UNITEDHEALTHCARE® COMMUNITY PLAN:
RADIOLOGY IMAGING COVERAGE DETERMINATION GUIDELINE

Adult Peripheral Vascular Disease (PVD) Imaging Guidelines (For Ohio Only)

V1.0.2025

Guideline Number: CSRAD013OH.D

Effective Date: November 1, 2025

Application (for Ohio Only)

This Medical Policy only applies to the state of Ohio. Any requests for services that are stated as unproven or services for which there is a coverage or quantity limit will be evaluated for medical necessity using Ohio Administrative Code 5160-1-01.

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Guideline Development (Preface-1)

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- These evidence-based, proprietary clinical guidelines evaluate a range of advanced imaging and procedures, including NM, US, CT, MRI, PET, Radiation Oncology, Sleep Studies, as well as Cardiac, musculoskeletal and Spine interventions.
- UnitedHealthcare reserves the right to change and update the guidelines. The guidelines undergo a formal review annually. These clinical guidelines are based on current evidence supported by major national and international association and society guidelines and criteria, peer-reviewed literature, major treatises as well as, input from health plans, and practicing academic and community-based physicians.
- These guidelines are not intended to supersede or replace sound medical judgment, but instead, should facilitate the identification of the most appropriate imaging or other designated procedure given the individual's clinical condition. These guidelines are written to cover medical conditions as experienced by the majority of individuals. However, these guidelines may not be applicable in certain clinical circumstances, and physician judgment can override the guidelines.
- These guidelines provide evidence-based, clinical benefits with a focus on health care quality and patient safety.
- Clinical decisions, including treatment decisions, are the responsibility of the individual and his/her provider. Clinicians are expected to use independent medical judgment, which takes into account the clinical circumstances to determine individual management decisions.
- UnitedHealthcare supports the Choosing Wisely initiative (**https:// www.choosingwisely.org/**) by the American Board of Internal Medicine (ABIM) Foundation and many national physician organizations, to reduce the overuse of diagnostic tests that are low value, no value, or whose risks are greater than the benefits.

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Benefits, Coverage Policies, and Eligibility Issues (Preface-2)

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Benefits, Coverage Policies, and Eligibility Issues (Preface-2.1)
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Benefits, Coverage Policies, and Eligibility Issues (Preface-2.1)

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Investigational and Experimental Studies

- Certain studies, treatments, procedures, or devices may be considered experimental, investigational, or unproven for any condition, illness, disease, injury being treated if one of the following is present:
  - if there is a paucity of supporting evidence;
  - if the evidence has not matured to exhibit improved health parameters;
  - if clinical utility has not been demonstrated in any condition; OR
  - if the study, treatment, procedure, or device lacks a collective opinion of support
- Supporting evidence includes standards that are based on credible scientific evidence published in peer-reviewed medical literature (such as well conducted randomized clinical trials or cohort studies with a sample size of sufficient statistical power) generally recognized by the relevant medical community. Collective opinion of support includes physician specialty society recommendations and the views of physicians practicing in relevant clinical areas when physician specialty society recommendations are not available.

Clinical and Research Trials

- Similar to investigational and experimental studies, clinical trial imaging requests will be considered to determine whether they meet these evidence-based clinical guidelines.
- Imaging studies which are inconsistent with established clinical standards, or are requested for data collection and not used in direct clinical management are not supported.[1]

Legislative Mandate

- State and federal legislations may need to be considered in the review of advanced imaging requests.

References (Preface-2)

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1. Coverage of Clinical Trials under the Patient Protection and Affordable Care Act; 42 U.S.C.A. § 300gg-8

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Clinical Information (Preface-3)

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Clinical Information (Preface-3.1)
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Clinical Information (Preface-3.1)

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Clinical Documentation and Age Considerations

- These clinical guidelines use an evidence-based approach to determine the most appropriate procedure for each individual, at the most appropriate time in the diagnostic and treatment cycle. These clinical guidelines are framed by:
  - clinical presentation of the individual, rather than the studies requested
  - adequate clinical information that must be submitted to UnitedHealthcare in order to establish medical necessity for advanced imaging or other designated procedures includes, but is not limited to, the following:
    - Pertinent clinical evaluation should include a recent detailed history, physical examination[20] since the onset or change in symptoms, and/or laboratory and prior imaging studies.
      - Condition-specific guideline sections may describe additional clinical information which is required for a pertinent clinical evaluation.
      - The Spine and Musculoskeletal guidelines require x-ray studies from when the current episode of symptoms has started or changed.
      - Advanced imaging or other designated procedures should not be ordered prior to clinical evaluation of an individual by the physician treating the individual. This may include referral to a consultant specialist who will make further treatment decisions.
      - Other meaningful technological contact (telehealth visit, telephone or video call, electronic mail or messaging) since the onset or change in symptoms by an established individual can serve as a pertinent clinical evaluation.
        - Some conditions may require a face-to-face evaluation as discussed in the applicable condition-specific guideline sections.
    - A recent clinical evaluation may be unnecessary if the individual is undergoing a guideline-supported, scheduled follow-up imaging or other designated procedural evaluation. Exceptions due to routine surveillance indications are addressed in the applicable condition-specific guideline sections.
  - the evidence-based approach to determine the most appropriate procedure for each individual requires submission of medical records pertinent to the requested imaging or other designated procedures.
- Many conditions affecting the pediatric population are different diagnoses than those occurring in the adult population. For those diseases which occur in both pediatric and adult populations, minor differences may exist in management due to individual

age, comorbidities, and differences in disease natural history between children and adults.
  - Individuals who are 18 years old or younger[19] should be imaged according to the Pediatric Imaging Guidelines if discussed in the condition-specific guideline sections. Any conditions not specifically discussed in the Pediatric Imaging Guidelines should be imaged according to the General Imaging Guidelines. Individuals who are >18 years old should be imaged according to the General Imaging Guidelines, except where directed otherwise by a specific guideline section.

General Imaging Information

- "Standard" or "conventional" imaging is most often performed in the initial and subsequent evaluations of malignancy. Standard or conventional imaging includes plain film, CT, MRI, or US.
  - Often, further advanced imaging is needed when initial imaging, such as ultrasound, CT, or MRI does not answer the clinical question. Uncertain, indeterminate, inconclusive, or equivocal may describe these situations.
- Appropriate use of contrast is a very important component of evidence-based advanced imaging use.
  - The appropriate levels of contrast for an examination (i.e., without contrast, with contrast, without and with contrast) is determined by the evidence-based guidance reflected in the condition-specific guideline sections.
  - If, during the performance of a non-contrast imaging study, there is the unexpected need to use contrast in order to evaluate a possible abnormality, then that is appropriate.[1]

Ultrasound

- Diagnostic ultrasound uses high-frequency sound waves to evaluate soft tissue structures and vascular structures utilizing grey scale and Doppler techniques.
- Ultrasound allows for dynamic real-time imaging at the bedside.
  - Ultrasound is limited in areas where there is dense bone or other calcification.
  - Ultrasound also has a relatively limited imaging window so may be of limited value in evaluating very large abnormalities.
  - In general, ultrasound is highly operator-dependent, and proper training and experience are required to perform consistent, high-quality evaluations.
- Indications for ultrasound may include, but are not limited to, the following:
  - Obstetric and gynecologic imaging
  - Soft tissue and visceral imaging of the chest, abdomen, pelvis, and extremities
  - Brain and spine imaging when not obscured by dense bony structures
  - Vascular imaging when not obscured by dense bony structures
  - Procedural guidance when not obscured by dense bony structures

- Initial evaluation of ill-defined soft tissue masses or fullness and differentiating adenopathy from mass or cyst. Prior to advanced imaging, ultrasound can be very beneficial in selecting the proper modality, body area, image sequences, and contrast level that will provide the most definitive information for the individual.

- More specific guidance for ultrasound usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.

Computed Tomography (CT)

- The AMA CPT® manual does not describe nor assign any minimum or maximum number of sequences for any CT study. CT imaging protocols are often influenced by the individual's clinical situation and additional sequences are not uncommon. There are numerous CT protocols that may be performed to evaluate specific clinical questions, and this technology is constantly undergoing development.
- CT utilizes ionizing radiation to create cross-sectional and volumetric images of the body.
  - Advantages over ultrasound include a much larger field of view and faster completion time in general. Disadvantages compared to ultrasound include lack of portability and exposure to ionizing radiation.
  - Advantages over MRI include faster imaging and a more spacious scanner area limiting claustrophobia. Disadvantages compared to MRI include decreased soft tissue definition, especially with non-contrast imaging, and exposure to ionizing radiation.
- CT can be performed without, with, or without and with intravenous (IV) contrast depending on the clinical indication and body area.
  - In general, non-contrast imaging is appropriate for evaluating structures with significant tissue density differences such as lung parenchyma and bony structures, or when there is a contraindication to contrast.
  - In general, CT with contrast is the most common level of contrast and can be used when there is need for improved vascular or soft tissue resolution, including better characterization of known or suspected malignancy, as well as infectious and inflammatory conditions.
  - CT without and with contrast has a limited role as the risks of doubling the ionizing radiation exposure rarely outweigh the benefits of multiphasic imaging, though there are some exceptions which include, but are not limited to, the following:
    - Characterization of a mass
    - Characterization of arterial and venous anatomy
    - CT with contrast may be used to better characterize findings on a very recent (within two weeks) inconclusive non-contrast CT where the guidelines would support CT without and with contrast.
  - More specific guidance for CT contrast usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.

- Shellfish allergy:
  - It is commonly assumed that an allergy to shellfish indicates iodine allergy, and that this implies an allergy to iodinated contrast media used with CT. However, this is NOT true. Shellfish allergy is due to tropomyosins. Iodine plays no role in these allergic reactions. Allergies to shellfish do not increase the risk of reaction to iodinated contrast media any more than that of other allergens.[1]
- Enteric contrast (oral or rectal) is sometimes used in abdominal imaging. There is no specific CPT® code which refers to enteric contrast.
- The appropriate contrast level and anatomic region in CT imaging is specific to the clinical indication, as listed in the condition-specific guideline sections.
- CT should not be used to replace MRI in an attempt to avoid sedation unless it is listed as a recommended study in the appropriate condition-specific guideline.
- There are significant potential adverse effects associated with the use of iodinated contrast media. These include hypersensitivity reactions, thyroid dysfunction, and contrast-induced nephropathy (CIN). Individuals with impaired renal function are at increased risk for CIN.[2]
- Both contrast CT and MRI may be considered to have the same risk profile with renal failure (GFR <30 mL/min).
- The use of CT contrast should proceed with caution in pregnant and breastfeeding individuals. There is a theoretical risk of contrast toxicity to the fetal and infant thyroid. The procedure can be performed if the specific need for that contrast-enhanced procedure outweighs risk to the fetus. Breastfeeding individuals may reduce this risk by choosing to pump and discard breast milk for 12-24 hours after the contrast injection.
- CT without contrast may be appropriate if clinical criteria for CT with contrast are met AND the individual has/is:
  - elevated blood urea nitrogen (BUN) and/or creatinine
  - renal insufficiency
  - allergies to iodinated contrast
  - thyroid disease which could be treated with I-131
  - diabetes
  - very elderly
  - urgent or emergent settings due to availability
  - trauma
- CT is superior to other imaging modalities in certain conditions including, but not limited to, the following:
  - Screening following trauma
  - Imaging pulmonary disease
  - Imaging abdominal and pelvic viscera
  - Imaging of complex fractures

  - Evaluation of inconclusive findings on Ultrasound or MRI, or if there is a contraindication to MRI
- More specific guidance for CT usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.

Magnetic Resonance Imaging (MRI)

- The AMA CPT® manual does not describe nor assign any minimum or maximum number of sequences for any MRI study. MRI protocols are often influenced by the individual's clinical situation and additional sequences are not uncommon. There are numerous MRI sequences that may be performed to evaluate specific clinical questions, and this technology is constantly undergoing development.
- Magnetic Resonance Imaging (MRI) utilizes the interaction between the intrinsic radiofrequency of certain molecules in the body (hydrogen in most cases) and a strong external magnetic field.
  - MRI is often superior for advanced imaging of soft tissues and can also define physiological processes in some instances (e.g., edema, loss of circulation [AVN], and increased vascularity [tumors]).
  - MRI does not use ionizing radiation and even non-contrast images have much higher soft tissue definition than CT or Ultrasound.
  - MRI typically takes much longer than either CT or Ultrasound, and for some individuals may require sedation. It is also much more sensitive to individual motion that can degrade image quality than either CT or Ultrasound.
- MRI Breast and MRI Chest are not interchangeable, as they focus detailed sequences on different adjacent body parts.
- MRI may be utilized either as the primary advanced imaging modality, or when further definition is needed based on CT or ultrasound imaging.
- Most orthopedic and dental implants are not magnetic. These include hip and knee replacements; plates, screws, and rods used to treat fractures; and cavity fillings. Yet, all of these metal implants can distort the MRI image if near the part of the body being scanned.
  - Other implants, however, may have contraindications to MRI. These include the following:
    - Pacemakers
    - ICD or heart valves
    - Metal implants in the brain
    - Metal implants in the eyes or ears
    - Infusion catheters and bullets or shrapnel
  - CT can therefore be an alternative study to MRI in these scenarios.
- The contrast level and anatomic region in MRI imaging is specific to the clinical indication, as listed in the specific guideline sections.

- MRI utilizing Xenon Xe 129 (CPT® C9791) for contrast is considered investigational and experimental at this time. MRI with or with and without contrast in these guidelines refers to MRI utilizing gadolinium for contrast.
- MRI is commonly performed without, without and with contrast.
  - Non-contrast imaging offers excellent tissue definition.
  - Imaging without and with contrast is commonly used when needed to better characterize tissue perfusion and vascularization.
    - Most contrast is gadolinium based and causes T2 brightening of the vascular and extracellular spaces.
    - Some specialized gadolinium and non-gadolinium contrast agents are available, and most commonly used for characterizing liver lesions.
  - MRI with contrast only is rarely appropriate and is usually used to better characterize findings on a recent inconclusive non-contrast MRI, commonly called a completion study.
  - MRI contrast is contraindicated in pregnant individuals.
  - More specific guidance for MRI contrast usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.
- MRI may be preferred in individuals with renal failure and in individuals allergic to intravenous CT contrast.
  - Both contrast CT and MRI may be considered to have the same risk profile with renal failure (GFR <30 mL/min).[2]
  - Gadolinium can cause Nephrogenic Systemic Fibrosis (NSF). The greater the exposure to gadolinium in individuals with a low GFR (especially if on dialysis), the greater the chance of individuals developing NSF.
  - Multiple studies have demonstrated potential for gadolinium deposition following the use of gadolinium-based contrast agents (GBCAs) for MRI studies.[3-7] The U.S. Food and Drug Administration (FDA) has noted that there is currently no evidence to suggest that gadolinium retention in the brain is harmful and restricting gadolinium-based contrast agents (GBCAs) use is not warranted at this time. It has been recommended that GBCA use should be limited to circumstances in which additional information provided by the contrast agent is necessary and the necessity of repetitive MRIs with GBCAs should be assessed.[8]
- A CT may be approved in place of an MRI when clinical criteria are met for MRI AND there is a contraindication to having an MRI (pacemaker, ICD, insulin pump, neurostimulator, etc.).
  - When replacing MRI with CT, contrast level matching should occur as follows:
    - MRI without contrast → CT without contrast
    - MRI without and with contrast → CT with contrast or CT without and with contrast
- The following situations may impact the appropriateness for MRI and or MR contrast:

  - Caution should be taken in the use of gadolinium in individuals with renal failure.
  - The use of gadolinium contrast agents is contraindicated during pregnancy unless the specific need for that procedure outweighs risk to the fetus.
  - MRI can be performed for non-ferromagnetic body metals (i.e., titanium), although some imaging facilities will consider it contraindicated if recent surgery, regardless of the metal type.
- MRI should not be used as a replacement for CT for the sole reason of avoidance of ionizing radiation when MRI is not supported in the condition-based guidelines, since it does not solve the problem of overutilization.
- MRI is superior to other imaging modalities in certain conditions including, but not limited to, the following:
  - Imaging the brain and spinal cord
  - Characterizing visceral and musculoskeletal soft tissue masses
  - Evaluating musculoskeletal soft tissues including ligaments and tendons
  - Evaluating inconclusive findings on ultrasound or CT
  - Individuals who are pregnant or have high radiation sensitivity
  - Suspicion, diagnosis, or surveillance of infections
- More specific guidance for MRI usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.

Positron Emission Tomography (PET)

- PET is a nuclear medicine study that uses a positron emitting radiotracer to create cross-sectional and volumetric images based on tissue metabolism.
- Conventional imaging (frequently CT, sometimes MRI or bone scan) of the affected area(s) drives much of initial and restaging and surveillance imaging for malignancy and other chronic conditions. PET is not indicated for surveillance imaging unless specifically stated in the condition-specific guideline sections.
- PET/MRI is generally not supported, see **PET-MRI (Preface-5.3)**.
- PET is rarely performed as a single modality, but is typically performed as a combined PET/CT.
  - The unbundling of PET/CT into separate PET and diagnostic CT CPT® codes is not supported, because PET/CT is done as a single study.
- PET/CT lacks the tissue definition of CT or MRI, but is fairly specific for metabolic activity based on the radiotracer used.
- Indications for PET/CT may include the following:
  - Oncologic Imaging for evaluation of tumor metabolic activity
  - Cardiac Imaging for evaluation of myocardial metabolic activity
  - Brain Imaging for evaluation of metabolic activity for procedural planning
- More specific guidance for PET usage, including exceptions to this general guidance, can be found throughout the condition-specific guidelines.

Overutilization of Advanced Imaging

- A number of recent reports describe overutilization in many areas of advanced imaging and other procedures, which may include the following:
  - High-level testing without consideration of less invasive, lower cost options which may adequately address the clinical question at hand
  - Excessive radiation and costs with unnecessary testing
  - Defensive medical practice
  - CT without and with contrast (so called "double contrast studies") requests, which have few current indications
  - MRI requested in place of CT to avoid radiation without considering the primary indication for imaging
  - Adult CT settings and protocols used for smaller people and children
  - Unnecessary imaging procedures when the same or similar studies have already been conducted
- A review of the imaging or other relevant procedural histories of all individuals presenting for studies has been recognized as one of the more important processes that can be significantly improved. By recognizing that a duplicate or questionably indicated examination has been ordered for individuals, it may be possible to avoid exposing them to unnecessary risks.[9,10] To avoid these unnecessary risks, the precautions below should be considered:
  - The results of initial diagnostic tests or radiologic studies to narrow the differential diagnosis should be obtained prior to performing further tests or radiologic studies.
  - The clinical history should include a potential indication such as a known or suspected abnormality involving the body part for which the imaging study is being requested. These potential indications are addressed in greater detail within the applicable guidelines.
  - The results of the requested imaging procedures should be expected to have an impact on individual management or treatment decisions.
  - Repeat imaging studies are not generally necessary unless there is evidence of disease progression, recurrence of disease, and/or the repeat imaging will affect an individual's clinical management.
- Pre-operative imaging/pre-surgical planning imaging/pre-procedure imaging is not indicated if the surgery/procedure is not indicated. Once the procedure has been approved or if the procedure does not require prior authorization, the appropriate pre-procedural imaging may be approved.

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Coding Issues (Preface-4)

Guideline

3D Rendering (Preface-4.1)

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CPT® 76376 and CPT® 76377

- Both codes require concurrent supervision of the image post-processing 3D manipulation of the volumetric data set and image rendering.
  - Concurrent supervision is defined as active physician participation in and monitoring of the reconstruction process including design of the anatomic region that is to be reconstructed; determination of the tissue types and actual structures to be displayed (e.g., bone, organs, and vessels); determination of the images or cine loops that are to be archived; and, monitoring and adjustment of the 3D work product. The American College of Radiology (ACR) recommends that it is best to document the physician's supervision or participation in the 3D reconstruction of images.
- These two codes differ in the need for and use of an independent workstation for post-processing.
  - CPT® 76376 reports procedures not requiring image post-processing on an independent workstation.
  - CPT® 76377 reports procedures that require image post-processing on an independent workstation.
- These 3D rendering codes should not be used for 2D reformatting.
- Two-dimensional reconstruction (e.g., reformatting an axial scan into the coronal plane) is now included in all cross-sectional imaging base codes and is not separately reimbursable.
- The codes used to report 3D rendering for ultrasound and echocardiography are also used to report the 3D post processing work on CT, MRI, and other tomographic modalities.
- Providers may be required to obtain prior authorization on these 3D codes even if prior authorization is not required for the echocardiography and/or ultrasound procedure codes. It may appear that UnitedHealthcare pre-authorizes echocardiography and/or ultrasound when, in fact, it may only be the 3D code that needs the prior authorization.
- CPT® codes for 3D rendering should not be billed in conjunction with computer-aided detection (CAD), MRA, CTA, nuclear medicine SPECT studies, PET, PET/CT, Mammogram, MRI Breast, US Breast, CT Colonography (virtual colonoscopy), Cardiac MRI, Cardiac CT, or Coronary CTA studies.

- CPT® 76377 (3D rendering requiring image post-processing on an independent workstation) or CPT® 76376 (3D rendering not requiring image post-processing on an independent workstation) can be considered in the following clinical scenarios:
  - Bony conditions:
    - Evaluation of congenital skull abnormalities in newborns, infants, and toddlers (usually for pre-operative planning)
    - Complex fractures (comminuted or displaced)/dislocations of any joint (for pre-operative planning when conventional imaging is insufficient)
    - Spine fractures, pelvic/acetabulum fractures, intra-articular fractures (for pre-operative planning when conventional imaging is insufficient)
    - Pre-operative planning for other complex surgical cases
    - Complex facial fractures
  - Pre-operative planning for other complex surgical cases
  - Cerebral angiography
  - Pelvis conditions:
    - Uterine intra-cavitary lesion when initial US is equivocal: See **Abnormal Uterine Bleeding (AUB) (PV-2.1)** and **Leiomyoma/Uterine Fibroids (PV-12.1)** in the Pelvis Imaging Guidelines.
    - Hydrosalpinxes or peritoneal cysts when initial US is indeterminate: See **Complex Adnexal Masses (PV-5.3)** in the Pelvis Imaging Guidelines.
    - Lost IUD (inability to feel or see IUD string) with initial US: See **Intrauterine Device (PV-10.1)** in the Pelvis Imaging Guidelines.
    - Uterine anomalies with initial US: See **Uterine Anomalies (PV-14.1)** in the Pelvis Imaging Guidelines.
    - Infertility: See **Initial Infertility Evaluation, Female (PV-9.1)** in the Pelvis Imaging Guidelines.
  - Abdomen conditions:
    - CT Urogram: See **Hematuria and Hydronephrosis (AB-39)** in the Abdomen Imaging Guidelines.
    - MRCP: See **MR Cholangiopancreatography (MRCP) (AB-27)** in the Abdomen Imaging Guidelines.

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CT-, MR-, or Ultrasound-Guided Procedures (Preface-4.2)

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- CT-, MR-, and Ultrasound-guidance procedure codes contain all of the imaging necessary to guide a needle or catheter. It is inappropriate to routinely bill a diagnostic procedure code in conjunction with a guidance procedure code.
- Imaging studies performed as part of a CT-, MR-, or Ultrasound-guided procedure should be reported using the CPT® codes in the following table:

TABLE: Imaging Guidance Procedure Codes

CPT®	Description
19085	Biopsy, breast, with placement of breast localization device(s), when performed, and imaging of the biopsy specimen, when performed, percutaneous; first lesion, including MR guidance
19086	Biopsy, breast, with placement of breast localization device(s), when performed, and imaging of the biopsy specimen, when performed, percutaneous; each additional lesion, including MR guidance
75989	Imaging guidance for percutaneous drainage with placement of catheter (all modalities)
76942	Ultrasonic guidance for needle placement
77011	CT guidance for stereotactic localization
77012	CT guidance for needle placement
77013	CT guidance for, and monitoring of parenchymal tissue ablation
77021	MR guidance for needle placement
77022	MR guidance for, and monitoring of parenchymal tissue ablation

CPT® 19085 and CPT® 19086

- The proper way to bill an MRI-guided breast biopsy is CPT® 19085 (Biopsy, breast, with placement of breast localization device(s), when performed, and imaging of the biopsy specimen, when performed, percutaneous; first lesion, including MR guidance). Additional lesions should be billed using CPT® 19086.
  - **CPT® 77021** (MR guidance for needle placement) is not an appropriate code for a breast biopsy.

CPT® 75989

- This code is used to report imaging guidance for a percutaneous drainage procedure in which a catheter is left in place.
- This code can be used to report whether the drainage catheter is placed under fluoroscopy, Ultrasound-, CT-, or MR-guidance modality.

CPT® 77011

- A stereotactic CT localization scan is frequently obtained prior to sinus surgery. The dataset is then loaded into the navigational workstation in the operating room for use during the surgical procedure. The information provides exact positioning of surgical instruments with regard to the individual's 3D CT images.[3]
- In most cases, the pre-operative CT is a technical-only service that does not require interpretation by a radiologist.
  - The imaging facility should report CPT® 77011 when performing a scan not requiring interpretation by a radiologist.
  - If a diagnostic scan is performed and interpreted by a radiologist, the appropriate diagnostic CT code (e.g., CPT® 70486) should be used.
  - It is not appropriate to report both CPT® 70486 and CPT® 77011 for the same CT stereotactic localization imaging session.
  - 3D Rendering (CPT® 76376 or CPT® 76377) should not be reported in conjunction with CPT® 77011 (or CPT® 70486 if used). The procedure inherently generates a 3D dataset.

CPT® 77012 (CT) and CPT® 77021 (MR)

- These codes are used to report imaging guidance for needle placement during biopsy, aspiration, and other percutaneous procedures.
- They represent the radiological supervision and interpretation of the procedure and are often billed in conjunction with surgical procedure codes.
  - For example, CPT® 77012 is reported when CT guidance is used to place the needle for a conventional arthrogram.
  - Only codes representing percutaneous surgical procedures should be billed with CPT® 77012 and CPT® 77021. It is inappropriate to use with surgical codes for open, excisional, or incisional procedures.

- **CPT® 77021** (MR guidance for needle placement) is not an appropriate code for breast biopsy.
  - CPT® 19085 would be appropriate for the first breast biopsy site and CPT® 19086 would be appropriate for additional concurrent biopsies.

CPT® 77013 (CT) and CPT® 77022 (MR)

- These codes include the initial guidance to direct a needle electrode to the tumor(s), monitoring for needle electrode repositioning within the lesion, and as necessary for multiple ablations to coagulate the lesion and confirmation of satisfactory coagulative necrosis of the lesion(s) and comparison to pre-ablation images.
  - **NOTE:** CPT® 77013 should only be used for non-bone ablation procedures.
    - CPT® 20982 includes CT guidance for bone tumor ablations.
  - Only codes representing percutaneous surgical procedures should be billed with CPT® 77013 and CPT® 77022. It is inappropriate to use with surgical codes for open, excisional, or incisional procedures.
- CPT® 77012 and CPT® 77021 (as well as guidance codes CPT® 76942 [US], and CPT® 77002 - CPT® 77003 [fluoroscopy]) describe radiologic guidance by different modalities.
  - Only one unit of any of these codes should be reported per individual encounter (date of service). The unit of service is considered to be the individual encounter, not the number of lesions, aspirations, biopsies, injections, or localizations.

Unlisted Procedures/Therapy Treatment Planning (Preface-4.3)

PRF.CD.0004.3.UOH
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CPT ®	Description
76497	Unlisted CT procedure (e.g., diagnostic or interventional)
76498	Unlisted MR procedure (e.g., diagnostic or interventional)
78999	Unlisted procedure, diagnostic nuclear medicine

- These unlisted codes should be reported whenever a diagnostic or interventional CT or MR study is performed in which an appropriate anatomic site-specific code is not available.
  - A Category III code that describes the procedure performed must be reported rather than an unlisted code if one is available.
- CPT® 76497 or CPT® 76498 (Unlisted CT or MRI procedure) can be considered in the following clinical scenarios:
  - Studies done for navigation and planning for neurosurgical procedures (i.e., Stealth or Brain Lab Imaging)[1,2]
  - Custom joint arthroplasty planning (not as an alternative recommendation): See **Osteoarthritis (MS-12.1)** in the Musculoskeletal Imaging Guidelines.
  - Any procedure/surgical planning if thinner cuts or different positional acquisition (than those on the completed diagnostic study) are needed. These could include navigational bronchoscopy: See **Navigational Bronchoscopy (CH-1.7)** in the Chest Imaging Guidelines.

Therapy Treatment Planning

- Radiation Therapy Treatment Planning: See **Unlisted Procedure Codes in Oncology (ONC-1.5)** in the Oncology Imaging Guidelines.

CPT® 76380 Limited or Follow-up CT (Preface-4.5)

PRF.CD.0004.5.UOH

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- CPT® 76380 describes a limited or follow-up CT scan. The code is used to report any CT scan, for any given area of the body, in which the work of a full diagnostic code is not performed.
- Common examples include, but are not limited to, the following:
  - Limited sinus CT imaging protocol
  - Limited or follow-up slices through a known pulmonary nodule
  - Limited slices to assess a non-healing fracture (such as the clavicle)
- Limited CT (CPT® 76380) is not indicated for treatment planning purposes. See **Unlisted Procedure Codes in Oncology (ONC-1.5)** in the Oncology Imaging Guidelines.
- It is inappropriate to report CPT® 76380, in conjunction with other diagnostic CT codes, to cover 'extra slices' in certain imaging protocols.
  - There is no specific number of sequences or slices defined in any CT CPT® code definition.
  - The AMA, in **CPT® 2019**, does not describe nor assign any minimum or maximum number of sequences or slices for any CT study.
    - A few additional slices or sequences are not uncommon.
    - CT imaging protocols are often influenced by the individual's clinical situation. Sometimes the protocols require more time and sometimes less.

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SPECT/CT Imaging (Preface-4.6)

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- SPECT/CT involves SPECT (Single Photon Emission Computed Tomography) nuclear medicine imaging and CT for optimizing location, accuracy, and attenuation correction and combines functional and anatomic information.
  - Common studies using this modality include ^{123}I- or ^{131}I-Metaiodobenzylguanidine (MIBG) and octreotide scintigraphy for neuroendocrine tumors.
- Hybrid Nuclear/CT scan can be reported as CPT® 78830 (single area and single day), CPT® 78831 (2 or more days), or CPT® 78832 (2 areas with one day and 2-day study).
- CPT® 78072 became effective January 1, 2013 for SPECT/CT parathyroid nuclear imaging.

CPT® 76140 Interpretation of an Outside Study (Preface-4.7)

PRF.CD.0004.7.UOH

v1.0.2025

- It is inappropriate to use diagnostic imaging codes for interpretation of a previously performed exam that was completed at another facility.
  - If the outside exam is being used for comparison with a current exam, the diagnostic code for the current examination includes comparison to the prior study.[4]
  - CPT® 76140 is the appropriate code to use for an exam which was completed elsewhere and a secondary interpretation of the images is requested.[5]

Quantitative MR Analysis (Preface-4.8)

PRF.CD.0004.8.A

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- Category III CPT® codes for quantitative analysis of multiparametric-MR (mp-MRI) data with and without an associated diagnostic MRI have been established. Quantitative mp-MRI uses software to analyze tissue physiology of visceral organs and other anatomic structures non-invasively. At present, these procedures are primarily being used in clinical trials and there is no widely recommended indications in clinical practice. As such, these procedures are considered to be investigational and experimental for coverage purposes.
  - CPT® 0648T (without diagnostic MRI) and CPT® 0649T (with diagnostic MRI) refer to data analysis with and without associate imaging of a single organ, with its most common use being LiverMultiScan (LMS).
    - See **Fatty Liver (AB-29.2)** in the Abdomen Imaging Guidelines.
  - CPT® 0697T (without diagnostic MRI) and CPT® 0698T (with diagnostic MRI) refer to data analysis with and without associate imaging of a multiple organs, with its most common use being CoverScan.
  - Volumetric and quantitative MRI analysis of the brain (CPT® 0865T or CPT® 0866T) lack sufficient specificity and sensitivity to be clinically useful. Its use is limited to research studies and is otherwise considered to be not medically necessary in routine clinical practice.

HCPCS Codes (Preface-4.9)

PRF.CD.0004.9.UOH

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- Healthcare Common Procedure Coding System (HCPCS) codes are utilized by some hospitals in favor of the typical Level-III CPT® codes. These codes are typically 4 digits preceded by a C or S.[6]
  - Many of these codes have similar code descriptions to Level-III CPT® codes (i.e., C8931 – MRA with dye, Spinal Canal; and, CPT® 72159 – MRA Spinal Canal).
  - If cases are submitted with HCPCS codes with similar code descriptions to the typical Level-III CPT® codes, those procedures should be managed in the same manner as the typical CPT® codes.
  - HCPCS code management is discussed further in the applicable guideline sections.
- Requests for many Healthcare Common Procedure Coding System (HCPCS) codes, including non-specific codes such as S8042 (Magnetic resonance imaging [MRI], low-field), should be redirected to a more appropriate and specific CPT® code. Exceptions are noted in the applicable guideline sections.

References (Preface-4)

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Whole-Body Imaging (Preface-5)

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Whole-Body CT Imaging (Preface-5.1)

PRF.WB.0005.1.UOH

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- Whole-body CT or LifeScan (CT Brain, Chest, Abdomen, and Pelvis) for screening of asymptomatic individuals is not indicated. The performance of whole-body screening CT examinations in healthy individuals does not meet any of the current validity criteria for screening studies and there is no clear documentation of benefit versus radiation risk.
- Whole-body low-dose CT is supported for oncologic staging in Multiple Myeloma. See **Multiple Myeloma and Plasmacytomas (ONC-25)** in the Oncology Imaging Guidelines.

Whole-Body MR Imaging (Preface-5.2)

PRF.WB.0005.2.A

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- Whole-body MRI (WBMRI) is, with the exception of select cancer predisposition syndromes and autoimmune conditions discussed below, generally not supported at this time due to lack of standardization in imaging technique and lack of evidence that WBMRI improves outcome for any individual disease state.
  - While WBMRI has the benefit of whole-body imaging and lack of radiation exposure, substantial variation still exists in the number of images, type of sequences (STIR vs. diffusion weighting, for example), and contrast agent(s) used.
- Coding considerations:
  - There are no established CPT® or HCPCS codes for reporting WBMRI.
  - WBMRI is at present only reportable using CPT® 76498. All other methods of reporting whole-body MRI are inappropriate including the following:
    - Separate diagnostic MRI codes for multiple individual body parts
    - MRI Bone Marrow Supply (CPT® 77084)
- Disease-specific considerations:
  - Cancer screening:
    - Interval WBMRI is recommended for cancer screening in individuals with select cancer predisposition syndromes. Otherwise, WBMRI has not been shown to improve outcomes for cancer screening.
      - For additional information, see **Li-Fraumeni Syndrome (LFS) (PEDONC-2.2)**, **Neurofibromatosis 1 and 2 (NF1 and NF2) (PEDONC-2.3)**, **Rhabdoid Tumor Predisposition Syndrome (PEDONC-2.11)**, **Hereditary Paraganglioma-Pheochromocytoma (HPP) Syndromes (PEDONC-2.13)**, **Constitutional Mismatch Repair Deficiency (CMMRD or Turcot Syndrome) (PEDONC-2.15)**, or **Infantile Myofibromatosis (PEDONC-2.18)** in the Pediatric and Special Populations Oncology Imaging Guidelines.
  - Cancer staging and restaging:
    - While the feasibility of WBMRI has been established, data remain conflicting on whether WBMRI is of equivalent diagnostic accuracy compared with standard imaging modalities such as CT, scintigraphy, and PET imaging.
    - Evidence has not been published establishing WBMRI as a standard evaluation for any type of cancer.
  - Autoimmune disease:
    - WBMRI can be approved in some situations for individuals with chronic recurrent multifocal osteomyelitis.
      - For additional information, see **Chronic Recurrent Multifocal Osteomyelitis (PEDMS-10.2)** in the Pediatric Musculoskeletal Imaging Guidelines.

PET-MRI (Preface-5.3)

PRF.WB.0005.3.A

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- PET-MRI is generally not supported for a vast majority of oncologic and neurologic conditions due to lack of standardization in imaging technique and interpretation. However, it may be appropriate in select circumstances when the following criteria are met:
  - The individual meets condition-specific guidelines for PET-MRI OR
  - The individual meets ALL of the following:
    - The individual meets guideline criteria for PET-CT, **AND**
    - PET-CT is not available at the treating institution, **AND**
    - The provider requests PET-MRI in lieu of PET-CT
- When the above criteria are met, PET-MRI may be reported using the code combination of PET Whole-Body (CPT® 78813) and MRI Unlisted (CPT® 76498). All other methods of reporting PET-MRI are inappropriate.
  - When clinically appropriate, diagnostic MRI codes may be indicated at the same time as the PET-MRI code combination.
- For more information, see **PET Imaging in Pediatric Oncology (PEDONC-1.4)** in the Pediatric and Special Populations Oncology Imaging Guidelines, and **PET Brain Imaging (PEDHD-2.3)** and **Special Imaging Studies in Evaluation for Epilepsy Surgery (PEDHD-6.3)** in the Pediatric Head Imaging Guidelines.

References (Preface-5)

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- Complete reference citations for the journal articles are embedded within the body of the guidelines and/or may be found on the Reference pages at the end of some guideline sections.
- The website addresses for certain references are included in the body of the guidelines but are not hyperlinked to the actual website.
- The website address for the American College of Radiology (ACR) Appropriateness Criteria® is http://www.acr.org.

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Copyright Information (Preface-7)

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Trademarks (Preface-8)

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Trademarks (Preface-8.1)

Trademarks (Preface-8.1)

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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

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General Guidelines (PVD-1.0)

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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
• 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 dopplers, where there is no hard copy output for evaluation of bidirectional blood flow, are not reportable by these codes.

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

Arterial Duplex – Upper and Lower Extremities	CPT®
Duplex scan of lower extremity arteries or arterial bypass grafts; complete bilateral.	93925
• 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).	
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 Studies	CPT®
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

Visceral Vascular Studies	CPT®
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; unilateral or limited study	93979

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

General Guidelines

- A pertinent clinical evaluation, or meaningful technological contact (telehealth visit, telephone call, electronic mail or messaging), is required prior to considering advanced imaging, including 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 (within 60 days) after symptoms started or worsened
- ABI should be measured first:
  - If normal, then further vascular studies are generally not indicated.
  - If clinical suspicion for PAD remains high with normal ABI's, exercise ABI's (CPT® 93924) can be performed on a treadmill to elicit ischemia
  - The TBI (toe-brachial index) is used to establish the diagnosis of PAD in the setting of non-compressible arteries (ABI ≥1.40) and may also be used to assess perfusion in 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 indicated unless there has been a change in the individual's condition, previous imaging showed an indeterminate finding, or eviCore healthcare guidelines support routine follow-up imaging.
- Runoff studies (CPT® 75635 for CTA or CPT® 74185, CPT® 73725, and CPT® 73725 for MRA) image from the umbilicus to the feet
  - CTA Abdomen and lower extremities should be reported as CPT® 75635, rather than using the individual CPT® codes for the abdomen, pelvis, and legs
  - MRA Abdomen, MRA Pelvis and MRA Lower extremities should be reported as CPT® 74185, CPT® 73725, and CPT® 73725. The CPT® code for MRA Pelvis (CPT® 72198) should not be included in this circumstance.

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
  - Studies used to quantify plaque morphology in noncoronary vessels (CPT® 0710T, CPT® 0711T, CPT® 0712T, CPT® 0713T) are considered experimental, investigational, or unproven.

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Nuclear Medicine Imaging indications (PVD-10.1)

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- Nuclear medicine studies are rarely used in the evaluation of peripheral vascular disorders but are indicated in the following circumstances:
  - Lymphoscintigraphy (CPT® 78195) is indicated for evaluation of lower extremity lymphedema when recent Doppler ultrasound of the lower extremity and abdomen are negative for valvular insufficiency.
  - Vascular flow imaging (CPT® 78445) is an obsolete study that has been replaced by MRA, CTA, or Duplex ultrasonography, and is not supported for any indication at this time.
  - Venous thrombosis imaging (CPT® 78456, CPT® 78457, and CPT® 75458) are obsolete studies that have been replaced by MRA, CTA, or Duplex ultrasonography, and are not supported for any indication at this time.
  - Indium 111 (^{111}In)–labeled white blood cell (WBC) or Gallium-67 citrate studies (CPT® 78800, CPT® 78801, CPT® 78802, or CPT® 78803) can be approved for evaluation of the following:
    - Mycotic aneurysms.
    - Vascular graft infection.
    - Infection of central venous catheter or other indwelling device.
  - PET/CT (CPT® 78815) can be approved if all of the following apply:
    - Clinical suspicion of aortic infection (graft or native aorta) AND
    - CT-angiogram is equivocal/indeterminate AND
    - Neither Indium-111 nor Gallium-67 studies have been performed, AND are not available (or not technically feasible)

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Genetic Predisposition to Arterial Disease

Guideline

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

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 advised. 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 indicated in individuals with abnormal pulse exams.

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's, 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 mutuations 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

Description	CPT®
CT Chest without contrast	71250
CT Chest with contrast	71260
CTA Chest	71275
MRA Chest	71555
Transesophageal echocardiogram (TEE)	93312 or 93313 or 93314

Screening and initial diagnosis

- Screening for Familial Syndromes 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.
  - 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** can be performed 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:
  - On initial diagnosis of Ehlers-Danlos, Loeys Deitz or Marfans or SCAD or suspicion of fibromuscular dysplasia, full vascular imaging should be performed from head to pelvis with:
    - CTA or MRA Head (CPT® 70496 or CPT® 70546 or CPT® 70545)
    - CTA or MRA Neck (CPT® 70498 or CPT® 70548 or CPT® 70549)
    - CTA or MRA Chest or CT Chest with contrast
    - CTA Abdomen/Pelvis or MRA Abdomen/Pelvis (CPT® 74174) or (CPT® 74185 and CPT® 72198)
  - 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 timeframe as described in **Thoracic Aortic Aneurysm (TAA) (PVD-6.2)**, **Abdominal Aortic Aneurysm (PVD-6.3)**, **Iliac Artery Aneurysm (PVD- 6.4)**, and **Visceral Artery Aneurysm (PVD-6.5)**.
- Follow-Up of aneurysms in individuals with documented SCAD/Marfan's/Loeys-Dietz/ Ehlers-Danlos type IV
  - Imaging can be performed every 6 months once an aneurysm has been identified until a decision has been made to repair.
    - Intracranial aneurysm – CTA or MRA Head (CPT® 70496 or 70544)
    - Aneurysm of a cervical artery – Carotid duplex or CTA or MRA neck if unable to fully visualize with carotid duplex
    - Thoracic aorta – CTA Chest (CPT® 71275) or CT Chest with (CPT® 71260) or without (CPT® 71250), MRA chest (CPT® 71555)

- 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, Marfans, 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's, 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

Description	CPT®
CT Chest without contrast	71250
CT Chest with contrast	71260
CTA Chest	71275
MRA Chest	71555
Transesophageal echocardiogram (TEE)	93312 or 93313 or 93314

Indications

Screening

- Screening 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).
    - Additional imaging such as Cardiac MRI, Cardiac CT, or CCTA is **not** generally indicated.
    - 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)**
- If no dilatation of the aortic root or ascending thoracic aorta is found, there is no evidence-based data to support continued surveillance imaging.

Surveillance

There is no evidence-based data to support continued surveillance imaging if **no** dilatation of the aortic root or ascending thoracic aorta is found.

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 can be approved:

- Transthoracic echocardiogram (TTE) (CPT® 93306)
- MRA Chest (CPT® 71555) or CTA Chest and CT Chest with contrast (CPT® 71275 and 71260)
- 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 indicated when there is documentation of new signs or symptoms.

Surveillance imaging

Surveillance imaging with any of the studies listed in initial imaging is indicated 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 mutuations 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.

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Cerebrovascular Imaging

Guideline

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

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- Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) should generally be used 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
    - See **Subclavian Steal Syndrome (CH-27)** in the Chest Imaging Guidelines
  - Blunt neck trauma in the absence of focal neurologic symptoms
  - Neurologic complaints after chiropractic neck manipulation
  - Vasculitis potentially involving carotid arteries, such as Takayasu's arteritis and fibromuscular dysplasia (FMD). In patients with neurologic symptoms and concern for cerebral vasculitis, see **Cerebral vasculitis (HD 22.1)**
  - Remote history of stroke or TIA (Greater than one month).
- Typical Symptoms of TIA/Stroke, see **Stroke/TIA (HD-21)** in the Head Imaging Guidelines
- CTA or MRA Neck is indicated for 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's
  - Stroke in the young (age ≤50)
- CTA or MRA Neck can be approved for suspected vertebrobasilar pathology:
  - Symptoms include:
    - Vertigo associated with nausea and vomiting

        - Diplopia
        - Loss of vision in one or both eyes
        - Dysarthria
        - Bifacial numbness
        - Bilateral extremity weakness and/or numbness
        - Acute changes in mental status
        - Loss of consciousness
        - Ataxia
    - MRA or CTA of **both** Neck and Head are required to visualize the entire vertebral-basilar system for evaluation of posterior circulation disease. See **General Guidelines – CT and MR Angiography (HD-1.5)** in the Head Imaging Guidelines
    - 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.
- For Suspected Subclavian Steal Syndrome:
    - Initial imaging should be a carotid duplex
        - If initial duplex demonstrates high-grade stenosis or occlusion of the subclavian artery, advanced imaging is NOT indicated unless the individual is symptomatic with arm claudication or signs of hypo-perfusion of the vertebral artery with recurrent dizziness
    - Surveillance of subclavian arterial disease is NOT indicated if there has not been any intervention such as a carotid-subclavian bypass or subclavian stent
    - Advanced imaging, see **Subclavian Steal Syndrome – General (CH-27)** in the Chest Imaging Guidelines
- 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 indicated 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 (CPT® 70548) or without and with contrast (CPT® 70549)
- CTA Neck (CPT® 70498)

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 indicated for pre-procedure planning. Additionally, CTA/MRA is indicated 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)

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- Surveillance imaging is indicated 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

- If normal study, no routine follow-up imaging is indicated
- If <50% internal carotid stenosis
  - Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) can be performed every **two** years
- Between 50% and 70% internal carotid stenosis

- Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) can be performed annually.
- A repeat duplex (CPT® 93880 bilateral or CPT® 93882 unilateral) may be performed in three to six months until stability is reached when **one** of the following occurs:
  - 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 (CPT® 70548) is indicated 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 (CPT® 93880 bilateral or CPT® 93882 unilateral) or MRA Neck with contrast (CPT® 70548) or CTA Neck (CPT® 70498) can be performed at the following intervals:
    - Every 6 months until one of the following occurs:
      - Intervention is performed
      - Decision is made to not intervene
- MRA Neck with contrast (CPT® 70548) or CTA Neck (CPT® 70498) is indicated if duplex Ultrasound shows ≥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 (CPT® 70544, or CPT® 70545, or CPT® 70546) or CTA Head (CPT® 70496) 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)

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- Duplex ultrasound (CPT® 93880 bilateral or CPT® 93882 unilateral) is indicated post-carotid surgery or intervention at the following intervals:
  - 1 month after procedure
  - Every 6 months for 2 years after procedure
  - Then annually
- If ≥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 indicated at the following intervals:
    - Every 3-6 months for one year
    - Then annually or until decision is made to re-intervene.
- If ≥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 indicated 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 indicated 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, 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.

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Aortic Imaging

Guideline

Aortic Disorders General Information (PVD-6.1)

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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 usually preferred to evaluate for stenosis of these vessels rather than ultrasound (Exception: Duplex ultrasound is indicated 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.

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Thoracic Aortic Aneurysm (TAA) (PVD-6.2)

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Thoracic Aortic Aneurysm (TAA) (PVD-6.2)

- Advanced imaging with a CT or MR is preferred imaging for this diagnosis. Transesophageal echocardiogram (TEE) can also be indicated for initial imaging of ascending and descending thoracic aortic aneurysms. For repeat imaging or established thoracic aneurysms, TEE is indicated **only** when imaging with CT or MR is contraindicated.
- Given the diversity of studies, pathology, and provider preference, **one** of the imaging studies in the Table of Thoracic Aorta Imaging Options can be approved for Thoracic Aortic Aneurysm (TAA) as indicated in this section

Table of Thoracic Aorta Imaging Options

Description	CPT®
CT Chest without contrast	71250
CT Chest with contrast	71260
CTA Chest	71275
MRA Chest	71555
Transesophageal echocardiogram (TEE)	93312 or 93313 or 93314

- For TAA associated with a dissection, please see section **Aortic Dissection and Other Aortic Conditions (PVD-6.7)**
- For suspected TAA, any requested imaging from the Table of Thoracic Aorta Imaging Options above:
  - Abnormalities identified on chest x-ray (abnormality including widened mediastinum, suspicious calcifications) or other imaging studies (fluoroscopy, MRI Spine, etc.) abnormality.
- For known TAA accompanied with chest pain or back pain and suspicion of rupture, any requested imaging from the Table of Thoracic Aorta Imaging Options above.
- For planning for pre–thoracic endovascular repair (TEVAR) of thoracic aorta disease.

- CTA Chest, and/or Abdomen, and/or Pelvis (CPT® 71275, CPT® 74175, CPT® 72191, CPT® 74174); or
- MRA Chest, and/or Abdomen, and/or Pelvis (CPT® 71555, CPT® 74185, CPT® 72198).

- For follow-up of ascending aortic aneurysms CTA Chest (CPT® 71275) or CT Chest (CPT® 71250 or CPT® 71260) or MRA chest (CPT® 71555)
  - Operative treatment is reasonable for asymptomatic individuals when the diameter of the arch exceeds 5.5 cm.
  - 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 indicated **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 indicated **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 indicated 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.
- Screening in individuals with bicuspid aortic valve or familial TAA syndromes. See **Screening for TAA with bicuspid aortic valve (PVD-2.3)**. See **Screening for Vascular related genetic connective tissue Disorders (PVD-2.2)**

Background and Supporting Information

The thoracic aorta is generally divided into two segments: the ascending aorta, which includes the aortic root, aortic arch and ends just distal to the left subclavian artery and the descending aorta, which starts just distal to the left subclavian artery to the level of the diaphragm.

Evidence Discussion

Thoracic Aortic Aneurysm (TAA)

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. 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. Transesophageal echocardiography has only been demonstrated to be effective for surveillance if CT/MR imaging is contraindicated.

Thoracic aortic aneurysms may be isolated; however, they may extended 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

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Abdominal Aortic Aneurysm (AAA) (PVD-6.3)

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Screen for AAA

- Ultrasound abdominal aorta with any of the studies from the table of Duplex ultrasound for visceral vascular studies in **Aortic Disorders General Information (PVD-6.1)** is the preferred initial imaging study to screen for AAA.
- 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 reasonable with ultrasound (CPT® 76706, 93975, 93976, 93978, or 93979) if there is a documented thoracic aortic aneurysm; however, there is insufficient evidence to support the use of advanced imaging to screen for a thoracic aortic aneurysm in individuals with known abdominal aortic aneurysm.

Survey known AAA

Ultrasound abdominal aorta with any of the studies from the table of Duplex ultrasound for visceral vascular studies in **Aortic Disorders General Information (PVD-6.1)** is the preferred initial imaging study to survey known AAA.

- Surveillance recommendations for AAA (CPT® 76706, 93975, 93976, 93978, 93979)
  - >2.5 cm but <3.0 cm: 10 years
  - 3.0 cm to 3.9 cm: 3 year intervals
  - 4.0 cm to 4.9 cm: every 12 months
  - 5.0 cm to 5.4 cm: every 6 months
  - >5.4 cm or aortic diameter has increased in size by 0.5 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
  - 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

Evaluate a pulsatile abdominal mass

Ultrasound abdominal aorta with any of the studies from the table of Duplex ultrasound for visceral vascular studies in **Aortic Disorders General Information (PVD-6.1)** is the preferred initial imaging study 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) can be substituted for 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.

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Iliac Artery Aneurysm (IAA) (PVD-6.4)

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- Ultrasound (CPT® 76882 or CPT® 93925) 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 ≥2cm
- 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) 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 indicated 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.

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

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Coding

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

- CTA or MRA of the entire aorta (including arch branches) and extending through the femoral arteries for suspected aortic dissection. Any of the following studies can be used if acute dissection is suspected:
  - CT Chest (CPT® 71260 or CPT® 71270) **and/or one of the following:**
    - CT Abdomen (CPT® 74160 or CPT® 74170) with or without and with contrast
    - CT Pelvis (CPT® 72193 or CPT® 72194) with or without and with contrast
    - CT Abdomen and Pelvis (CPT® 74177 or CPT® 74178) with or without and with contrast
  - CTA Chest (CPT® 71275) and/or **one** of the following:
    - CTA Abdomen (CPT® 74175)
    - CTA Pelvis (CPT® 72191)
    - CTA Abdomen and Pelvis (CPT® 74174)

- MRA Chest and/or Abdomen and/or Pelvis (CPT® 71555 and/or CPT® 74185 and/or CPT® 72198)

- Any aortic dissection, regardless of treatment modality (medical or surgical), may have the following advanced imaging of the involved segment(s) of aorta according to the Imaging for Aortic Conditions table above at the following intervals:
  - 1 month
  - 6 months
  - 12 months
  - If stable, annually
- In individuals with Marfan syndrome/Loeys-Dietz/Ehlers-Danlos
  - As aneurysmal expansion within a dissection can occur rapidly, post-dissection imaging in these individuals is indicated as follows:
    - 1 month
    - 3 months
    - 6 months
    - 12 months
    - yearly thereafter
  - Depending on the location of the dissection the following may be approved:
    - CTA or MRA Head (CPT® 70496 or CPT® 70544)
    - Carotid duplex or CTA Neck or MRA Neck (CPT® 93980, CPT® 70498, or CPT® 70547)
    - CTA or MRA Chest (CPT® 71275 or CPT® 71555)
    - CTA Abdomen and Pelvis (CPT® 74174); or CTA or MRA Abdomen (CPT® 74175 or CPT® 74185); or CTA or MRA Pelvis (CPT® 72191 or CPT® 72198)
- Asymptomatic incidentally found arterial dissections not affecting the aorta including but not excluded to iliac arteries, visceral arteries, extracranial arteries can be imaged according to the general schedule:
  - Within one month of discovery
  - Six months
  - 12 months
  - No further imaging after 12 months if noted to be stable
- Asymptomatic penetrating aortic ulcers treated medically can be imaged according to the following time intervals:
  - 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

Background and Supporting Information

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.

Evidence Discussion

Aortic and Arterial Dissection and Other Aortic Conditions

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. 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 indicated 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.

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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 indicated 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 indicated 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):
  - Within 1 year post-operative
  - Then every 5-years
  - As requested to assess for suspected infection of the graft (see **Nuclear Medicine Imaging indications (PVD-10.1)** for nuclear medicine imaging for 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 indicated only if TEVAR performed for a dissection that extends into the abdomen or pelvis

- **Any** of the above studies listed in the table can be performed as follows:
  - One month
  - Twelve months
  - Then annually for life
- If an endoleak is identified at the 1-month study more frequent imaging can be considered

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

- 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.
  - Non-contrast CT of the entire aorta at 5-year intervals (CPT®74176)

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 can be obtained at 1 month with CT and then follow protocol as above.

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

Additional Information

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 indicated 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 indicated 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.

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Large Vessel Vasculitis (PVD-6.9)

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

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 after the following workup:
  - Lab studies: CBC, CMP, elevated inflammatory markers such as ESR or CRP
  - Clinical history suggestive of disease listed below in **Background and Supporting Information**
  - PET/CT is considered **not medically necessary** for management of pediatric vasculitis at this time.

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 **Aneurysm and AVM (HD-12)** in the Head Imaging Guidelines
    - See **Thoracic Aortic Aneurysms (PVD-6.2)**
    - See **Abdominal Aortic Aneurysms (PVD-6.3)**

Background and Supporting Information

Aortitis may be congenital (Marfan's, 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 (GCA) (PVD-6.9.2)

Imaging for Giant Cell Arteritis	CPT®
CTA Chest	71275
MRA Chest	71555
CTA Pelvis	72191
MRA Pelvis	72198
CTA Abdomen and Pelvis	74174
CTA Abdomen	74175
MRA Abdomen	74185
MRA Head without contrast	70544
MRA Head with contrast	70545
MRA Neck without contrast	70547

Imaging for Giant Cell Arteritis	CPT®
MRA Neck with contrast	70548
CTA Neck	70498
PET/CT skull base to mid-thigh	78815

Initial imaging

- GCA may be subdivided into two basic types; Cranial and Extra-cranial
  - **Cranial GCA** is the more common type with temporal artery involvement. For predominantly Cranial GCA:
    - US (CPT® 93880 or CPT® 93882) of the temporal (and or axillary) arteries is the preferred modality. Ultrasound should be considered prior to advanced imaging.
    - MRA Head and/or MRA Neck (CPT® 70544, or CPT® 70545, or CPT® 70547, or CPT® 70548) may be considered when:
      - Vascular trained ultrasonography is not available
      - US is negative or equivocal with a clinical suspicion of GCA
    - CT and PET are **not** currently recommended for the assessment of inflammation of cranial arteries.

Note:

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

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  - **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
    - Imaging for aortic root, arch or abdomen involvement:
      - MRA Chest (CPT® 71555), MRA Neck (CPT® 70547), MRA Abdomen (CPT® 74185), CTA Chest (CPT® 71275), CTA Neck (CPT® 70498) or CTA Abdomen (CPT® 74175)

- PET (CPT® 78815) is indicated 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 indicated 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 **Thoracic Aortic Aneurysm (TAA) (PVD-6.2)** for thoracic aneurysm surveillance
    - See **Abdominal Aortic Aneurysm (AAA) (PVD-6.3)** for abdominal aneurysm surveillance.
- Follow-up imaging is not routinely recommended for individuals in clinical and biochemical remission or without aneurysm/complication.

Background and Supporting Information

Giant Cell Arteritis is the most commonly encountered vasculitis in adults. Although classically thought of as a disease of the temporal arteries, aortic arch involvement is now recognized as a frequent complication (up to 50% of individuals) and responsible for many of the more serious comorbidities encountered such as blindness.

Evidence Discussion

Large Vessel Vasculitis

Initial diagnosis of large vessel vasculitis (Inflammatory aortis, Giant cell, and Takayasu 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.[4,5,6,7] 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 indicated for individuals with known aneurysmal disease or who remain symptomatic on active therapy. For Takayasu arteritis, annual surveillance in the absence of symptoms is recommended due to the high risk of progressive vascular damage.

Takayasu Arteritis (PVD-6.9.3)

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

Initial imaging

- Initial imaging is indicated for signs and symptoms suggestive of disease such as absent radial pulse, difficulty obtaining BP in one arm, or unexplained hypertension.
- Any of the following modalities may be indicated for evaluation of Takayasu arteritis:
  - MRA of the affected body area(s) (contrast as requested)
  - CTA of the affected body area(s) (contrast as requested)
  - Ultrasound with Doppler of the affected body area(s)

Repeat imaging

Repeat imaging is indicated 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

Initial diagnosis of large vessel vasculitis (Inflammatory aortis, Giant cell, and Takayasu 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.[4,5,6,7] 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 indicated for individuals with known aneurysmal disease or who remain symptomatic on active therapy. For Takayasu arteritis, annual surveillance in the absence of symptoms is recommended due to the high risk of progressive vascular damage

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Medium Vessel Vasculitis (PVD-6.10)

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

Kawasaki disease

- Imaging guidelines for Kawasaki Disease are addressed in **Kawasaki Disease (PEDCD-6)** in the Pediatric Cardiac imaging guideline
- Long-term routine surveillance imaging in asymptomatic Kawasaki disease is indicated as follows:

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 indicated 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 indicated 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 abnormalities[1]
  - 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

[1] 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:

- Polyarteritis nodosa
- Kawasaki disease

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.

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PVD.AD.0006.10.A

v1.0.2025

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Small Vessel Vasculitis (PVD-6.11)

PVD.AD.0006.11.A
v1.0.2025

- Advanced imaging is not sensitive enough to detect changes in small vessels, and is not indicated for primary assessment of any small vessel vasculitis.
- End-organ damage occurs with several of the small vessel vasculitides. Advanced imaging indicated for the following:
  - 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 indicated 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) if additional information is needed after ultrasound for management

Repeat imaging

US Abdomen (CPT® 76700) is indicated 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 indicated 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 indicated 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 indicated 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 indicated 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 indicated 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 indicated 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.

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PVD.AD.0006.11.A
v1.0.2025

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Peripheral Arterial Imaging

Guideline

Upper Extremity PVD – Imaging (PVD-4.1)

PVD.AI.0004.1.A
v1.0.2025

Initial Imaging

- Arterial ultrasound upper extremities (CPT® 93930 or CPT® 93931) 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
- For Subclavian Steal Syndrome (see **Background and Supporting Information**) carotid duplex (CPT® 93882) is the initial and definitive imaging study.

  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

- CTA Upper extremity (CPT® 73206) or MRA of Upper extremity (CPT® 73225), **and/or** CTA Chest (CPT® 71275) or MRA Chest (CPT® 71555) for:
  - Abnormal arterial ultrasound results
  - Equivocal arterial ultrasound results
  - Pre-operative planning
- For suspected Fibromuscular Dysplasia of the brachial artery, appropriate 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 (see background and supporting information):
  - Initial imaging with CXR must be done to identify bony abnormalities and other potential causes of symptoms.
  - 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) can be obtained following upper extremity arterial revascularization at:
  - Baseline (within one month)
  - 6 months
  - Then annually if stable
  - Anytime for new or worsening symptoms of arterial insufficiency

Background and Supporting Information

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)**

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

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PVD.AI.0004.1.A
v1.0.2025

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Renovascular Hypertension/Renal Artery Stenosis (PVD-6.6)

PVD.AI.0006.6.A
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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 indicated 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 (≥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 reasonable 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) 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 reasonable 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 indicated after stent placement at the following intervals:

- 1 month post-procedure
- 6 months post-procedure
- 12 months post-procedure
- Then annually

Background and Supporting Information

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

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 (≥140/90) within the first 20 weeks of pregnancy when hypertension persists >12 weeks post-partum o 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 indicated 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.

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PVD.AI.0006.6.A
v1.0.2025

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Visceral Artery Aneurysm (PVD-6.5)

PVD.AD.0006.5.A
v1.0.2025

- Treatment is generally indicated for visceral aneurysms ≥2cm.
- Workup for suspected visceral artery aneurysm (spleen, kidney, liver or intestines) if calcifications seen on plain film imaging can include:
  - Ultrasound (CPT® 76700, 76705, 93975, 93976, 93978, or 93979), or
  - CTA Abdomen (CPT® 74175), or
  - CT Abdomen with contrast (CPT® 74160).
- Ultrasound (CPT® 76700,76705, 93975, 93976, 93978, or 93979) **or** CTA Abdomen (CPT® 74175) **or** CT Abdomen with contrast (CPT® 74160) 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:
    - <20mm can be imaged every three years
    - 20mm to 29mm can be imaged annually
    - If ≥30mm, they should be referred for treatment, either stent, excision or splenectomy
  - For all other visceral artery aneurysms:
    - Initial evaluation with six-month follow-up for one year
    - Further follow-up annually if no significant enlargement is seen
- CTA Abdomen (CPT® 74175), MRA Abdomen (CPT® 74185), or CT Abdomen with contrast (CPT® 74160) are indicated following stent placement at:
  - 1 month
  - 6 months
  - 12 months
  - Then every year

Background and Supporting Information

- 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.
- Vascular specialty consultation is beneficial in order to determine the time-frame to intervention.

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.

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PVD.AD.0006.5.A
v1.0.2025

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

PVD.AI.0018.A
v1.0.2025

Median Arcuate Ligament Syndrome

Codes included

CPT®	Description
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)
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 indicated as the initial imaging
- CTA or MRA Abdomen (CPT® 74175 or 74185) is indicated for **either** :
  - US results are equivocal
  - Preoperative planning

Repeat imaging

- Surveillance imaging is not indicated post-operatively in the absence of abdominal symptoms.

Background and Supporting Information

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 ischemic 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 postprocessing
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 indicated 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 indicated for preoperative planning when left renal vein compression syndrome is confirmed by duplex ultrasound.

Repeat imaging

- Postoperative follow up imaging is not indicated 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.

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PVD.AI.0018.A
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Lower Extremity Artery Aneurysms (PVD-7.4)

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Imaging indications

Iliac artery aneurysm

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

Femoral artery aneurysm

- Initial imaging
  - Ultrasound (CPT® 93925 bilateral study or CPT® 93926 unilateral study).
- Surveillance imaging
  - 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
  - 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
  - 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
  - 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
  - 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.

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Claudication and Critical Limb Ischemia (PVD-7.1)

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- 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 may be performed once
  - Follow-up studies may be performed with CPT® 93922
  - Post-exercise ABI (CPT® 93924) can be performed 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 necessary only if there is consideration for invasive therapy not to confirm diagnosis

- Duplex ultrasound (CPT® 93925 bilateral study or CPT® 93926 unilateral study) and Doppler studies are adjuncts to abnormal ABI that may be used to identify location and extent of disease once there has been a decision for revascularization.
- MRA Aorta and Pelvic vessels, and Lower extremities (CPT® 74185, CPT® 73725 and CPT® 73725), **or** CTA with run-off (CPT® 75635) to further evaluate the lower extremity arteries for **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) can be approved 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

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Note:

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

- To evaluate for an embolic source:
  - CTA chest (CPT 71275) **OR** MRA Chest (CPT 71555) AND
  - CTA A/P (74174) **OR** MRA a/p (74185) (if imaging of abdomen/pelvis not already obtained)

  See also Echocardiogram in the Cardiac imaging guideline

Background and Supporting Information

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

Evidence Discussion

Claudication and Critical Limb Ischemia

Introduction and natural history:

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.

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Popliteal Artery Entrapment Syndrome (PVD-7.2)

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- Diagnosis of popliteal artery stenosis or occlusion due to compression by adjacent muscle and tendons all of the following are indicated:
  - 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

Background and Supporting Information

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

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.

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.

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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 indicated generally after a history/physical has been performed
    - Further imaging studies such as CTA or MRA are indicated for worsening symptoms, an abnormal duplex or a significant reduction (>0.15) in the ABI

Indication	Imaging
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) 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) ◦ 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) ◦ 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): ◦ 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 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)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, no additional imaging is recommended for surveillance.
- Repeat arterial duplex imaging can be obtained for worsening clinical signs and symptoms such as the presence of a new wound or rest pain

Additional information

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.

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

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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 indicated to evaluate perforator anatomy for planned fibular flap
  - Bilateral imaging is indicated when requested from the operating surgeon to select harvest site

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Arteriovenous Malformations (AVMs) (PVD-9.1)

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- 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 indicated 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 can be approved for evaluation and surveillance of known AVMs.
- It is unusual for both MRI and MRA to be necessary for routine treatment response or surveillance imaging of AVMs, but both may be approved for preoperative planning.
- CT and CTA can also be used to characterize AVMs and their relationship to normal structures but is generally not better than MRI and has associated radiation risks.
  - CT with contrast and/or CTA (contrast as requested) of the affected body part can be approved when MRI and/or MRA is inconclusive or contraindicated.

Post-embolization

- Advanced imaging can be approved 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) can be approved 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.

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Venous Imaging

Guideline

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Venous Imaging General Information (PVD-11)

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Abbreviations and glossary (PVD-11.1)

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

Abbreviation	Definition
VVI	Venous Valvular Insufficiency – a study utilizing ultrasound to assess for the presence of reflux within the superficial and deep veins of the lower extremity.

Venous imaging - General guidelines (PVD-11.2)

- A current clinical evaluation (within 60 days), including medical treatments, are required prior to considering advanced imaging, which includes:
  - Relevant history and physical examination including:
    - The affected limb(s), the extent of the edema (calf and/or thigh), pitting or non-pitting. With regard to venous insufficiency, presence or absence of hyperpigmentation or other skin changes, ulcerations if applicable, size of varicosities if present as well as distribution
    - Arterial examination to rule out phlegmasia alba/cerulea dolens which is compromised arterial flow secondary to extensive DVT if applicable
    - Appropriate laboratory studies, for example d-dimer, if applicable
    - Non-advanced imaging modalities, such as a venous duplex or venous valvular insufficiency study (VVI) after symptoms started or worsened
  - Other meaningful contact (telephone call, electronic mail or messaging) by an established patient can substitute for a face-to-face clinical evaluation.
- General Guidelines-Imaging
  - Venous duplex (CPT® 93970, CPT® 93971) of the limb is the initial imaging of choice
    - Follow-up duplex imaging (CPT® 93970, CPT® 93971) is not generally indicated to document resolution and should only be obtained for new signs/symptoms or for concerns of propagation of thrombus when the treatment plan would change (Insertion of IVC filter, change of anticoagulation, etc.)
  - Imaging studies
    - Venous duplex (CPT® 93970, CPT® 93971) should visualize the veins, with demonstration of the presence or absence of compressibility and venous flow.
    - Venous valvular insufficiency studies (CPT® 93970, CPT® 93971) visualize the veins of the lower extremity, assess for reflux (reversal of venous antegrade flow after valve closure) and measure its duration.
    - CTV or MRV Abdomen and Pelvis (CPT® 74174) or (CPT® 74185 and 72198) 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

Background and Supporting Information

Venous disease can be classified into three categories:

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

Procedure Coding (PVD-11.3)

Venous Studies – Extremities	CPT®
CTV Abdomen and Pelvis involves obtaining images from the diaphragm to just below the inguinal ligament after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	74174
CTV Pelvis involves obtaining images from the top of the pelvic brim to the upper thighs or just below the inguinal ligament. The venogram portion is performed by obtaining images after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	72191
MRV Abdomen and Pelvis involves taking images from the diaphragm to just below the inguinal ligament after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	74185 and 72198

Venous Studies – Extremities	CPT®
MRV Pelvis involves obtaining images from the top of the pelvic brim to the upper thighs or just below the inguinal ligament. The venogram portion is performed by obtaining images after a delay of a few minutes after IV contrast is administered to optimize filling and therefore visualization of the venous vasculature.	72198
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 external iliac veins, common femoral, proximal deep femoral, great saphenous and popliteal veins. Calf veins may also be included. • A complete bilateral study of upper extremity veins includes examination of the subclavian, jugular, axillary, brachial, basilic, and cephalic veins. Forearm veins may also be included.	
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; complete study	93978
Duplex scan of extremity veins, including responses to compression and other maneuvers; unilateral or limited study.	93979

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Upper Extremity Venous – Imaging (PVD-4.2)

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- 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) should be performed initially
  - If duplex ultrasound is non-diagnostic:
    - MRV Upper extremity (CPT® 73225) and/or MRV Chest (CPT® 71555), or
    - CTV Upper extremity (CPT® 73206) and/or CTV Chest (CPT® 71275)
      - For venous thoracic outlet syndrome, CXR must be performed initially in all cases, since it can identify bony abnormalities or other causes of upper extremity pain. CTV Upper extremity (CPT® 73206) or MRV Upper extremity (CPT® 73225), and/or CTV Chest (CPT® 71275) or MRV Chest (CPT® 71555) is indicated.
- CT Chest with contrast (CPT® 71260) for Superior Vena Cava Syndrome (upper extremity and facial symptoms).
- **Either** of the following is indicated when stenting of the SVC is being considered:
  - MRV Chest (CPT® 71555)
  - CTV Chest (CPT® 71275)

Background and Supporting Information

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.

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 indicated to assess these more proximal segments of the venous outflow and central venous structures including the innominate veins and SVC.

Advanced imaging is indicated 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.

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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 the initial imaging if the diagnosis is equivocal
  - Follow-up duplex ultrasound (CPT® 93970, CPT® 93971) is indicated 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 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 can be performed 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) can be performed.
- 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 can be performed.
- If the cause of the DVT is found to be due to May-Thurner, iliac vein angioplasty followed by stenting of the left iliac vein is generally performed. See **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)

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

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

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

- Sclerotherapy

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 indicated 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 indicated 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 lymphaniography (CPT® 73718)

Unilateral lower extremity edema (PVD-12.6)

Initial imaging is duplex ultrasound (CPT 93971, unilateral study):

- If there is concern for proximal DVT
  - focused abdominal duplex should be performed to evaluate the iliac veins and IVC
  - CTV or MRV abdomen and pelvis (CPT 74174 or CPT 74185 and 72198) can be performed 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.

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

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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 indicated 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 indicated 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 indicated 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 indicated 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) can be approved 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 indicated 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 iliocaval 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 indicated 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 indicated 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 indicated in patients with recurrent symptoms and a history of iliocaval 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 indicated if ultrasound is inconclusive or non-diagnostic or for treatment planning.

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Venous Reflux (PVD-14.2)

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- A venous valvular insufficiency study (CPT® 93970 bilateral study or CPT® 93971 unilateral study) is indicated 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 indicated 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 indicated within seven days post-procedure.
  - If thrombus is noted within the saphenofemoral junction, repeat imaging can be performed within seven days to assess for propagation into the deep system.
- Post-procedure assessment by imaging techniques is not indicated to confirm efficacy or outcome of the procedure.

Background and Supporting Information

Venous insufficiency -– General information

- Venous insufficiency is characterized by failure of the venous blood to flow in its normal antegrade path of flow and instead reflux backwards by the force of gravity usually secondary to malfunction of the venous valves.
- Risk factors include previous DVT, obesity, female sex, 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 stocks, pneumatic pumps or specialized dressings such as Unna boots.
- Treatment of symptomatic superficial venous reflux is via endovenous laser radiofrequency ablation of the greater or lesser saphenous vein resulting in closure of the vein allowing for venous blood to be rerouted to the deep venous system.
- Treatment of symptomatic superficial venous reflux can also be treated via saphenous vein ligation and stripping which has fallen out of favor but can be performed for a tortuous or enlarged (>15mm) greater or lesser saphenous vein. One complication of endovenous ablation is deep venous thrombosis.

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 achiness and heaviness of the legs and pain/discomfort over the varicosities. Varicose veins can exist both in the absence and presence of venous reflux.
- Treatment involves conservative therapy such as compression stockings, avoidance of prolonged standing, intermittent elevation, weight loss (if applicable) and exercise which relieves the distention of the varicose veins ameliorating the symptoms.

Spider veins/reticular veins

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

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PVD.VI.0014.UOH

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Imaging for Hemodialysis Access (PVD-8)

PVD.AI.0008.0.A
v1.0.2025

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

- Imaging prior to AV fistula creation:
  - 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 may be indicated
  - CPT® 93930 or CPT® 93931 can be used to report upper extremity arterial evaluation
- Venous mapping (CPT® 93970 or CPT® 93971) to assess venous suitability prior to AV fistula creation may be indicated

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 indicated 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.

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IVC filters – Treatment (PVD-16.2)

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v1.0.2025

- IVC filter insertion
  - An initial venous duplex can be performed to assess for the presence of thrombus in the femoral vein which would affect the approach (transjugular or transfemoral)
  - Advanced imaging is not indicated
- CT Abdomen and Pelvis with contrast CPT® 74177 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

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Post iliac vein stenting/angioplasty (PVD-17.1)

PVD.VI.0017.A
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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) can be obtained 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 can be obtained for an abnormal or indeterminate duplex

References

PVD.VI.0017.A
v1.0.2025

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Policy History and Instructions for Use

Guideline

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Instructions for Use

This Medical Policy provides assistance in interpreting United HealthCare Services, Inc. standard benefit plans. When deciding coverage, the federal, state (Ohio Administrative Code [OAC]) or contractual requirements for benefit plan coverage must be referenced as the terms of the federal, state (OAC) or contractual requirements for benefit plan coverage may differ from the standard benefit plan. In the event of a conflict, the federal, state (OAC) or contractual requirements for benefit plan coverage govern.

Before using this policy, please check the federal, state (OAC) or contractual requirements for benefit plan coverage. United HealthCare Services, Inc. reserves the right to modify its Policies and Guidelines as necessary. This Medical Policy is provided for informational purposes. It does not constitute medical advice.

United HealthCare Services, Inc. uses InterQual® for the primary medical/surgical criteria, and the American Society of Addiction Medicine (ASAM) for substance use, in administering health benefits. If InterQual® does not have applicable criteria, United HealthCare Services, Inc. may also use United HealthCare Services, Inc.'s Medical Policies, Coverage Determination Guidelines, and/or Utilization Review Guidelines that have been approved by the Ohio Department for Medicaid Services. The United HealthCare Services, Inc.'s Medical Policies, Coverage Determination Guidelines, and Utilization Review Guidelines are intended to be used in connection with the independent professional medical judgment of a qualified health care provider and do not constitute the practice of medicine or medical advice.

Policy History/Revision Information

Date	Summary of Changes
02/01/2024	Annual evidence-based updates
07/01/2024	Interim evidence-based updates
05/01/2025	Annual evidence-based updates