic resonance angiography, head; with contrast material(s)
70546	Magnetic resonance angiography, head; without contrast material(s), followed by contrast material(s) and further sequences
70547	Magnetic resonance angiography, neck; without contrast material(s)
70548	Magnetic resonance angiography, neck; with contrast material(s)
70549	Magnetic resonance angiography, neck; without contrast material(s), followed by contrast material(s) and further sequences
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s), including noncontrast images, if performed, and image postprocessing
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)
74174	Computed tomographic angiography, abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74175	Computed tomographic angiography, abdomen, with contrast material(s), including noncontrast images, if performed, and image postprocessing
72191	Computed tomographic angiography, pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74185	Magnetic resonance angiography, abdomen, with or without contrast material(s)
72198	Magnetic resonance angiography, pelvis, with or without contrast material(s)
73725	Magnetic resonance angiography, lower extremity, with or without contrast material(s)
78815	Positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization imaging; skull base to mid-thigh

CPT®	Imaging for Giant Cell Arteritis
78816	Positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization imaging; whole body

Initial imaging

Cranial GCA is the more common type with temporal artery involvement. For predominantly Cranial GCA the following studies are considered medically necessary for initial imaging:

- US (CPT® 93880 or CPT® 93882) of the temporal (and or axillary) arteries is the preferred modality where available.
- MRA Head and/or MRA Neck when **either** of the following apply:
 - Vascular trained ultrasonography is not available
 - US is negative or equivocal with a clinical suspicion of GCA
- MRA of the Abdomen and/or Lower extremities when involvement suspected clinically
- PET/CT Whole Body is considered medically necessary when MRA or US are equivocal and one of the following conditions exists:
 - temporal artery biopsy is negative and GCA is still suspected
 - where the result would change clinical management
- US of the neck vessels (CPT® 93880 or CPT® 93882) and MRA Chest

Note:

For suspected cerebral vasculitis in individuals with neurological symptoms, see **Cerebral Vasculitis (HD-22)** in the Head Imaging Guidelines

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 fever of unknown origin (FUO) symptoms
 - New murmurs
 - Pulse asymmetry
 - Abdominal pain
 - Pulsatile mass
 - High inflammatory markers such as CRP or ESR > 50 mm/h
- Medically necessary imaging for aortic root, arch or abdomen involvement:
 - MRA Chest, MRA Neck , MRA Abdomen , CTA Chest , CTA Neck or CTA Abdomen

- PET/CT Skull base to mid thigh if MRA or CTA are non-diagnostic and there is still suspicion for aortic root, arch or abdomen involvement

Repeat imaging

- Follow-up imaging is medically necessary for **any** of the following:
 - One-time documentation of remission or disease control
 - Change in signs/symptoms suggesting progression of disease
 - Although individuals with GCA can develop aortic aneurysms over time screening in the absence of signs or symptoms is not medically necessary
 - In individuals with known thoracic or abdominal aortic aneurysm:
 - See **TAA Imaging Indications** for thoracic aneurysm surveillance
 - See **Abdominal Aortic Aneurysm (AAA) (PVD-6.3)** for abdominal aneurysm surveillance.
- Follow-up imaging is not considered medically necessary for individuals in clinical and biochemical remission or without aneurysm/complication.

Takayasu's Arteritis (PVD-6.9.3)

CPT®	Imaging for Takayasu's Arteritis
71275	Computed tomographic angiography, chest (noncoronary), with contrast material(s), including noncontrast images, if performed, and image postprocessing
72191	Computed tomographic angiography, pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74174	Computed tomographic angiography, abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing
74175	Computed tomographic angiography, abdomen, with contrast material(s), including noncontrast images, if performed, and image postprocessing
71555	Magnetic resonance angiography, chest (excluding myocardium), with or without contrast material(s)
72198	Magnetic resonance angiography, pelvis, with or without contrast material(s)
74185	Magnetic resonance angiography, abdomen, with or without contrast material(s)

CPT®	Imaging for Takayasu's Arteritis
78815	Positron emission tomography (PET) with concurrently acquired computed tomography (CT) for attenuation correction and anatomical localization imaging; skull base to mid-thigh

Initial imaging

- Initial imaging is medically necessary for signs and symptoms suggestive of disease such as absent radial pulse, difficulty obtaining BP in one arm, or unexplained hypertension.
- Initial staging PET-CT is considered medically necessary in place of MRA or CTA of multiple areas when diffuse large vessel involvement, or occult vessel involvement, is suspected.
- Any of the following modalities are medically necessary for evaluation of Takayasu's 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)

Repeat imaging

Repeat imaging with any CTA or MRA in the above table is medically necessary at the following intervals:

- Every 3 months to monitor treatment response during active treatment with systemic therapy.
- Annually for surveillance of known involved body areas to detect progressive vascular damage that may require intervention

Evidence Discussion

Large Vessel Vasculitis

Large vessel vasculitis is generally sub-grouped into three areas

- Aortitis (Inflammatory Aortitis)
- Giant Cell Vasculitis
- Takayasu's Arteritis

Initial diagnosis of large vessel vasculitis (Inflammatory aortitis, Giant cell, and Takayasu's arteritis) should be made through history, physical exam and laboratory values including inflammatory markers. In cases of suspected large vessel disease, ultrasound, CT/ and MR imaging of the neck/chest/abdomen/pelvis are indicated.

PET imaging should be reserved for cases where CT/MR are non-diagnostic and the likelihood of disease based on other factors is high.

PET imaging has recently been incorporated into the American College of Rheumatology GL for the Diagnosis of GCA, for research purposes and to exclude alternate diagnosis.⁵ PET can be utilized in the rare instances MRA or US are equivocal, temporal artery biopsy is negative and GCA is still suspected, or where the result would change clinical management.⁶⁷

Aortic arch involvement is common (see below); US of the neck vessels and MRA of the chest may also be considered in initial screening. Abdominal involvement is less common in GCA, but common in Takayasu's arteritis (see below). MRA of the abdomen and/or LE's, may also be considered in initial screening when involvement suspected clinically.^{1 3}

Aortitis

Aortitis may be congenital (Marfan, Hypermobility Syndromes, others) or acquired, including traumatic, atherosclerotic (dissecting aneurysm, 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).

Giant Cell Arteritis

Historically, GCA had been subdivided into two basic types; Cranial Predominant and Extra-cranial. Currently, both GCA type vasculitis and Takayasu's arteritis have similar management requirements as variants of Large vessel vasculitis (LVV).

Initial diagnosis of large vessel vasculitis (Inflammatory aortitis, Giant cell, and Takayasu's arteritis) should be made through history, physical exam and laboratory values including inflammatory markers. In cases of suspected large vessel disease, ultrasound, CT/ and MR imaging of the neck/chest/abdomen/pelvis are may be indicated. PET imaging should be reserved for cases where CT/MR are non-diagnostic and the likelihood of disease based on other factors is high. Follow-up imaging is medically necessary for individuals with known aneurysmal disease or who remain symptomatic on active therapy. PET imaging has recently been

⁵ Ponte C, Grayson PC, Robson JC, et al. 2022 American College of Rheumatology/EULAR classification criteria for giant cell arteritis. *Ann Rheum Dis.* 2022;81(12):1647–1653. doi: 10.1136/ard-2022-223480.

⁶ American College of Radiology (ACR). ACR Appropriateness Criteria® Noncerebral Vasculitis. *J Am Coll Radiol.* 2021;18(11S):S380–S393. doi: 10.1016/j.jacr.2021.08.005.

⁷ Dejaco C, Ramiro S, Bond M, et al. EULAR recommendations for the use of imaging in large vessel vasculitis in clinical practice: 2023 update. *Ann Rheum Dis.* 2024;83(6):741–751. doi: 10.1136/ard-2023-224543.

incorporated into the American College of Rheumatology GL for the Diagnosis of GCA, for research purposes and to exclude alternate diagnosis.¹

Takayasu's Arteritis

Instead of multiple MRA's, an initial staging PET-CT can be approved where diffuse large vessel involvement, or occult vessel involvement, is suspected in an LVV. Ordering both studies initially is discouraged. Follow-up MRA is preferred as PET-CT in some patients may never normalize. For Takayasu's arteritis, annual surveillance in the absence of symptoms is recommended due to the high risk of progressive vascular damage.

References

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1. Taimen K, Salomäki SP, Hohenthal U, et al. The Clinical Impact of Using 18F-FDG-PET/CT in the Diagnosis of Suspected Vasculitis: The Effect of Dose and Timing of Glucocorticoid Treatment. *Contrast Media & Molecular Imaging*. 2019;2019:1-8. doi:10.1155/2019/9157637.
2. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
3. Muratore F, Pipitone N, Salvarani C, Schmidt WA. Imaging of vasculitis: State of the art. *Best Practice Research Clinical Rheumatology*. 2016;30(4):688-706. doi:10.1016/j.berh.2016.09.010.
4. Soussan M, Nicolas P, Schramm C, et al. Management of Large-Vessel Vasculitis With FDG-PET. *Medicine*. 2015;94(14). doi:10.1097/md.0000000000000622.
5. Besson FL, Parienti J-J, Bienvenu B, et al. Diagnostic performance of 18F-fluorodeoxyglucose positron emission tomography in giant cell arteritis: a systematic review and meta-analysis. *European Journal of Nuclear Medicine and Molecular Imaging*. 2011;38(9):1764-1772. doi:10.1007/s00259-011-1830-0.
6. Sivaraman V, Fels EC, and Ardoin SP. Vasculitis syndromes. Nelson Textbook of Pediatrics, Chapter 192. eds Kliegman RM, St. Geme JW III, Blum NJ, et al. 21st ed. Philadelphia, PA: Elsevier; 2020:1317-1327.
7. Soliman M, Laxer R, Manson D, et al. Imaging of systemic vasculitis in childhood. *Pediatric Radiology*. 2015;45(8):1110-1125. doi:10.1007/s00247-015-3339-3.
8. Sharma AM, Singh S, Lewis JE. Diagnostic Approach in Patients With Suspected Vasculitis. *Techniques in Vascular and Interventional Radiology*. 2014;17(4):226-233. doi:10.1053/j.tvir.2014.11.002.
9. Ammirati E, Moroni F, Pedrotti P, et al. Non-Invasive Imaging of Vascular Inflammation. *Frontiers in Immunology*. 2014;5:1-15. doi:10.3389/fimmu.2014.00399.
10. Granata C, Damasio MB, Zaottini F, et al. Imaging of Childhood Vasculitis. *Radiologic Clinics of North America*. 2017;55(5):1131-1143. doi:10.1016/j.rcl.2017.05.001.
11. Broncano J, Vargas D, Bhalla S, Cummings KW, Raptis CA, Luna A. CT and MR Imaging of Cardiothoracic Vasculitis. *RadioGraphics*. 2018;38(4):997-1021. doi:10.1148/rg.2018170136.
12. Jennette JC, Falk RJ, Bacon PA, et al. 2012 Revised International Chapel Hill Consensus Conference Nomenclature of Vasculitides. *Arthritis & Rheumatism*. 2012;65(1):1-11. doi:10.1002/art.37715.
13. Ozen S, Pistorio A, Iusan SM, et al. EULAR/PRINTO/PRES criteria for Henoch-Schönlein purpura, childhood polyarteritis nodosa, childhood Wegener granulomatosis and childhood Takayasu arteritis: Ankara 2008. Part II: Final classification criteria. *Annals of the Rheumatic Diseases*. 2010;69(5):798-806. doi:10.1136/ard.2009.116657
14. Cui J, Huang LY, Guo J, Wu CR, Zhang B. Diagnosis and treatment of adult mixed-type Henoch-Schönlein purpura. *Cent Eur J Immunol*. 2019;44(2):138-143. doi:10.5114/ceji.2019.87064.
15. HRCT imaging of pulmonary involvement in granulomatosis with polyangiitis and microscopic polyangiitis at disease onset and during follow-up. Thomas Villeneuve, Stanislas Faguer, et al. *Semin Arthritis Rheum*. 2023 Dec;63:152307.

Medium Vessel Vasculitis (PVD-6.10)

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- There are two main types of medium-size vessel vasculitis:
 - Kawasaki disease
 - Polyarteritis Nodosa

Kawasaki disease

- Imaging guidelines below for Kawasaki Disease can also be accessed in **Kawasaki Disease (PEDCD-6)** in the Pediatric Cardiac imaging guideline

Long term routine surveillance in asymptomatic imaging for Kawasaki disease

AHA risk level	Largest Aneurysm At Any Point	Largest Current Aneurysm	Routine Echo	Routine Stress Imaging	Routine Coronary Imaging
All			All risk levels 4-6 weeks after acute illness		
1	Normal	Normal	One echo 2-12 months after acute illness	none	none
2	Dilation	Dilation	6 months One year If dilation remains echo every 2-5 years until resolves	None	None
		Normal	After acute illness: 2-12 months One echocardiogram at one year No echocardiogram after one year		

AHA risk level	Largest Aneurysm At Any Point	Largest Current Aneurysm	Routine Echo	Routine Stress Imaging	Routine Coronary Imaging
3.1	Small	Small	6 months 12 months then yearly	2-3 years	3-5 years
3.2	Small	Normal or dilated	6 months 12 months Then yearly	3-5 years	none
4.1	Medium	Medium	3 months 6 months 12 months Every 6-12 months after that	1-3 years	2-5 years
4.2	Medium	Small	6 months and 12 months, every 1 year	2-3 years	3-5 years
4.3	Medium	Normal Or Dilated	Every 1-2 years	2-4 years	none
5.1	Large	Large	1 month 3 months 6 months 9 months 12 months Then every 3-6 months	6-12 months	at 2-6 months, every 1-5 years
5.2	Large	Medium	Every 6-12 months	yearly	2-5 years
5.3	Large	Small	6-12 month	1-2 years	2-5 years

AHA risk level	Largest Aneurysm At Any Point	Largest Current Aneurysm	Routine Echo	Routine Stress Imaging	Routine Coronary Imaging
5.4	Large	Normal Or Dilation	1-2 years	2-5 years	none

Polyarteritis Nodosa

Initial imaging

Any ONE of the following modalities is medically necessary for documented clinical suspicion of Polyarteritis Nodosa:

- MRA of the affected body area(s) (contrast as requested)
- CTA of the affected body area(s) (contrast as requested)
- Ultrasound (US) with Doppler of the affected body area(s)

Repeat imaging

Imaging with MRA, CTA, or US with Doppler of the affected body area(s) is medically necessary for established Polyarteritis Nodosa as follows:

- Every 3 months during active treatment with systemic therapy to evaluate treatment response
- Annually for surveillance of known involved body areas to detect progressive vascular damage that may require intervention

Background and Supporting Information

- Based on AHA recommendations, the following classifications are used in risk stratification of coronary artery abnormalities⁸:
 - Z-score classification accounts for the effects of body size and age through use of baseline coronary dimensions adjusted for body surface area. The z-score value represents the number of standard deviation above the mean. (e.g., z=0 pt. has coronary artery dimension value equal to mean, z=2 person has value 2 standard deviation above the mean, based on age, gender, BSA).
 - Coronary Artery Abnormalities Risk Classification based on z-score:
 - 1 - No involvement at any time point (z-score always <2)
 - 2 - Dilation only (z-score 2 to <2.5)
 - 3 - Small aneurysm (z-score ≥2.5 to <5)
 - 3.1 - Current or persistent

⁸ Mccrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, Treatment, and Long-Term Management of Kawasaki Disease: A Scientific Statement for Health Professionals from the American Heart Association. Circulation. 2017;135(17). doi:10.1161/cir.0000000000000484.

- 3.2 - Decreased to dilation only or normal luminal dimension
- 4 - Medium aneurysm (z-score ≥ 5 to < 10 , and absolute dimension < 8 mm)
 - 4.1 - Current or persistent
 - 4.2 - Decreased to small aneurysm
 - 4.3 - Decreased to dilation only or normal luminal dimension
- 5 - Large and giant aneurysm (z-score ≥ 10 , or absolute dimension ≥ 8 mm)
 - 5.1 - Current or persistent
 - 5.2 - Decreased to medium aneurysm
 - 5.3 - Decreased to small aneurysm
 - 5.4 - Decreased to dilation only or normal luminal dimension
- Additional clinical features that may increase the long-term risk of myocardial ischemia:
 - Greater length and distal location of aneurysms that increase the risk of flow stasis
 - Greater total number of aneurysms
 - Greater number of branches affected
 - Presence of luminal irregularities
 - Abnormal characterization of the vessel walls (calcification, luminal myofibroblastic proliferation)
 - Presence of functional abnormalities (impaired vasodilation, impaired flow reserve)
 - Absence or poor quality of collateral vessels
 - Previous revascularization performed
 - Previous coronary artery thrombosis
 - Previous myocardial infarction
 - Presence of ventricular dysfunction

Evidence Discussion

Medium Vessel Vasculitis

Medium vessel vasculitis includes multiple inflammatory processes that affect the major arteries the cerebrovascular, thoracic and abdominal regions. Cardiac involvement is also common. Pediatric populations are most often affected. Aneurysmal degeneration risk is high and does require regular surveillance. The two most common types include:

- Kawasaki disease
- Polyarteritis nodosa

Initial diagnosis should be made through history, physical exam and laboratory values including inflammatory markers. Aneurysmal degeneration of vessels may be seen in

multiple anatomic regions. For individuals with suspected disease, ultrasound, CT and MR imaging of the neck/chest/abdomen/pelvis is indicated.

Annual surveillance in the absence of symptoms is still recommended due to the high risk of progressive vascular damage.

References

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1. Sivaraman V, Fels EC, and Ardoin SP. Vasculitis syndromes. Nelson Textbook of Pediatrics, Chapter 192. eds Kliegman RM, St. Geme JW III, Blum NJ, et al. 21st ed. Philadelphia, PA: Elsevier; 2020:1317-1327.
2. Sharma AM, Singh S, Lewis JE. Diagnostic Approach in Patients With Suspected Vasculitis. *Techniques in Vascular and Interventional Radiology*. 2014;17(4):226-233. doi:10.1053/j.tvir.2014.11.002.
3. Ozen S, Pistorio A, Iusan SM, et al. EULAR/PRINTO/PRES criteria for Henoch-Schonlein purpura, childhood polyarteritis nodosa, childhood Wegener granulomatosis and childhood Takayasu arteritis: Ankara 2008. Part II: Final classification criteria. *Annals of the Rheumatic Diseases*. 2010;69(5):798-806. doi:10.1136/ard.2009.116657.
4. McCrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, Treatment, and Long-Term Management of Kawasaki Disease: A Scientific Statement for Health Professionals from the American Heart Association. *Circulation*. 2017; 135(17). doi:10.1161/cir.0000000000000484.
5. Granata C, Damasio MB, Zaottini F, et al. Imaging of Childhood Vasculitis. *Radiologic Clinics of North America*. 2017;55(5):1131-1143. doi:10.1016/j.rcl.2017.05.001.
6. Ammirati E, Moroni F, Pedrotti P, et al. Non-Invasive Imaging of Vascular Inflammation. *Frontiers in Immunology*. 2014;5:1-15. doi:10.3389/fimmu.2014.0039.
7. Soliman M, Laxer R, Manson D, et al. Imaging of systemic vasculitis in childhood. *Pediatric Radiology*. 2015;45(8):1110-1125. doi:10.1007/s00247-015-3339-3.

Small Vessel Vasculitis (PVD-6.11)

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- Advanced imaging is not sensitive enough to detect changes in small vessels, and is not medically necessary for primary assessment of any small vessel vasculitis.
- End-organ damage can occur with several of the small vessel vasculitides and are addressed in this guideline:
 - Henoch-Schönlein Purpura (HSP)
 - Granulomatosis with polyangiitis (GPA, formerly known as Wegener's granulomatosis)
 - Eosinophilic granulomatosis with polyangiitis (EGPA, formerly known as ChurgStrauss Syndrome)
 - Immune complex associated small-vessel vasculitis [immunoglobulin A–associated vasculitis (IgAV)]

IgA Vasculitis Henoch-Schönlein Purpura (HSP)

Initial imaging

Ultrasound (US) Abdomen (CPT® 76700) is medically necessary to evaluate possible gastrointestinal complications of known or suspected HSP including **any** of the following:

- Bowel wall edema and hemorrhage
- Intussusception

CT Abdomen with contrast (CPT® 74160) is medically necessary if additional information is needed after ultrasound for management

Repeat imaging

US Abdomen (CPT® 76700) is medically necessary for known HSP to evaluate new or worsening gastrointestinal symptoms

Background and Supporting Information

Henoch-Schönlein Purpura (HSP) is the most common vasculitis of childhood, mainly involving small blood vessels.

Granulomatosis with Polyangiitis (GPA) Formerly Wegener's Granulomatosis

Initial Imaging

Initial imaging as a baseline prior to starting immunosuppressive therapy is medically necessary in all individuals who are newly diagnosed or suspected of having antineutrophil cytoplasmic autoantibody (ANCA)-associated vasculitides (AAV) with either or both of the following to evaluate the extent of the disease:

- CT Sinuses (CPT® 70486) and/or
- CT Chest without contrast (CPT® 71250) or with contrast (CPT® 71260)

Note:

Preferred CT imaging in individuals with AAV should be performed without an iodinated contrast agent administered.

Repeat Imaging

CT Sinuses (CPT® 70486) and/or CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) are medically necessary for **any** of the following:

- New or worsening clinical symptoms affecting the body area requested
- Assess response to medical therapy when a change in treatment regimen is being considered
- Annually-to evaluate the extent of disease

Eosinophilic Granulomatosis with Polyangiitis (EGPA) Formerly Churg-Strauss Syndrome

Initial Imaging

- CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) is medically necessary in the initial evaluation of Eosinophilic granulomatosis with polyangiitis (EGPA) formerly known as Churg-Strauss Syndrome.

Repeat Imaging

- CT Chest without contrast (CPT® 71250) or CT Chest with contrast (CPT® 71260) is medically necessary for any of the following:
 - New or worsening clinical symptoms affecting the body area requested

- Assess response to medical therapy when a change in treatment regimen is being considered
- Annually-to evaluate the extent of disease

Immune Complex Associated Small-vessel Vasculitis

Initial Imaging

- Doppler ultrasound (US) of the affected body part (most commonly abdomen) is medically necessary in the initial evaluation of immune complex associated small-vessel vasculitis

Repeat Imaging

- Doppler ultrasound (US) of the affected body part (most commonly abdomen) is medically necessary in the following circumstances
 - New or worsening clinical symptoms affecting the body area requested
 - To assess response to medical therapy when a change in treatment is being considered
 - Annually-to evaluate the extent of disease

Evidence Discussion

Small Vessel Vasculitis

Advanced imaging is not routinely needed with diagnosis of Small vessel vasculitis. In suspected cases, clinical assessment of end-organ damage is usually indicated in both the adult and pediatric population

Initial diagnostic workup should include history, physical exam, and laboratory data including inflammatory markers. End-organ damage may involve multiple organ systems based on the type of vasculitis. For individuals with suspected disease, ultrasound, CT and MR imaging of the affected anatomic regions may be indicated. Annual surveillance in the absence of symptoms is still recommended due to the high risk of progressive vascular damage.

References

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1. Anderson JL, Halperin JL, Albert N, et al. Management of Patients with Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations). *J Am Coll Cardiol*. 2013;61(14):1555-1570. doi:10.1016/j.jacc.2013.01.004.
2. Dejaco C, Ramiro S, Duftner C, et al. EULAR recommendations for the use of imaging in large vessel vasculitis in clinical practice. *Annals of the Rheumatic Diseases*. 2018;77(5):636-643. doi:10.1136/annrheumdis-2017-212649.
3. Persu A, Giavarini A, Touzé E, et al. European consensus on the diagnosis and management of fibromuscular dysplasia. *Journal of Hypertension*. 2014;32(7):1367-1378. doi:10.1097/hjh.0000000000000213.
4. Taimen K, Salomäki SP, Hohenthal U, et al. The Clinical Impact of Using 18F-FDG-PET/CT in the Diagnosis of Suspected Vasculitis: The Effect of Dose and Timing of Glucocorticoid Treatment. *Contrast Media & Molecular Imaging*. 2019;2019:1-8. doi:10.1155/2019/9157637.
5. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
6. Muratore F, Pipitone N, Salvarani C, Schmidt WA. Imaging of vasculitis: State of the art. *Best Practice Research Clinical Rheumatology*. 2016;30(4):688-706. doi:10.1016/j.berh.2016.09.010.
7. Lensen KDF, Comans EFI, Voskuyl AE, et al. Large-Vessel Vasculitis: Interobserver Agreement and Diagnostic Accuracy of 18F-FDG-PET/CT. *BioMed Research International*. 2015;2015:1-8. doi:10.1155/2015/914692.
8. Soussan M, Nicolas P, Schramm C, et al. Management of Large-Vessel Vasculitis With FDG-PET. *Medicine*. 2015;94(14). doi:10.1097/md.0000000000000622.
9. Besson FL, Parienti J-J, Bienvenu B, et al. Diagnostic performance of 18F-fluorodeoxyglucose positron emission tomography in giant cell arteritis: a systematic review and meta-analysis. *European Journal of Nuclear Medicine and Molecular Imaging*. 2011;38(9):1764-1772. doi:10.1007/s00259-011-1830-0.
10. Sivaraman V, Fels EC, and Ardoin SP. Vasculitis syndromes. *Nelson Textbook of Pediatrics*, Chapter 192. eds Kliegman RM, St. Geme JW III, Blum NJ, et al. 21st ed. Philadelphia, PA: Elsevier; 2020:1317-1327.
11. Soliman M, Laxer R, Manson D, et al. Imaging of systemic vasculitis in childhood. *Pediatric Radiology*. 2015;45(8):1110-1125. doi:10.1007/s00247-015-3339-3.
12. Sharma AM, Singh S, Lewis JE. Diagnostic Approach in Patients With Suspected Vasculitis. *Techniques in Vascular and Interventional Radiology*. 2014;17(4):226-233. doi:10.1053/j.tvir.2014.11.002.
13. Ammirati E, Moroni F, Pedrotti P, et al. Non-Invasive Imaging of Vascular Inflammation. *Frontiers in Immunology*. 2014;5:1-15. doi:10.3389/fimmu.2014.00399.
14. Granata C, Damasio MB, Zaottini F, et al. Imaging of Childhood Vasculitis. *Radiologic Clinics of North America*. 2017;55(5):1131-1143. doi:10.1016/j.rcl.2017.05.001.
15. Broncano J, Vargas D, Bhalla S, Cummings KW, Raptis CA, Luna A. CT and MR Imaging of Cardiothoracic Vasculitis. *RadioGraphics*. 2018;38(4):997-1021. doi:10.1148/rg.2018170136.
16. Jennette JC, Falk RJ, Bacon PA, et al. 2012 Revised International Chapel Hill Consensus Conference Nomenclature of Vasculitides. *Arthritis & Rheumatism*. 2012;65(1):1-11. doi:10.1002/art.37715.
17. Ozen S, Pistorio A, Iusan SM, et al. EULAR/PRINTO/PRES criteria for Henoch-Schönlein purpura, childhood polyarteritis nodosa, childhood Wegener granulomatosis and childhood Takayasu arteritis: Ankara 2008. Part II: Final classification criteria. *Annals of the Rheumatic Diseases*. 2010;69(5):798-806. doi:10.1136/ard.2009.116657.
18. Cui J, Huang LY, Guo J, Wu CR, Zhang B. Diagnosis and treatment of adult mixed-type Henoch-Schönlein purpura. *Cent Eur J Immunol*. 2019;44(2):138-143. doi:10.5114/ceji.2019.87064.
19. HRCT imaging of pulmonary involvement in granulomatosis with polyangiitis and microscopic polyangiitis at disease onset and during follow-up. Thomas Villeneuve, Stanislas Faguer, et al. *Semin Arthritis Rheum*. 2023 Dec;63:152307.

Peripheral Artery Aneurysms

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Visceral Artery Aneurysm (PVD-6.5)

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Treatment is generally indicated for visceral aneurysms $\geq 2\text{cm}$. Imaging of visceral artery aneurysms for initial evaluation or for treatment planning is medically necessary as follows:

- Initial imaging of calcifications seen on plain film imaging suspicious for visceral artery aneurysms (spleen, kidney, liver or intestines) with ultrasound (CPT® 76700, 76705, 93975, 93976, 93978, or 93979), **or** CTA Abdomen (CPT® 74175), **or** CT Abdomen with contrast (CPT® 74160)
- MRA Abdomen (CPT® 74185) without contrast in place of CTA or CT Abdomen in pediatric individuals or when there is a contraindication to contrast materials (i.e., renal insufficiency, contrast allergy, pregnancy)
- Ultrasound (CPT® 76700, 76705, 93975, 93976, 93978, or 93979) **or** CTA Abdomen (CPT® 74175) **or** CT Abdomen with contrast (CPT® 74160) is considered medically necessary for further monitoring based on the intervals below or as determined by a vascular specialist or any provider in consultation with a vascular specialist:
 - Splenic artery aneurysms:
 - $<20\text{mm}$ can be imaged every three years
 - 20mm to 29mm can be imaged annually
 - If $\geq 30\text{mm}$, 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) is considered medically necessary following stent placement at:
 - 1 month
 - 6 months
 - 12 months
 - Then every year

Evidence Discussion

Aneurysmal disease, besides primarily involving the large vessels, can also affect medium and smaller sized vessels. Visceral cases are uncommon and occasionally are associated with certain connective tissue and genetic disorders. They are often found incidentally on imaging. Ultrasound, CT, or CTA imaging may be indicated for

surveillance in these cases. Due to the anatomic location of the visceral vessels, duplex ultrasound may have technical limitations. Consideration of best surveillance study should be decided on initial imaging and whether a certain modality is felt to provide diagnostic information. Example; some splenic arterial aneurysms may be diagnostic with US but others may be obscured by bowel gas requiring CT/CTA. 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. Visceral Artery Aneurysms are defined by an increase of more than 50% of the original arterial diameter and include hepatic, renal and intestinal artery aneurysms.

References

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1. Erben Y, Brownstein AJ, Rajaei S. Natural History of and Management of Splanchnic Artery Aneurysms in a Single Tertiary Referral Center. *J Vasc Surg*. 2018 Oct; 68(4): 1079-1087
2. Alcantara S, Yank CK. The evidence for nonoperative management of visceral arterial dissections. A single center experience. *Annals of Vasc Surg* 2015; 29: 103–108.
3. Chaer R, Abularrage C, Coleman D et al. The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms. *J Vasc Surg*. 2020;72:3S-39S.
4. Corey MR, Ergul EA, Cambria RP. The Natural History of Splanchnic Aneurysms and Outcome after Operative Intervention. *J Vasc Surg*. 2016 April 63 (4):949-57.
5. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *Am J Roent*. 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
6. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.

Iliac Artery Aneurysm (IAA) (PVD-6.4)

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- Ultrasound (CPT® 76882 or CPT® 93925) is medically necessary for evaluation of a suspected IAA
 - CT Pelvis with contrast (CPT® 72193) if ultrasound is equivocal.
 - Ultrasound for follow-up imaging annually if an aneurysm is ≥ 2 cm
- Additional Imaging
 - CT Abdomen and Pelvis with contrast (CPT® 74177), CT Abdomen and Pelvis without and with contrast (CPT® 74178), or CTA Abdomen and Pelvis (CPT® 74174) is medically necessary for preoperative imaging if endovascular or open repair is being considered

Background and Supporting Information

- 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

Evidence Discussion

Annual surveillance of iliac artery aneurysms is medically necessary to determine when intervention is necessary if an iliac aneurysm exceeds 2cm in diameter. Duplex ultrasound is the primary imaging modality for individuals without technical limitations related to body habitus. It has been demonstrated to be accurate, cost-effective and does not use ionizing radiation or contrast. CT imaging may be indicated for cases where ultrasound is equivocal or for surgical planning.

References

PVD.AD.0006.4.A

v2.0.2026

1. Bonci G, Steigner ML, et al. ACR Appropriateness Criteria® Thoracic Aorta Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2017;14(11S):S570-S583. doi:10.1016/j.jacr.2017.08.042.
2. Kalva SP, Dill KE, et al. ACR Appropriateness Criteria® nontraumatic aortic disease. *J Thorac Imaging*. 2014;29(5):W85-W88. doi:10.1097/RTI.000000000000107.
3. Alborno G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. *Ann Thorac Surg*. 2006;82(4):1400-1405. doi:10.1016/j.athoracsur.2006.04.098.
4. Anderson JL, Halperin JL, Albert N, et al. Management of Patients with Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations). *J Am Coll Cardiol*. 2013;61(14):1555-1570. doi:10.1016/j.jacc.2013.01.004.
5. Bennett SJ, Dill KE, Hanley M, et al. ACR Appropriateness Criteria® Suspected Thoracic Aortic Aneurysm. *J Am Coll Radiol*. 2018;15(5). doi:10.1016/j.jacr.2018.03.031.
6. Chaikof EL, Dalman RL, Eskandari MK, et al. The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. *J Vasc Surg*. 2018;67(1). doi:10.1016/j.jvs.2017.10.044.
7. Elefteriades JA. Natural history of thoracic aortic aneurysms: indications for surgery, and surgical versus nonsurgical risks. *Ann Thorac Surg* 2002; 74: S1877-S1880.
8. Erben Y, Brownstein AJ, Rajaei S. Natural History of and Management of Splanchnic Artery Aneurysms in a Single Tertiary Referral Center. *J Vasc Surg* 2018 Oct; 68(4): 1079-1087.
9. Chaer RA, Abularrage CJ, Coleman DM, et al. The Society for Vascular Surgery clinical practice guidelines on the management of visceral aneurysms. *J Vasc Surg*. 2020;72(1S):3S-39S. doi:10.1016/j.jvs.2020.01.039.
10. Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® Acute Chest Pain-- Suspected Aortic Dissection. *American College of Radiology (ACR)*; 2014.
11. Collard M, Sutphin PD, Kalva SP, et al. Expert Panel on Vascular Imaging. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm Follow-up (without Repair). *J Am Coll Radiol*. 2019;16(5S):S2-S6. doi:10.1016/j.jacr.2019.02.005.
12. Corey MR, Ergul EA, Cambria RP. The Natural History of Splanchnic Aneurysms and Outcome after Operative Intervention. *J Vasc Surg*. 2016 April 63 (4):949-57.
13. DeJaco C, Ramiro S, Duftner C, et al. EULAR recommendations for the use of imaging in large vessel vasculitis in clinical practice. *Annals of the Rheumatic Diseases*. 2018;77(5):636-643. doi:10.1136/annrheumdis-2017-212649.
14. Diercks D, Promes S, Schuur J, et al. American College of Emergency Physicians. Clinical policy: critical issues in the evaluation and management of adult patients with suspected acute nontraumatic thoracic aortic dissection. *Ann Emerg Med*. 2015 Jan; 65 (1):32-42.
15. Francois CJ, Skulborstad EP, Majdalany BS, et al. Expert Panels on Vascular Imaging and Interventional Radiology. ACR Appropriateness Criteria® Abdominal Aortic Aneurysm: Interventional Planning and Follow-Up. *J Am Coll Radiol*. 2018;15(5S):S2-S12. doi:10.1016/j.jacr.2018.03.008.
16. Harvin HJ, Verma N, Nikolaidis P, et al. ACR Appropriateness Criteria® Renovascular Hypertension. *J Am Coll Radiol*. 2017;14(11). doi:10.1016/j.jacr.2017.08.040.
17. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine [published correction appears in *J Am Coll Cardiol*. 2013 Sep 10;62(11):1039-40]. *J Am Coll Cardiol*. 2010;55(14):e27-e129. doi:10.1016/j.jacc.2010.02.015.

18. Kallianos KG, Burris NS. Imaging Thoracic Aortic Aneurysm. *Radiol Clin North Am.* 2020;58(4):721-731. doi:10.1016/j.rcl.2020.02.009.
19. Loren F, Hiratzka MD, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients with Thoracic Aortic Disease. *Circulation* 2010; 121: e266-e369.
20. Masuda Y1, Yamada Z, Morooka N, Watanabe S, Inagaki Y. Prognosis of patients with medically treated aortic dissections. *Circulation.* 1991 Nov;84(5 Suppl):III7-13.
21. Moser M, Setaro JF. Resistant or Difficult-to-Control Hypertension. *New England Journal of Medicine.* 2006;355(4):385-392. doi:10.1056/nejmcp041698.
22. Persu A, Giavarini A, Touzé E, et al. European consensus on the diagnosis and management of fibromuscular dysplasia. *Journal of Hypertension.* 2014;32(7):1367-1378. doi:10.1097/hjh.0000000000000213.
23. Sakamoto I, Sueyoshi E, Hazama S, et al. Endovascular treatment of iliac artery aneurysms. *Radiographics* October 2005;25:S213-S227.
24. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic Accuracy of Transesophageal Echocardiography, Helical Computed Tomography, and Magnetic Resonance Imaging for Suspected Thoracic Aortic Dissection: Systematic Review and Meta-analysis. *Arch Intern Med* 2006; 166 (13): 1350-1356.
25. Alcantara S, Yang CK, Sasson J, et al. The evidence for nonoperative management of visceral artery dissections: a single-center experience. *Ann Vasc Surg.* 2015;29(1):103-108. doi:10.1016/j.avsg.2014.09.004.
26. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *American Journal of Roentgenology.* 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
27. Tadros TM, Klein MD, Shapira OM. Ascending aortic dilatation associated with bicuspid aortic valve. *Circulation* 2009; 119: 880-890.
28. Taimen K, Salomäki SP, Hohenthal U, et al. The Clinical Impact of Using 18F-FDG-PET/CT in the Diagnosis of Suspected Vasculitis: The Effect of Dose and Timing of Glucocorticoid Treatment. *Contrast Media & Molecular Imaging.* 2019;2019:1-8. doi:10.1155/2019/9157637.
29. van Bogerijen GH, Tolenaar JL, Rampoldi V, et al. Predictors of aortic growth in uncomplicated type B aortic dissection. *J Vasc Surg.* 2014 Apr;59(4):1134-43. doi: 10.1016/j.jvs.2014.01.042.
30. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension.* 2018;71(6). doi:10.1161/hyp.0000000000000065.
31. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg.* 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.
32. Salim S, Machin M, Patterson BO, Bicknell C. The Management of Penetrating Aortic Ulcer. *Hearts.* 2020;1(1):5-13. doi:10.3390/hearts1010003.
33. Eric M. Isselbacher, MD, Ourania Preventza, MD, et al. 2022 ACC/AHA guideline for the diagnosis and management of aortic disease: a report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation.* 2022;146:e334–e482. doi: 10.1161/CIR.0000000000001106.
34. Nicolaou G, Ismail M, Cheng D. Thoracic endovascular aortic repair: update on indications and guidelines. *Anesthesiol Clin.* 2013 Jun;31(2):451-78. doi: 10.1016/j.andclin.2013.01.001.
35. Isselbacher EM, Preventza O, Black JH, et al. ACC/AHA Clinical Practice Guideline: 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/ American College of Cardiology Joint Committee on Clinical Practice Guidelines. *Circulation* (2022); 146:e334-e482. DOI: 10.1161/CIR.0000000000001106.
36. Wanhainen A, Van Herzele I, Goncalves FB, et al. Clinical Practice Guideline Document: Editor's Choice – European Society for Vascular Surgery (ESVS) 2024 Clinical Practice Guidelines on the Management of Abdominal Aorto-Iliac Artery Aneurysms. *Eur J Vasc Endovasc Surg* (2024); 67:192-331.
37. Olukorode JO, Onwuzo CN, Otabor EO, et al. Aortic Size Index Versus Aortic Diameter in the Prediction of Rupture in Women With Abdominal Aortic Aneurysm. *Cureus.* 2024;16(4):e58673. Published 2024 Apr 21. doi:10.7759/cureus.58673.

Lower Extremity Artery Aneurysms (PVD-7.4)

PVD.AI.0007.4.A

v2.0.2026

Imaging Indications

Iliac Artery Aneurysm

See Iliac Artery Aneurysm (IAA) (PVD-6.4)

Femoral Artery Aneurysm

- Initial imaging is medically necessary as follows:
 - Ultrasound (CPT® 93925 bilateral study or CPT® 93926 unilateral study).
- Surveillance imaging is medically necessary as follows:
 - Asymptomatic true femoral aneurysms smaller than 2.5 cm in diameter
 - Ultrasound (CPT® 93926 unilateral study) annually
 - Asymptomatic true femoral aneurysms larger than 2.5 cm
 - Ultrasound (CPT® 93926 unilateral study) every 6 months
- Other imaging is medically necessary as follows:
 - CTA or MRA Lower extremity (CPT® 73706 or 73725 or 74198 or 75635):
 - Preoperative study for individuals with no plans for invasive angiography
 - Technically limited or abnormal ultrasound results

Popliteal Artery Aneurysm

- Initial imaging is medically necessary as follows:
 - 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 is medically necessary as follows:
 - If no intervention: Ultrasound (CPT® 93926 unilateral study) annually
 - Post-intervention: (ABI (CPT® 93922) and Duplex ultrasound are indicated as follows:
 - 3 months post-operative
 - 6 months post-operative
 - 12 months post-operative
 - Then annually

- Other imaging is medically necessary as follows:
 - CTA or MRA (CPT® 73706 or 73725 or 74185 or 75635) for:
 - Preoperative study
 - Technically limited or abnormal ultrasound results

Evidence Discussion

Duplex ultrasound is the preferred modality for surveillance of lower extremity arterial aneurysms. This modality uses no ionizing radiation or contrast, has a reasonable level of accuracy and is cost-effective. CT/MR imaging may be indicated for preoperative planning or in cases where ultrasound is technically limited.

References

PVD.AI.0007.4.A

v2.0.2026

1. Hall HA, Minc S, Babrowski T. Peripheral artery aneurysm. *Surg Clin North Am*. 2013;93(4):911-ix. doi:10.1016/j.suc.2013.04.008.
2. von Stumm M, Teufelsbauer H, Reichenspurner H, Debus ES. Two Decades of Endovascular Repair of Popliteal Artery Aneurysm--A Meta-analysis. *Eur J Vasc Endovasc Surg*. 2015;50(3):351-359. doi:10.1016/j.ejvs.2015.04.036
3. Kim TI, Sumpio BE. Management of Asymptomatic Popliteal Artery Aneurysms. *Int J Angiol*. 2019;28(1):5-10. doi:10.1055/s-0038-1676792.
4. Corriere MA, Guzman RJ. True and false aneurysms of the femoral artery. *Semin Vasc Surg*. 2005;18(4):216-223. doi:10.1053/j.semvascsurg.2005.09.008
5. Farber A, Angle N, Avgerinos E, Dubois L, Eslami M, Geraghty P, et al. The Society for Vascular Surgery clinical practice guidelines on popliteal artery aneurysms. *J Vasc Surg* 2022; 75:109S-20S.
6. Smith T, Quencer KB. Best Practice Guidelines: Imaging Surveillance After Endovascular Aneurysm Repair. *American Journal of Roentgenology*. 2020;214(5):1165-1174. doi:10.2214/ajr.19.22197.
7. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.1.

Peripheral Arterial Imaging

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Upper Extremity PVD – Imaging (PVD-4.1)

PVD.AI.0004.1.A

v2.0.2026

Initial Imaging

For arterial insufficiency, arterial ultrasound upper extremities (CPT® 93930 or CPT® 93931) is medically necessary for signs and symptoms of arterial insufficiency including:

- Arm or hand claudication
- 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
- CTA Upper extremity (CPT® 73206) or MRA of Upper extremity (CPT® 73225), **and/or** CTA Chest (CPT® 71275) or MRA Chest (CPT® 71555) is medically necessary for:
 - Abnormal arterial ultrasound results
 - Equivocal arterial ultrasound results
 - Pre-operative planning

For Subclavian Steal Syndrome, the following studies are considered medically necessary:

- Carotid duplex (CPT® 93882) is the initial and definitive imaging study.
- CTA chest (CPT® 71275) or MRA chest (CPT® 71555) for carotid duplex showing reversal of flow in one of the vertebral arteries.
- Surveillance of subclavian arterial disease is **not** medically necessary if there has not been any intervention such as a carotid-subclavian bypass or subclavian stent

Note:

If the carotid duplex is not diagnostic for reversal of flow in the ipsilateral vertebral artery, then neurological symptoms should be evaluated according to the Head Imaging guideline

For suspected Fibromuscular Dysplasia of the brachial artery, medically necessary studies include:

- MRA Upper extremity (CPT® 73225)
- CTA Upper extremity (CPT® 73206)

- Arterial Ultrasound (CPT® 93930 bilateral study or CPT® 93931 unilateral study)

For arterial thoracic outlet syndrome, medically necessary studies include:

- CTA Chest (CPT® 71275) (preferred study) or MRA Chest (CPT® 71555) (preferred study) or CT Chest either without or with contrast (CPT® 71250 or CPT® 71260) or MRI Chest with contrast (CPT® 71551)

Post-revascularization

- Arterial Duplex (CPT® 93931) is medically necessary following upper extremity arterial revascularization at:
 - Baseline (within one month)
 - 6 months
 - Then annually if stable
 - Anytime for new or worsening symptoms of arterial insufficiency

Evidence Discussion

Upper extremity PVD

Duplex ultrasound (DU) is the initial imaging modality for assessment of patients with symptoms of upper extremity arterial occlusive disease including arm/hand claudication, non-healing wounds, blue discoloration, or a unilateral cold, painful, and pulseless hand.

DU is a non-invasive, cost-effective method for screening for arterial disease of the upper extremity. It has high sensitivity and specificity when compared to CT angiography (CTA) and MR angiography (MRA). CTA and MRA also evaluate anatomic location of disease but are reserved for confirmed vascular disease, suspected fibromuscular dysplasia of the brachial artery, and/or pre-operative planning. They are not first line imaging studies due to the higher risks associated with their use and the cost.

Post-revascularization surveillance with DU has been established as a reliable method to monitor the intervention for recurrence of disease. The time intervals for surveillance have been established at one and six months post-intervention, then yearly. If at any time, there are new signs or symptoms of disease, repeat duplex imaging is supported.

If initial duplex demonstrates high-grade stenosis or occlusion of the subclavian artery, advanced imaging is NOT indicated unless the individual is symptomatic with arm claudication or signs of hypo-perfusion of the vertebral artery with recurrent dizziness.

Subclavian Steal refers to a hemodynamically significant stenosis or occlusion of the subclavian/innominate artery which results in the reversal of blood flow in the vertebral artery (VA). Signs/Symptoms associated with this syndrome include:

- Physical examination with a >15mmHg discrepancy in blood pressure between two arms
- Supraclavicular bruit

- Symptoms of vertebrobasilar insufficiency, including vertigo and limb paresthesia particularly with use of the ipsilateral arm.

Thoracic outlet syndrome (TOS) refers to compression of the neurovascular structures within the thoracic outlet as they pass from the neck and thorax to the axilla.

- There are three types of TOS, neurogenic, arterial and venous.
- Neurogenic TOS refer to Brachial Plexus (PN-4.1) in the peripheral nerve disorders imaging
- Venous TOS refer to **Upper Extremity Venous Imaging (PVD 4.2)**

References

PVD.AI.0004.1.A**v2.0.2026**

1. Skeik N, Soo-Hoo SS, Porten BR, et al. Arterial Embolisms and Thrombosis in Upper Extremity Ischemia. *Vascular and Endovascular Surgery*. 2015;49(5-6):100-109. doi:10.1177/1538574415596740.
2. Hughes K, Cubangbang M, Blackman K, et al. Upper Extremity Bypass for Chronic Ischemia—A National Surgical Quality Improvement Program Study Database Study. *Vascular and Endovascular Surgery*. 2013;47(3):192-194. doi:10.1177/1538574413478472.
3. Louis L Nguyen, Andrew J Soo Hoo. Evaluation and Management of Arterial Thoracic Outlet Syndrome. *Thorac Surg Clin*. 2021 Feb;31(1):45-54. doi:10.1016/j.thorsurg.2020.09.006.
4. Dalio MB, Filho ERDS, Barufi MB, et al. Contemporary Management of Arterial Thoracic Outlet Syndrome. *Ann Vasc Surg*. 2021;74:42-52. doi:10.1016/j.avsg.2021.01.078.
5. Potter BJ, Pinto DS. Subclavian steal syndrome. *Circulation*. 2014;129(22):2320-2323. doi:10.1161/CIRCULATIONAHA.113.006653.
6. Mohebbi J, Clouse WD. Innominate, common carotid, and subclavian disease. In: Cronenwett JL, Farber A, Mitchell EL, eds. *Vascular Decision Making: Medical, Endovascular, Surgical*. 1st ed. Philadelphia: Wolters-Kluwer; 2021.
7. Aboyans V, Ricco JB, Bartelink ML, et al. Editor's Choice – 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS). *Eur J Vasc Endovasc Surg*. 2018;55(3):305–368. PMID: 28851596.
8. Zurkiya O, Ganguli S, Kalva SP, et al. ACR Appropriateness Criteria thoracic outlet syndrome. *J Am Coll Radiol*. 2020;17:S323-S334. doi:10.1016/j.jacr.2020.01.029.

Renovascular Hypertension/Renal Artery Stenosis (PVD-6.6)

PVD.AI.0006.6.A

v2.0.2026

Initial imaging

- MRA Abdomen (CPT® 74185) or CTA Abdomen (CPT® 74175) or US kidney retroperitoneal (CPT® 76775) and/or Doppler (CPT® 93975, 93976, 93978, or 93979 if expertise is available) are medically necessary when there is documentation of **any** of the following:
 - 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)
- Carotid duplex (CPT® 93880) is medically necessary to screen for carotid involvement in individuals with documented or highly suspicious renal artery stenosis due to fibromuscular dysplasia (mostly women between 15 and 50 years of age).

Screening

CTA Abdomen (CPT® 74175) or MRA Abdomen (CPT® 74185) is medically necessary to screen for renovascular fibromuscular dysplasia in hypertensive individuals with documented cervicocephalic fibromuscular dysplasia. The assessment of other vascular beds should be considered if supported by suggestive symptoms or medical history.

Carotid duplex (CPT® 93880) is medically necessary to screen for carotid involvement in individuals with documented or highly suspicious renal artery stenosis due to fibromuscular dysplasia (mostly women between 15 and 50 years of age)

Repeat imaging post revascularization

- CTA Abdomen (CPT® 74175), or MRA Abdomen (CPT® 74185), or CT Abdomen with contrast (CPT® 74160) is medically necessary after stent placement at the following intervals:
 - 1 month post-procedure
 - 6 months post-procedure
 - 12 months post-procedure
 - Then annually

Evidence Discussion**Renovascular Hypertension**

The American Heart Association 2017 guidelines on hypertension estimate renovascular disease to be the source of 5-34% of all cases. Multiple studies have shown that intervention is not more effective than medical therapy in most cases as reviewed by the KDIGO conference in 2022; however, it is noted that these recommendations continue to evolve. While duplex ultrasound is the preferred imaging modality, patients with compromised renal function or technical limitations due to body habitus may require CT/MR imaging for monitoring.

Current recommendations for renal artery screening in the setting of hypertension refractory to medical therapy include the following:

- 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 or New or worsening renal function/increasing creatinine (especially after the administration of an ACE inhibitor or with angiotensin receptor blocking agent)

Fibromuscular dysplasia carries a higher risk of concomitant renal and carotid artery involvement. Screening of both anatomic regions is medically necessary upon diagnosis.

Post-intervention imaging with CT/MR imaging at standard 1/6/12 month intervals followed by annual imaging to assess for stent patency follow standard recommendations for non-coronary interventions. Additional surveillance is not indicated in the absence of symptoms.

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. Gadolinium agents may be contraindicated in individuals with severe renal disease or on dialysis due to the risk of developing nephrogenic systemic sclerosis.

References

PVD.AI.0006.6.A**v2.0.2026**

1. Harvin HJ, Verma N, Nikolaidis P, et al. ACR Appropriateness Criteria® Renovascular Hypertension. *J Am Coll Radiol*. 2017;14(11). doi:10.1016/j.jacr.2017.08.040.
2. Moser M, Setaro JF. Resistant or Difficult-to-Control Hypertension. *N Engl J Med*. 2006;355(4):385-392. doi:10.1056/nejmcp041698.
3. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension*. 2018;71(6). doi:10.1161/hyp.0000000000000065.
4. Hicks CW, Clark TWI, Cooper CJ, et al. Atherosclerotic Renovascular Disease: A KDIGO (Kidney Disease: Improving Global Outcomes) Controversies Conference. *Am J Kidney Dis*. 2022;79(2):289-301. doi:10.1053/j.ajkd.2021.06.025.

Median Arcuate Ligament Syndrome, Nutcracker Syndrome and other Abdominal Vascular Compression Syndromes (PVD-18)

PVD.AI.0018.A

v2.0.2026

Median Arcuate Ligament Syndrome

Codes included

CPT®	Description
74175	Computed tomographic angiography, abdomen, with contrast material(s), including noncontrast images, if performed, and image post-processing
74185	Magnetic resonance angiography, abdomen, with or without contrast material(s)
93975	Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; complete study
93976	Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; limited study

Initial Imaging

- Duplex Doppler Ultrasound of Mesenteric Arteries (CPT® 93975 or 93976) is medically necessary as the initial imaging
- CTA or MRA Abdomen (CPT® 74175 or 74185) is medically necessary for **either**:
 - US results are equivocal
 - Preoperative planning

Repeat Imaging

- Surveillance imaging is **not** medically necessary post-operatively in the absence of abdominal symptoms.

Evidence Discussion

A non-atherosclerotic cause of chronic mesenteric ischemia.

Patients are typically younger with an average age range of 30-50 years old and a female to male ratio of 4:1

Patients may have symptoms of postprandial abdominal pain, nausea, vomiting, food aversion, weight loss. Symptoms are nonspecific, so MALS may be considered a diagnosis of exclusion.

Imaging will demonstrate compression of the celiac artery by fibers of the median arcuate ligament, but this is a nonspecific finding and may be seen in the asymptomatic population.

Pathophysiologically related to foregut ischemia from compression of the celiac artery; may also be related to neuropathic pain secondary to compression of the celiac ganglion.

Treatment is generally surgical, via a variety of approaches.

Left Renal Vein Compression (“Nutcracker”) Syndrome

Codes included

CPT®	description
93975	Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; complete study
93976	Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; limited study
74174	Computed tomographic angiography, abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image post-processing
72198	Magnetic resonance angiography, pelvis, with or without contrast material(s)
74185	Magnetic resonance angiography, abdomen, with or without contrast material(s)

Initial Imaging

- Abdominal duplex (CPT® 93975 or 93976) is medically necessary as the initial imaging to confirm left renal vein compression syndrome.
- CTV or MRV Abdomen and Pelvis (CPT® 74174) or (CPT® 74185 and 72198) is medically necessary for preoperative planning when left renal vein compression syndrome is confirmed by duplex ultrasound.

Repeat imaging

- Postoperative follow-up imaging is **not** medically necessary in the absence of symptomatology.

Background and Supporting Information

Patients may present with symptoms related to compression of the left renal vein between the aorta and superior mesenteric artery. A less common presentation (“posterior nutcracker syndrome”) is related to compression of a retroaortic (or circumaortic) left renal vein between the aorta and vertebral body.

The radiologic finding may be asymptomatic or considered a normal variant.

Signs/symptoms may include hematuria, proteinuria, flank pain, pelvic congestion/associated pain in females, varicocele in males.

There may be an overlap in symptom complex with patients who have pelvic congestion syndrome, iliac vein compression (May-Thurner).

There is no single accepted treatment modality. Approaches will range from conservative/medical (esp in younger patients), to endovascular, to open/laparoscopic/robotic surgical.

References

PVD.AI.0018.A**v2.0.2026**

1. Velasquez CA, Saeyeldin A, Zafar MA, Brownstein AJ, Erben Y. A systematic review on management of nutcracker syndrome. *J Vasc Surg Venous Lymphat Disord*. 2018;6(2):271-278. doi:10.1016/j.jvsv.2017.11.005.
2. Ananthan K, Onida S, Davies AH. Nutcracker Syndrome: An Update on Current Diagnostic Criteria and Management Guidelines. *Eur J Vasc Endovasc Surg*. 2017;53(6):886-894. doi:10.1016/j.ejvs.2017.02.015.
3. Meissner MH, Khilnani NM, Labropoulos N, et al. The Symptoms-Varices-Pathophysiology classification of pelvic venous disorders: A report of the American Vein & Lymphatic Society International Working Group on Pelvic Venous Disorders. *J Vasc Surg Venous Lymphat Disord* 2021;9:568-84.
4. De Maeseneer MG, Kakkos SK, Aherne T, et al. Editor's Choice - European Society for Vascular Surgery (ESVS) 2022 Clinical Practice Guidelines on the Management of Chronic Venous Disease of the Lower Limbs [published correction appears in *Eur J Vasc Endovasc Surg*. 2022 Aug-Sep;64(2-3):284-285]. *Eur J Vasc Endovasc Surg*. 2022;63(2):184-267. doi:10.1016/j.ejvs.2021.12.024.
5. Gloviczki P, Comerota AJ, Dalsing MC, et al. The care of patients with varicose veins and associated chronic venous diseases: clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum. *J Vasc Surg*. 2011;53(5 Suppl):2S-48S. doi:10.1016/j.jvs.2011.01.079.
6. Columbo JA, Trus T, Nolan B, et al. Contemporary management of median arcuate ligament syndrome provides early symptom improvement. *J Vasc Surg*. 2015;62(1):151-156. doi:10.1016/j.jvs.2015.01.050.
7. Goodall R, Langridge B, Onida S, et al. Median arcuate ligament syndrome. *J Vasc Surg*. 2020;71(6):2170-2176. doi:10.1016/j.jvs.2019.11.012.
8. Kim EN, Lamb K, Relles D, et al. Median Arcuate Ligament Syndrome-Review of This Rare Disease. *JAMA Surg*. 2016;151(5):471-477. doi:10.1001/jamasurg.2016.0002.
9. Björck M, Koelemay M, Acosta S, et al. Editor's Choice - Management of the Diseases of Mesenteric Arteries and Veins: Clinical Practice Guidelines of the European Society of Vascular Surgery (ESVS). *Eur J Vasc Endovasc Surg*. 2017;53(4):460-510. doi:10.1016/j.ejvs.2017.01.010.
10. Expert Panels on Vascular Imaging and Gastrointestinal Imaging; Ginsburg M, Obara P, et al. ACR Appropriateness Criteria® Imaging of Mesenteric Ischemia. *J Am Coll Radiol*. 2018;15(11S):S332-S340. doi:10.1016/j.jacr.2018.09.018.

Claudication and Critical Limb Ischemia (PVD-7.1)

PVD.AI.0007.1.A

v2.0.2026

- Resting ABI for initial evaluation of suspected PAD. 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 is medically necessary once
 - Follow-up studies are medically necessary with CPT® 93922
 - Post-exercise ABI (CPT® 93924) is medically necessary if the resting ABI is >0.89 and PAD is still highly suspected clinically.
- 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 **Lumbar Spinal Stenosis (SP-9)** in the Spine Imaging Guidelines
 - Re-measure ABI after exercise (CPT® 93924)
 - A TBI (toe-brachial index) may be used as further screening in individuals with ABI's ≥ 1.4
 - Advanced imaging is medically 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 are considered medically necessary 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) are medically necessary to further evaluate the lower extremity arteries for ANY of the following:
 - 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
 - Preoperative planning for Intermittent claudication (i.e., non-limb threatening ischemia) AND there is documentation of both of the following:
 - Failed 3-months' conservative medical therapy (physician supervised walking/ exercise program plus medical therapy)
 - Functional disability (e.g., exercise impairment sufficient to threaten the individual's employment or to require significant alterations in the individual's lifestyle)
 - CTA lower extremity (CPT® 73706) OR MRA lower extremity (CPT® 73725) is medically necessary for evaluation of PVD when aortoiliac disease is not a concern or the state of the aorta and iliac arteries is already known as documented in the clinical history

Note:

MRA Pelvis (CPT® 72198) should not be requested/billed with CPT® 74185, CPT® 73725 and CPT® 73725

- To evaluate for an embolic source, the following studies are medically necessary:
 - CTA chest (CPT® 71275) OR MRA Chest (CPT® 71555) AND
 - CTA Abdomen and Pelvis (CPT® 74174) OR MRA Abdomen and Pelvis (CPT® 74185) (if imaging of abdomen/pelvis not already obtained)

See also Echocardiogram in the Cardiac imaging guideline

Evidence Discussion

Peripheral arterial disease (PAD) is defined as chronic, atherosclerotic occlusive disease of the lower extremities. The vast majority of patients with PAD are asymptomatic. A much smaller group has symptomatic PAD, consisting of intermittent claudication(IC), rest pain or tissue loss.

The natural history of PAD for asymptomatic and IC patients is relatively benign. It is estimated that 7% (4%–11%) of asymptomatic patients deteriorate to IC over a 5-year period. Multiple studies have established that patients with IC are at very low risk of major amputation (<1% per year).

For these reasons, the first line of treatment for patient with IC is risk factor reduction/modification and exercise therapy. A meta-analysis of 1200 patients determined that exercise therapy, compared with placebo or usual care, provides an overall improvement in walking ability of 50% to 200%, with improvements maintained for up to 2 years. Additionally, with intensive medical management, <5% of patients will develop symptoms of advanced ischemia, such as ischemic rest pain, tissue loss, or require amputation.

Diagnosis:

Measurement of the ankle-brachial index (ABI) is the primary method for establishing the diagnosis of PAD. An ABI of 0.90 has been demonstrated to have high sensitivity and specificity for the identification of PAD compared with the gold standard of conventional angiography (CA). It is a simple non-invasive method to assess for PAD. It avoids use of radiation, and contrast agents. It can be performed easily in an office setting and is cost-effective.

Further studies for evaluation of anatomic location of disease are warranted if PAD is proven. Arterial duplex combines Doppler spectral analysis and B-mode imaging to evaluate blood flow and anatomy. It has been shown to be effective in localizing arterial vascular disease with comparable sensitivity and specificity to CT angiography (CTA), MR angiography (MRA) and CA. It is also non-invasive, cost-effective, and avoids radiation and contrast exposure.

Due to their associated risks, CTA, MRA and CA should be reserved for patients in whom revascularization treatment is being considered. CTA risks include exposure to intravenous contrast and radiation. Contrast complications include allergy and contrast induced nephropathy. MRA risk includes exposure to gadolinium which confers the risk of nephrogenic systemic fibrosis in patients with renal insufficiency. MRA also is contraindicated in patients with metallic implants. CA risks include radiation and contrast exposure as well as access site complications. Since it is an invasive procedure, there is risk for arterial injury, embolization and thrombosis.

References

PVD.AI.0007.1.A

v2.0.2026

1. Dick F, Ricco J-B, Davies A.H, Cao P, et. al. Chapter VI: Follow-up after Revascularization. *European Journal of Vascular and Endovascular Surgery*, Volume 42, Supplement 2, 2011 pp.S75-90.
2. Lane TRA et al. Post-Operative Surveillance after Open Peripheral Arterial Surgery. *Eur J Vasc Endovasc Surg*. Volume 42, Issue 1, July 2011. Pages 59-77.
3. Brooke BS, Beck AW, Kraiss LW, et al. Association of Quality Improvement Registry Participation with Appropriate Follow-up after Vascular Procedures. *JAMA Surgery*. 2018;153(3):216. doi:10.1001/jamasurg.2017.3942.
4. Rooke TW, Hirsch AT, Misra S, Sidawy AN, et al. 2011 ACCF/AHA focused update of the guideline for the management of patients with peripheral artery disease (updating the 2005 guideline): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines: developed in collaboration with the Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society for Vascular Medicine, and Society for Vascular Surgery. American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines., Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society for Vascular Medicine, Society for Vascular Surgery. *J Vasc Surg*. 2011 Nov; 54(5):e32-58.
5. Conte MS, Pomposelli FB, and Clair DG. Society for Vascular Surgery practice guidelines for atherosclerotic occlusive disease of the lower extremities: Management of asymptomatic disease and claudication. *J Vasc Surg*. March 2015;61(3):2S-41S.e1.
6. Bui TD, Mills JL Sr, Inhnat DM et al. The natural history of duplex-detected stenosis after femoropopliteal endovascular therapy suggests questionable clinical utility of routine duplex surveillance. *J Vasc Surg*. 2012 Feb 55:2:346-352.
7. Troutman DA, Madden NJ, Dougherty MJ, et al. Duplex Ultrasound Diagnosis of Failing Stent Grafts Placed for Occlusive Disease. *J Vasc Surg* 2014;70:1–5.
8. Humphries MD, Pevec WC, Laird JR, et.al. Early Duplex Scanning after Infrainguinal Endovascular Therapy. *J Vasc Surg* 2011; 53:353–8.
9. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *J Vasc Surg*. 2018 Jul;68(1):256-284. doi: 10.1016/j.jvs.2018.04.018.
10. Cooper K, Majdalany BS, Kalva SP, et al. ACR Appropriateness Criteria® Lower Extremity Arterial Revascularization—Post-Therapy Imaging. *J Am Coll Radiol*. 2018;15:S104-S115.
11. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC Guideline on the management of patients with lower extremity peripheral artery disease: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2017; 135: e726-e779.
12. Ahmed O, Hanley M, Bennett SJ, et al. ACR Appropriateness Criteria® Vascular claudication -Assessment for Revascularization. *J Am Coll Radiol*. 2017 May;14(5S):S372-S379. doi: 10.1016/j.jacr.2017.02.037.
13. Macedo TA, Johnson M, Hallett Jr JW, and Breen JF. Popliteal artery entrapment syndrome: role of imaging in the diagnosis. *AJR Am J Roentgen*. 2003 Nov;181(5):1259-1265. doi:10.2214/ajr.181.5.1811259.
14. Ahmed O, Hanley M, Bennett SJ, et al. ACR® Appropriateness Criteria Vascular Claudication-Assessment for Revascularization. *J Am Coll Radiol*. 2017;14(5):S372-S379. doi:10.1016/j.jacr.2017.02.037.
15. Expert Panels on Vascular Imaging and Cardiac Imaging: Parenti VG, Vijay K, Maroules CD, Majdalany BS, Kowek LM, Khaja MS, et al. ACR Appropriateness Criteria® Workup of Noncerebral Systemic Arterial Embolic Source. *Journal of the American College of Radiology*, Volume 20, Issue 5, Supplement, S285-S300, May 2023
16. Sigvant B, Lundin F, Wahlberg E. The risk of disease progression in peripheral arterial disease is higher than expected: a meta-analysis of mortality and disease progression in peripheral arterial disease. *Eur J Vasc Endovasc Surg*. 2016;51(3):395–403.
17. Watson L, Ellis B, Leng GC. Exercise for intermittent claudication. *Cochrane Database Syst Rev* 2008; (4):CD000990.

18. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *J Vasc Surg* 2007;45(Suppl S):S5-67.
19. Collins R, Burch J, Cranny G, et al. Duplex ultrasound, magnetic resonance angiography, and computed tomography angiography for the diagnosis and assessment of symptomatic, lower limb peripheral disease: systematic review. *BMJ* 2007;334:1257.
20. Conte MS, Pomposelli FB, et al. Society for Vascular Surgery practice guidelines for atherosclerotic occlusive disease of the lower extremities: Management of asymptomatic disease and claudication. *J Vasc Surg* 2015;61:2S-41S.
21. Hirsch AT, Haskal ZJ, et al. ACC/AHA Guidelines for the Management of Patients with Peripheral Arterial Disease. *J Vasc Interv Radiol* 2006; 17:1383–1398.
22. Conte MS, Bradbury AW, et al. Global vascular guidelines on the management of chronic limb-threatening ischemia. *JVS*, June 2019. 69:6 3S-125S.

Popliteal Artery Entrapment Syndrome (PVD-7.2)

PVD.AI.0007.2.A

v2.0.2026

- Diagnosis of popliteal artery stenosis or occlusion due to compression by adjacent muscle and tendons all of the following are medically necessary:
 - Resting ABI (CPT® 93922 OR 93923) AND/OR Post-Exercise ABI (CPT® 93924) AND
 - Ultrasound (CPT® 93926 unilateral study) AND
 - Either CTA Lower extremity (CPT® 73706), or MRA Lower extremity (CPT® 73725).
 - CT or MRI Lower Extremity (contrast as requested) if requested by the operating surgeon

Evidence Discussion

Popliteal Artery Entrapment

Popliteal artery entrapment syndrome is a nonatheromatous cause of lower extremity ischemic symptoms. It is caused by abnormal embryologic development of the structures in the popliteal fossa. The symptoms are caused by compression of the popliteal artery by the muscles or fibrous bands. The typical presentation is claudication symptoms in physically active young men who have normal pulse examination.

Popliteal Artery Entrapment Syndrome is typically seen in young men (ages 20 to 40) but is not exclusive to this gender or age group.

Due to its unusual nature and presentation, ultrasound, CT Angiography or MR Angiography of the lower extremity is supported for diagnosis. Since it is critical to understand the anatomic relationships of the muscles to the vessels in the popliteal fossa, CT or MRI of the lower extremity is supported if requested by the surgeon for pre-operative planning.

References

PVD.AI.0007.2.A

v2.0.2026

1. Expert Panels on Vascular Imaging: Francois CJ, Skulborstad EP, Kalva SP, et al. ACR Appropriateness Criteria ® Nonatherosclerotic Peripheral Arterial Disease. *J Am Coll Radiol* 2019; 16: S174-S183.
2. Grimm NL, Danilkowicz R, Shortell C, Toth AP. Popliteal Artery Entrapment Syndrome. *JBJS Rev* 2020;8(1):e0035.
3. Zhong H, Gan J, Zhao Y, Xu Z, Liu C, Shao G, and Wu X. Role of CT angiography in the diagnosis and treatment of popliteal vascular entrapment syndrome. *Am J Roentgenol*. 2011;197(6):W1147-54.
4. Sinha S, Houghton J, Holt PJ, et al. Popliteal entrapment syndrome. *J Vasc Surg*.2012;55(1):252–262e30.
5. Shahi N, Arosemena M, Kwon J, et al.Functional popliteal artery entrapment syndrome: a review of diagnosis and management.*Ann Vasc Surg*.2019;59:259–267.

Arterial Imaging for Free Flaps in Reconstructive Surgery (PVD-7.5)

PVD.AI.0007.5.A

v2.0.2026

Indications

- Breast reconstruction preoperative planning: See **Breast Reconstruction (BR-3)** in the Breast Imaging Guidelines
- Head and neck reconstruction: CTA or MRA unilateral lower extremity (CPT® 73706 or 73725) of the harvest site is medically necessary to evaluate perforator anatomy for planned fibular flap
 - Bilateral imaging is medically necessary when requested from the operating surgeon to select harvest site

References (PVD-7.5)

PVD.AI.0007.5.A

v2.0.2026

1. Ettinger KS, Morris JM, Alexander AE, Nathan JM, Arce K. Accuracy and Precision of the Computed Tomographic Angiography Perforator Localization Technique for Virtual Surgical Planning of Composite Osteocutaneous Fibular Free Flaps in Head and Neck Reconstruction. *J Oral and Maxillofac Surg* 2022; 80(8):1434-1444.
2. Garvey PB, Chang EI, Selber JC, Skoracki RJ, Madewell JE, Liu, J, Yu et al. A Prospective Study of Preoperative Computed Tomographic Angiographic Mapping of Free Fibula Osteocutaneous Flaps for Head and Neck Reconstruction. *Plas Reconstr Surg* 2012; 130(4):541e-549e.
3. Jin KN, Lee W, Yin YH, et al. Preoperative Evaluation of Lower Extremity Arteries for Free Fibula Transfer Using MDCT Angiography. *J Comput Assist Tomogr* 2007; 31(5): 820-825.
4. Knitschke M, Baumgart AK, Bäcker C, et al. Computed Tomography Angiography (CTA) before Reconstructive Jaw Surgery Using Fibula Free Flap: Retrospective Analysis of Vascular Architecture. *Diagnostics* 2021; 11, 1865.

Arteriovenous Malformations (AVMs) (PVD-9.1)

PVD.AI.0009.1.A

v2.0.2026

- See **Pulmonary AVMs (CH-24.1)** in the Chest Imaging Guidelines
- See **Arteriovenous Malformations (AVMs) and Related Lesions (HD 12.2)** in the Head Imaging Guidelines
- See **Arteriovenous Malformations (AVMs) and Fistulas (PEDPVD-2.5)** in the Pediatric Peripheral Vascular Disease Imaging Guidelines
- See **Pelvic Pain/Dyspareunia, Female (PV-11.1)** in the Pelvis Imaging Guidelines

Initial imaging

- Ultrasound with Doppler is medically necessary as an initial examination for superficial lesions in the limbs.
 - Large lesion characterization may be limited by ultrasound imaging window.
 - Ultrasound is also limited in evaluating AVM relationship to airway or bony structures.

Evaluation and surveillance

- MRI without contrast or without and with contrast of the affected body part is the study of choice for abdominal AVMs and deep tissue (below the skin) AVM's in the limbs.
- MRA (contrast as requested) of the affected body part is medically necessary 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 is medically necessary when MRI and/or MRA is inconclusive or contraindicated.

Post-embolization

- Advanced imaging is medically necessary one-time post-embolization to evaluate for successful resolution of the AVM.
- Additional imaging (same study performed pre-procedure or as requested by the treating provider) is medically necessary for treatment planning purposes if resolution of the AVM was not achieved.

Background and Supporting Information

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.

References

PVD.AI.0009.1.A

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1. Pizzo PA, Poplack DG, Krishnamurthy R, Daldrop-Link HE, Jones JY, et. al. Imaging studies in the diagnosis and management of pediatric malignancies. In: Principles and Practice of Pediatric Oncology. Vol 7. Philadelphia: Wolters Kluwer; 2016:185-234.
2. Martin KL. Vascular disorders. *Nelson Textbook of Pediatrics*, Chapter 669. eds Kliegman R, St. Geme JW III, Blum NJ, et al. 21st ed. Philadelphia, PA: Elsevier; 2020:3461-3469.
3. Blei F, Guarini A. Current workup and therapy of infantile hemangiomas. *Clinics in Dermatology*. 2014;32(4):459-470. doi:10.1016/j.clindermatol.2014.02.001.
4. Cahill AM, Nijs ELF. Pediatric Vascular Malformations: Pathophysiology, Diagnosis, and the Role of Interventional Radiology. *CardioVascular and Interventional Radiology*. 2011;34(4):691-704. doi:10.1007/s00270-011-0123-0.
5. Bagrodia N, Defnet AM, Kandel JJ. Management of lymphatic malformations in children. *Current Opinion in Pediatrics*. 2015;27(3):356-363. doi:10.1097/mop.0000000000000209.
6. Wassef M, Blei F, Adams D, et al. Vascular Anomalies Classification: Recommendations from the International Society for the Study of Vascular Anomalies. *Pediatrics*. 2015;136(1):e203-e214. doi:10.1542/peds.2014-3673.
7. Kutz AM, Aranibar L, Lobos N, Wortsman X. Color Doppler Ultrasound Follow-Up of Infantile Hemangiomas and Peripheral Vascularity in Patients Treated with Propranolol. *Pediatric Dermatology*. 2015;32(4):468-475. doi:10.1111/pde.12596.
8. Adams DM, Trenor CC, Hammill AM, et al. Efficacy and Safety of Sirolimus in the Treatment of Complicated Vascular Anomalies. *Pediatrics*. 2016;137(2). doi:10.1542/peds.2015-3257.
9. Snyder E, Puttgen K, Mitchell S, Ahlawat S, Tekes A. Magnetic Resonance Imaging of the Soft Tissue Vascular Anomalies in Torso and Extremities in Children: An Update with 2014 International Society for the Study of Vascular Anomalies Classification. *Journal of Computer Assisted Tomography*. 2017;42(2):167-177. doi:10.1097/rct.0000000000000675.
10. Merrow AC, Gupta A, Patel MN, Adams DM. 2014 Revised Classification of Vascular Lesions from the International Society for the Study of Vascular Anomalies: Radiologic-Pathologic Update. *RadioGraphics*. 2016;36(5):1494-1516. doi:10.1148/rg.2016150197.
11. Johnson CM, Navarro OM. Clinical and sonographic features of pediatric soft-tissue vascular anomalies part 1: classification, sonographic approach and vascular tumors. *Pediatric Radiology*. 2017;47(9):1184-1195. doi:10.1007/s00247-017-3885-y.
12. Johnson CM, Navarro OM. Clinical and sonographic features of pediatric soft-tissue vascular anomalies part 2: vascular malformations. *Pediatric Radiology*. 2017;47(9):1196-1208. doi:10.1007/s00247-017-3906-x.
13. Sadick M, Müller-Wille R, Wildgruber M, Wohlgemuth W. Vascular Anomalies (Part I): Classification and Diagnostics of Vascular Anomalies. *RöFo - Fortschritte auf dem Gebiet der Röntgenstrahlen und der bildgebenden Verfahren*. 2018;190(09):825-835. doi:10.1055/a-0620-8925.
14. Olivieri B, White CL, Restrepo R, et. al. Low-Flow Vascular Malformation Pitfalls: From Clinical Examination to Practical Imaging Evaluation—Part 2, Venous Malformation Mimickers. *American Journal of Roentgenology*. 2016;206(5):952-962. doi:10.2214/ajr.15.15794.
15. White CL, Olivieri B, Restrepo R, et.al. Low-Flow Vascular Malformation Pitfalls: From Clinical Examination to Practical Imaging Evaluation—Part 1, Lymphatic Malformation Mimickers. *American Journal of Roentgenology*. 2016;206(5):940-951. doi:10.2214/ajr.15.15793.

Complications

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Vascular Graft Infection (PVD-21)

PVD.PA.21.A

v2.0.2026

Suspected or Known Vascular Graft Infection

Clinical concern for vascular graft infection

Imaging of the affected vascular segment is considered medically necessary for the diagnosis of suspected vascular graft infection and/or treatment planning for known vascular graft infection as follows:

- Duplex arterial ultrasound and/or CTA or MRA of the affected arterial segment.
- CTA or MRA of proximal and/or distal vascular beds of the affected segment for operative planning as requested by the surgeon (or provider in consultation with the performing surgeon).
- Indium 111 (111In)-labeled white blood cell (WBC) or Gallium-67 citrate studies (CPT® 78800, CPT® 78801, CPT® 78802, or CPT® 78803)
- PET/CT (CPT® 78815) for clinical suspicion of aortic infection (graft or native aorta) when **both** of the following apply:
 - CT-angiogram is equivocal/indeterminate AND
 - Indium-111 or Gallium-67 studies have not been performed **and** are not available or not technically feasible.

Evidence Discussion

Infection of vascular grafts is uncommon but serious and potentially life-threatening. Clinical presentations are variable, and imaging may be necessary to identify and/or define extent of infection, as well as for surgical planning.

Ultrasound is an inexpensive imaging modality that may identify findings associated with infection, such as fluid collections and pseudoaneurysm. This method is considered a reasonable first-line modality to image extracavitary infection, but utility in evaluating intracavitary grafts and associated infection is limited.

CTA is a commonly used modality to evaluate intracavitary grafts, but is also useful in evaluating extracavitary graft, especially for surgical planning. Disadvantages include contrast exposure, and limited sensitivity/specificity.

MRI may also be useful in evaluating vascular grafts and allows for good soft tissue resolution. Disadvantages include generally higher cost than CT scan, longer acquisition

times, and limitations in use when patients have intracardiac devices and/or renal disease.

WBC scintigraphy, as well as PET/CT scan, allow for more definitive identification of infection, compared with CT scans. WBC scintigraphy may be limited due to the time needed for the study; while PET/CT may be limited due to low specificity.

References

PVD.PA.21.A

v2.0.2026

1. Reinders Folmer EI, Von Meijenfeldt GCI, Van der Laan MJ, et al. Diagnostic Imaging in Vascular Graft Infection: A Systematic Review and Meta-Analysis. *Eur J Vasc Endovasc Surg*. 2018;56(5):719-729. doi:10.1016/j.ejvs.2018.07.010.
2. Wilson WR, Bower TC, Creager MA, et al. Vascular Graft Infections, Mycotic Aneurysms, and Endovascular Infections. *Circulation* 2016; 134:e412-e460. DOI: 10.1161/CIR.0000000000000457.
3. Lucinian Y, Lamarche, Y, Demers P, et al. FDG-PET/CT for the Detection of Infection Following Aortic Root Replacement Surgery. *JACC: Cardiovascular Imaging*. 2020; 13; 1447-1448.
4. Keidar Z, Engel A, Hoffman A, Israel O, Nitecki S. Prosthetic Vascular Graft Infection: The Role of 18F-FDG PET/CT. *J Nucl Med*. 2007; 48:1230–1236.
5. Wassélius J, Malmstedt J, Kalin B, et al. High 18F-FDG Uptake in Synthetic Aortic Vascular Grafts on PET/CT in Symptomatic and Asymptomatic Patients. *J Nucl Med*. 2008; 49:1601–1605.
6. Fukuchi K, Ishida Y, Higashi M, et al. Detection of aortic graft infection by fluorodeoxyglucose positron emission tomography: Comparison with computed tomographic findings. *J Vasc Surg*. 2005;42:919-925.
7. Dibble EH, Yoo DC, Baird GL, Noto RB. FDG PET/CT of Infection: Should It Replace Labeled Leukocyte Scintigraphy of Inpatients? *AJR*. 2019; 213:1358–1365.
8. Lauri C, Iezzi R, Rossi M, et al. Imaging Modalities for the Diagnosis of Vascular Graft Infections: A Consensus Paper amongst Different Specialists. *J Clin Med*. 2020, 9, 1510; doi:10.3390/jcm9051510.
9. Chakfé N, Diener H, Lejay A, et al. Editor's Choice – European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections. *Eur J Vasc Endovasc Surg*. 2020; 59: 339-384.
10. Puges M, Bérard X, Ruiz JB, et al. Retrospective Study Comparing WBC scan and 18F-FDG PET/CT in Patients with Suspected Prosthetic Vascular Graft Infection. *Eur J Vasc Endovasc Surg*. 2019; 57: 876-884.
11. Saleem BR, Berger P, Vaartjes I, et al. Modest utility of quantitative measures in 18F-fluorodeoxyglucose positron emission tomography scanning for the diagnosis of aortic prosthetic graft infection. *J Vasc Surg*. 2015;61:965-971.
12. Reinders Folmer EI, von Meijenfeldt GCI, Te Riet Ook Genaamd Scholten RS, et al. A systematic review and meta-analysis of ¹⁸F-fluoro-d-deoxyglucose positron emission tomography interpretation methods in vascular graft and endograft infection. *J Vasc Surg*. 2020;72(6):2174-2185.e2. doi:10.1016/j.jvs.2020.05.065.

13. Kim SJ, Lee SW, Jeong SY, Pak K, Kim K. A systematic review and meta-analysis of ^{18}F -fluorodeoxyglucose positron emission tomography or positron emission tomography/computed tomography for detection of infected prosthetic vascular grafts. *J Vasc Surg*. 2019;70(1):307-313. doi:10.1016/j.jvs.2019.01.051.

Suspected Retroperitoneal Bleed (PVD-20)

PVD.PA.20.A

v2.0.2026

Imaging

Any of the following studies is considered medically necessary to evaluate for retroperitoneal bleed:

- CT Abdomen and Pelvis with IV contrast (CPT® 74177)
- CT Abdomen and Pelvis with and without IV contrast (CPT® 74178)
- CTA Abdomen and Pelvis (CPT® 74174)

References

PVD.PA.20.A**v2.0.2026**

1. Expert Panel on Vascular Imaging: Verma N, Steigner ML, Aghayev A, et al. ACR Appropriateness Criteria® Suspected Retroperitoneal Bleed. *J Amer Coll Radiol* 2021; 18: S482-S487.

Venous Procedures

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Imaging for Hemodialysis Access (PVD-8)

PVD.AI.0008.0.A

v2.0.2026

Arterial Evaluation and Venous Mapping Prior to AV Fistula (PVD-8.1)

- Imaging prior to AV fistula creation is medically necessary:
 - For vessel mapping CPT® 93985 or 93986
 - MRA Upper Extremity (CPT® 73225) may be needed if duplex imaging is equivocal
- Arterial evaluation to assess arterial suitability (size, degree of stenosis and calcification) prior to AV fistula creation is medically necessary as follows:
 - CPT® 93930 or CPT® 93931 can be used to report upper extremity arterial evaluation
- Venous mapping (CPT® 93970 or CPT® 93971) is medically necessary to assess venous suitability prior to AV fistula creation

Hemodialysis access imaging (PVD-8.2)

- Indications for Duplex ultrasound (CPT® 93990) of hemodialysis access include but are not limited to:
 - Individuals 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.
 - One Duplex US (CPT® 93990) can be performed after a surgically created AV fistula for assessment, although it is not generally needed.
- Central venous stenosis can cause new dialysis access to fail to mature or cause the premature failure of existing fistulas/grafts.
- CT Chest with contrast (CPT® 71260), or CTA Chest (CPT® 71275), or MRA Chest (CPT® 71555) is medically necessary when there is documentation of either:
 - Signs and symptoms of central venous stenosis including:
 - Arm swelling
 - Presence of numerous collateral veins

- Prolonged bleeding from dialysis puncture sites
- A history of pacemaker placement or previous tunneled dialysis graft, regardless of signs and symptoms.

Evidence Discussion

Hemodialysis Access for creation and maintenance

Hemodialysis access imaging is required to assess options for creation of hemodialysis access as well as to evaluate for maturation, failure and complications related to the access and outflow central veins.

Prior to creation of a native arteriovenous fistula (AVF), venous duplex ultrasound should be performed of both upper extremities to assess for adequate vein for fistula creation on all patients. Vessel mapping should include arterial inflow assessment to assess size, degree of stenosis and areas of calcification that may exclude access creation. Advanced imaging (CT or MR) of the chest or upper extremity may be indicated to further assess abnormalities identified on duplex imaging or evidence of central venous outflow obstruction.

Duplex evaluation of hemodialysis access should be performed for patients with evidence of failed maturation, poor function of access or complication related to the use of the hemodialysis access by history, physical exam or functional parameters during dialysis. These parameters may include: elevated venous pressures, inefficient dialysis, and recirculation greater than 10-15% or decreased flow.

CT or MR of the chest may be indicated for patients with a history of central venous catheters or pacemaker/ICD wires, signs and symptoms of ipsilateral central venous stenosis including arm swelling, venous collaterals or prolonged bleeding after dialysis.

References

PVD.AI.0008.0.A**v2.0.2026**

1. Sidawy AN, Spergel LM, Besarab A, et al. The Society for Vascular Surgery: Clinical practice guidelines for the surgical placement and maintenance of arteriovenous hemodialysis access. *J Vasc Surg.* 2008;48(5). doi:10.1016/j.jvs.2008.08.042.
2. Schmidli J, Widmer MK, Basile C, et al. Editor's Choice – Vascular Access: 2018 Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS). *Eur J Vasc Endovasc Surg.* 2018;55(6):757-818. doi:10.1016/j.ejvs.2018.02.001
3. Kundu S. Central venous disease in hemodialysis patients: prevalence, etiology and treatment. *Journal of Vascular Access.* 2010;11(1):1-7.
4. Ibrahim A, Ali H, Raza H, Mohamed M. Hemodialysis Access Surveillance: A Review of the Literature. *Saudi J Kidney Dis Transpl.* 2022;33(Supplement):S66-S76. doi:10.4103/1319-2442.367827.
5. Lok CE, Huber TS, Lee T, et al. KDOQI Clinical Practice Guideline for Vascular Access: 2019 Update [published correction appears in *Am J Kidney Dis.* 2021 Apr;77(4):551. doi: 10.1053/j.ajkd.2021.02.002].

IVC filters – Treatment (PVD-16.2)

PVD.VI.0016.A

v2.0.2026

- Prior to IVC filter insertion
 - An initial venous duplex is medically necessary to assess for the presence of thrombus in the femoral vein which would affect the approach (transjugular or transfemoral)
- For consideration of removal, CT or CTA Abdomen and Pelvis (CPT® 74177 or, 74174) is medically necessary 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

Background and Supporting Information

- IVC filters are placed in individuals with known DVT that cannot be anti-coagulated, individuals with poor pulmonary reserve and high risk for DVT, or prophylaxis in trauma and surgical individuals.
- 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.

References

PVD.VI.0016.A**v2.0.2026**

1. Sheehan M , Coppin K, et al. A single center 9-year experience in IVC filter retrieval - the importance of an IVC filter registry. CVIR Endovasc. 2022 Mar 5;5(1):15. doi: 10.1186/s42155-022-00291-5.
2. Xin Li, Ihab Haddadin, et al. Inferior vena cava filter - comprehensive overview of current indications, techniques, complications and retrieval rates. Vasa. 2020 Oct;49(6):449-462. doi: 10.1024/0301-1526/a000887. Epub 2020 Jul 14. DOI: 10.1024/0301-1526/a000887.

Post iliac vein stenting/angioplasty (PVD-17.1)

PVD.VI.0017.A

v2.0.2026

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.

- Arterial duplex (CPT® 93975, 93976, 93978, 93979) are medically necessary for:
 - Surveillance of iliac venous stents
 - Worsening signs or symptoms including increased edema when stent malfunction is suspected
 - Post-operatively within the first month, at six months, twelve months and then annually
- CTV or MRV Abdomen and Pelvis are medically necessary for an abnormal or indeterminate duplex

References

PVD.VI.0017.A**v2.0.2026**

1. Rossi FH, Kambara AM, Izukawa NM, et al. Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease. *J Vasc Surg Venous Lymphat Disord*. 2018;6(2):183-191.
2. Sermathanasawadi N, Pruekprasert K, Pitaksantayothin W, et al. Prevalence, risk factors, and evaluation of ilio caval obstruction in advanced chronic venous insufficiency. *J Vasc Surg Venous Lymphat Disord*. 2019 May;7(3):441-447.
3. Vikram Vasan 1, Halbert Bai. Iliac vein stenting outcomes for patients with superficial venous insufficiency concurrent with deep venous disease. *J Vasc Surg Venous Lymphat Disord*. 2022 Nov;10(6):1215-1220.e1. doi: 10.1016/j.jvsv.2022.06.015.

Venous Imaging

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Upper Extremity Venous – Imaging (PVD-4.2)

PVD.AI.0004.1.A

v2.0.2026

Venous Insufficiency

- For symptoms of venous insufficiency including but not limited to unilateral pain and swelling of the upper extremity
 - Venous duplex upper extremities (CPT® 93970 or CPT® 93971) is medically necessary initially
 - If duplex ultrasound is non-diagnostic, the following studies are medically necessary:
 - MRV Upper extremity (CPT® 73225) and/or MRV Chest (CPT® 71555), or
 - CTV Upper extremity (CPT® 73206) and/or CTV Chest (CPT® 71275)
 - For venous thoracic outlet syndrome, CTV Upper extremity (CPT® 73206) or MRV Upper extremity (CPT® 73225), and/or CTV Chest (CPT® 71275) or MRV Chest (CPT® 71555).
- CT Chest with contrast (CPT® 71260) is medically necessary for Superior Vena Cava Syndrome (upper extremity and facial symptoms).
- **Either** of the following is medically necessary when stenting of the SVC is being considered:
 - MRV Chest (CPT® 71555)
 - CTV Chest (CPT® 71275)

Lymphedema of the Upper extremity

When initial imaging with venous duplex has ruled out DVT, **either** of the following studies are medically necessary to evaluate for suspected lymphedema of the upper extremity:

- Lymphoscintigraphy (CPT® 78195)
- MR lymphangiography (CPT® 75801)

Evidence Discussion

Upper Extremity Venous Imaging

Duplex ultrasound is the initial imaging modality for assessment of patients with symptoms of upper extremity venous occlusive disease or venous insufficiency including arm edema, pain and ulceration. Duplex imaging is limited in assessment of the proximal subclavian vein and central veins due to anatomic interference by the rib

cage and lungs. MRV or CTV is medically necessary to assess these more proximal segments of the venous outflow and central venous structures including the innominate veins and SVC.

Advanced imaging is medically necessary for treatment planning in SVC syndrome and proximal venous intervention. Follow-up imaging after PTA and/or stenting for SVC syndrome or proximal vein occlusive disease may be approved assessment of stent patency and for recurrent symptoms.

SVC syndrome is caused by acute or subacute, intrinsic or extrinsic obstruction of the SVC, (ex: lung cancer, fibrosis, indwelling catheters/devices, thrombus). Other symptoms include dyspnea, headache and dizziness.

Thoracic Outlet Syndrome (TOS) refers to compression of the neurovascular structures within the thoracic outlet as they pass from the neck and thorax to the axilla. There are three types of TOS, neurogenic (see Brachial plexus-PN 4.1), venous and arterial (see Upper Extremity PVD-PVD 4.1). Venous TOS typically occurs in young athlete after a history of exertion of the limb, or in the presence of a central venous catheter which traverses the subclavian vein.

Lymphedema is caused by dysfunction of the lymphatic system. Primary lymphedema is a result of a congenital malformation of the lymphatic system, whereas secondary lymphedema is due to an exogenous cause that impairs the lymphatic system. Typical etiologies include trauma, chronic infection, cancer treatments including lymph node dissections and radiation therapy. Most cases of secondary lymphedema of the upper extremity are related to breast cancer and its treatment. Due to the anatomic disruption of the lymphatic system, there is accumulation of protein-rich interstitial fluid, persistent swelling and later fibro-adipose hypertrophy.

References

PVD.AI.0004.1.A**v2.0.2026**

1. Skeik N, Soo-Hoo SS, Porten BR, et al. Arterial Embolisms and Thrombosis in Upper Extremity Ischemia. *Vascular and Endovascular Surgery*. 2015;49(5-6):100-109. doi:10.1177/1538574415596740.
2. Desjardins B, Rybicki FJ, Kim HS, et al. ACR Appropriateness Criteria®. Suspected Upper Extremity Deep Vein Thrombosis. *J Am Coll Radiol*. 2012;9(9):613-619. doi:10.1016/j.jacr.2012.05.021.
3. Kraaijpoel N, Es NV, Porreca E, et al. The diagnostic management of upper extremity deep vein thrombosis: A review of the literature. *Thrombosis Research*. 2017;156:54-59. doi:10.1016/j.thromres.2017.05.035.
4. Azizi AH, Shafi I, Shah N, et al. Superior Vena Cava Syndrome. *JACC Cardiovasc Interv*. 2020;13(24):2896-2910. doi:10.1016/j.jcin.2020.08.038.
5. Cook JR, Thompson RW. Evaluation and Management of Venous Thoracic Outlet Syndrome. *Thorac Surg Clin*. 2021;31(1):27-44. doi:10.1016/j.thorsurg.2020.08.012.1.
6. Shah RP, Bolaji O, Duhan S, et al. Superior Vena Cava Syndrome: An Umbrella Review. *Cureus*. 2023 Jul 20;15(7):e42227. doi: 10.7759/cureus.42227.
7. ACR Appropriateness Criteria. Thoracic Outlet Syndrome. Expert Panels on Vascular Imaging, Thoracic Imaging, and Neurological Imaging: Omar Zurkiya, MD, PhD, Suvranu Ganguli, MD, Sanjeeva P. Kalva, MD, et al. *J Am Coll Radiol* 2020;17:S323-S334. American College of Radiology
8. Executive Committee of the International Society of Lymphology. The Diagnosis and Treatment of Peripheral Lymphedema: 2023 Consensus Document of The International Society of Lymphology. *Lymphology*. 2023;56(4):133-151.
9. Kitayama S. Diagnosis and Treatments of Limb Lymphedema: Review. *Ann Vasc Dis*. 2024;17(2):114–119. doi:10.3400/avd.ra.24-00011.
10. Lurie F, Malgor R, Carman T, et al. The American Venous Forum, American Vein and Lymphatic Society and the Society for Vascular Medicine expert opinion consensus on lymphedema diagnosis and treatment. *Phlebology* 2022, Vol. 37(4) 252–266 DOI: 10.1177/02683555211053532.

Acute Limb Swelling (PVD-12)

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Superficial venous thrombosis (SVT) (PVD-12.1)

- The diagnosis of superficial venous thrombosis is generally made on the basis of physical examination.
 - Duplex ultrasound (CPT® 93970, CPT® 93971) is medically necessary as the initial imaging if the diagnosis is equivocal
 - Follow-up duplex ultrasound (CPT® 93970, CPT® 93971) is medically necessary only if thrombus in the superficial systems is encroaching onto the deep venous system (saphenofemoral or saphenopopliteal junction)

Background and Supporting Information

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). Treatment: Elevation and warm compresses until pain and swelling subsides.

Acute deep venous thrombosis (DVT) (PVD-12.2)

- Duplex ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is medically necessary as 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 cerulean dolens
 - Risk factors for DVT include age >40, obesity, malignancy, prolonged immobilization, hypercoagulability as well as those outlined in **Pulmonary Embolism (PE) (CH-25)** in Chest Imaging Guidelines.
- CTA/CTV Abdomen and pelvis with contrast are medically necessary to rule out IVC thrombus secondary to the filter when there is acute bilateral lower extremity swelling in an individual 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 an individual. If the results are equivocal or indeterminate:
 - CTV or MRV Abdomen and Pelvis with contrast (CPT® 74174 or CPT® 74185 and 73725) is medically necessary.
- For request concerning abdominal vein thrombosis, see **Abdominal Veins other than Hepatic and Portal Veins (AB-43.2)** in the Abdomen Imaging Guidelines
- For proximal DVT's (iliac vein DVT's or in cases of phlegmasia (extensive DVT compromising arterial inflow), thrombectomy (rarely performed) or thrombolysis is medically necessary.
- If the cause of the DVT is found to be due to May-Thurner, see also **May-Thurner Syndrome (PVD-13.3)**

Background and Supporting Information

Deep venous thrombosis is characterized by thrombosis of a deep vein in either the upper (brachial, axillary, subclavian veins) or the lower extremity (soleus muscle veins, gastrocnemius muscle veins, peroneal, posterior tibial, popliteal, femoral or iliac veins).

Follow-up imaging of known DVT (PVD-12.3)

- A repeat duplex ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is medically necessary in order to rule out proximal extension of a calf vein DVT in individuals who cannot be anticoagulated as follows:
 - One week after the initial diagnosis.
 - Serial imaging (up to 3 studies) over the first three weeks if calf DVT is not treated.
- Evidence does not support the use of imaging during long-term anticoagulation therapy to determine venous recanalization or for the purpose of determining whether or not to continue anticoagulation therapy.

Follow-up imaging after venous surgery (PVD-12.4)

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

Generalized bilateral lower extremity edema (PVD-12.5)

Bilateral lower extremity edema is multifactorial. Prior to any request for advanced imaging, a workup for causes of the edema should be instituted including echocardiogram to rule out congestive heart failure and laboratory studies to exclude renal insufficiency and liver disease. The following imaging is medically necessary based on the suspected cause of the edema:

- Suspected abdominal or pelvic pathology
 - Abdominal ultrasound or duplex is the initial imaging
 - CT Abdomen and Pelvis or CT pelvis either with or without contrast can be performed if abdominal US is equivocal or indeterminate
- Suspected chronic venous insufficiency
 - A venous duplex CPT® 93970 (bilateral) or CPT® 93971 (unilateral) is medically necessary to evaluate for venous reflux.
- Suspected lymphedema
 - When initial noninvasive studies, such as ultrasound, are negative for venous valvular insufficiency **either** of the following advanced imaging studies is indicated:
 - Lymphoscintigraphy (CPT® 78195)
 - MRI lymphangiography (CPT® 73718)

Unilateral lower extremity edema (PVD-12.6)

Initial imaging for unilateral lower extremity edema with duplex ultrasound (CPT® 93971, unilateral study) is medically necessary.

- If there is concern for proximal DVT:
 - focused abdominal duplex to evaluate the iliac veins and IVC
 - CTV or MRV Abdomen and Pelvis (CPT® 74174 or CPT® 74185 and CPT® 72198) for indeterminate or equivocal duplex results.
- If there is concern for abdominal or pelvic pathology:
 - Abdominal/pelvic ultrasound or duplex
 - CT Abdomen and Pelvis, or CT Pelvis with or without contrast if the abdominal ultrasound is indeterminate or inconclusive

Background and Supporting Information

Unilateral edema favors localized causes of venous or lymphatic compromise, rather than systemic etiologies which tend to result in bilateral edema. Initial imaging is duplex ultrasound. This can assess for vascular and non-vascular causes, including DVT, venous reflux, popliteal cysts, hematoma, mass.

References

PVD.VI.0012.A**v2.0.2026**

1. Lim W, Gal GL, Bates SM, et al. American Society of Hematology 2018 guidelines for management of venous thromboembolism: diagnosis of venous thromboembolism. *Blood Advances*. 2018;2(22):3226-3256. doi:10.1182/bloodadvances.2018024828.
2. American College of Phlebology. Treatment of Superficial Venous Disease of the Lower Leg Guidelines. American Vein & Lymphatic Society. <http://www.phlebology.org/member-resources/publications/treatment-superficial-venous-disease-lower-leg-guidelines>. Published 2016.
3. American College of Phlebology. Duplex Ultrasound Imaging of Lower Extremity Veins in Chronic Venous Disease. American Vein & Lymphatic Society. <http://www.phlebology.org/member-resources/publications/duplex-ultrasound-imaging-lower-extremity-veins-chronic-venous-disease>. Published 2012.
4. Healy DA, Kimura S, Power D, et al. A Systematic Review and Meta-analysis of Thrombotic Events Following Endovenous Thermal Ablation of the Great Saphenous Vein. *European Journal of Vascular and Endovascular Surgery*. 2018;56(3):410-424. doi:10.1016/j.ejvs.2018.05.008.
5. Jacobs CE, Pinzon MM, Orozco J, et al. Deep Venous Thrombosis after Saphenous Endovenous Radiofrequency Ablation: Is it Predictable? *Annals of Vascular Surgery*. 2014;28(3):679-685. doi:10.1016/j.avsg.2013.08.012.
6. Liu N, Wang C, Sun M. Noncontrast three-dimensional magnetic resonance imaging vs lymphoscintigraphy in the evaluation of lymph circulation disorders: A comparative study. *J Vasc Surg*. 2005;41(1):69-75. doi:10.1016/j.jvs.2004.11.013.
7. Diagnostic approach to lower limb edema. Antonios P Gasparis, Pamela S Kim, Steven M Dean, Neil M Khilnani and Nicos Labropoulos. *Phlebology* 2020, Vol. 35(9) 650–655.
8. Approach to the Patient with Non-cardiac Leg Swelling. Geno J.MerliMD, HeatherYenserMSN,DinaOrapalloMSN. *Medical Clinics of North America*, Volume 107, Issue 5,September 2023, Pages 945-961.

Chronic Limb Swelling

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Chronic limb swelling due to chronic deep venous thrombosis (DVT)/May-Thurner syndrome (PVD-13)

PVD.VI.0013.A

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Chronic DVT with incompletely lysed or residual DVT (PVD-13.1)

Individuals 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.

- Imaging is medically necessary to evaluate for iliac venous obstruction from incompletely lysed thrombus in individuals with a history of proximal (iliofemoral) DVT who have developed post thrombotic syndrome.
 - Initial imaging is duplex (CPT® 93970 bilateral study or CPT® 93971 unilateral study)
 - Either a CTV or MRV Abdomen and Pelvis (CPT® 74174) or (CPT® 74185 and 72198) OR CTV Pelvis (CPT® 72191) or MRV Pelvis (CPT® 72198), or venography for treatment planning purposes.
- Imaging for post-thrombotic syndrome is only medically necessary for **either**:
 - Signs and symptoms suggestive of a new acute DVT
 - Preoperative planning for iliac vein/stenting for suspected iliac vein stenosis or occlusion

Background and Supporting Information

- Chronic deep venous thrombosis is defined as an acute DVT that is greater than 14 days old.
- 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.
 - The mainstay of treatment for chronic deep venous thrombosis is compression stockings
 - Selected individuals may be a candidate for iliac vein angioplasty/stenting.

Post-thrombotic syndrome (PVD-13.2)

- Imaging for post-thrombotic syndrome is medically necessary when:
 - There are signs and symptoms suggestive of a new acute DVT
 - 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.
- Imaging for post-thrombotic syndrome is NOT medically necessary for chronic swelling that has not changed in severity or character

May-Thurner syndrome (PVD-13.3)

- CTV or MRV Abdomen and Pelvis (CPT® 74174, or 74185 and 72198) OR CTV Pelvis or MRV Pelvis (CPT® 72191 or 72198) is medically necessary in individuals with a history of **one** of the following:
 - Left lower extremity iliac DVT
 - Persistent left lower extremity edema OR varicose veins OR venous stasis ulcer despite treatment of superficial venous disease in that extremity
 - Persistent left lower extremity edema OR varicose vein OR venous stasis ulcer in the absence of saphenous vein reflux.
- Imaging and/or prophylactic treatment of May-Thurner 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

Background and Supporting 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.

- Treatment is with iliac vein angioplasty/stenting

Pelvic congestion syndrome (PVD-13.4)

- Signs and symptoms of pelvic congestion syndrome include:
 - Chronic pelvic pain OR post-coital discomfort >6 months.
 - Associated symptoms can include the presence of labial varicosities or heavy menstrual periods.
- Initial imaging is via transvaginal or pelvic ultrasound to exclude other pathologies of chronic pelvic pain
- CTV or MRV Abdomen and Pelvis (CPT® 74174, or 74185 and 72198) is medically necessary if initial ultrasound is inconclusive or non-diagnostic.

Evidence Discussion

Chronic limb swelling due to chronic deep venous thrombosis (DVT)/ May-Thurner syndrome, post-thrombotic syndrome and pelvic congestion syndrome

For patients with isolated left leg edema, or left leg edema greater than right leg, duplex ultrasound of the extremity should be performed to assess for DVT. If femoral DVT is identified, duplex ultrasound of the pelvis should be performed to assess for ilio caval DVT or evidence of a mass that may be causing compression of the iliac vein or IVC.

In patients with acute iliofemoral DVT, advanced imaging with either CTV or MRV of the abdomen and or pelvis is medically necessary for cases of iliofemoral DVT identified on ultrasound for treatment planning, or cases where iliofemoral DVT or stenosis is suspected but pelvic ultrasound is indeterminate or limited due to body habitus or overlying bowel gas obscuring the iliac vein.

Advanced imaging with CTV or MRV of the abdomen and/or pelvis is medically necessary in patients without acute DVT but a prior history of left iliac DVT or leg edema, varicosities or venous stasis disease in the absence of underlying venous insufficiency or following treatment of superficial venous insufficiency to assess for iliac vein compression. Post-Thrombotic syndrome due to prior DVT and subsequent deep venous insufficiency may lead to recurrent or chronic lower extremity edema. Management is compression therapy and advanced imaging is only indicated for assessment of symptoms consistent with new iliofemoral DVT or for preoperative planning for identified iliac vein stenosis.

Advanced imaging with CTV or MRV is medically necessary in patients with recurrent symptoms and a history of ilio caval stenting for iliac vein DVT, or compression.

Pelvic congestion syndrome may be a cause of chronic pelvic pain or post-coital discomfort. Initial imaging is pelvic or transvaginal ultrasound to assess for other sources of pelvic pain. Advanced imaging such as CTV or MRV of the abdomen and pelvis is medically necessary if ultrasound is inconclusive or non-diagnostic or for treatment planning.

References

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1. Eberhardt RT and Raffetto JD. Chronic Venous Insufficiency. *Circulation*. 2005; 111: 2398-2409.
2. Partsch H, Flour M, Smith PC, et al. Indications for compression therapy in venous and lymphatic disease. Consensus based on experimental data and scientific evidence. *Int Angiol*. 2008;27:193-219.
3. Nayak L, Vedantham S. Multifaceted Management of the Postthrombotic Syndrome. *Seminars in Interventional Radiology*. 2012; 29:1.
4. Christof T, Kaltenmeier, Erben Y, et al. Systematic review of May-Thurner syndrome with emphasis on gender differences. *J Vasc Surg Venous Lymphat Disord*. 2018;6(3):399-407.
5. Rossi FH, Kambara AM, Izukawa NM, et al. Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease. *J Vasc Surg Venous Lymphat Disord*. 2018;6(2):183-191.
6. Sermsathanasawadi N, Pruekprasert K, Pitaksantayothin W, et al. Prevalence, risk factors, and evaluation of ilio caval obstruction in advanced chronic venous insufficiency. *J Vasc Surg Venous Lymphat Disord*. 2019 May;7(3):441-447.
7. Vedantham S, Kahn SR, Goldhaber SZ, Comerota AJ, et al. Endovascular therapy for advanced post-thrombotic syndrome: Proceedings from a multidisciplinary consensus panel. *Vasc Med*. 2016 Aug;21(4):400-7.
8. O'Brian M and Gillespie B. Diagnosis and treatment of the pelvic congestion syndrome. *Journal of Vascular Surgery. Venos and Lymphatic Disorders*. 2015. 3(1):96-106.
9. Brown CL, Rizer M et al. Pelvic Congestion Syndrome: Systematic Review of Treatment Success. *Semin Intervent Radiol*. 2018 Mar;35(1):35-40.
10. Poyyamoli S, Mehta P, Cherian M, et al. May-Thurner syndrome. *Cardiovasc Diagn Ther*. 2021 Oct;11(5):1104-1111. doi: 10.21037/cdt.2020.03.07.

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

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v2.0.2026

Venous Reflux (PVD-14.2)

- A venous valvular insufficiency study (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is medically necessary to diagnose presence of reflux in the greater saphenous vein as well as the size of the refluxing vein.
- A duplex ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is medically necessary within six months before treatment with intervention to demonstrate the presence of pathologic reflux (>500ms) within the greater and lesser saphenous veins and document vein size.
- A post-ablation venous ultrasound (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is medically necessary 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.
- Post-procedure assessment by imaging techniques is not medically necessary to confirm efficacy or outcome of the procedure.

Evidence Discussion

Venous insufficiency— General information

- Venous insufficiency is characterized by failure of the venous blood to flow in its normal path of flow and instead refluxes backwards by the force of gravity usually secondary to malfunction of the venous valves.
- Risk factors include previous DVT, obesity, 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.
- Diagnosis is made with a venous valvular insufficiency study which documents the presence of reflux (>500ms) in the greater saphenous vein as well as the size of the refluxing vein (3-15mm).
- Treatment of superficial venous reflux is amenable to intervention in selected individuals who are symptomatic and have failed conservative therapy.

- Ultrasound mapping or monitoring techniques are considered medically necessary only to initially determine the extent and configuration of symptomatic varicosities or valvular insufficiency.

Venous reflux

- 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 socks, pneumatic pumps or specialized dressings such as Unna boots.
- Treatment of symptomatic superficial venous reflux is via endovenous laser or 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) great saphenous or small saphenous vein. One complication of endovenous ablation is deep venous thrombosis.

Varicose Veins

- If the varicosities remain symptomatic despite conservative therapy, varicose veins are treated with sclerotherapy or phlebectomy generally on the basis of size.
- Varicose veins are defined as enlarged, tortuous veins visible under the skin. Symptoms associated with varicose veins include aching 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.

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.

References

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1. Piazza G. Varicose veins. *Circulation*. 2014;130(7):582-587. doi:10.1161/CIRCULATIONAHA.113.008331.
2. Jones WS, Vemulapalli S, Parikh KS, et al. Treatment Strategies for Patients with Lower Extremity Chronic Venous Disease (LECVD). Technology Assessment Program. Project ID: DVTT0515. (Prepared by the Duke University Evidence-based Practice Center under Contract No. 290-2015-00004-I). Rockville, MD: Agency for Healthcare Research and Quality; April 2017.
3. National Institute for Health and Care Excellence (NICE). Varicose veins in the legs: the diagnosis and management of varicose veins. NICE Clinical Guideline: Methods, evidence and recommendations. London: National Institute for Health and Care Excellence (UK). July, 2013.
4. Khilnani NM. Duplex ultrasound evaluation of patients with chronic venous disease of the lower extremities. *AJR Am J Roentgenol*. 2014;202(3):633-642. doi:10.2214/AJR.13.11465.
5. Smith JJ, Garratt AM, Guest M, Greenhalgh RM, Davies AH. Evaluating and improving health-related quality of life in patients with varicose veins. *J Vasc Surg*. 1999;30(4):710-719. doi:10.1016/s0741-5214(99)70110-2.
6. Peter Gloviczki, MD, Peter F. Lawrence, MD, et al. The 2022 Society for Vascular Surgery, American Venous Forum, and American Vein and Lymphatic Society clinical practice guidelines for the management of varicose veins of the lower extremities. Part I. Duplex Scanning and Treatment of Superficial Truncal Reflux Endorsed by the Society for Vascular Medicine and the International Union of Phlebology. *J Vasc Surg Venous Lymphat Disord*. 2023;11:231-61.
7. Magdoleen H. Farah, MBBS, Tarek Nayfeh, MD, et al. A systematic review supporting the Society for Vascular Surgery, the American Venous Forum, and the American Vein and Lymphatic Society guidelines on the management of varicose veins. *J Vasc Surg Venous and Lymphatic Disorders*. 2022;10:1155-71.