CLINICAL APPROPRIATENESS GUIDELINES

ADVANCED IMAGING

Appropriate Use Criteria: Vascular Imaging

EFFECTIVE SEPTEMBER 12, 2021
Proprietary

Approval and implementation dates for specific health plans may vary. Please consult the applicable health plan for more details.

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Description and Application of the Guidelines

The AIM Clinical Appropriateness Guidelines (hereinafter "the AIM Clinical Appropriateness Guidelines" or the "Guidelines") are designed to assist providers in making the most appropriate treatment decision for a specific clinical condition for an individual. As used by AIM, the Guidelines establish objective and evidence-based criteria for medical necessity determinations where possible. In the process, multiple functions are accomplished:

- To establish criteria for when services are medically necessary
- To assist the practitioner as an educational tool
- To encourage standardization of medical practice patterns
- To curtail the performance of inappropriate and/or duplicate services
- To advocate for patient safety concerns
- To enhance the quality of health care
- To promote the most efficient and cost-effective use of services

The AIM guideline development process complies with applicable accreditation standards, including the requirement that the Guidelines be developed with involvement from appropriate providers with current clinical expertise relevant to the Guidelines under review and be based on the most up-to-date clinical principles and best practices. Relevant citations are included in the References section attached to each Guideline. AIM reviews all of its Guidelines at least annually.

AIM makes its Guidelines publicly available on its website twenty-four hours a day, seven days a week. Copies of the AIM Clinical Appropriateness Guidelines are also available upon oral or written request. Although the Guidelines are publicly-available, AIM considers the Guidelines to be important, proprietary information of AIM, which cannot be sold, assigned, leased, licensed, reproduced or distributed without the written consent of AIM.

AIM applies objective and evidence-based criteria, and takes individual circumstances and the local delivery system into account when determining the medical appropriateness of health care services. The AIM Guidelines are just guidelines for the provision of specialty health services. These criteria are designed to guide both providers and reviewers to the most appropriate services based on a patient's unique circumstances. In all cases, clinical judgment consistent with the standards of good medical practice should be used when applying the Guidelines. Guideline determinations are made based on the information provided at the time of the request. It is expected that medical necessity decisions may change as new information is provided or based on unique aspects of the patient's condition. The treating clinician has final authority and responsibility for treatment decisions regarding the care of the patient and for justifying and demonstrating the existence of medical necessity for the requested service. The Guidelines are not a substitute for the experience and judgment of a physician or other health care professionals. Any clinician seeking to apply or consult the Guidelines is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment.

The Guidelines do not address coverage, benefit or other plan specific issues. Applicable federal and state coverage mandates take precedence over these clinical guidelines. If requested by a health plan, AIM will review requests based on health plan medical policy/guidelines in lieu of the AIM Guidelines.

The Guidelines may also be used by the health plan or by AIM for purposes of provider education, or to review the medical necessity of services by any provider who has been notified of the need for medical necessity review, due to billing practices or claims that are not consistent with other providers in terms of frequency or some other manner.

General Clinical Guideline

Clinical Appropriateness Framework

Critical to any finding of clinical appropriateness under the guidelines for a specific diagnostic or therapeutic intervention are the following elements:

- Prior to any intervention, it is essential that the clinician confirm the diagnosis or establish its pretest likelihood based on a complete evaluation of the patient. This includes a history and physical examination and, where applicable, a review of relevant laboratory studies, diagnostic testing, and response to prior therapeutic intervention.
- The anticipated benefit of the recommended intervention should outweigh any potential harms that may result (net benefit).
- Current literature and/or standards of medical practice should support that the recommended intervention offers the greatest net benefit among competing alternatives.
- Based on the clinical evaluation, current literature, and standards of medical practice, there exists a reasonable likelihood that the intervention will change management and/or lead to an improved outcome for the patient.

If these elements are not established with respect to a given request, the determination of appropriateness will most likely require a peer-to-peer conversation to understand the individual and unique facts that would supersede the requirements set forth above. During the peer-to-peer conversation, factors such as patient acuity and setting of service may also be taken into account.

Simultaneous Ordering of Multiple Diagnostic or Therapeutic Interventions

Requests for multiple diagnostic or therapeutic interventions at the same time will often require a peer-to-peer conversation to understand the individual circumstances that support the medical necessity of performing all interventions simultaneously. This is based on the fact that appropriateness of additional intervention is often dependent on the outcome of the initial intervention.

Additionally, either of the following may apply:

- Current literature and/or standards of medical practice support that one of the requested diagnostic or therapeutic interventions is more appropriate in the clinical situation presented; or
- One of the diagnostic or therapeutic interventions requested is more likely to improve patient outcomes based on current literature and/or standards of medical practice.

Repeat Diagnostic Intervention

In general, repeated testing of the same anatomic location for the same indication should be limited to evaluation following an intervention, or when there is a change in clinical status such that additional testing is required to determine next steps in management. At times, it may be necessary to repeat a test using different techniques or protocols to clarify a finding or result of the original study.

Repeated testing for the same indication using the same or similar technology may be subject to additional review or require peer-to-peer conversation in the following scenarios:

- Repeated diagnostic testing at the same facility due to technical issues
- Repeated diagnostic testing requested at a different facility due to provider preference or quality concerns
- Repeated diagnostic testing of the same anatomic area based on persistent symptoms with no clinical change, treatment, or intervention since the previous study
- Repeated diagnostic testing of the same anatomic area by different providers for the same member over a short period of time

Repeat Therapeutic Intervention

In general, repeated therapeutic intervention in the same anatomic area is considered appropriate when the prior intervention proved effective or beneficial and the expected duration of relief has lapsed. A repeat intervention requested prior to the expected duration of relief is not appropriate unless it can be confirmed that the prior intervention was never administered.

Vascular Imaging

General Information/Overview

Scope

These guidelines address vascular imaging (advanced imaging and arterial ultrasound) in both adult and pediatric populations. For interpretation of the Guidelines, and where not otherwise noted, “adult” refers to persons age 19 and older, and “pediatric” refers to persons age 18 and younger. Where separate indications exist, they are specified as **Adult** or **Pediatric**. Where not specified, indications and prerequisite information apply to persons of all ages.

See the Coding section for a list of modalities included in these guidelines.

Technology Considerations

Advanced imaging is an umbrella term that refers to anatomy-based (structural), physiology-based (functional), and hybrid imaging methods that offer greater spatial and/or contrast resolution relative to conventional imaging methods in radiology such as radiography or ultrasound. Examples of advanced structural imaging include computed tomography (CT) and magnetic resonance imaging (MRI) and some technique variants. Advanced vascular imaging refers to CT or MR angiography. Advanced functional imaging includes nuclear medicine and molecular imaging techniques such as scintigraphy, single photon emission computed tomography (SPECT), and positron emission tomography (PET) as well as those MRI/CT technique variants that create image contrast based on a physiological parameter (for example, functional magnetic resonance imaging (fMRI). Hybrid advanced imaging techniques may add diagnostic accuracy by coupling structural and functional approaches (such as PET-CT or PET-MRI).

Duplex imaging is a combination of direct vascular ultrasound imaging and Doppler interrogation of both arterial and venous flow. In many clinical scenarios, duplex imaging is recommended before advanced vascular imaging because it is readily available, portable, not associated with radiation exposure, and lower cost. Duplex imaging is, however, highly operator dependent. Furthermore, in evaluation prior to revascularization, duplex imaging may not need to be performed if advanced imaging will also be required.

Computed tomography angiography (CTA) and **magnetic resonance angiography (MRA)** scans both provide high contrast and can yield a 3D map of vasculature, making them useful for imaging prior to intervention. CTA acquires images during the arterial phase of contrast to provide direct visualization of arterial blood flow and anatomy. MRA can be performed without contrast using time of flight techniques measuring flow related enhancement or with gadolinium contrast. Depending on the clinical scenario, MRA and CTA are alternatives to or add on tests following duplex ultrasound and may have comparable or greater diagnostic accuracy. CTA offers faster image acquisition and is less susceptible than MRA to respiration or motion artifact. CTA is reliable for vascular lesion localization and stenosis grading. Disadvantages of CTA include exposure to ionizing radiation and risks associated with infusion of iodinated contrast media, including allergic reactions or renal compromise. The presence of implantable devices such as pacemakers or defibrillators, a potential need for sedation in pediatric patients, and claustrophobia are the main limitations of MRA. Infusion of gadolinium may also confer an unacceptable risk in persons with advanced renal disease.

Computed tomography venography (CTV) and **magnetic resonance venography (MRV)** are similar to CTA and MRA but involve different timing of contrast administration (in the venous phase) and/or different MR pulse sequences to optimize visualization of the venous system. Since CTV and MRV are respectively part of the same current procedural terminology (CPT) as CTA and MRA CPT series and since AIM does not manage advanced imaging technique variants, these terms will be used interchangeably throughout this document.

Ankle brachial index, the ratio of blood pressure at the ankle to blood pressure in the brachial artery, is a noninvasive metric used in the diagnosis of peripheral artery disease, particularly lower extremity arterial

disease, and a predictor of cardiovascular disease risk. Ankle brachial index is one of several approaches to physiological assessments of downstream blood flow. Others include volume plethysmography, transcutaneous oxygen tension, and pulse volume recordings. Physiological testing may be performed at rest and following exercise.

Digital subtraction angiography, a type of catheter angiography, has long been the gold standard for vascular imaging. In contrast to the modalities described above, digital subtraction angiography allows for treatment in addition to diagnosis of some vascular pathologies. Due to associated risks it is used much less frequently than CTA or MRA, but may be indicated in imaging of below-the-knee arterial disease, or when noninvasive imaging modalities have yielded conflicting or inconclusive results.

Definitions

Phases of the care continuum are broadly defined as follows:

- **Screening** is testing in the absence of signs or symptoms of disease
- **Diagnosis** is testing based on a reasonable suspicion of a particular condition or disorder, usually due to the presence of signs or symptoms
- **Management** is testing to direct therapy of an established condition, which may include preoperative or postoperative imaging, or imaging performed to evaluate the response to nonsurgical intervention. Patients will usually have new or worsening signs or symptoms although progressive imaging findings may be sufficient in some scenarios.
- **Surveillance** is the periodic assessment following completion of therapy, or for monitoring known disease that is stable or asymptomatic

Indeterminate lesion – focal mass or mass-like finding identified on prior imaging that has not been confidently diagnosed as either benign or malignant based on imaging appearance and/or biopsy

Cannot be performed or is nondiagnostic – applies when the test:

- Is positive or indeterminate for clinically significant pathology when the information provided about the abnormality by the test is not sufficient to direct subsequent management
- Is negative when the negative likelihood ratio of the test is both insufficient to confidently exclude the absence of suspected disease and unable to direct subsequent management. This typically applies in scenarios with moderate to high clinical pretest probability with negative testing or low pretest probability with clear evidence for net benefit
- Has been previously nondiagnostic because of a persistent clinical factor (e.g., body habitus, immobility) that is very likely to make retesting nondiagnostic as well
- Cannot be performed due to a medical contraindication (e.g., contrast nephrotoxicity, allergy, or in highly radiation sensitive populations such as pediatrics and pregnancy) or reasonable unavailability related to lack of local expertise or service availability.

Statistical terminology

- **Confidence interval (CI)** is a range of values which is likely to contain the cited statistic. For example, 92% sensitivity (95% CI, 89%-95%) means that, while the sensitivity was calculated at 92% on the current study, there is a 95% chance that, if a study were to be repeated, the sensitivity on the repeat study would be in the range of 89%-95%.
- **Diagnostic accuracy** relates to the ability of a test to discriminate between the target condition and health. Diagnostic accuracy is quantified using sensitivity and specificity, predictive values, and likelihood ratios.
- **Hazard ratio** is the odds that an individual in the group with the higher hazard reaches the outcome first. Hazard ratio is analogous to odds ratio and is reported most commonly in time-to-

event analysis or survival analysis. A hazard ratio of 1 means that the hazard rates of the 2 groups are equivalent. A hazard ratio of greater than 1 or less than 1 means that there are differences in the hazard rates between the 2 groups.

- **Likelihood ratio** is the ratio of an expected test result (positive or negative) in patients *with* the disease to an expected test result (positive or negative) in patients *without* the disease. Positive likelihood ratios, especially those greater than 10, help rule in a disease (i.e., they substantially raise the post-test probability of the disease, and hence make it very likely and the test very useful in identifying the disease). Negative likelihood ratios, especially those less than 0.1, help rule out a disease (i.e., they substantially decrease the post-test probability of disease, and hence make it very unlikely and the test very useful in excluding the disease).
- **Odds ratio** represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. An odds ratio of 1 means that the exposure does not affect the odds of the outcome. An odds ratio greater than 1 means that the exposure is associated with higher odds of the outcome. An odds ratio less than 1 means that the exposure is associated with lower odds of the outcome.
- **Predictive value** is the likelihood that a given test result correlates with the presence or absence of disease. Positive predictive value is defined as the number of true positives divided by the number of test positives. Negative predictive value is defined as the number of true negatives divided by the number of test negative patients. Predictive value is dependent on the prevalence of the condition.
- **Pretest probability** is the probability that a given patient has a disease prior to testing. May be divided into very low (less than 5%), low (less than 20%), moderate (20%-75%), and high (greater than 75%) although these numbers may vary by condition.
- **Relative risk** is the probability of an outcome when an exposure is present relative to the probability of the outcome occurring when the exposure is absent. Relative risk is analogous to odds ratio; however, relative risk is calculated by using percentages instead of odds. A relative risk of 1 means that there is no difference in risk between the 2 groups. A relative risk of greater than 1 means that the outcome is more likely to happen in the exposed group compared to the control group. A relative risk less than 1 means that the outcome is less likely to happen in the exposed group compared to the control group.
- **Sensitivity** is the conditional probability that the test is positive, given that the patient has the disease. Defined as the true positive rate (number of true positives divided by the number of patients with disease). Excellent or high sensitivity is usually greater than 90%.
- **Specificity** is the conditional probability that the test is negative, given that the patient does not have the disease. Defined as the true negative rate (number of true negatives divided by the number of patients without the disease). Excellent or high specificity is usually greater than 90%.

Clinical Indications

The following section includes indications for which advanced vascular imaging is considered medically necessary, along with prerequisite information and supporting evidence where available. Indications, diagnoses, or imaging modalities not specifically addressed are considered not medically necessary.

For the indications that follow, vascular imaging studies, including duplex ultrasound, MR or CT angiography, are the preferred methods of evaluation. There are many indications, however, where the necessary information may be obtained utilizing nonvascular modalities. Where these alternatives exist, they are listed in the document.

It is recognized that imaging often detects abnormalities unrelated to the condition being evaluated. Such findings must be considered within the context of the clinical situation when determining whether additional imaging is required.

General Vascular

Congenital or developmental vascular anomalies, not otherwise specified

Applies only to imaging not otherwise addressed in one of the condition-based indications within this document.

Advanced imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA head, neck, chest, abdomen and pelvis, or extremities (based on location)
- MRA head, neck, chest, abdomen and pelvis, or extremities (based on location)
- CT brain
- CT or MRI chest; alternative to CTA or MRA chest

Traumatic vascular injury

Vascular imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA head, neck, chest, abdomen and pelvis, or extremities (based on location)
- MRA head, neck, chest, abdomen and pelvis, or extremities (based on location)
- CT chest
- Duplex arterial ultrasound for vascular trauma to the upper or lower extremity

Vasculitis

Advanced imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA head, neck, chest, abdomen and pelvis, or extremities (based on location)
- MRA head, neck, chest, abdomen and pelvis, or extremities (based on location)
- MRI brain
- CT chest

Procedure-related Imaging

Applies only to imaging not otherwise addressed in one of the condition-based indications in this document.

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

Vascular anatomic delineation prior to surgical and interventional procedures, not otherwise specified*

IMAGING STUDY

- CTA head, neck, chest, abdomen and pelvis, or extremities (based on specific procedure)
- MRA head, neck, chest, abdomen and pelvis, or extremities (based on specific procedure)

***Exclusions:** coronary artery bypass graft (CABG), **open** valve replacement/repair and stenting or angioplasty of the dural venous sinus

Vascular evaluation prior to transcatheter aortic valve implantation/replacement (TAVI/TAVR)

IMAGING STUDY

- Duplex arterial ultrasound for carotid artery evaluation
- CTA chest, abdomen and pelvis; CTA neck requires initial duplex arterial ultrasound
- MRA chest, abdomen and pelvis; MRA neck requires initial duplex arterial ultrasound

Evaluation for suspected vascular complications following a procedure

IMAGING STUDY

- CTA head, neck, chest, abdomen and pelvis, or extremities (based on specific procedure)
- MRA head, neck, chest, abdomen and pelvis, or extremities (based on specific procedure)

Rationale

Carotid screening is sometimes performed in asymptomatic patients prior to CABG to detect clinically significant stenosis and increased post procedure stroke risk. However, severe carotid artery stenosis alone may not be an independent risk factor for stroke or mortality, and the value of prophylactic carotid endarterectomy prior to CABG is uncertain.[3] Society guidelines do not routine recommend carotid screening prior to CABG.[4]

Vascular imaging may be requested for preoperative planning prior to stenting or angioplasty of the venous sinus in patients with multiple sclerosis. Evidence-based guidelines strongly recommend against performing this procedure based on lack of evidence.[5]

Stenting or angioplasty of the venous sinus ("liberation therapy") is based on an unproven hypothesis that multiple sclerosis is related to chronic cerebrospinal venous insufficiency, which leads to iron buildup in the central nervous system and an immune or inflammatory reaction. The FDA issued a warning in 2012 about liberation therapy, stating there is a lack of evidence to support its use and the criteria used to diagnose chronic cerebrospinal venous insufficiency have not been adequately established. Stenting or angioplasty of the venous sinus has been associated with deaths and serious complications, including migration of stents to the heart or other parts of the body, venous injury, blood clots, cranial nerve damage, and abdominal bleeding in patients who have been treated for chronic cerebrospinal venous insufficiency. The FDA concluded that these procedures put patients at risk without clear evidence that they might benefit.[6]

Brain, Head and Neck

Aneurysm, intracranial

Advanced imaging is considered medically necessary in **ANY** of the following scenarios:

Screening in **ANY** of the following high risk groups:

- Two (2) or more first-degree relatives with intracranial aneurysm or subarachnoid hemorrhage

- Heritable condition that is associated with intracranial aneurysm (examples include autosomal dominant polycystic kidney disease and Ehlers-Danlos syndrome type IV)
- Known fibromuscular dysplasia

Diagnosis of clinically suspected intracranial aneurysm:

- CT or MRI findings suspicious for aneurysm
- Neurologic signs or symptoms (including headache) suggestive of intracranial aneurysm (**ANY** of the following):
  - At least one first degree relative with intracranial aneurysm or subarachnoid hemorrhage
  - Presence of a heritable condition associated with intracranial aneurysm (such as autosomal dominant polycystic kidney disease, Ehlers-Danlos syndrome type IV)
  - Known fibromuscular dysplasia
- Cranial nerve deficits
- Focal neurologic deficits unexplained by CT or MRI
- Headache with **ANY** of the following features:
  - Sudden onset worst headache of life ("thunderclap")
  - Brought on by and occurring in association with exertion or valsalva
  - Persistent headache that meets Brain Imaging guidelines for headache and that remains undifferentiated/unexplained by MRI

Management of known intracranial aneurysm:

- Evaluation for aneurysm progression or recurrence based on new or worsening neurologic symptoms
- Preoperative evaluation
- Initial postoperative evaluation

Surveillance

- Initial evaluation at 6 to 12 months following diagnosis, then annually

IMAGING STUDY

- CTA head
- MRA head
- CT brain
- MRI brain

Rationale

SCREENING

The incidence of intracranial aneurysm may be as high as 19% in patients with a significant family history of intracranial aneurysms as compared to 2% to 3.5% in the general population.[7, 8] As a result, the American Heart and Stroke Foundation, American Academy of Neurology, and the American Association of Neurological Surgeons strongly recommend screening in patients with ≥ 2 family members with intracranial aneurysm or subarachnoid hemorrhage by CTA or MRA, an approach also supported by a Choosingly Wisely recommendation from the American Association of Neurological Surgeons.[9-11] Evidence does not support screening in patients with only one affected family member and no additional risk factors as incidence is low (1.14%), and early detection was not associated with improved outcomes.[12] A 2016 prospective trial evaluated screening MRA in first-degree relatives of patients with ruptured intracranial aneurysms. Of the 305 total exams, unruptured intracranial aneurysms were seen in 2.3% of patients (95% CI, 1.02%-4.76%) and less than 1% of the screened population required an endovascular procedure or surgical intervention.[13]

In patients with autosomal dominant polycystic kidney disease, the incidence for intracranial aneurysm may be as high as 10%, and there is general agreement that these patients should be screened. The evidence supporting aneurysm screening in patients with other hereditary syndromes, including Ehlers-Danlos, primordial dwarfism, or glucocorticoid-remediable aldosteronism, is less compelling.

The American Heart Association and American Stroke Association recommend advanced imaging screening for patients with autosomal dominant polycystic kidney disease as well as consideration for screening in patients with microcephalic osteodysplastic primordial dwarfism. Routine screening is not specifically recommended for other hereditary syndromes.[11] Both CTA and MRA are highly sensitive for aneurysm screening with sensitivities above 95%.[1, 2] As MRA does not require ionizing radiation or contrast, it confers greater potential net benefit and is generally preferred unless contraindicated.

DIAGNOSIS

Symptoms of unruptured intracranial aneurysm (UIA) include headache, ischemic cerebrobvascular events, and cranial nerve deficits.[14] Headache is the most common but also the most nonspecific and the relationship to aneurysm as a cause is controversial.[11, 15] Certain headache patterns, including sudden onset worst headache of life ("thunderclap") are classically associated with aneurysm rupture.[14] Headaches brought on by and occurring in association with exertion or Valsalva including exercise or sexual activity are rare[16], but are more frequently associated with intracranial vascular abnormalities[16, 17] and advanced vascular imaging may be appropriate as suggested by clinical guidelines.[18, 19] The use of advanced imaging for diagnosis of clinically suspected aneurysm as well as management (including perioperative evaluation) of known aneurysm is appropriate. Both MRA and CTA can reliably detect intracranial aneurysms > 5mm,[1, 2] so modality selection is often based on factors such as patient preference, radiation sensitivity, contrast risk, and availability. For patients with a suspected subarachnoid hemorrhage, CT head without intravenous contrast is the most appropriate initial imaging modality.[10]

SURVEILLANCE

In the absence of new or worsening symptoms, the American Heart Association and American Stroke Association recommend aneurysm surveillance at 6 to 12 months following diagnosis, then every 1 to 2 years or as follow up after treatment with clips, endovascular coil, or stenting as medically necessary. In patients with unruptured intracranial aneurysm, approximately 12% will have continued growth of their aneurysms and a 24-fold increased risk of rupture.[20] Surveillance is also recommended after surgical intervention by the American Heart Association and American Stroke Association as well as the American College of Radiology. Either MRA or CTA may be used for surveillance of untreated intracranial aneurysm, although follow up using the same imaging modality on which the aneurysm was initially found is preferred. In patients with treated aneurysms, MRA head without intravenous contrast is superior to CTA for the evaluation of coiled aneurysms, while CTA head with intravenous contrast is preferred for evaluation of clipped aneurysms.[10]

Aneurysm, extracranial (carotid or vertebral)

Vascular imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- Duplex arterial ultrasound
- CTA neck
- MRA neck

Arteriovenous malformation (AVM) or fistula (AVF)

Vascular imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA head or neck
- MRA head or neck
- CT head
- MRI brain
- Duplex arterial ultrasound for extracranial AVM or AVF

Dissection, intracranial or extracranial

Vascular imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- Duplex arterial ultrasound (extracranial dissection only)

- CTA head or neck
- MRA head or neck

Fibromuscular dysplasia

Advanced imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA head or neck
- MRA head or neck

Hemorrhage, intracranial

Also see Brain Imaging guidelines.

ADULT

Advanced imaging is considered medically necessary in the diagnosis and management of patients with established hemorrhage in **EITHER** of the following scenarios:

- Intracerebral hemorrhage with clinical or imaging features atypical for hypertensive hemorrhage
- Subarachnoid hemorrhage suggested by lumbar puncture or by imaging

PEDIATRIC

Advanced imaging is considered medically necessary in the diagnosis and management of patients with intracerebral hemorrhage.

IMAGING STUDY

- CTA or MRA head

Rationale

There are four major forms of intracranial hemorrhage—epidural, subdural, subarachnoid, and intracerebral. All four types are typically medical emergencies. Subarachnoid hemorrhage, commonly due to ruptured intracranial aneurysm, can be traumatic or spontaneous. Intracerebral hemorrhage in the deep brain nuclei is commonly due to hypertension, but intracerebral hemorrhage can be associated with tumor or vascular malformations in atypical locations or patient populations.[21] Advanced vascular imaging is helpful when underlying vascular malformation or aneurysm is suspected.[22]

Horner's syndrome

Also see Brain Imaging and Head and Neck Imaging guidelines.

Advanced imaging is considered medically necessary for evaluation of a suspected vascular lesion.

IMAGING STUDY

- Duplex arterial ultrasound for evaluation of extracranial dissection
- CTA neck
- MRA neck

Pulsatile tinnitus

Also see Brain Imaging and Head and Neck Imaging guidelines.

Advanced imaging is considered medically necessary for evaluation of a suspected vascular lesion.

IMAGING STUDY

- CTA head
- MRA head

Stenosis or occlusion, intracranial

Advanced imaging is considered medically necessary in **ANY** of the following scenarios:

- Diagnosis of suspected intracranial stenosis:
  - Persons with predisposing congenital or genetic disease
  - Following subacute (within 30 days) stroke or TIA when the presence of intracranial stenosis will lead to use of dual antiplatelet therapy.
  - To exclude a tandem stenosis or occlusion prior to cartoid revascularization
  - Prior intracranial stenting
- Management of known intracranial stenosis
  - Known intracranial stenosis with new or progressive symptoms
- Surveillance in patients with established Moyamoya disease who are being considered for revascularization

IMAGING STUDY

- CTA head
- MRA head

Rationale

For subacute and chronic strokes or transient ischemic attacks (TIAs), primary medical management options include secondary stroke prevention with antiplatelets and risk reduction (see also rationale in the stroke/TIA section). Surgical options include carotid endarterectomy or stenting for patients with moderate or several extracranial stenosis, or rarely extracranial-intracranial bypass.[23] Advanced vascular imaging has a high negative predictive value (91%; 95% CI, 89%-93%) for moderate to severe intracranial stenosis[24] and may be helpful for posterior circulation strokes or TIAs or for large vessel anterior circulation strokes in atypical cases that remain unexplained after the initial evaluation for an extracranial source when the results of imaging will impact medical or surgical management. Intracranial vascular imaging may be used to diagnose and manage patients with known intracranial stenosis, especially when they are being considered for bypass[25] and in patients with known or suspected Moyamoya or predisposing congenital or genetic conditions.[26] Intracranial vascular imaging may also aid in preoperative planning prior to revascularization.

Stenosis or occlusion, extracranial carotid arteries

See separate indication for acute stroke or transient ischemic attack.

Vascular imaging is considered medically necessary in patients who are candidates for carotid revascularization in **ANY** of the following scenarios:

- Diagnosis of suspected carotid stenosis
  - Following subacute (within 30 days) stroke or TIA with neurologic symptoms or signs attributable to the anterior (carotid) circulation
  - Hollenhorst plaques (cholesterol emboli) or retinal neovascularity on retinal examination
- Management of known carotid stenosis
  - Worsening neurologic symptoms or signs attributable to the anterior circulation
  - Initial baseline evaluation and at 6 months following carotid revascularization
- Surveillance of established carotid disease
  - Stenosis or occlusion in asymptomatic persons with no prior revascularization

        - Moderate (50%-69%) stenosis: every 12 months
        - Severe (70% or greater) stenosis: every 6 months
    - Post-revascularization with residual stenosis on prior surveillance imaging
        - Mild to moderate (less than 70%) stenosis: every 12 months
        - Severe (70% or greater) stenosis: every 6 months

Note: Screening for carotid disease utilizing vascular imaging is not indicated. Revascularization refers to carotid endarterectomy or carotid artery stenting. Standard field of view for advanced imaging of the neck includes the aortic arch.

IMAGING STUDY

- Duplex arterial ultrasound: first line study for all indications
- CTA or MRA neck: above criteria are met and **EITHER** of the following applies:
    - Duplex arterial ultrasound cannot be performed or is nondiagnostic
    - Duplex arterial ultrasound shows moderate to severe stenosis or occlusion

Rationale

In the absence of symptoms, multiple high-quality evidence-based guidelines do not recommend screening for high-grade carotid stenosis in low or average risk patients.[27-29] However, the recommendations are inconsistent with regard to screening of high-risk patients. The U.S. Preventive Services Task Force does not recommend screening for asymptomatic carotid artery stenosis in the general adult population.[28] While Brott et al.[27] suggested that duplex ultrasound might be considered in patients without symptoms but with two or more risk factors, there is no direct evidence that screening reduces stroke mortality or morbidity and low-level evidence that the harms of screening may outweigh the benefits, with the 30-day risk of post-revascularization stroke slightly higher than the absolute stroke risk reduction from screening.[28]

Outside of acute stroke or TIA (see separate criteria), ultrasound is recommended in the initial evaluation of known or suspected carotid stenosis with CTA or MRA used as an add-on or alternative test when duplex ultrasound is not available or is nondiagnostic.[27, 28, 30] While operator dependent, duplex ultrasound has diagnostic accuracy for carotid stenosis comparable to advanced vascular imaging with sensitivities and specificities of 92% and 89% respectively, based on a recent systematic review.[30, 31] Duplex ultrasound is further readily available, does not require contrast, is non-ionizing (versus CTA), and less prone to motion (versus MRA). Duplex ultrasound is less accurate in evaluating lesions in the distal cervical internal carotid artery and in differentiating high grade stenosis from occlusion. It may also be nondiagnostic due to patient-related or technical factors such as in the presence of moderate or severe calcified plaque in the carotid bulbs.[10] Duplex ultrasound has poor diagnostic accuracy for evaluation of the posterior (vertebrobasilar) circulation.

Stenosis or occlusion, vertebral or basilar arteries

See separate indication for acute stroke or transient ischemic attack.

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

- Diagnosis of suspected stenosis or occlusion:
    - Following subacute (within 30 days) stroke or TIA with neurologic symptoms or signs other than syncope attributable to the posterior circulation
    - Evaluation of syncope following exclusion of valvular heart disease and rhythm disturbance as the etiology
    - Subclavian steal syndrome
- Management of known stenosis or occlusion with worsening neurologic symptoms or signs attributable to the posterior circulation

IMAGING STUDY

- Duplex arterial ultrasound
- CTA head or neck
- MRA head or neck

Stroke or transient ischemic attack (TIA), acute (7 days or less)

Also see Brain Imaging guidelines.

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of acute stroke in an interventional candidate
- Evidence of acute ischemia or infarct on brain imaging
- Evaluation following acute TIA

IMAGING STUDY

- CTA head or neck
- MRA head or neck
- Duplex arterial ultrasound

Rationale

Multiple guidelines recommend advanced imaging of the brain and vascular imaging of the head and neck to identify a thromboembolic source.[10, 32-34] In the hyperacute setting, patients with acute stroke may be candidates for thrombolysis with tissue plasminogen activator (TPA) or mechanical thrombectomy which has been shown to offer net benefit in multiple randomized controlled trials.[33] Outside of the interventional window, medical management with dual antiplatelet therapy may benefit patients with acute stroke or TIA due to high-grade intracranial stenosis, but this is controversial. In the Clopidogrel plus aspirin versus aspirin alone for reducing embolisation in patients with acute symptomatic cerebral or carotid artery stenosis (CLAIR) trial, patients with acutely symptomatic intracranial stenosis assigned to the dual antiplatelet arm (clopidogrel and aspirin) had a relative risk reduction of 42% (95% CI, 4.6%-65.2%) for the indirect primary outcome measure of microembolic events with no difference in adverse event rates, suggesting possible net benefit.[35] In the Clopidogrel with Aspirin in Acute Minor Stroke or Transient Ischemic Attack (CHANCE) trial, patients with symptomatic intracranial atherosclerotic disease had higher rates of recurrent stroke, but dual antiplatelet therapy did not offer risk reduction relative to monotherapy.[36] A large randomized controlled trial of Warfarin versus aspirin therapy for symptomatic intracranial stenosis showed a higher rate of major hemorrhage and no overall net benefit to Warfarin.[37]

Trigeminal neuralgia

Advanced imaging is considered medically necessary for evaluation of a suspected vascular lesion.

IMAGING STUDY

- CTA head
- MRA head

Venous thrombosis or compression, intracranial

Includes dural venous sinus thrombosis, venous sinus thrombosis, and cerebral vein thrombosis

Advanced imaging is considered medically necessary for diagnosis and management based on **ANY** of the following:

- Exclusion of venous sinus thrombosis in the initial evaluation of idiopathic intracranial hypertension (IIH, also known as pseudotumor cerebri)
- Patients with risk factors for venous thrombosis, or elevated D-dimer, or following suspicious or nondiagnostic CT or MRI, associated with **ANY** of the following signs or symptoms:
    - Unexplained headache
    - Seizure
    - Focal neurologic abnormality
    - Altered mental status

- History of intracranial venous sinus thrombosis, with current signs or symptoms of recurrent thrombosis
- Follow-up of known venous sinus thrombosis
- To exclude venous compression by an adjacent intracranial mass

IMAGING STUDY

- CTA head
- MRA head
- CT brain
- MRI brain

Rationale

Intracranial venous sinus thrombosis (VST) includes thrombosis of both the dural sinuses and cerebral veins with an estimated annual incidence of 5 per million.[38] Risk factors for VST include medical conditions (eg, thrombophilias, inflammatory bowel disease), transient situations (eg, pregnancy, dehydration, infection), selected medications (eg, oral contraceptives, substance abuse), and unpredictable events (eg, head trauma).

The American Heart and Stroke (AHA/ASA) multisociety-endorsed guideline on the diagnosis and management of cerebral venous sinus thrombosis makes a strong recommendation based on low quality evidence for either CT or MR venography to evaluate idiopathic intracranial hypertension to exclude venous sinus thrombosis as an underlying etiology. Headache is the most common manifestation of venous sinus thrombosis and can rarely be the sole clinical feature. For these patients "the proper strategy for indentification of CVT is much less clear,"[38] and evaluation of headache with atypical features is reasonable as a weak recommendation based on low-quality evidence. While they do not negate a strong clinical suspicion, absence of risk factors for venous sinus thrombosis and a normal D-dimer further lower the pretest probability for disease[38] and hence facilitate decisions about use of CT or MR venography as part of a simultaneous or sequential diagnostic testing strategy with CT or MRI. Follow up of venous sinus thrombosis in patients with established disease may be helpful to direct management.

Venous thrombosis or compression, extracranial

Advanced imaging is considered medically necessary for diagnosis and management, following nondiagnostic venous ultrasound.

IMAGING STUDY

- CTA neck
- MRA neck

Chest

Acute aortic syndrome

Includes aortic dissection, rupture, intramural hematoma, penetrating ulcer, and pseudoaneurysm

Advanced imaging is considered medically necessary in in **ANY** of the following scenarios:

- Initial diagnosis of suspected disease
- Management of known disease
- Annual surveillance of clinically stable disease

IMAGING STUDY

- CTA chest
- MRA when CTA cannot be performed or is nondiagnostic

Aortic aneurysm

Also see Cardiac Imaging guidelines.

Advanced imaging is considered medically necessary in **ANY** of the following scenarios:

Screening

- Annual evaluation of patients with connective tissue disease or genetic mutations that predispose to aortic aneurysms as an alternative to screening with echocardiography or when echocardiography is nondiagnostic

  (For bicuspid aortic valve, see Cardiac Imaging guidelines).

Diagnosis of suspected thoracic aneurysm based on signs, symptoms, or other imaging studies suggesting the diagnosis.

Management

- Evaluation for disease progression based on new or progressive signs, symptoms or enlargement by imaging.
- 6-month follow up of newly diagnosed aneurysms to establish stability
- Endoleak evaluation
- Preprocedure* planning

  ** Surgical or endovascular repair*

Surveillance

- Annual surveillance for aneurysms ≤ 4.4 cm
- Every 6 months for aneurysms larger than 4.4 cm

IMAGING STUDY

- CTA chest
- MRA chest
- CT or MRI chest; alternatives to CTA or MRA chest

Rationale

Echocardiography, CT, and MRI have high and comparable diagnostic accuracy for the evaluation of thoracic aortic aneurysms with positive likelihood ratios all greater than 10 and overlapping confidence intervals.[39] Given the wide availability and lack of ionizing radiation, TTE is an excellent imaging modality for measurement of the aortic root diameter and for following known thoracic aortic aneurysms to assist in determining the timing of surgery. Since the predominant area of dilation is often in the proximal aorta, TTE may suffice for screening. Transthoracic echocardiography may be limited in patients with abnormal chest wall configurations, pulmonary emphysema, and obesity; transesophageal echocardiography (TEE) can offer improved visualization in these patients.[40]

CTA and MRA are important modalities in the diagnosis and management of aortic disease. Unlike TTE, they are less operator dependent and can visualize the entire length of the thoracic aorta and hence serve as alternatives to TTE or add on tests when TTE is nondiagnostic. In several reports, CT was found to have a pooled sensitivity of 100% and a pooled specificity of 98% for the detection of thoracic aortic dissection or intramural hematoma. MRI reliably demonstrates the relevant features of aortic disease, such as aortic diameter and the relationship of aortic branches to an aneurysm or dissection. Advantages of MRI include the lack of ionizing radiation and ability to avoid the use of iodinated contrast. Disadvantages include longer image acquisition times and reduced ability to monitor potentially unstable patients.[40]

A recent American multispecialty society endorsed guideline on the diagnosis and management of patients with thoracic aortic disease makes a strong recommendation based on low to moderate quality evidence for screening patients with predisposing generic syndromes like Marfan's or for patients with at least one affected first degree relative.[41] When planning for endovascular repair of a thoracic aortic aneurysm, CTA is the imaging modality of choice. It allows for accurate measurement of the length of the aneurysmal segment, evaluation of involved branches, and assessment of the healthy aortic segments above and below the graft. When evaluating patients after repair, CT or CTA is the study of choice. MRI may be safely done to evaluate nitinol-based stent grafts, but may not be used for evaluation of stainless steel grafts and is unable to visualize metallic stent struts. Following endovascular repair, imaging is appropriate at 1

month, 6 months, 12 months, and annually thereafter for aneurysm. Annual evaluation is appropriate following endovascular repair of aortic dissection. Following surgical repair, less-frequent imaging may be performed after 1 year of stability has been established.

Atheromatous disease (Adult only)

Advanced imaging is considered medically necessary for evaluation of the thoracic aorta as a source of distal emboli when a cardiac source has not been identified on echocardiography.

IMAGING STUDY

- CTA chest
- MRA chest when CTA cannot be performed or is nondiagnostic

Pulmonary artery hypertension

Advanced imaging is considered medically necessary for diagnosis and management in **EITHER** of the following scenarios:

- To diagnose chronic thromboembolic pulmonary artery hypertension (CTEPH) as the underlying cause of pulmonary artery hypertension, following non-diagnostic VQ scintigraphy
- To evaluate disease extent after diagnosis of chronic thromboembolic pulmonary artery hypertension (CTEPH) in patients being considered for surgery

IMAGING STUDY

- CT chest
- CTA chest

Rationale

Chronic pulmonary thromboembolism (CTEPH) is an uncommon but potentially treatable complication of venous thromboembolism (VTE), with an incidence of less than 2%.[42] Guidelines do not recommend routine use of advanced imaging in asymptomatic patients following VTE,[43] but suggest VQ scintigraphy for the initial evaluation of symptomatic patients due to the higher sensitivity of this modality for pulmonary perfusion abnormalities and high negative likelihood ratio.[43, 44] In patients with established chronic pulmonary thromboembolism, CTA is suggested instead of VQ scintigraphy to evaluate the anatomic extent of surgically accessible disease and MRA is not recommended.[43]

Pulmonary embolism

Also see Cardiac Imaging guidelines.

ADULT

Advanced imaging is considered medically necessary following nondiagnostic chest radiograph in **ANY** of the following scenarios:

- **Pulmonary embolism likely** based on modified Wells criteria[45] (> 4 points)
- **Pulmonary embolism unlikely** based on modified Wells criteria[45] (≤ 4 points) with a positive D-dimer
- **Suspected pulmonary embolism in pregnancy** when PE cannot be excluded by YEARS algorithm (**EITHER** of the following scenarios):
    - D-dimer ≥ 1000 ng/mL
    - D-dimer ≥ 500 ng/mL and **ANY** of the following:
        - Clinical signs of deep-vein thrombosis, after normal compression ultrasonography
        - Hemoptysis
        - Pulmonary embolism as the most likely diagnosis

PEDIATRIC

Advanced imaging is considered medically necessary following nondiagnostic chest radiograph in **EITHER** of the following scenarios:

- Moderate or high clinical suspicion of pulmonary embolism
- Concern for recurrent embolism in patients on adequate medical therapy

IMAGING STUDY

- CT chest; alternative to CTA chest
- CTA chest (preferred)

Rationale

Clinical signs and symptoms of pulmonary embolism (PE) are notoriously nonspecific, and relatively few patients will present with the classic constellation of pleuritic chest pain, dyspnea, and hypoxia. Furthermore, incidence of the condition is rare relative to mimics like pneumonia, pleurisy, pericarditis, and myocardial infarction; thus, chest radiograph may help detect an alternate explanation for symptomatology. Vascular imaging plays an important role in establishing the diagnosis of PE, but there is evidence that vascular imaging is overutilized in select patient populations where diagnostic yield can be less than 3%.[43, 46-50]

LOW PRE-TEST PROBABILITY OF PULMONARY EMBOLISM

Consensus exists among multiple high-quality evidence-based guidelines that CTA or other forms of vascular imaging are not indicated in patients with a low pretest probability of PE. The American College of Physicians recommends clinicians use validated clinical prediction rules to estimate the pretest probability in patients with suspected PE. Clinicians should not obtain D-dimer measurements or imaging studies in patients with a low pretest probability of PE and who meet all Pulmonary Embolism Rule-out Criteria. Clinicians should obtain a high-sensitivity D-dimer measurement as the initial diagnostic test in patients who have an intermediate pretest probability of PE, or in patients with low pretest probability of PE who do not meet all Pulmonary Embolism Rule-out Criteria. Clinicians should not use imaging studies as the initial test in patients who have a low or intermediate pretest probability of PE.[51-53]

In a 2016 meta-analysis, Crawford et al. concluded that a negative D-dimer test is valuable in ruling out PE in patients who present to the emergency setting with a low pretest probability. They noted high levels of false-positive results, especially among those over the age of 65 years with estimates of specificity from 23% to 63%. No empirical evidence was available, however, to support an increase in the diagnostic threshold of interpretation of D-dimer results for those over the age of 65 years.[47, 54]

In a 2016 multicenter prospective cohort management study of 808 consecutive patients with suspected PE, Bates et al. evaluated whether PE can be safely excluded in patients with negative D-dimer testing without incorporating clinical probability assessment. Ninety-nine (12%) were diagnosed with venous thromboembolism (VTE) at presentation. Four hundred and twenty (52%) had a negative D-dimer level at presentation and were treated without anticoagulation; of these, 1 had venous thromboembolism during follow up. The negative predictive value of D-dimer testing for PE was 99.8% (95% CI, 98.7%-99.9%).[55, 56]

MODERATE TO HIGH PRE-TEST PROBABILITY OF PULMONARY EMBOLISM

Consensus exists among multiple high-quality evidence-based guidelines that CT/CTA is indicated in patients with intermediate or high clinical suspicion for PE. CT should be offered to patients in whom PE is suspected with a likely Wells score or with an unlikely two-level pulmonary embolism Wells score and positive D-dimer.[49, 53, 57-60] Patients with intermediate or high pretest probability of PE require diagnostic imaging studies,[52] and additional diagnostic testing should be considered if CT is negative.[50] In patients with an elevated D-dimer level, imaging should be obtained [49, 60] The American College of Radiology gives CT pulmonary angiography and optimized CT chest with intravenous contrast a score of 9, in patients with a positive plasma D-dimer test. [61]

In pregnant patients, though overlap exists between the clinical symptoms of VTE and symptoms caused by physiological changes in pregnancy (e.g., tachycardia, swelling of the legs, dyspnea), the threshold to test for PE is low because of the well-known elevated risk of VTE/PE, However, both CT/CTA and ventilation-perfusion scanning involve radiation exposure to the mother and fetus. A prospective study found PE to be safely ruled out by using the pregnancy-adapted YEARS algorithm (consisting of the three most predictive criteria of the Wells criteria – clinical signs of deep vein thrombosis, hemoptysis, and whether PE is the most likely diagnosis - and incorporates variable D-dimer thresholds depending on the number of criteria filled); CTA was avoided in 32%-65% of patients (variable by trimester, with decreasing specificity attributed to the physiologic rise of D-dimer that also commonly occurs during pregnancy).[60]

MRI OR MRA FOR EVALUATION OF PULMONARY EMBOLISM

There is no consistent evidence that MRA or MRI have comparable reliability or diagnostic accuracy to either CTA or VQ scintigraphy.

In a 2016 systematic review/meta-analysis, Li et al. concluded that MRA can be used for the diagnosis of acute PE; however, due to limited sensitivity, it cannot be used as a stand-alone test to exclude acute PE. Five studies were included in the meta-analysis. The pooled sensitivity 0.83 (0.78-0.88) and specificity 0.99 (0.98-1.00) demonstrated that MRA had limited sensitivity and high specificity in the detection of acute pulmonary embolism.[62] Zhou et al. conducted a meta-analysis of 15 studies for patient accuracy and 9 studies for vessel accuracy on MRI. Authors concluded that MRI exhibits a high diagnostic capability with proximal arteries, but lacks sensitivity for peripheral embolism. The patient-based analysis yielded an overall sensitivity of 0.75 (0.70-0.79) and 0.84 (0.80-0.87) for all patients and patients with technically adequate images, respectively. The overall specificity was 0.80 (0.77-0.83) and 0.97 (0.96-0.98). On average, MRI was technically inadequate in 18.89% of patients (range, 2.10%-27.70%).[63, 64]

VQ SCINTIGRAPHY FOR EVALUATION OF PULMONARY EMBOLISM

For patients with suspected PE of moderate to high pretest probability, the majority of high-quality evidence based guidelines recommend the use of VQ scintigraphy as an add-on test when CTA is nondiagnostic or cannot be performed due to contrast allergy or nephrotoxicity.[5, 6] While systematic reviews of comparative diagnostic accuracy are mixed,[65, 66] many cited studies used earlier generations of CT technology, limiting the applicability of this literature to contemporary clinical practice. CT has fewer nondiagnostic studies[8] and is widely available. Comparative effective radiation dose between VQ scintigraphy and CT is also controversial, but a normal VQ or Q scan may offer a lower radiation dose than CT and confidently exclude PE when negative (negative likelihood ratio 0.05).[65] Scintigraphy is also recommended by consensus based guidelines as an alternative test in pregnant patients.[67]

EVALUATION OF PULMONARY EMBOLISM IN PEDIATRIC POPULATIONS

The evidence base for diagnosis of PE is limited in children and the diagnostic testing strategy is not well defined.[68] Further research is very likely to change recommendations for the appropriate use of advanced imaging in pediatric populations. Hence, evaluation of PE is primarily based on clinical gestalt and selection of initial imaging modality based on local practice experience and expertise.

Other vascular indications in the chest

Also see Cardiac Imaging guidelines.

Advanced imaging is considered medically necessary for diagnosis and management of **ANY** of the following conditions.

- Hematoma
- Pulmonary arteriovenous malformation
- Pulmonary sequestration
- Subclavian steal syndrome
- Superior vena cava syndrome
- Systemic venous thrombosis or occlusion
- Thoracic outlet syndrome

IMAGING STUDY

- CTA chest
- MRA chest
- CT chest or MRI chest (alternative modalities for evaluation of superior vena cava syndrome and thoracic outlet syndrome)

Abdomen and Pelvis

Acute aortic syndrome

Includes aortic dissection, rupture, intramural hematoma, penetrating ulcer, and pseudoaneurysm

Advanced imaging is considered medically necessary in **ANY** of the following scenarios:

- Initial diagnosis of suspected aortic disease
- Management of known aortic disease

- Annual surveillance of clinically stable aortic disease

IMAGING STUDY

- CTA abdomen
- MRA abdomen
- CT or MRI abdomen; alternatives to CTA or MRA abdomen

Aneurysm of the abdominal aorta or iliac arteries

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

Screening

One time evaluation in:

- Males between 60 and 75 years who have ever smoked **OR** have a first-degree relative with an abdominal aortic aneurysm (AAA)
- Females between 60 and 75 years who have ever smoked **AND** have a first-degree relative with AAA
- Previously diagnosed aneurysm of the thoracic aorta, iliac, or popliteal arteries

Diagnosis

In patients with suspected aortic or iliac aneurysm presenting with **ANY** of the following:

- Pulsatile abdominal mass or bruit
- Other imaging that is suggestive but not diagnostic
- Decreased or absent femoral pulses or bruit
- Lower extremity claudication
- Suggestive physiologic testing
- Signs or symptoms of atheroembolic disease in the lower extremities (e.g., ischemic or discolored toes, livedo reticularis)

Management

- New or worsening symptoms or signs of aortic disease or enlargement by imaging
- Pre-procedure planning
- Baseline and initial 6-month evaluation following endograft or surgical repair
- Every 6 months for endografts that are increasing in size or endoleaks

Surveillance

Stable aortic aneurysm without prior repair:

- 4.5 cm or greater: every 6 months
- 3.5 to 4.4 cm: 6 months and 12 months following diagnosis, then annually
- 3 to 3.4 cm: At one year following diagnosis, then every 3 years

Stable iliac aneurysm without prior repair:

- 3 cm or greater: every 6 months
- Less than 3 cm: annually

Stable aneurysms treated with endografts: annually

Stable aneurysms treated with open surgical repair: every 5 years

IMAGING STUDY

- Duplex arterial ultrasound; all indications

- CT abdomen and/or pelvis for management, surveillance with endografts or surgical repair or when duplex arterial ultrasound cannot be performed or is nondiagnostic
- CTA abdomen and/or pelvis for management, surveillance with endografts or surgical repair or when duplex arterial ultrasound cannot be performed or is nondiagnostic
- MRI abdomen and/or pelvis for management, surveillance with endografts or surgical repair or when duplex arterial ultrasound cannot be performed or is nondiagnostic
- MRA abdomen and/or pelvis for management, surveillance with endografts or surgical repair or when duplex arterial ultrasound cannot be performed or is nondiagnostic

Rationale

Given its wide availability and ability to diagnose or exclude a wide variety of causes of symptoms, ultrasound is generally the initial modality used in the evaluation of abdominal aortic aneurysm (AAA). Several studies have reported high sensitivity and specificity, 94%-100% and 98%-100%, respectively.[69]

CT is less operator-dependent and allows for more reproducible measurements over serial scans, in addition to providing detail about many aneurysm features relevant to clinical decision making. When endovascular repair of an aneurysm is planned, contrast-enhanced CT or CTA is essential for procedural planning. This modality allows accurate measurements to be taken at the proximal and distal landing sites for the stent graft as well as for evaluation of the relationship between the aneurysm and aortic branches, and for evaluation of the iliac arteries.[40]

MRI and MRA are able to reliably depict the anatomic features of aneurysms such that these modalities are well suited to aortic evaluation. Limitations include potential for artifact due to longer image acquisition times, and less accessibility for monitoring of potentially unstable patients. Given the lack of ionizing radiation and absence of a need for iodinated contrast use, these modalities may be considered in cases where serial follow-up studies are needed.[40]

A high-quality evidence-based guideline recommends follow up surveillance of AAA at 12-month intervals for AAA of 35 to 44 mm in diameter and at 6-month intervals for AAA 45 to 54 mm in diameter.[40] Following endovascular repair, surveillance is recommended after 1 month, 6 months, 12 months, and annually thereafter. Shorter intervals may be appropriate when there are abnormal findings warranting closer surveillance. If there is no evidence of endoleak or AAA sac enlargement in the first year after endovascular repair, using duplex ultrasound for annual screening supplemented with CT at 5-year intervals may be considered. Following open surgical repair, surveillance may be considered at approximately 5-year intervals and may be performed with duplex ultrasound or CT.[40]

Four randomized trials compared the outcomes of population-based studies with or without screening for AAA. The prevalence of AAA was 5.5% in these studies, and AAA screening in men greater than 65 years of age was associated with a statistically significant decline in AAA-related mortality over 10 years. No similar benefit was seen in women, though women were included in only 1 of the trials and comprised a small number of patients (9342 out of a total 127,891 patients). Rescreening of patients has demonstrated few positive results, suggesting that a single ultrasound scan should be sufficient for screening. [69]

CTA abdomen and pelvis with intravenous contrast is the gold standard for preoperative endovascular aneurysm repair planning and for monitoring following endovascular aneurysm repair procedure in patients with AAA.[70] MRA abdomen and pelvis without and with intravenous contrast is an appropriate alternative to CTA abdomen and pelvis with intravenous contrast for patients undergoing planning for endovascular aneurysm repair and for monitoring following endovascular aneurysm repair procedure where iodonated contrast is contraindicated.[70] Following endovascular aneurysm repair, the most widely used surveillance regimen includes multiphasic contrast-enhanced CT at 1, 6, 12 months, and annually thereafter.[70]

Arteriovenous malformation (AVM) or fistula (AVF)

Advanced imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA abdomen and/or pelvis
- MRA abdomen and/or pelvis

Hematoma/hemorrhage within the abdomen

Vascular imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA abdomen and/or pelvis
- MRA abdomen and/or pelvis
- CT abdomen and/or pelvis; alternative to CTA or MRA

Unexplained hypotension

Vascular imaging is considered medically necessary for evaluation of volume status in patients with unexplained hypotension.

IMAGING STUDY

- Duplex ultrasound of the IVC

Mesenteric ischemia

Advanced imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA abdomen and pelvis
- MRA abdomen and pelvis

Rationale

In patients with suspected mesenteric ischemia, CTA abdomen with intravenous contrast should be the first-line imaging test.[71]

MRA may be considered an alternative to CTA for diagnosis of suspected chronic mesenteric ischemia, although there is some evidence that images obtained with MRA are not as accurate or complete as those obtained with CTA.[72]

Portal hypertension

Advanced imaging is considered medically necessary for diagnosis and management.

IMAGING STUDY

- CTA abdomen
- MRA abdomen

Renal artery stenosis (RAS)/Renovascular hypertension

Advanced imaging is considered medically necessary in patients with documented hypertension (including at least 2 serial blood pressure measurements) unexplained by initial clinical evaluation for secondary causes in **ANY** of the following high pre-test likelihood scenarios:

- Refractory hypertension, in patients receiving therapeutic doses of 4 or more anti-hypertensive medications
- Hypertension with renal failure or progressive renal insufficiency
- Hypertensive crisis (systolic blood pressure > 180 or diastolic blood pressure > 110, with or without end-organ damage)
- Hypertension developing in patients younger than age 30
- Severe hypertension in patients over age 55 with chronic kidney disease (CKD) or heart failure
- Rapid and persistent worsening of previously controlled hypertension

- Deteriorating renal function or new azotemia on renin-angiotensin-aldosterone system (RAAS) blocking medications including angiotensin converting enzyme inhibitors (ACEI) and angiotension receptor blockers (ARB)
- Hypertension and abdominal bruit, suspected to originate in the renal artery
- Unexplained episodes of “flash” pulmonary edema
- Unexplained atrophic kidney or renal size asymmetry (greater than 1.5 cm difference in renal size on ultrasound)

IMAGING STUDY

- CTA abdomen
- MRA abdomen

Rationale

While the majority of hypertension is essential, renal artery stenosis is the most common secondary cause, with an estimated prevalence between 0.5 and 5% of the population.[73] Following the Cardiovascular Outcomes in Renal Atherosclerotic Lesions (CORAL) trial, there is no net benefit to routine revascularization in patients with RAS secondary to atherosclerosis. Guidelines from both the American College of Radiology (ACR)[73] and the European society for cardiology (ESC)/European Society for Vascular Surgery (ESVS)[23] recommend diagnostic testing only in patients with high pretest likelihood of disease.

Duplex ultrasound, MRA and CTA all have good diagnostic accuracy in establishing the diagnosis of renal artery stenosis with sensitivities and specificities above 85%.[74] The negative likelihood ratio for duplex ultrasound is very good, approximately 0.16 depending on the criteria for peak systolic velocity used.[23] As such, a normal renal artery ultrasound makes renovascular hypertension unlikely. Ultrasound is also nonionizing and does not require contrast, and hence should be considered initial evaluation of renal artery stenosis, especially in patients with diminished renal function.[73] However, renal artery ultrasound however has a lower positive likelihood ratio and can overestimate the degree of stenosis; it is further operator dependent and requires specialized expertise that may limit availability.[23]

Stenosis or occlusion of the abdominal aorta or branch vessels, not otherwise specified

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

Diagnosis of suspected aortoiliac stenosis or occlusion based on **ANY** of the following signs or symptoms:

- Abdominal or femoral bruit
- Decreased or absent femoral pulse
- Atypical lower extremity claudication (including buttocks or thighs)
- Leriche’s syndrome (buttock and thigh claudication, absent or decreased femoral pulses, erectile dysfunction)
- Evidence of atheroembolic disease of the lower extremities such as ischemic or discolored toes or livedo reticularis
- Physiological testing suggesting aorto-iliac disease
- Established femoral or popliteal artery aneurysm

Management of known stenosis:

- Presurgical evaluation of aortoiliac stenosis or occlusion when endovascular or surgical intervention is being considered

Surveillance

- Annual surveillance of surgical bypass grafts

IMAGING STUDY

- Duplex arterial ultrasound

- CTA abdomen and/or pelvis
- MRA abdomen and/or pelvis

Venous thrombosis or occlusion

Advanced imaging is considered medically necessary for diagnosis and management of thrombosis or occlusion of major abdominal vessels, including portal and systemic venous systems.

IMAGING STUDY

- Duplex venous ultrasound required for initial evaluation of hepatic or portal veins
- CTA of the abdomen and/or pelvis for all other venous structures, or when ultrasound cannot be performed or is nondiagnostic
- MRA of the abdomen and/or pelvis for all other venous structures, or when ultrasound cannot be performed or is nondiagnostic

Visceral artery aneurysm

Advanced imaging is considered medically necessary for diagnosis, management, and surveillance of aneurysm involving **ANY** of the following abdominal vessels:

- Renal artery
- Celiac artery
- Splenic artery
- Hepatic artery
- Superior/inferior mesenteric arteries and their branches

IMAGING STUDY

- CTA abdomen and/or pelvis
- MRA abdomen and/or pelvis

Upper Extremity

Physiologic testing for peripheral arterial disease

Physiologic testing is considered medically necessary for diagnosis and management in **ANY** of the following scenarios:

- New or worsening signs or symptoms (**ANY** of the following):
  - Claudication
  - Unilateral cold painful hand
  - Finger discoloration or ulcer
  - Non healing arm ulcers or gangrene
  - Absent pulses of the arm or hand associated with infection
- Arterial entrapment syndrome or positional arterial obstruction
- Arm or hand trauma and a suspicion of vascular injury
- Prior to planned harvest of the radial artery (e.g., for CABG)
- Suspected complication of upper extremity arterial access

- Post procedure baseline and initial 6 month follow up after revascularization with a vein bypass graft
- Annual surveillance starting 1 year after revascularization with a vein or prosthetic bypass graft

IMAGING STUDY

- Limited, complete, or noninvasive physiologic studies

Peripheral arterial disease (PAD)

Vascular imaging is considered medically necessary for diagnosis, management, and surveillance in **ANY** of the following scenarios:

Diagnosis of suspected PAD based on **ANY** of the following signs or symptoms:

- Resting ischemic pain
- New claudication with inconclusive physiologic testing
- Signs of atheroembolic disease of the upper extremities such as ischemic or discolored digits or livedo reticularis
- Atypical symptoms and inconclusive physiological testing

Management of known PAD in **ANY** of the following scenarios:

- Persistent claudication despite a trial of conservative therapy in initial revascularization candidates
- Baseline study following percutaneous or surgical revascularization
- Post-revascularization, with any new or worsening upper extremity signs or symptoms
- Post revascularization when surveillance physiological testing is inconclusive

Surveillance

- At 6 months, then annually following surgical revascularization

IMAGING STUDY

- Duplex arterial ultrasound
- CTA upper extremity
- MRA upper extremity

Vascular access procedures

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

- Evaluation of native arteries prior to AVF for dialysis access
- Planned harvest of the radial artery (e.g., for CABG)
- Complications of a vascular access procedure suggested by **ANY** of the following:
  - Pulsatile mass, bruit, or thrill at the access site
  - Significant (more than expected post procedure) hematoma at the access site
  - Severe (more than expected post procedure) pain at the access site
  - Signs of embolism in the involved extremity (such as ischemic or discolored fingers, livedo reticularis)

IMAGING STUDY

- Duplex arterial ultrasound
- CTA upper extremity when ultrasound cannot be performed or is nondiagnostic

- MRA upper extremity when ultrasound cannot be performed or is nondiagnostic

Venous thrombosis or occlusion

Advanced imaging is considered medically necessary for the diagnosis and management when ultrasound cannot be performed or is nondiagnostic.

IMAGING STUDY

- CTA upper extremity
- MRA upper extremity

Other vascular indications in upper extremity

Vascular imaging of the upper extremity is considered medically necessary when the results of imaging are essential to establish a diagnosis and/or direct management of the following vascular conditions:

- Aneurysm
- Arterial entrapment syndrome (vascular thoracic outlet syndrome)
- Arteriovenous malformation (AVM) or fistula (AVF)
- Dissection or intramural hematoma

IMAGING STUDY

- Duplex arterial ultrasound
- CTA upper extremity
- MRA upper extremity

Lower Extremity

Physiologic testing for peripheral arterial disease

Physiologic testing is considered medically necessary for diagnosis and management in **ANY** of the following scenarios:

- New or worsening signs or symptoms (**ANY** of the following):
  - Claudication
  - Resting limb pain with diminished or absent pulses
  - Non healing ulcers or gangrene
  - Absent pulses of the leg or foot
- Acute limb ischemia
- Baseline in newly diagnosed peripheral arterial disease (ABI) or prior to revascularization (segmental pressure measurements)
- Post procedure baseline and initial 6 month follow up after surgical revascularization with a venous bypass graft
- At one year following any revascularization
- Annual surveillance starting one year after revascularization in patients who have undergone surgical bypass using a venous graft

IMAGING STUDY

- Limited, complete, or noninvasive physiologic studies

Peripheral arterial disease (PAD)

Vascular imaging is considered medically necessary in **ANY** of the following scenarios:

Screening

- Not indicated

Diagnosis of suspected PAD based on **ANY** of the following signs or symptoms:

- Resting ischemic pain, non-healing wounds, and gangrene
- Ischemic or discolored toes, and livedo reticularis
- Sudden onset of pain associated with pulselessness, pallor, loss of motor or sensory function

Management of known PAD in **ANY** of the following scenarios:

- Prior diagnosis of PAD with **ANY** of the following new or worsening signs or symptoms:
  - Resting ischemic pain, non-healing wounds, and gangrene
  - Ischemic or discolored toes, and livedo reticularis
  - Sudden onset of pain associated with pulselessness, pallor, loss of motor or sensory function
- Persistent claudication following a trial of 3 months of conservative therapy including a supervised exercise therapy program and cilostazol (provided no contraindication) in patients being evaluated for initial revascularization
- Post revascularization with any new or worsening lower extremity signs or symptoms, following nondiagnostic physiologic testing unless a venous graft was used
- At 3-month intervals within the first 2 years after surgical revascularization using a venous graft, and annually thereafter
- Post revascularization when surveillance physiological testing is inconclusive (ABI > 1.40), borderline (ABI 0.91–0.99), or abnormal (ABI ≤ 0.90)

Surveillance

- Annual follow up after surgical revascularization when a venous graft has been used

IMAGING STUDY

- Duplex arterial ultrasound
- CTA abdominal aorta with bilateral lower extremity runoff
- CTA lower extremity
- MRA lower extremity

Rationale

An estimated 8 to 12 million people in the U.S. are affected by peripheral arterial disease (PAD). Symptomatic PAD often presents as intermittent claudication. Presenting signs and symptoms in the lower extremity may also include weak or absent distal pulses, absent distal hair growth, dry skin, and poor skin healing. Though evidence does not support the use of screening studies for PAD in the general population, the primary study for making the diagnosis in symptomatic patients is the ankle-brachial index (ABI). Compared with arteriography, an ABI of 0.90 or less has a high sensitivity and specificity for hemodynamically significant PAD.[75] Additional imaging should be reserved for patients in whom revascularization treatment is being considered. Advanced imaging is not indicated for patients with asymptomatic PAD or intermittent claudication who are not appropriate candidates for revascularization.[75]

The 2016 American Heart Association/American College of Cardiology Guideline on the Management of Patients with Lower Extremity Peripheral Arterial Disease recommends against performing angiography, either invasive or

noninvasive, to evaluate for peripheral artery disease in the absence of lower extremity symptoms, indicating that there are several potential risks and that management will not be altered on the basis of the angiographic findings.[76]

The Society for Vascular Surgery commissioned a systematic review which suggested that there was no clear benefit to screening for PAD in asymptomatic patients. The U.S. Preventive Services Task Force concluded in 2013 that there is insufficient evidence to support screening for PAD with the ABI.[77]

Venous thrombosis or occlusion

Advanced imaging is considered medically necessary for the diagnosis and management when venous ultrasound cannot be performed or is nondiagnostic.

IMAGING STUDY

- CTA lower extremity
- MRA lower extremity

Other vascular indications in lower extremity

Vascular imaging of the lower extremity is considered medically necessary when the results of imaging are essential to establish a diagnosis and/or direct management of the following vascular conditions:

- Arterial entrapment syndrome
- Aneurysm/dilation
- Arteriovenous malformation or arteriovenous fistula
- Dissection or intramural hematoma

IMAGING STUDY

- CTA lower extremity
- MRA lower extremity
- CTA abdominal aorta with bilateral lower extremity runoff indicated for arterial evaluation when there is evidence of disease originating in the abdominal aorta or branch vessels

MR Angiography of the Spinal Canal

MR angiography of the spinal canal

MR angiography of the spinal canal is an evolving technology under clinical development, and its impact on health outcomes will continue to undergo review as new evidence-based studies are published. Medically necessary applications are currently limited to the following:

- Preoperative or postoperative imaging
- Follow up of prior imaging findings suggestive of a vascular lesion

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Codes

The following code list is not meant to be all-inclusive. Authorization requirements will vary by health plan. Please consult the applicable health plan for guidance on specific procedure codes.

Specific CPT codes for services should be used when available. Nonspecific or not otherwise classified codes may be subject to additional documentation requirements and review.

CPT/HCPCS

70450 CT head, without contrast
70460 CT head, with contrast
70470 CT head, without contrast, followed by re-imaging with contrast

70496	CT angiography head, with contrast material(s), including noncontrast images, if performed, and image post-processing
70498	CT angiography neck, with contrast material(s), including noncontrast images, if performed, and image post-processing
70544	MR angiography head, without contrast
70545	MR angiography head, with contrast
70546	MR angiography head, without contrast, followed by re-imaging with contrast
70547	MR angiography neck, without contrast
70548	MR angiography neck, with contrast
70549	MR angiography neck, without contrast, followed by re-imaging with contrast
70551	MRI head, without contrast
70552	MRI head, with contrast
70553	MRI head, without contrast, followed by re-imaging with contrast
71250	Computed tomography, thorax, diagnostic; without contrast material
71260	Computed tomography, thorax, diagnostic; with contrast material(s)
71270	Computed tomography, thorax, diagnostic; without contrast material, followed by contrast material(s) and further sections
71275	CT angiography of chest (non-coronary), with contrast material(s), including non-contrast images, if performed, and image post-processing
71550	MRI chest, without contrast
71551	MRI chest, with contrast
71552	MRI chest, without contrast, followed by re-imaging with contrast
71555	MR angiography chest (excluding the myocardium) without contrast, followed by re-imaging with contrast
72159	MR angiography spinal canal
72191	CT angiography pelvis, with contrast material(s), including non-contrast images, if performed, and image post-processing
72192	CT pelvis, without contrast
72193	CT pelvis, with contrast
72194	CT pelvis without contrast, followed by re-imaging with contrast
72195	MRI pelvis, without contrast
72196	MRI pelvis, with contrast
72197	MRI pelvis, without contrast, followed by re-imaging with contrast
72198	MR angiography pelvis; without contrast, followed by re-imaging with contrast
73206	CT angiography upper extremity, with contrast material(s), including non-contrast images, if performed, and image post-processing
73225	MR angiography upper extremity, without and with contrast
73706	CT angiography lower extremity, with contrast material(s), including noncontrast images, if performed, and image post-processing
73725	MR angiography lower extremity, without and with contrast
74150	CT abdomen, without contrast
74160	CT abdomen, with contrast
74170	CT abdomen, without contrast, followed by re-imaging with contrast
74174	CT angiography abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image post-processing
74175	CT angiography abdomen, with contrast material(s), including non-contrast images, if performed, and image post-processing
74176	CT abdomen and pelvis, without contrast
74177	CT abdomen and pelvis, with contrast
74178	CT abdomen and pelvis, without contrast, followed by re-imaging with contrast
74181	MRI abdomen, without contrast
74182	MRI abdomen, with contrast
74183	MRI abdomen, without contrast, followed by re-imaging with contrast
74185	MR angiography abdomen; without or with contrast
75635	CT angiography abdominal aorta and bilateral iliofemoral lower extremity run off, with contrast material(s), including non-contrast images, if performed, and image post-processing
93880	Duplex scan of extracranial arteries; complete bilateral study
93882	Duplex scan of extracranial arteries; unilateral or limited study

93922 Limited bilateral noninvasive physiologic studies of upper or lower extremity arteries, (e.g., for lower extremity: ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus bidirectional, Doppler waveform recording and analysis at 1-2 levels, or ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus volume plethysmography at 1-2 levels, or ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries with, transcutaneous oxygen tension measurement at 1-2 levels)

93923 Complete bilateral noninvasive physiologic studies of upper or lower extremity arteries, 3 or more levels (e.g., for lower extremity: ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus segmental blood pressure measurements with bidirectional Doppler waveform recording and analysis, at 3 or more levels, or ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus segmental volume plethysmography at 3 or more levels, or ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus segmental transcutaneous oxygen tension measurements at 3 or more levels), or single level study with provocative functional maneuvers (e.g., measurements with postural provocative tests, or measurements with reactive hyperemia)

93924 Noninvasive physiologic studies of lower extremity arteries, at rest and following treadmill stress testing, (i.e., bidirectional Doppler waveform or volume plethysmography recording and analysis at rest with ankle/brachial indices immediately after and at timed intervals following performance of a standardized protocol on a motorized treadmill plus recording of time of onset of claudication or other symptoms, maximal walking time, and time to recovery) complete bilateral study

93925 Duplex scan of lower extremity arteries or arterial bypass grafts; complete bilateral study

93926 Duplex scan of lower extremity arteries or arterial bypass grafts; unilateral or limited study

93930 Duplex scan of upper extremity arteries or arterial bypass grafts; complete bilateral study

93931 Duplex scan of upper extremity arteries or arterial bypass grafts; unilateral or limited study

93978 Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; complete study

93979 Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; unilateral or limited study

C8900 MR angiography with contrast, abdomen

C8901 MR angiography without contrast, abdomen

C8902 MR angiography without contrast followed by with contrast, abdomen

C8909 MR angiography with contrast, chest (excluding myocardium)

C8910 MR angiography without contrast, chest (excluding myocardium)

C8911 MR angiography without contrast followed by with contrast, chest (excluding myocardium)

C8912 MR angiography with contrast, lower extremity

C8913 MR angiography without contrast, lower extremity

C8914 MR angiography without contrast followed by with contrast, lower extremity

C8918 MR angiography with contrast, pelvis

C8919 MR angiography without contrast, pelvis

C8920 MR angiography without contrast followed by with contrast, pelvis

C8931 MR angiography with contrast, spinal canal and contents

C8932 MR angiography without contrast, spinal canal and contents

C8933 MR angiography without contrast followed by with contrast, spinal canal and contents

C8934 MR angiography with contrast, upper extremity

C8935 MR angiography without contrast, upper extremity

C8936 MR angiography without contrast followed by with contrast, upper extremity

ICD-10 Diagnosis

Refer to the ICD-10 CM manual

History

Status	Review Date	Effective Date	Action
Revised	12/03/2020	09/12/2021	Independent Multispecialty Physician Panel (IMPP) review. Revised definitions and these indications: Congenital or developmental vascular anomalies, not otherwise specified, Aneurysm, intracranial, Hemorrhage, intracranial, Horner's syndrome, Pulsatile tinnitus, Stenosis or occlusion, intracranial, Stenosis or occlusion, extracranial carotid arteries,

Status	Review Date	Effective Date	Action
			Stenosis or occlusion, vertebral or basilar arteries, Stroke or transient ischemic attack (TIA), acute (7 days or less), Trigeminal neuralgia, Venous thrombosis or compression, intracranial, Aortic aneurysm, Pulmonary embolism, Acute aortic syndrome, Aneurysm of the abdominal aorta or iliac arteries, Hematoma/hemorrhage within the abdomen, Renal artery stenosis (RAS)/Renovascular hypertension, Stenosis or occlusion of the abdominal aorta or branch vessels, not otherwise specified, Venous thrombosis or occlusion, Peripheral arterial disease (PAD).
Revised	-	03/14/2021	Added HCPCS codes C8900, C8901, C8902, C8909, C8910, C8911, C8912, C8913, C8914, C8918, C8919, C8920, C8931, C8932, C8933, C8934, C8935, and C8936.
Revised	-	01/01/2021	Annual CPT code update: revised descriptions for 71250, 71260, 71270.
Revised	08/12/2019	05/17/2020	IMPP review. Surveillance of stable abdominal aortic or iliac aneurysms in patients who have had open surgical repair changed to every 5 years. Added annual surveillance of stenosis or occlusion of abdominal aortic/branch vessels in patients who have had surgical bypass grafts.
Revised	03/25/2019	11/10/2019	IMPP review. Added arterial ultrasound guideline content. Aligned peripheral arterial ultrasound and advanced vascular imaging criteria. Added clinical content to all document sections based on literature surveillance. Added CPT codes 93880, 93882, 93922, 93923, 93924, 93925, 93926, 93930, 93931, 93978, 93979.
Restructured	09/12/2018	01/01/2019	Advanced Imaging guidelines redesigned and reorganized to a condition-based structure
Revised	07/11/2018	03/09/2019	IMPP review. Renamed the Administrative Guidelines to “General Clinical Guideline.” Retitled Pretest Requirements to “Clinical Appropriateness Framework” to summarize the components of a decision to pursue diagnostic testing. Revised to expand applicability beyond diagnostic imaging, retitled Ordering of Multiple Studies to “Ordering of Multiple Diagnostic or Therapeutic Interventions” and replaced imaging-specific terms with “diagnostic or therapeutic intervention.” Repeated Imaging split into two subsections, “repeat diagnostic testing” and “repeat therapeutic intervention.”
Revised	03/01/2018	10/30/2018	IMPP review and revision.
Created	-	03/30/2005	Original effective date