

# Clinical Appropriateness Guidelines: Advanced Imaging

## Imaging Program Guidelines

Effective Date: September 5, 2017

Proprietary

Guideline	Last Revised	Last Reviewed
Administrative	07-26-2016	07-26-2016
Head and Neck	11-01-2016	11-01-2016
Chest	11-01-2016	11-01-2016
Cardiac	07-26-2016	07-26-2016
Abdomen and Pelvis	11-01-2016	11-01-2016
Spine	07-26-2016	07-26-2016
Extremity	07-26-2016	07-26-2016
PET or PET/CT	11-01-2016	11-01-2016
MRI Bone Marrow Blood Supply	08-27-2015	07-26-2016
Magnetic Resonance Spectroscopy (MRS)	06-19-2012	07-26-2016
Quantitative CT (QCT) Bone Mineral Densitometry	11-01-2016	11-01-2016



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# Description and Application of the Guidelines



AIM's Clinical Appropriateness Guidelines (hereinafter "AIM's 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, where possible, criteria for medical necessity determinations. 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 healthcare
- To promote the most efficient and cost-effective use of services

AIM's 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 AIM's 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. If requested by a health plan, AIM will review requests based on health plan medical policy/guidelines in lieu of AIM's 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.

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# Administrative Guideline: Ordering of Multiple Studies



Requests for multiple imaging studies to evaluate a suspected or identified condition and requests for repeated imaging of the same anatomic area are subject to additional review to avoid unnecessary or inappropriate imaging.

## Simultaneous Ordering of Multiple Studies

In many situations, ordering multiple imaging studies at the same time is not clinically appropriate because:

- Current literature and/or standards of medical practice support that one of the requested imaging studies is more appropriate in the clinical situation presented; or
- One of the imaging studies requested is more likely to improve patient outcomes based on current literature and/or standards of medical practice; or
- Appropriateness of additional imaging is dependent on the results of the lead study.

When multiple imaging studies are ordered, the request will often require a peer-to-peer conversation to understand the individual circumstances that support the medically necessity of performing all imaging studies simultaneously.

Examples of multiple imaging studies that may require a peer-to-peer conversation include:

- CT brain and CT sinus for headache
- MRI brain and MRA brain for headache
- MRI cervical spine and MRI shoulder for pain indications
- MRI lumbar spine and MRI hip for pain indications
- MRI or CT of multiple spine levels for pain or radicular indications
- MRI foot and MRI ankle for pain indications
- Bilateral exams, particularly comparison studies

There are certain clinical scenarios where simultaneous ordering of multiple imaging studies is consistent with current literature and/or standards of medical practice. These include:

- Oncologic imaging – Considerations include the type of malignancy and the point along the care continuum at which imaging is requested
- Conditions which span multiple anatomic regions – Examples include certain gastrointestinal indications or congenital spinal anomalies

## Repeated Imaging

In general, repeated imaging of the same anatomic area should be limited to evaluation following an intervention, or when there is a change in clinical status such that imaging is required to determine next steps in management. At times, repeated imaging done with different techniques or contrast regimens may be necessary to clarify a finding seen on the original study.

Repeated imaging of the same anatomic area (with same or similar technology) may be subject to additional review in the following scenarios:

- Repeated imaging at the same facility due to motion artifact or other technical issues
- Repeated imaging requested at a different facility due to provider preference or quality concerns
- Repeated imaging of the same anatomic area (MRI or CT) based on persistent symptoms with no clinical change, treatment, or intervention since the previous study
- Repeated imaging of the same anatomical area by different providers for the same member over a short period of time

# Administrative Guideline: Pre-Test Requirements



Critical to any finding of clinical appropriateness under the guidelines for specific imaging exams is a determination that the following are true with respect to the imaging request:

- A clinical evaluation has been performed prior to the imaging request (which should include a complete history and physical exam and review of results from relevant laboratory studies, prior imaging and supplementary testing) to identify suspected or established diseases or conditions.
- **For suspected diseases or conditions:**
  - Based on the clinical evaluation, there is a reasonable likelihood of disease prior to imaging; and
  - Current literature and standards of medical practice support that the requested imaging study is the most appropriate method of narrowing the differential diagnosis generated through the clinical evaluation and can be reasonably expected to lead to a change in management of the patient; and
  - The imaging requested is reasonably expected to improve patient outcomes based on current literature and standards of medical practice.
- **For established diseases or conditions:**
  - Advanced imaging is needed to determine whether the extent or nature of the disease or condition has changed; and
  - Current literature and standards of medical practice support that the requested imaging study is the most appropriate method of determining this and can be reasonably expected to lead to a change in management of the patient; and
  - The imaging requested is reasonably expected to improve patient outcomes based on current literature and standards of medical practice.
- 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 pre-test 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.

# Computed Tomography (CT) Head



## CPT Codes

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

## Standard Anatomic Coverage

- From the skull base to vertex, covering the entire calvarium and intracranial contents
- Scan coverage may vary, depending on the specific clinical indication

## Technology Considerations

- MRI of the head is preferable to CT in most clinical scenarios, due to its superior contrast resolution and lack of beam-hardening artifact adjacent to the petrous bone (which may limit visualization in portions of the posterior fossa and brainstem on CT).
- Exceptions to the use of brain MRI as the neuroimaging procedure of choice and situations where CT is preferred:
  - initial evaluation of recent craniocerebral trauma
  - evaluation of acute intracranial hemorrhage (parenchymal, subarachnoid, subdural, epidural)
  - evaluation of calcified intracranial lesions
  - osseous assessment of the calvarium, skull base and maxillofacial bones, including detection of calvarial and facial bone fractures

## Common Diagnostic Indications

This section begins with general indications for CT Head, followed by Neurologic Signs and Symptoms and Vascular indications.

### General Head/Brain

#### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

#### Acoustic neuroma

Management of known acoustic neuroma when at least one of the following applies:

- Symptoms suggestive of recurrence or progression
- Following conservative treatment or incomplete resection at 6, 18, 30, and 42 months
- Post resection, baseline imaging and follow up at 12 months after surgery

#### Congenital or developmental anomaly

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital anomaly or developmental condition

*Examples* include Chiari malformation, craniosynostosis, macrocephaly, and microcephaly.

#### Dementia\*\*

- Initial evaluation to exclude a secondary cause of symptoms
- Evaluation of rapidly progressive symptoms

*\*\* requires contraindication to MRI*

# Common Diagnostic Indications

## Hearing loss, sensorineural\*\*

Diagnosis—detection of acoustic neuroma or other retrocochlear lesion in persons diagnosed with sensorineural hearing loss characterized by either of the following features:

- Gradual onset of unilateral or asymmetric hearing loss demonstrated by audiometric testing (15 dB or greater at 2 consecutive frequencies between 0.5 and 3 kHz)
- Hearing loss associated with at least one neurologic sign or symptom known to increase the pretest probability of a retrocochlear lesion

*\*\* requires contraindication to MRI*

## Horner's syndrome\*\*

*\*\* requires contraindication to MRI*

## Hydrocephalus/ventricular assessment

Diagnosis of suspected increased intracranial pressure or hydrocephalus

Management of ventricular shunt

## Infectious disease

Diagnosis or management (including perioperative evaluation) of infection involving the brain or related structures

## Inflammatory disease

Diagnosis or management of inflammatory disease with CNS involvement

## Lumbar puncture risk assessment

- Evaluation prior to lumbar puncture when at least one of the following is present:
  - Papilledema
  - Abnormal neurological exam
  - Absent venous pulsations on funduscopic exam
  - Altered mental status
  - Evidence for meningeal irritation

## Movement disorders

Initial evaluation of the following movement disorders, to exclude an underlying structural lesion

- Hemifacial spasm
- Huntington's disease
- Multiple system atrophy (MSA)
- Parkinson's disease with atypical features
- Progressive supranuclear palsy
- Secondary dystonia
- Other focal or lateralizing movement disorder, such as hemiballismus, athetosis or chorea

**Note:** Imaging is generally not indicated for evaluation of typical Parkinson's disease, essential tremor or primary dystonia.

## Multiple sclerosis and other white-matter diseases\*\*

Diagnosis of suspected demyelinating disease

Management or surveillance of established disease

*\*\* requires contraindication to MRI*

# Common Diagnostic Indications

## Neurocutaneous disorders

Diagnosis or management (including perioperative evaluation) of CNS lesions associated with a known neurocutaneous disorder

*Examples include neurofibromatosis, Sturge-Weber syndrome, tuberous sclerosis, von Hippel-Lindau disease*

## Papilledema

## Pituitary adenoma

Diagnosis of suspected pituitary adenoma when supported by symptoms and laboratory findings

Management (including perioperative evaluation) of known adenoma

## Seizure disorder

- Initial evaluation, to rule out a structural brain lesion as a cause of seizure
- Evaluation of seizures increasing in frequency or severity
- Prior to discontinuation of anticonvulsant therapy in patients who have not been previously imaged

## Trauma

Initial evaluation when a mechanism of injury has been identified and at least one of the following features is present:

- Age 65 or greater
- Retrograde amnesia
- At least two (2) episodes of emesis
- Evidence of open, depressed or basilar skull fracture
- Focal neurologic findings
- Glasgow coma score less than 15 or altered mental status
- High risk mechanism of injury
- Seizure

## Tumor (benign or malignant)

Diagnosis of suspected tumor when supported by the clinical presentation

Management (including perioperative evaluation) of established tumor when imaging is required to direct treatment

Surveillance of established tumor

# Common Diagnostic Indications

## Neurologic Signs & Symptoms

This section contains indications for Bell's palsy, headache, mental status change, syncope, vertigo/dizziness, and visual disturbance.

Advanced imaging based on nonspecific signs or symptoms is subject to a high level of clinical review.

Appropriateness of imaging depends upon the context in which it is requested. At a minimum, this includes a differential diagnosis and temporal component, along with documented findings on physical exam.

Additional considerations which may be relevant include comorbidities, risk factors, and likelihood of disease based on age and gender.

In general, the utility of structural brain imaging is limited to the following categories, each with a unique set of clinical presentations:

- Identification of a space occupying lesion or other focal abnormality (tumor, CVA)
- Detection of parenchymal abnormalities (atrophy, demyelinating disease, infection, ischemic change)
- Identification of ventricular abnormalities (hydrocephalus)

**There are a number of common symptoms or conditions for which the likelihood of an underlying central nervous system process is extremely low. The following indications include specific considerations and requirements which help to determine appropriateness of advanced imaging for these symptoms.**

### Bell's palsy (peripheral facial weakness)

Evaluation of hemifacial weakness when either of the following is present:

- Additional neurologic findings suggestive of intracranial pathology
- Symptoms persisting beyond six (6) weeks

## Headache

### New headache

- When associated with one or more red flag features (see **Table** below); **OR**,
- Headache has not improved or has worsened during a course of physician-directed treatment, and the patient has been reevaluated by a clinician following completion of therapy.

### Recurrent headache

- When associated with at least one red flag feature (see **Table**) and advanced imaging (CT or MRI) has not been performed to evaluate the headache; **OR**,
- When CT or MRI has been performed to evaluate the headache, and a red flag feature has developed since the prior imaging study; **OR**,
- Headaches are increasing in frequency and/or severity despite at least four (4) weeks of physician-directed treatment and reevaluation by a clinician following completion of therapy.

# Common Diagnostic Indications

Table: Red flag features for headache

Headache Characteristics	Associated clinical features and conditions
<ul style="list-style-type: none"><li>Brought on by exertion or valsalva</li><li>Cluster headache not previously evaluated with MRI</li><li>Postural/positional</li><li>Thunderclap or sentinel headache—sudden onset and severe (worst headache of life) reaching maximal intensity within minutes</li></ul>	<ul style="list-style-type: none"><li>Abnormal neurological exam during the headache episode or in between episodes (Note: <i>photophobia and nausea are not considered abnormalities on neurologic exam</i>)</li><li>Neck or facial pain (concern for dissection)—see <b>Dissection</b> indication in <b>CTA/MRA Head</b> guideline</li><li>Neck stiffness and fever—see <b>Infectious disease</b> and <b>Inflammatory disease</b> indications</li><li>Risk factors for venous thrombosis—see <b>Venous thrombosis</b> indication</li></ul>
<b>Patient Populations</b>	<b>High-risk vascular patient</b>
<ul style="list-style-type: none"><li>Age over 50 years with new onset of headache</li><li>Known malignancy</li><li>Increased genetic risk for intracranial neoplasms (including basal cell nevus syndrome, Gorlin syndrome, Li-Fraumeni syndrome, neurofibromatosis type 1 and type 2, Turcot syndrome, and von Hippel-Lindau syndrome)</li><li>Immunodeficiency (including HIV)</li></ul>	<ul style="list-style-type: none"><li>Personal or family history (at least one first-degree relative) of aneurysm, subarachnoid hemorrhage (SAH), or arteriovenous malformation (AVM)</li><li>Heritable condition associated with intracranial aneurysm formation, including autosomal dominant polycystic kidney disease, Ehlers-Danlos syndrome, Marfan syndrome, neurofibromatosis type 1 and type 2, and other rare conditions (including hereditary hemorrhagic telangiectasia, multiple endocrine neoplasia, pseudoxanthoma elasticum)</li></ul>

## Mental status changes, with documented objective evidence from neurologic exam

### Syncope

Evaluation for a structural brain lesion when at least one of following:

- Documented abnormality on neurological examination
- Presence of at least one persistent neurological symptom
- Witnessed or highly suspected seizure activity at the time of the episode

### Vertigo and dizziness

Evaluation for a structural brain lesion when either of the following is present:

- Abnormal audiogram or auditory brainstem response
- Signs or symptoms suggestive of a CNS lesion

**Note:** Vertigo or dizziness which is clearly related to positional change does not require advanced imaging.

### Visual disturbance

Evaluation for central nervous system pathology when suggested by the ophthalmologic exam

# Common Diagnostic Indications

## Vascular indications

This section contains indications for aneurysm, cerebrovascular accident/transient ischemic attack, congenital/developmental vascular anomalies, hemorrhage/hematoma, and venous thrombosis.

### Aneurysm

- **Screening** in asymptomatic high-risk individuals
  - At least two (2) first degree relatives with intracranial aneurysm or subarachnoid hemorrhage
  - Presence of a heritable condition which predisposes to intracranial aneurysm (examples include autosomal dominant polycystic kidney disease and Ehlers-Danlos syndrome type IV)
- **Diagnosis** of suspected aneurysm based on neurologic signs or symptoms (for isolated headache, see **Headache** indication)
- **Management** (including perioperative evaluation) of known (treated or untreated) intracranial aneurysm when associated with new or worsening neurologic symptoms
- **Surveillance** of known aneurysm in the absence of new or worsening symptoms
  - Initial evaluation at 6–12 months following diagnosis, then every 1–2 years
  - Follow-up after treatment with clips, endovascular coil or stenting

### Cerebrovascular accident (CVA or stroke) and transient ischemic attack (TIA)

Diagnosis of signs or symptoms suggestive of acute infarction

**Note:** *CT is preferred for evaluation of acute intracranial hemorrhage. MRI is preferred for evaluation of subacute and chronic hemorrhage.*

Management of CVA when imaging is required to direct treatment

### Congenital or developmental vascular anomaly

Diagnosis or management of known or suspected vascular anomaly

**Examples** include arteriovenous malformation (AVM), cavernous malformation, dural arteriovenous fistula (DAVF).

### Hemorrhage / hematoma

Diagnosis of suspected hemorrhage (intracranial or subarachnoid) or hematoma

Management (including perioperative evaluation) of known hemorrhage (intracranial or subarachnoid) or hematoma, when imaging is required to direct treatment

## References

### Venous thrombosis (including dural venous sinus thrombosis, venous sinus thrombosis, cerebral vein thrombosis)

Diagnosis (requires at least one clinical finding AND one risk factor, OR at least two clinical findings as specified below)

- Clinical findings
  - Abnormal neurological exam
  - Headache
- Risk factors
  - Bechet's disease
  - Coagulopathy (examples: protein S, protein C, antithrombin 3, antiphospholipid antibody)
  - Drugs (including all trans retinoic acid [ATRA])
  - Iron deficiency anemia
  - Known malignancy
  - Meningitis /intracranial infection
  - Oral contraceptive
  - Pregnancy
  - Prior episodes of venous sinus thrombosis
  - Trauma

### Management (including perioperative evaluation) of established venous thrombosis

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# Magnetic Resonance Imaging (MRI) Head/Brain



## CPT Codes

- 70551..... MRI Head, without contrast
- 70552..... MRI Head, with contrast
- 70553..... MRI Head, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- From skull base to vertex, covering the entire calvarium and intracranial contents, including the internal auditory canals
- Scan coverage may vary, depending on the specific clinical indication.

## Technology Considerations

- MRI of the head is preferable to CT in most clinical scenarios, due to its superior contrast resolution and lack of beam-hardening artifact adjacent to the petrous bone (which may limit visualization in portions of the posterior fossa and brainstem on CT).
- Exceptions to the use of brain MRI as the neuroimaging procedure of choice and situations where CT is preferred:
  - initial evaluation of recent craniocerebral trauma
  - evaluation of acute intracranial hemorrhage (parenchymal, subarachnoid, subdural, epidural)
  - evaluation of calcified intracranial lesions
  - osseous assessment of the calvarium, skull base and maxillofacial bones, including detection of calvarial and facial bone fractures

## Common Diagnostic Indications

This section begins with general indications for MRI Head/Brain, followed by Neurologic Signs and Symptoms and Vascular indications.

### General Head/Brain

#### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

#### Acoustic neuroma

Management of known acoustic neuroma when at least one of the following applies:

- Symptoms suggestive of recurrence or progression
- Following conservative treatment or incomplete resection at 6, 18, 30, and 42 months
- Post resection, baseline imaging and follow up at 12 months after surgery

#### Congenital or developmental anomaly

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital anomaly or developmental condition

**Examples** include Chiari malformation, craniosynostosis, macrocephaly, and microcephaly.

#### Dementia

- Initial evaluation to exclude a secondary cause of symptoms
- Evaluation of rapidly progressive symptoms

# Common Diagnostic Indications

## Hearing loss, sensorineural

Diagnosis—detection of acoustic neuroma or other retrocochlear lesion in persons diagnosed with sensorineural hearing loss characterized by any of the following features:

- Idiopathic sudden onset sensorineural loss
- Gradual onset of unilateral or asymmetric hearing loss demonstrated by audiometric testing (15 dB or greater at 2 consecutive frequencies between 0.5 and 3 kHz)
- Hearing loss associated with at least one neurologic sign or symptom known to increase the pretest probability of a retrocochlear lesion

## Horner's syndrome

## Hydrocephalus/ventricular assessment

Diagnosis of suspected increased intracranial pressure or hydrocephalus

Management of ventricular shunt

## Infectious disease

Diagnosis or management (including perioperative evaluation) of infection involving the brain or related structures

## Inflammatory disease

Diagnosis or management of inflammatory disease with CNS involvement

## Movement disorders

Initial evaluation of the following movement disorders, to exclude an underlying structural lesion

- Hemifacial spasm
- Huntington's disease
- Multiple system atrophy (MSA)
- Parkinson's disease with atypical features
- Progressive supranuclear palsy
- Secondary dystonia
- Other focal or lateralizing movement disorder, such as hemiballismus, athetosis or chorea

**Note:** Imaging is generally not indicated for evaluation of typical Parkinson's disease, essential tremor or primary dystonia.

## Multiple sclerosis and other white-matter diseases

Diagnosis of suspected demyelinating disease

Management or surveillance of established disease

## Neurocutaneous disorders

Diagnosis or management (including perioperative evaluation) of CNS lesions associated with a known neurocutaneous disorder

**Examples** include neurofibromatosis, Sturge-Weber syndrome, tuberous sclerosis, von Hippel-Lindau disease

## Papilledema

## Pituitary adenoma

Diagnosis of suspected pituitary adenoma when supported by symptoms and laboratory findings

Management (including perioperative evaluation) of known adenoma

# Common Diagnostic Indications

## Seizure disorder

- Initial evaluation, to rule out a structural brain lesion as a cause of seizure
- Evaluation of seizures increasing in frequency or severity
- Prior to discontinuation of anticonvulsant therapy in patients who have not been previously imaged

## Trauma

Following initial evaluation with CT, when MRI is needed to direct management or inform prognosis

## Trigeminal neuralgia and persistent idiopathic facial pain

Evaluation for a structural lesion or demyelinating disease as a cause of symptoms

## Tumor (benign or malignant)

Diagnosis of suspected tumor when supported by the clinical presentation

Management (including perioperative evaluation) of established tumor when imaging is required to direct treatment

Surveillance of established tumor

## Neurologic Signs & Symptoms

This section contains indications for Bell's palsy, headache, syncope, tinnitus, vertigo/dizziness, and visual disturbance.

Advanced imaging based on nonspecific signs or symptoms is subject to a high level of clinical review.

Appropriateness of imaging depends upon the context in which it is requested. At a minimum, this includes a differential diagnosis and temporal component, along with documented findings on physical exam.

Additional considerations which may be relevant include comorbidities, risk factors, and likelihood of disease based on age and gender.

In general, the utility of structural brain imaging is limited to the following categories, each with a unique set of clinical presentations:

- Identification of a space occupying lesion or other focal abnormality (tumor, CVA)
- Detection of parenchymal abnormalities (atrophy, demyelinating disease, infection, ischemic change)
- Identification of ventricular abnormalities (hydrocephalus)

There are a number of common symptoms or conditions for which the likelihood of an underlying central nervous system process is extremely low. The following indications include specific considerations and requirements which help to determine appropriateness of advanced imaging for these symptoms.

## Bell's palsy (peripheral facial weakness)

Evaluation of hemifacial weakness when either of the following is present:

- Additional neurologic findings suggestive of intracranial pathology
- Symptoms persisting beyond six (6) weeks

# Common Diagnostic Indications

## Headache

### New headache

- When associated with one or more red flag features (see **Table** below); **OR**,
- Headache has not improved or has worsened during a course of physician-directed treatment, and the patient has been reevaluated by a clinician following completion of therapy.

### Recurrent headache

- When associated with at least one red flag feature (see **Table** below) and advanced imaging (CT or MRI) has not been performed to evaluate the headache; **OR**,
- When CT or MRI has been performed to evaluate the headache, and a red flag feature has developed since the prior imaging study; **OR**,
- Headaches are increasing in frequency and/or severity despite at least four (4) weeks of physician-directed treatment and reevaluation by a clinician following completion of therapy.

**Table:** Red flag features for headache

Headache Characteristics	Associated clinical features and conditions
<ul style="list-style-type: none"><li>• Brought on by exertion or valsalva</li><li>• Cluster headache not previously evaluated with MRI</li><li>• Postural/positional</li><li>• Thunderclap or sentinel headache—sudden onset and severe (worst headache of life) reaching maximal intensity within minutes</li></ul>	<ul style="list-style-type: none"><li>• Abnormal neurological exam during the headache episode or in between episodes (<i>Note: photophobia and nausea are not considered abnormalities on neurologic exam</i>)</li><li>• Neck or facial pain (concern for dissection)—see <b>Dissection</b> indication in <b>CTA/MRA Head</b> guideline</li><li>• Neck stiffness and fever—see <b>Infectious disease</b> and <b>Inflammatory disease</b> indications</li><li>• Risk factors for venous thrombosis—see <b>Venous thrombosis</b> indication</li></ul>
Patient Populations	High-risk vascular patient
<ul style="list-style-type: none"><li>• Age over 50 years with new onset of headache</li><li>• Known malignancy</li><li>• Increased genetic risk for intracranial neoplasms (including basal cell nevus syndrome, Gorlin syndrome, Li-Fraumeni syndrome, neurofibromatosis type 1 and type 2, Turcot syndrome, and von Hippel-Lindau syndrome)</li><li>• Immunodeficiency (including HIV)</li></ul>	<ul style="list-style-type: none"><li>• Personal or family history (at least one first-degree relative) of aneurysm, subarachnoid hemorrhage (SAH), or arteriovenous malformation (AVM)</li><li>• Heritable condition associated with intracranial aneurysm formation, including autosomal dominant polycystic kidney disease, Ehlers-Danlos syndrome, Marfan syndrome, neurofibromatosis type 1 and type 2, and other rare conditions (hereditary hemorrhagic telangiectasia, multiple endocrine neoplasia, pseudoxanthoma elasticum)</li></ul>

## Mental status changes, with documented objective evidence from neurologic exam

## Syncope

Evaluation for a structural brain lesion when associated with at least one of following:

- Documented abnormality on neurological examination
- Presence of at least one persistent neurological symptom
- Witnessed or highly suspected seizure activity at the time of the episode

## Tinnitus

Evaluation for vascular pathology, when tinnitus is pulsatile in quality

Evaluation for retrocochlear pathology, when at least one of the following features is present:

- Abrupt or sudden onset
- Associated neurologic findings
- Unilateral or asymmetric symptoms
  - Abnormality on audiogram or auditory brainstem response is required if present longer than six (6) months

# Common Diagnostic Indications

## Vertigo and dizziness

Evaluation for a structural lesion when either of the following is present:

- Abnormal audiogram or auditory brainstem response
- Signs or symptoms suggestive of a CNS lesion

*Note: Vertigo or dizziness which is clearly related to positional change does not require advanced imaging.*

## Visual disturbance

Evaluation for central nervous system pathology when suggested by the ophthalmologic exam

## Vascular indications

This section contains indications for aneurysm, cerebrovascular accident, congenital/developmental vascular anomalies, hemorrhage/hematoma, vasculitis, and venous thrombosis.

### Aneurysm

- **Screening** in asymptomatic high-risk individuals
  - At least two (2) first degree relatives with intracranial aneurysm or subarachnoid hemorrhage
  - Presence of a heritable condition which predisposes to intracranial aneurysm (examples include autosomal dominant polycystic kidney disease and Ehlers-Danlos syndrome type IV)
- **Diagnosis** of suspected aneurysm based on neurologic signs or symptoms (for isolated headache, see **Headache** indication)
- **Management** (including perioperative evaluation) of known (treated or untreated) intracranial aneurysm when associated with new or worsening neurologic symptoms
- **Surveillance** of known aneurysm in the absence of new or worsening symptoms
  - Initial evaluation at 6–12 months following diagnosis, then every 1–2 years
  - Follow-up after treatment with clips, endovascular coil or stenting

### Cerebrovascular accident (CVA or stroke) and transient ischemic attack (TIA)

Diagnosis of signs or symptoms suggestive of acute infarction

*Note: CT is preferred for evaluation of acute intracranial hemorrhage. MRI is preferred for evaluation of subacute and chronic hemorrhage.*

Management of CVA when imaging is required to direct treatment

### Congenital or developmental vascular anomaly

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital vascular anomaly or developmental condition

*Examples include arteriovenous malformation (AVM), cavernous malformation, dural arteriovenous fistula (DAVF).*

### Hemorrhage / hematoma

Diagnosis of suspected hemorrhage (intracranial or subarachnoid) or hematoma

Management (including perioperative evaluation) of known hemorrhage (intracranial or subarachnoid) or hematoma, when imaging is required to direct treatment

### Vasculitis

Evaluation of vasculitis with known or suspected CNS involvement

# Common Diagnostic Indications

## Venous thrombosis (including dural venous sinus thrombosis, venous sinus thrombosis, cerebral vein thrombosis)

Diagnosis (requires at least one clinical finding AND one risk factor, OR at least two clinical findings as specified below)

- Clinical findings
  - Abnormal neurological exam
  - Headache
- Risk factors
  - Bechet's disease
  - Coagulopathy (examples: protein S, protein C, antithrombin 3, antiphospholipid antibody)
  - Drugs (including all trans retinoic acid [ATRA])
  - Iron deficiency anemia
  - Known malignancy
  - Meningitis /intracranial infection
  - Oral contraceptive
  - Pregnancy
  - Prior episodes of venous sinus thrombosis
  - Trauma

## Management (including perioperative evaluation) of established venous thrombosis

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# CT Angiography (CTA) and MR Angiography (MRA) Head: Cerebrovascular



## CPT Codes

- 70496..... Computed tomographic angiography, head, with contrast material(s), including noncontrast images, if performed, and image postprocessing  
70544..... Magnetic resonance angiography, head, without contrast  
70545..... Magnetic resonance angiography, head, with contrast  
70546..... Magnetic resonance angiography, head, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- CTA or MRA may be performed to assess the major intracranial arteries of the anterior and posterior circulations (including the Circle of Willis) as well as the venous structures (major cerebral veins and dural venous sinuses).
- For specific clinical indications, exams may be tailored to the region of interest.
- MRA of the head includes imaging of the entire arteriovenous system of the brain. Separate requests for concurrent imaging of the arteries and the veins in the head are inappropriate.

## Choice of Imaging Study

### Advantages of CTA

- Higher sensitivity for detection of mural calcification
- Absence of in-plane flow phenomenon which can exaggerate the degree of stenosis
- Improved detection of surgical clips and stents
- Shorter scan time, resulting in less motion artifact and better quality images

### Advantages of MRA

- Provides information about the age of blood
- No need for iodinated contrast material
- No exposure to ionizing radiation

## Combination with MRI

- In the majority of clinical situations, appropriateness of a second imaging study is dependent on the results of the lead study. This is particularly true with regard to MRI and MRA of the same anatomic region, as there is considerable overlap in visualizing vascular structures. Therefore, it is prudent to begin with the optimal study for the indication requested.
- When ordered in combination, peer to peer conversation will be required to understand the individual and unique facts that would support the medical necessity of all imaging studies requested.

## Common Diagnostic Indications

### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

# Common Diagnostic Indications

## Aneurysm

- **Screening** in asymptomatic high-risk individuals
  - At least two (2) first degree relatives with intracranial aneurysm or subarachnoid hemorrhage
  - Presence of a heritable condition which predisposes to intracranial aneurysm (examples include autosomal dominant polycystic kidney disease and Ehlers-Danlos syndrome type IV)
- **Diagnosis** of suspected aneurysm based on neurologic signs or symptoms (for isolated headache, see **Headache** indication)
- **Management** (including perioperative evaluation) of known (treated or untreated) intracranial aneurysm when associated with new or worsening neurologic symptoms
- **Surveillance** of known aneurysm in the absence of new or worsening symptoms
  - Initial evaluation at 6–12 months following diagnosis, then every 1–2 years
  - Follow-up after treatment with clips, endovascular coil or stenting

## Cerebrovascular accident (CVA)

- Evaluation for stenosis or occlusion of the intracranial arteries following confirmation of recent non-hemorrhagic CVA on MRI or CT scan
- Evaluation for a vascular etiology following confirmation of a recent hemorrhagic CVA on MRI or CT scan

## Congenital or developmental vascular anomaly

Diagnosis or management (including perioperative or periprocedural management) of a suspected or known cerebrovascular anomaly

*Examples include arteriovenous malformation (AVM), cavernous malformation, dural arteriovenous fistula (DAVF).*

## Dissection

Diagnosis of suspected intracranial artery dissection when suggested by the clinical presentation

Management (including perioperative evaluation) of established dissection

## Headache

Evaluation for a vascular etiology when all of the following requirements have been met:

- MRI or CT criteria for imaging of headache are met
- MRI/CT has not determined the etiology of the headache
- Headache is persistent and undifferentiated

**Note:** Undifferentiated headache refers to those not meeting criteria for a primary headache disorder (tension-type, migraine or cluster).

## Hemorrhage / hematoma

Diagnosis of suspected hemorrhage (intracranial or subarachnoid) or hematoma

Management (including perioperative evaluation) of known hemorrhage (intracranial or subarachnoid) or hematoma, when imaging is required to direct treatment

## Pulsatile tinnitus

- Evaluation for vascular etiology

## Stenosis or occlusion of intracranial arteries

- Diagnosis or management of known or suspected steno-occlusive disease

## Thromboembolic disease of major intracranial arterial systems

# Common Diagnostic Indications

## Trauma

- When vascular involvement is known or suspected

## Trigeminal neuralgia

- Evaluation for vascular etiology

## Tumor (benign or malignant)

- Evaluation of vascular supply to established tumor

## Vascular abnormalities associated with sickle cell disease

## Vasculitis

Diagnosis or management of vasculitis with known or suspected CNS involvement

## Venous thrombosis (including dural venous sinus thrombosis, venous sinus thrombosis, cerebral vein thrombosis)

Diagnosis (requires at least one clinical finding AND one risk factor, OR at least two clinical findings as specified below)

- Clinical findings
  - Abnormal neurological exam
  - Headache
- Risk factors
  - Bechet's disease
  - Coagulopathy (examples: protein S, protein C, antithrombin 3, antiphospholipid antibody)
  - Drugs (including all trans retinoic acid [ATRA])
  - Iron deficiency anemia
  - Known malignancy
  - Meningitis /intracranial infection
  - Oral contraceptive
  - Pregnancy
  - Prior episodes of venous sinus thrombosis
  - Trauma

Management (including perioperative evaluation) of established venous thrombosis

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# Functional Magnetic Resonance Imaging (fMRI) Brain



## CPT Codes

- 70554..... Magnetic resonance imaging, brain, functional MRI; including test selection and administration of repetitive body part movement and/or visual stimulation, not requiring physician or psychologist administration
- 70555..... Magnetic resonance imaging, brain, functional MRI; including test selection and administration of repetitive body part movement and/or visual stimulation, requiring physician or psychologist administration of entire neurofunctional testing

## Standard Anatomic Coverage

- From the skull base to vertex, covering the intra-cranial contents
- Scan coverage may vary, depending on the specific clinical indication

## Technology Considerations

- Functional MRI of the brain may be used to localize eloquent areas in the brain, prior to resection of neoplasm or medically intractable epileptogenic foci.
- Studies have shown excellent agreement in language localization, when comparing functional brain MRI with the Wada test and direct electrical stimulation.
- Advantages of functional brain MRI over a Wada test include the non-invasive technique (not requiring catheter placement and contrast injection), lack of ionizing radiation, shorter time-requirement, lower cost and quicker post-procedural recovery. Additionally, the Wada test is considered limited in right hemisphere dominance.
- Advantages of functional brain MRI over intraoperative electrocortical stimulation include its non-invasive technique and more extensive anatomic brain mapping. Direct electrical stimulation is an invasive procedure, which usually evaluates only one hemisphere (limiting assessment for partial or bilateral language dominance) and usually identifies only eloquent brain regions on the surface of the brain.
- Functional MRI may successfully map primary brain activities related to motor, sensory and language functions. Examples of tasks which may be used include sentence completion (to map language) and bilateral hand squeeze task (for sensory motor mapping).

## Common Diagnostic Indications

### Brain tumors

- Preoperative neurosurgical planning, as a replacement for a Wada test or direct electrical stimulation mapping

### Seizures refractory to medical treatment

- Preoperative neurosurgical planning, as a replacement for a Wada test or direct electrical stimulation mapping

# Positron Emission Tomography (PET) Brain Imaging



## CPT Codes

78608..... PET brain, metabolic evaluation

78609..... PET brain, perfusion evaluation

## Commonly Used Radiopharmaceuticals

- 2-(fluorine-18) fluoro-2-deoxy-d-glucose (FDG) Scan coverage may vary, depending on the specific clinical indication

## Common Diagnostic Indications

### Brain tumor

- Diagnosis or staging
- Differentiation of post treatment scarring from residual or recurrent disease

### Frontotemporal lobe dementia and Alzheimer's disease

A one-time FDG-PET scan for differentiating between frontotemporal dementia and Alzheimer's disease is medically necessary and appropriate, provided that all of the following conditions are met:

- A recent diagnosis of frontotemporal dementia or Alzheimer's disease has been made by a physician experienced in the evaluation of dementia.
- There is documentation of cognitive decline of at least six (6) months duration.
- A comprehensive clinical evaluation has been performed, including all of the following:
  - History and physical examination, including an assessment of activities of daily living from a well-acquainted informant other than the patient.
  - Cognitive scales or neuropsychological testing
  - Laboratory testing to evaluate for metabolic causes of cognitive impairment
  - Structural imaging of the brain (CT or MRI) to identify a structural cause for cognitive impairment
  - The evaluation has not clearly identified a specific neurodegenerative disease or other cause for the clinical symptoms.
  - Results of the PET scan will help clarify the diagnosis in order to guide future treatment.
  - A brain SPECT has not been obtained for the same indication.

**Note:** Documentation of this evaluation, including results of all testing, and a current list of medications are required.

### Refractory seizures / epilepsy

- Pre-surgical evaluation to identify a focus of seizure activity in patients who have failed conventional medical therapy

# Computed Tomography (CT) Orbit, Sella Turcica, Posterior Fossa, Temporal Bone, including Mastoids



## CPT Codes

- 70480..... CT of orbit, sella or posterior fossa and outer, middle or inner ear, without contrast  
70481..... CT of orbit, sella or posterior fossa and outer, middle or inner ear, with contrast  
70482..... CT of orbit, sella or posterior fossa and outer, middle or inner ear, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Anatomic coverage and protocol specifications will vary, depending on the clinical indication. Anatomic evaluation includes the internal auditory canals (IACs), posterior fossa, sella turcica, orbits and temporal bone, with the mastoid air cells.
- Targeted evaluation, such as CT of the temporal bones, involves collimated views through the region of interest, often in two imaging planes: axial images (petrous bones through mastoid tips) and coronal views (temporomandibular joints through temporal bones).

## Technology Considerations

- CT is often the preferred study for suspected fracture or follow-up of a known fracture, foreign body detection, assessment of calcified lesions and temporal bone evaluation.
- With capability for high-resolution osseous imaging, CT can provide detailed anatomic depiction of the temporal bone anatomy, including the middle and inner ear structures.
- MRI (unless contraindicated) is usually preferred over CT for evaluation of the sella turcica, internal auditory canal regions and visual pathways, as well as for most soft tissue tumor evaluation.
- Bony changes from a sellar, para-sellar or orbital mass or infectious process are usually well demonstrated by CT.

## Common Diagnostic Indications

This section begins with general indications, followed by orbital and otic indications.

### General indications

#### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

#### Congenital or developmental anomaly

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital anomaly or developmental condition of the orbit, temporal bone, sella turcica or posterior fossa (see Standard Anatomic Coverage for detail)

#### Infectious disease

Diagnosis or management (including perioperative evaluation) of infection involving the orbit, temporal bone, sella turcica or posterior fossa

#### Inflammatory disease

Diagnosis or management of inflammatory disease known to involve the orbit, temporal bone, sella turcica or posterior fossa

#### Localized facial pain – when persistent and unexplained

# Common Diagnostic Indications

## Osseous lesions

*Examples include fibrous dysplasia, Paget's disease and otosclerosis*

## Trauma to the orbit, temporal bone, or skull base

## Tumor (benign or malignant)

Diagnosis or management (including perioperative evaluation) of benign or malignant tumor of the orbit, temporal bone, sella turcica or posterior fossa

## Orbital indications

### Diagnosis or management of any of the following:

- Dysconjugate gaze
- Exophthalmos (or proptosis)
- Extraocular muscle weakness
- Nystagmus
- Optic neuritis
- Orbital pseudotumor
- Papilledema
- Strabismus
- Thyroid ophthalmopathy
- Visual field defect

## Foreign body in the orbit

- Following non-diagnostic X-ray

## Visual disturbance

Evaluation for orbital or optic nerve pathology when suggested by the ophthalmologic exam

## Otic indications

### Cholesteatoma

### Cochlear implant

Preoperative and post-operative evaluation

### Conductive hearing loss

### Sensorineural hearing loss\*\*

Diagnosis—detection of acoustic neuroma or other retrocochlear pathology in persons diagnosed with sensorineural hearing loss characterized by either of the following features:

- Gradual onset of unilateral or asymmetric hearing loss demonstrated by audiometric testing (15 dB or greater at 2 consecutive frequencies between 0.5 and 3 kHz)
- Hearing loss associated with at least one neurologic sign or symptom known to increase the pretest probability of a retrocochlear lesion

**\*\*requires contraindication to MRI**

# Common Diagnostic Indications

## Tinnitus\*\*

Evaluation for vascular pathology when tinnitus is pulsatile in quality

Evaluation for retrocochlear pathology when at least one of following features is present:

- Abrupt or sudden onset
- Associated neurologic findings
- Unilateral or asymmetric symptoms
  - Abnormality on audiogram or auditory brainstem response is required if present longer than six (6) months.

**\*\*requires contraindication to MRI**

## Vertigo and dizziness

- Evaluation of signs or symptoms suggestive of a CNS lesion
- Symptoms associated with abnormal audiogram or auditory brainstem response

**Note:** Vertigo or dizziness which is clearly related to positional change does not require advanced imaging.

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# Magnetic Resonance Imaging (MRI) Orbit, Face & Neck (Soft Tissues)



## CPT Codes

- 70540..... MRI orbit, face and neck, without contrast
- 70542..... MRI orbit, face and neck, with contrast
- 70543..... MRI orbit, face and neck, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage is dependent on the specific anatomic area of clinical interest, and may include the following:
  - Facial structures
  - Larynx and subglottic regions
  - Nasopharynx, oropharynx and hypopharynx
  - Neck soft tissues, surrounding the airway and glands
  - Optic nerve
  - Orbit
  - Salivary glands
  - Sinuses
  - Thyroid and parathyroid gland

## Technology Considerations

- MRI is usually preferred over CT for evaluation of the sella turcica and visual pathways.
- CT is generally the modality of choice for traumatic injury, calcified lesions, localized infection (for example, orbital extension of an adjacent complicated sinusitis), and foreign body evaluation following initial radiographic evaluation for a radiopaque foreign body.
- CT is preferred for visualization of soft tissue structures in the neck.
- MRI of the orbit, face and neck is not indicated for imaging the internal auditory canals (see MRI brain, CPT codes 70551–70553).

## Common Diagnostic Indications

This section begins with general indications, followed by nasal, neck, and orbital indications.

### General indications

#### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

#### Congenital anomalies

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital anomaly of the orbit, maxillofacial area, or soft tissue structures of the neck (see Standard Anatomic Coverage for detail)

#### Horner's syndrome

#### Infectious disease (excluding sinusitis)

Diagnosis or management (including perioperative evaluation) of infection involving the orbit, maxillofacial area, or soft tissue of the neck

**Note:** For sinus infection, see CT Paranasal Sinus and Maxillofacial Area

# Common Diagnostic Indications

## Inflammatory disease

Diagnosis or management of inflammatory disease known to involve the orbit, maxillofacial area, or soft tissue structures of the neck

*Example includes Wegener's granulomatosis (granulomatosis with polyangiitis)*

## Osteonecrosis of the jaw

Evaluation following non-diagnostic Panorex/radiographs

## Thyroid nodule or thyromegaly (goiter)

- Following thyroid ultrasound or thyroid scintigraphy
- When associated with mass effect on the upper airway or esophagus
- For preoperative evaluation

## Trauma to facial structures or soft tissues of the neck

## Tumor (primary neoplasm or metastatic disease)

Diagnosis of suspected malignancy based on exam findings or testing abnormalities

Management (including perioperative evaluation) of known malignancy when imaging is required to direct treatment

**Exclusion:** Advanced imaging is not indicated for surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy.

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## Nasal indications

### Evaluation of any of the following:

- Anosmia
- Recurrent epistaxis
- Nasal airway obstruction or polyposis refractory to medical therapy

## Neck indications

### Hoarseness, dysphonia or vocal cord weakness/paralysis

Initial evaluation when at least one of the following applies:

- Following laryngoscopy, when findings suggest recurrent laryngeal nerve dysfunction or identify a suspicious lesion
- Symptoms persisting longer than one month which are unexplained by laryngoscopy
- Presence of at least one of the following high risk features:
  - Tobacco use
  - Alcohol abuse
  - Hemoptysis
  - History of radiation therapy
  - Known head and neck malignancy

## Laryngeal edema

## Lymphadenopathy

- When persistent and unexplained

# Common Diagnostic Indications

## Neck mass

- Evaluation of a palpable neck mass
- Follow up of a non-palpable neck mass identified on a prior imaging study
- Management (including perioperative evaluation) of known cystic neck mass or other benign tumor

## Parathyroid adenoma

- Diagnosis following abnormal parathyroid ultrasound or scintigraphy
- Management following failed parathyroidectomy for localization of residual parathyroid tissue

## Stridor / Tracheal stenosis / Upper airway obstruction

- For subacute and chronic stridor, soft tissue radiographs and ENT evaluation are required.

## Orbital indications

### Diagnosis or management of any of the following:

- Dysconjugate gaze
- Exophthalmos (or proptosis)
- Extraocular muscle weakness
- Nystagmus
- Optic neuritis
- Orbital pseudotumor
- Papilledema
- Strabismus
- Thyroid ophthalmopathy
- Visual field defect

## Visual disturbance

Evaluation for orbital or optic nerve pathology when suggested by the ophthalmologic exam

## References

1. American Academy of Otolaryngology — Head and Neck Surgery Foundation. Choosing Wisely: Five Things Physicians and Patients Should Question. ABIM Foundation; February 21, 2013. Available at [www.choosingwisely.org](http://www.choosingwisely.org).
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# Computed Tomography (CT) Paranasal Sinus & Maxillofacial Area



## CPT Codes

- 70486..... CT of maxillofacial area, without contrast  
70487..... CT of maxillofacial area, with contrast  
70488..... CT of maxillofacial area, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Includes the sinuses, facial structures and maxillary regions. Individual scan coverage depends on the specific clinical request, but generally includes images through the entire frontal, ethmoid, maxillary and sphenoid sinuses. Coverage may be extended to include the mandible and temporomandibular joint (TMJ) in select cases and depending on the clinical indication. CT sections may be obtained in one or two (usually coronal and axial) planes.

## Common Diagnostic Indications

### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

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### Congenital anomaly

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital maxillofacial anomaly when imaging is required to direct treatment

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### Infectious disease

Diagnosis or management (including perioperative evaluation) of the following:

- Fungal or other complex sinus infections
- Osteomyelitis of the facial bones

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### Inflammatory disease

Diagnosis or management of inflammatory disease known to involve the maxillofacial region

*Examples* include Wegener's granulomatosis (granulomatosis with polyangiitis)

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### Osteonecrosis of the jaw

Evaluation following non-diagnostic Panorex/radiographs

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### Sinus and nasal indications

Diagnosis or management (including perioperative evaluation) of the following:

- Anosmia
- Foreign body in the maxillofacial region
- Mucocoele of paranasal sinuses
- Nasal airway obstruction refractory to medical therapy
- Polyposis
- Recurrent epistaxis

# Common Diagnostic Indications

## Sinusitis / rhinosinusitis

### Acute, Uncomplicated Sinusitis / Rhinosinusitis

- Defined as symptoms that last for less than 4 weeks. Common symptoms include purulent rhinorrhea, postnasal drainage, anosmia, nasal congestion, facial pain, headache, fever, cough, purulent discharge and/or findings of an upper respiratory tract infection.
- No radiographic imaging is usually necessary for immunocompetent patients with acute rhinosinusitis, unless a complication or alternative diagnosis is suspected that requires imaging.
- CT may be performed if symptoms persist beyond 3 – 4 weeks of adequate treatment, which may include antibiotics, nasal steroids and/or decongestants. Under these circumstances, a complication of acute sinusitis/rhinosinusitis or an alternative diagnosis may warrant CT imaging of the paranasal sinuses.

### Acute Recurrent Sinusitis / Rhinosinusitis

- Defined as 3 or more separate episodes of sinusitis during the past year
- Imaging used to corroborate the diagnosis and/or investigate for underlying causes of acute recurrent sinusitis.
- Clinicians should assess patients with recurrent acute sinusitis / rhinosinusitis for factors that modify management, such as allergic rhinitis, cystic fibrosis, immunocompromised states, ciliary dyskinesia and anatomic variations.

### Chronic Sinusitis / Rhinosinusitis

- Defined as signs and symptoms of sinusitis that last for 12 weeks or longer
- Imaging used to corroborate the diagnosis and/or investigate for underlying causes of chronic sinusitis.
- Clinicians should assess patients with chronic sinusitis / rhinosinusitis for factors that modify management, such as allergic rhinitis, cystic fibrosis, immunocompromised states, ciliary dyskinesia and anatomic variations.

## Peri-Orbital Swelling Associated with Sinus Infection

## Barosinusitis / Headache Refractory to Antibiotics and Responding only to Decongestants / Oral Steroids

## Temporomandibular disease (TMD)

Diagnosis of a temporomandibular joint (TMJ) source of TMD when at least one of the following applies:

- Panorex is inconclusive or not available
- Panorex findings require further characterization
- Panorex is normal but high clinical suspicion for TMJ pathology remains, and the results will change management (including perioperative evaluation)

**Note:** Temporomandibular disease is a collective term, which includes disorders of both the masticatory muscles and the TMJ. CT is generally not indicated when a muscular etiology for TMD is suspected. Most TMJ pathology can be evaluated with a Panorex radiograph.

## Trauma to the facial bones

## Tumor or mass lesion in the sinus or nasal region

Diagnosis or management (including perioperative evaluation) of benign or malignant tumors

## References

1. American Academy of Orofacial Pain. Orofacial Pain: Guidelines for Assessment, Diagnosis, and Management. De Leeuw R, Klasser GD, eds. Chicago: Quintessence Publishing Co., Inc.; 2013.
2. American Association of Oral and Maxillofacial Surgeons (AAOMS). Clinical Paper: Temporomandibular Disorders. Rosemont, IL: AAOMS; 2013.
3. Arce K, Assael LA, Weissman JL, Markiewicz MR. Imaging findings in bisphosphonate-related osteonecrosis of jaws. *J Oral Maxillofac Surg*. 2009;67(5 Suppl):75-84.
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6. Setzen G, Ferguson BJ, Han JK, et al. Clinical consensus statement: appropriate use of computed tomography for paranasal sinus disease. *Otolaryngol Head Neck Surg*. 2012;147(5):808-816.

# Magnetic Resonance Imaging (MRI) Temporomandibular Joint (TMJ)



## CPT Codes

70336..... MRI of the Temporomandibular Joint(s)

## Standard Anatomic Coverage

- Bilateral study, including open and closed mouth views, often performed with surface coils
- Images may be obtained in axial, (oblique) sagittal and (oblique) coronal planes.

## Common Diagnostic Indications

### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

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### Arthropathy of the temporomandibular joints

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### Frozen jaw

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### Temporomandibular joint dysfunction

Evaluation of persistent symptoms when all of the following requirements are met:

- X-ray or Panorex has not provided sufficient information to guide treatment.
- Intervention is being considered.
- Symptoms have not improved with conservative treatment, including NSAIDs or acetaminophen, a short-term trial of soft diet and proper chewing techniques, and an oral appliance (such as a bite block).

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### Trauma to the temporomandibular joints

- Evaluation of meniscal position and integrity

**Note:** Conventional radiographs, Panorex views or CT of the TMJ are preferred for initial evaluation of trauma.

# Computed Tomography (CT) Neck for Soft Tissue Evaluation



## CPT Codes

- 70490..... CT, soft tissue neck, without contrast
- 70491..... CT, soft tissue neck, with contrast
- 70492..... CT, soft tissue neck, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Axial images from the skull base to the clavicles

## Technology Considerations

- CT is generally the modality of choice for the following indications: detection of sialolithiasis (salivary gland calculi); following trauma to the soft tissues of the neck; and during foreign body evaluation, after initial radiographic assessment for a radiopaque foreign body.

## Common Diagnostic Indications

### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

### Congenital anomaly

Diagnosis or management (including perioperative evaluation) of a suspected or known congenital or developmental anomaly of the soft tissue structures of the neck

### Foreign body in the upper aero-digestive tract or surrounding neck tissue

- Following non-diagnostic neck radiograph

### Hoarseness, dysphonia, or vocal cord weakness/paralysis

Initial evaluation when at least one of the following applies:

- Following laryngoscopy, when findings suggest recurrent laryngeal nerve dysfunction or identify a suspicious lesion
- Symptoms persisting longer than one month which are unexplained by laryngoscopy
- Presence of at least one of the following high risk features:
  - Tobacco use
  - Alcohol abuse
  - Hemoptysis
  - History of radiation therapy
  - Known head and neck malignancy

### Horner's syndrome

### Infectious disease

Diagnosis or management (including perioperative evaluation) of infection involving soft tissue structures in the neck

### Inflammatory disease

Diagnosis or management of inflammatory disease involving soft tissue structures in the neck

# Common Diagnostic Indications

## Laryngeal edema

## Lymphadenopathy

- When persistent and unexplained

## Neck mass

- Evaluation of a palpable neck mass
- Follow up of a non-palpable neck mass identified on a prior imaging study
- Management (including perioperative evaluation) of known cystic neck mass or other benign tumor

## Osteonecrosis of the jaw

Evaluation following non-diagnostic X-ray or Panorex

## Parathyroid adenoma

- Evaluation of suspected adenoma following abnormal parathyroid ultrasound or scintigraphy
- Localization of residual parathyroid tissue following failed parathyroidectomy
- Preoperative planning in patients with aberrant anatomy

## Salivary / parotid gland ductal calculi

## Stridor

- For subacute and chronic stridor, soft tissue radiographs and ENT evaluation are required.

## Thyroid nodule or thyromegaly (goiter)

- Following thyroid ultrasound or thyroid scintigraphy
- When associated with mass effect on the upper airway or esophagus
- For preoperative evaluation

## Tracheal stenosis or upper airway obstruction

## Traumatic injury to soft tissues of the neck

## Tumor (primary neoplasm or metastatic disease)

Diagnosis of suspected malignancy based on exam findings or testing abnormalities

Management (including perioperative evaluation) of known malignancy when imaging is required to direct treatment

**Exclusion:** Advanced imaging is not indicated for surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy.

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## References

1. American Academy of Otolaryngology – Head & Neck Surgery Foundation. Choosing Wisely: CT scans or MRIs for hoarseness. Philadelphia, PA: ABIM Foundation; February 21, 2013. Available at [www.choosingwisely.org](http://www.choosingwisely.org). Accessed August 15, 2016
2. American Society of Hematology. Choosing Wisely: Limit surveillance CT scans following treatment for lymphoma. Philadelphia, PA: ABIM Foundation; December 4, 2013 and December 3, 2014. Available at [www.choosingwisely.org](http://www.choosingwisely.org). Accessed August 15, 2016
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4. Johnson NA, Tublin ME, Ogilvie JB. Parathyroid imaging: technique and role in the preoperative evaluation of primary hyperparathyroidism. *AJR Am J Roentgenol.* 2007 Jun;188(6):1706-1715.
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# CT Angiography (CTA) and MR Angiography (MRA) Neck



## CPT Codes

- 70498..... CTA, neck, with contrast material(s), including noncontrast images, if performed, and image post-processing  
70547..... MRA, neck, without contrast  
70548..... MRA, neck, with contrast  
70549..... MRA, neck, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- CTA and MRA of the neck involve image acquisitions from the aortic arch to the skull base, to visualize major vessels including the extracranial carotid arteries and vertebral arteries. The major venous structures may also be interrogated with CT and MR angiographic techniques.

## Choice of Imaging Study

- Duplex Doppler ultrasound is a first line imaging study for most carotid indications.

### Advantages of CTA

- Higher sensitivity for detection of mural calcification
- Absence of in-plane flow phenomenon which can exaggerate the degree of stenosis
- Improved detection of surgical clips and stents
- Shorter scan time, resulting in less motion artifact and better quality images

### Advantages of MRA

- Provides information about the age of blood
- No need for iodinated contrast material
- No exposure to ionizing radiation

## Common Diagnostic Indications

### Abnormal imaging findings

Follow up of abnormal or indeterminate findings on a prior imaging study when required to direct treatment

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### Aneurysm or dissection of carotid or vertebral arteries

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### Carotid stenosis or occlusion

Diagnosis or management of known or suspected steno-occlusive disease

- Following abnormal or equivocal duplex Doppler study, unless the diagnosis is supported by clinical exam findings

*Note: Screening for carotid disease utilizing advanced imaging is not appropriate.*

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### Congenital or developmental vascular anomaly

Diagnosis or management (including perioperative evaluation) of a vascular anomaly of the carotid or vertebral arteries including arteriovenous malformation (AVM)

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### Horner's syndrome

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### Intramural hematoma

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### Post-operative or post-procedure evaluation

# Common Diagnostic Indications

## Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

### Exclusions:

- Screening for carotid disease using advanced imaging in preparation for coronary artery bypass graft (CABG) surgery is not considered appropriate.
- MRV (or CTV) in preparation for either a neurosurgical or percutaneous procedure to treat multiple sclerosis is not considered appropriate

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## Thromboembolic disease of major extracranial arterial and/or venous systems

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## Traumatic vascular injury to the extracranial carotid and vertebral arteries

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## Vasculopathy (including fibromuscular dysplasia and vasculitis)

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## Venous thrombosis or compression

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## Vertebobasilar stenosis or occlusion

## References

1. American Academy of Family Physicians. Choosing Wisely: Ten Things Physicians and Patients Should Question. ABIM Foundation; Updated February 21, 2013. Available at [www.choosingwisely.org](http://www.choosingwisely.org).
2. LeFevre ML, U.S. Preventive Services Task Force. Screening for asymptomatic carotid artery stenosis: U.S. Preventive Services Task Force recommendation. *Ann Intern Med.* 2014;161(5):356-362.
3. Wolff T, Guirguis-Blake J, Miller T, Gillespie M, Harris R. Screening for carotid artery stenosis: an update of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med.* 2007 Dec 18;147(12):860-870.

# Computed Tomography (CT) Chest



## CPT Codes

- 71250..... Chest CT without contrast
- 71260..... Chest CT with contrast
- 71270..... Chest CT without contrast, followed by re-imaging with contrast
- G0297..... Low dose CT scan (LDCT) for lung cancer screening

## Standard Anatomic Coverage

- Lung apices through costophrenic sulci
- Scan coverage may vary, depending on the specific clinical indication.

## Technology Considerations

- In the majority of clinical situations, chest radiographs should be performed prior to advanced imaging with CT, preferably within 30 days of the chest CT exam request.
- CT chest is not appropriate for cardiac and coronary artery imaging. Please see guidelines for cardiac CT and CCTA.
- When the purpose of the study is imaging of the heart, including the coronary arteries, do not request both a chest CT and a dedicated cardiac/coronary artery CT.

## Common Diagnostic Indications

Indications for chest CT are contained in general chest, pulmonary, mediastinal and hilar, pleural, chest wall and diaphragm.

### General Chest

#### Broncho-pleural fistula

#### Congenital thoracic anomalies

#### Cough persisting three (3) or more weeks with normal chest X-ray

- Unresponsive to medical treatment and/or after evaluation for other causes (e.g., post-nasal drainage, asthma, gastroesophageal reflux disease and medication effects); **OR**
- Cough in immunosuppressed (e.g. HIV, after organ or bone marrow transplant, on infliximab or other tumor necrosis factor antagonists individual (In these individuals, a higher level of suspicion is warranted); **OR**
- Other etiologies for chronic cough which include, but are not limited to:
  - Smoking
  - Chronic bronchitis
  - Cough-inducing medications (e.g., ACE inhibitors)
  - Exposure to an environmental irritant
  - Respiratory infection
  - Neoplasm

#### Fever of unknown origin

- Lasting more than three weeks with exceptions for immunocompromised patients
- Following standard work-up to localize the source

#### Hemoptysis

- Following non-diagnostic chest radiographs

#### Horner's syndrome

# Common Diagnostic Indications

## Infectious and inflammatory processes when not otherwise specified

- For initial evaluation and surveillance

**Note:** This indication is for evaluation of infectious and inflammatory processes not specifically referenced elsewhere in this guideline (e.g., pneumonia complications, mediastinitis, sternal infection, lung abscess and empyema).

## Lung abscess

## Lung cancer screening

- For annual screening of lung cancer (**all of the following**)
  - Patient has no signs or symptoms suggestive of underlying cancer
  - Patient's age is equal to or greater than 55 and less than or equal to 80
  - There is at least a 30 pack-year history of cigarette smoking (and if former smoker, quit date is within previous 15 years)
  - Patient does not have a health problem that substantially limits life expectancy or the ability/willingness to undergo an intervention with curative intent

**Note:** One (1) pack-year of smoking equals smoking one pack (20 cigarettes) per day for one year or 7300 cigarettes annually. CT should be performed using a low-dose technique (LDCT).

## Mediastinitis

- Includes:
  - Mediastinal infection/abscess
  - Fibrosing mediastinitis

## Paraneoplastic syndrome with unknown primary

**Note:** This includes Lambert Eaton syndrome, myasthenia gravis, paraneoplastic cerebellar degeneration, opsoclonus-myoclonus ataxia, positive paraneoplastic panel, anti-GAD antibody syndrome (stiff-person's syndrome), voltage-gated K<sup>+</sup> channelopathy (epilepsy syndrome), limbic encephalitis (rapidly progressive dementia syndromes with abnormal lumbar puncture), dermatomyositis/polymyositis, and anti-NMDA

## Persistent pneumonia

- Repeat radiographs show no improvement following at least four (4) weeks of medical treatment
- Recurrent pneumonia in the same location within six months
- Patient is immunosuppressed

## Pneumonia, complications

(any one of the following)

- Following non-diagnostic chest radiograph
- Immunosuppressed patient

**Note:** Complications of the mediastinum, lung parenchyma, or pleura include abscess, bronchopleural fistula, complicated or loculated parapneumonic effusion, empyema, necrotic pneumonia, and purulent pericarditis

## Positive sputum cytology for malignancy

## Post-operative or post-procedure evaluation

## Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

## Pulmonary embolism

- For moderate or high clinical suspicion of pulmonary embolism or follow-up when recurrent thromboembolism is a concern in patients on adequate medical therapy

# Common Diagnostic Indications

## Sarcoidosis

- Initial evaluation and periodic follow-up

## Sternal infection and dehiscence

**Note:** Rare complication of cardiothoracic surgery

## Structural abnormalities on chest X-ray, which require further clarification with CT

## Trauma

- Injury involving the chest wall, cardiomedastinal structures and/or lungs

## Tumor (primary neoplasm or metastatic disease)

### Management of biopsy-proven malignancy

- For renal cell carcinoma (where biopsy is contraindicated) when surgical resection is planned, ultrasound or CT findings highly suspicious for cancer may constitute documentation of malignancy

### Exclusions—advanced imaging is not indicated in the following scenarios:

- Breast cancer
  - Staging of low risk breast cancer (stage 2B or less) in the absence of signs or symptoms suggestive of metastatic disease
  - Surveillance of breast cancer in the absence of signs or symptoms of recurrent disease
- Colon cancer
  - Surveillance imaging of colon cancer in remission, **unless one of the following high risk features is present:**
    - Lymphatic or venous invasion
    - Lymph node involvement
    - Perineural invasion
    - Poorly differentiated tumor
    - T4 tumor
    - Associated with bowel obstruction
    - Close, indeterminate or positive margins
    - Fewer than 12 nodes examined at surgery
    - Localized perforation
- Gynecologic malignancies
  - Surveillance imaging in patients with previously treated gynecologic malignancies including ovarian, endometrial, cervical, vaginal or vulvar cancer (**Note:** This exclusion does not apply to sarcoma or other rare histologies not typically associated with these structures).
- Non-Hodgkin's lymphoma
  - Surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy
- Prostate cancer
  - Staging of low risk prostate cancer: Gleason score equal to six (6), PSA less than 10 ng/mL, and stage T1 or T2
  - Follow up or surveillance of prostate cancer following completion of therapy in the absence of a rising PSA

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## Unexplained weight loss – significant weight loss exceeding 10% of desirable body weight, over a short time interval (6 months or less), after initial evaluation for other causes

# Common Diagnostic Indications

## Pulmonary

### Asbestos-related benign and malignant lesions, involving the lungs and pleura

- Pleural plaques
- Interstitial lung disease
- Malignant mesothelioma
- Pleural effusion
- Lung cancer

### Bronchiectasis

- Consider high resolution chest CT (HRCT) technique

### Interstitial lung disease / pulmonary fibrosis

- Consider high resolution chest CT (HRCT) technique

### Occupational lung disease (pneumoconioses)

- Diagnosis and management of any one of the following:
  - Silicosis
  - Coal workers pneumoconiosis
  - Progressive massive fibrosis
  - Hard metal pneumoconiosis
  - Talcosis
  - Caplan's syndrome (in patients with Rheumatoid Arthritis)

### Pulmonary mass or suspicious parenchymal abnormality on recent chest X-ray or other imaging exam

# Common Diagnostic Indications

## Pulmonary nodule(s) – without a known primary malignancy

**Note:** A nodule by definition is a rounded or regular opacity measuring up to 3 cm in diameter. Nodules can be solid (soft tissue attenuation), subsolid (ground glass attenuation) or part solid (mixed solid and ground glass). Nodules with central calcifications such as granulomas are benign and do not require further imaging.

### Solid pulmonary nodules

- For patients less than 35 years of age, a single follow-up exam in 6–12 months may be considered.

**Note:** Primary lung cancer is rare in patients less than 35 years of age. The risks associated with radiation are greater in younger patients; therefore, follow-up imaging for small incidental pulmonary nodules should be avoided.

- For patients aged 35 years or older, see **Table 1** below.
  - High-risk patients have at least **one of the following:**
    - Smoking history
    - First degree relative with lung cancer
    - Significant exposure to asbestos, uranium and/or radon, typically through high-risk profession (for example, shipyard/construction workers)

**Table 1: Appropriate follow-up of solid, stable nodules in patients 35 years or older**

Nodule size (mm)	Follow-up intervals (months)	
	Low-risk patient	High-risk patient
Less than or equal to 4	none	12
Greater than 4 and less than or equal to 6	12	6–12 and 18–24
Greater than 6 and less than or equal to 8	6–12 and 18–24	3–6, 9–12, and 24
Greater than 8	3, 9, and 24 unless biopsy or PET CT	

### Subsolid, groundglass, or part solid pulmonary nodules

- When nodule size is 5 mm or less, follow up at 2 years and 4 years
- When nodule size is greater than 5 mm, follow up in 3 months, then annually for 3 years unless diagnostic biopsy has been performed

## Pulmonary sequestration

### Mediastinal and Hilar

#### Hilar enlargement on recent chest X-ray

#### Hoarseness, dysphonia or vocal cord weakness/paralysis

Initial evaluation when **at least one** of the following applies:

- Following laryngoscopy, when findings suggest recurrent laryngeal nerve dysfunction or identify a suspicious lesion
- Symptoms persisting longer than one month which are unexplained by laryngoscopy
- Presence of **at least one** of the following high-risk features:
  - Tobacco use
  - Alcohol abuse
  - Hemoptysis
  - History of radiation therapy
  - Known head and neck malignancy

#### Known hilar and/or mediastinal lymphadenopathy / mass

- Periodic follow-up

#### Mediastinal widening on recent chest X-ray

# Common Diagnostic Indications

## Penetrating atherosclerotic aortic ulcer

## Superior vena cava (SVC) syndrome

## Thoracic aorta evaluation

### Acute aortic syndrome (any one of the following)

- Diagnosis and management
- Periodic surveillance in patients with established acute aortic syndrome undergoing medical management

**Note:** *Initial diagnosis of acute aortic syndrome is considered a medical emergency. This indication includes aortic rupture, dissection, pseudoaneurysm, mural hematoma, and penetrating ulcer mediastinal hematoma.*

### Non-acute thoracic aorta (any one of the following)

- In patients with suspected thoracic aortic aneurysm
- In patients with confirmed thoracic aortic aneurysm with new or worsening signs/symptoms
- For ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm who have not undergone imaging of the thoracic aorta within the preceding six months
- In patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning)
- For ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year
- In patients with confirmed aortic dissection or thoracic aortic aneurysm who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding six months
- In patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone CTA or MRA of the chest within the preceding 60 days

**Note:** See acute aortic syndrome (section above) for complications of aneurysm including aortic dissection.

## Thymoma

- Note that approximately 15% of patients with myasthenia gravis will have a thymoma

## Tracheobronchial lesion evaluation

## Traumatic aortic injury

## Vasculitis of the thoracic aorta or branch vessel

## Pleural, Chest Wall and Diaphragm

### Abnormal pleural fluid collection, including effusion, hemothorax, empyema and chylothorax

**Note:** Ultrasound should be considered as the initial imaging modality and prior to a diagnostic or therapeutic pleural tap.

## Chest wall mass

## Diaphragmatic hernia

## Pleural mass

## Pneumothorax – unexplained or recurrent

## Thoracic outlet syndrome

## Unexplained diaphragmatic elevation or immobility

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1. Akira M, Yamamoto S, Inoue Y, Sakatani M. High-resolution CT of asbestosis and idiopathic pulmonary fibrosis. *AJR Am J Roentgenol.* 2003;181(1):163-169.
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# CT Angiography (CTA) Chest (Non-Coronary)

## CPT Codes

71275..... CTA of chest (non-coronary), with contrast material(s), including non-contrast images, if performed, and image post-processing

## Standard Anatomic Coverage

- Scan coverage varies depending on the clinical indication. This exam does not include cardiac and coronary artery indications.
- Chest CTA may be used for anatomic depiction from the pulmonary apices through the costophrenic sulci.

## Technology Considerations

### Advantages of CTA:

- Rapidly acquired exam, with excellent anatomic detail afforded by most multidetector CT scanners

### Disadvantages of CTA:

- Potential complications from use of intravascular iodinated contrast administration

### Biosafety Issues:

- Ordering and imaging providers are responsible for considering safety issues prior to the CTA exam. One of the most significant considerations is the requirement for intravascular iodinated contrast material, which may have an adverse effect on patients with a history of documented allergic contrast reactions or atopy, as well as on individuals with renal impairment, who are at greater risk for contrast-induced nephropathy.

### Ordering Issues:

- CTA chest is not appropriate for cardiac and coronary artery imaging. Please review guidelines for cardiac CT and CCTA.
- Pulmonary embolus is rare in the absence of elevated blood D-dimer levels and certain specific risk factors.

## Common Diagnostic Indications

Indications for chest CTA are contained in general chest, thoracic aorta and great vessel, and pulmonary artery and vein.

### General Chest

#### Developmental anomalies of the thoracic vasculature

- Examples of congenital thoracic vascular anomalies include but are not limited to the following:
  - Aortic coarctation
  - Double aortic arch
  - Hypoplastic or atretic pulmonary arteries
  - Inferior vena caval interruption
  - Partial anomalous pulmonary venous return
  - Persistent left-sided superior vena cava
  - Right-sided aortic arch
  - Total anomalous pulmonary venous return
  - Truncus arteriosus

#### Post-traumatic vascular injury

#### Post-operative or post-procedure evaluation

# Common Diagnostic Indications

## Preoperative or pre-procedure evaluation

*Note: This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.*

## Systemic venous thrombosis or occlusion, including superior vena cava (SVC) syndrome

### Subclavian steal syndrome

### Thoracic outlet syndrome

### Vascular involvement from neoplasm in the chest

## Thoracic Aorta and Great Vessel

### Atheromatous disease

- Evaluation of the thoracic aorta as a source of distal emboli when transthoracic and/or transesophageal echocardiography are non-diagnostic

### Hematoma

## Post-operative or post-procedure evaluation

### Stent graft evaluation, including detection of an endoleak

- Pre-procedure assessment and post-procedure follow-up

## Thoracic aorta evaluation

### Acute aortic syndrome

#### (any one of the following)

- Diagnosis and management
- Periodic surveillance in patients with established acute aortic syndrome undergoing medical management

*Note: Initial diagnosis of acute aortic syndrome is considered a medical emergency. This guideline includes aortic rupture, dissection, pseudoaneurysm, mural hematoma, and penetrating ulcer mediastinal hematoma*

### Non-acute thoracic aorta

#### (any one of the following)

- In patients with suspected thoracic aortic aneurysm
- In patients with confirmed thoracic aortic aneurysm with new or worsening signs/symptoms
- For ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm who have not undergone imaging of the thoracic aorta within the preceding six months
- In patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning)
- For ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year
- In patients with confirmed aortic dissection or thoracic aortic aneurysm who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding six months
- In patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone CTA or MRA of the chest within the preceding 60 days

*Note: See acute aortic syndrome section for complications of aneurysm including aortic dissection*

## Vasculitis

# Common Diagnostic Indications

## Pulmonary Artery and Vein

### Pulmonary arterial hypertension

### Pulmonary arteriovenous malformation (AVM)

### Pulmonary embolism

- For moderate or high clinical suspicion of pulmonary embolism or follow-up when recurrent thromboembolism is a concern in patients on adequate medical therapy

### Pulmonary sequestration

## References

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# Magnetic Resonance Imaging (MRI) Chest



## CPT Codes

- 71550..... MRI chest, without contrast
- 71551..... MRI chest, with contrast
- 71552..... MRI chest, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Chest MRI studies are often performed as problem-solving exams, following chest CT. In these circumstances, anatomic coverage will depend on the specific indication for the study.
- MRI of the chest should not be performed for imaging of the heart. For cardiac indications, see Cardiac MRI guideline section and corresponding CPT codes 75557–75563, 75565.

## Technology Considerations

### Advantages of chest MRI:

- Chest MRI may be helpful after a CT in the following scenarios:
  - Defining mediastinal and hilar lymphadenopathy (particularly after an unenhanced chest CT exam)
  - Determining direct lung tumor invasion into the mediastinum and hilar structures, without the need for iodinated contrast material in CT
  - Assessing spinal canal extension from a postero-medially located thoracic mass
  - Evaluating a suspected Pancoast tumor (also referred to as apical pleuro-pulmonary groove or superior pulmonary sulcus tumors) for direct chest wall extension, given the multiplanar capability of MRI

### Disadvantages of chest MRI:

- Lung lesions are usually better imaged with CT when compared with MRI, given the superior spatial resolution of CT.
- MRI should not be performed in patients with certain implanted devices that are not MRI compatible, such as pacemakers.

### Ordering issues:

- For initial evaluation of most thoracic lesions, such as pulmonary nodules and masses, chest CT is considered the study of choice.
- Contrast utilization for chest MRI is at the discretion of the ordering and imaging providers.
- For cardiac and coronary artery imaging, see Cardiac MRI guidelines.

## Common Diagnostic Indications

### Developmental anomalies of the thoracic vasculature

- Examples of congenital thoracic vascular anomalies include but are not limited to the following:
  - Aortic coarctation
  - Double aortic arch
  - Hypoplastic or atretic pulmonary arteries
  - Inferior vena caval interruption
  - Partial anomalous pulmonary venous return
  - Persistent left-sided superior vena cava
  - Right-sided aortic arch
  - Total anomalous pulmonary venous return
  - Truncus arteriosus

# Common Diagnostic Indications

## Documented malignancy – primary neoplasm and metastatic disease

- For staging and periodic surveillance
- To evaluate the mediastinum, hilae, pericardium, heart, chest wall and paraspinal region

## Horner's syndrome

## Mediastinal and hilar mass lesions – when abnormal findings cannot be thoroughly evaluated with CT

- Particularly in patients who have an allergic history to intravascular iodinated CT contrast material or who have renal insufficiency and thus are at greater risk for contrast-induced nephropathy
- Chest MRI may be helpful in the following circumstances:
  - To differentiate mediastinal and hilar lesions from vascular structures; **OR**
  - To assess vascular invasion by tumor; **OR**
  - To detect spinal extension from a postero-medially located chest mass

## Pancoast tumor

- To evaluate for chest wall extension at the superior pulmonary sulcus

## Superior vena cava syndrome

## Thoracic aorta evaluation

### Acute aortic syndrome (any one of the following)

- Diagnosis and management
- periodic surveillance in patients with established acute aortic syndrome undergoing medical management

**Note:** *Initial diagnosis of acute aortic syndrome is considered a medical emergency. This guideline includes aortic rupture, dissection, pseudoaneurysm, mural hematoma, and penetrating ulcer mediastinal hematoma.*

### Non-acute thoracic aorta (any one of the following)

- In patients with suspected thoracic aortic aneurysm
- In patients with confirmed thoracic aortic aneurysm with new or worsening signs/symptoms
- For ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm who have not undergone imaging of the thoracic aorta within the preceding six months
- In patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning)
- For ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year
- In patients with confirmed aortic dissection or thoracic aortic aneurysm who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding six months
- In patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone CTA or MRA of the chest within the preceding 60 days

**Note:** See acute aortic syndrome (section above) for complications of aneurysm including aortic dissection.

## Thoracic outlet syndrome

## Thymoma evaluation or history of myasthenia gravis

**Note:** Approximately 15% of patients with myasthenia gravis will have a thymoma.

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12. Tarver RD, Teague SD, Heitkamp DE, Conces DJ Jr. Radiology of community-acquired pneumonia. *Radiol Clin N Am*. 2005;43(3):497-512.
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# MR Angiography (MRA) Chest



## CPT Codes

71555..... MRA of chest (excluding the myocardium) without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage varies depending on the clinical indication
- Chest MRA may be used for vascular anatomic depiction, from the pulmonary apices through the costophrenic sulci.

## Technology Considerations

### Advantages of Chest MRA:

- Use of MR imaging is advantageous over CT in avoiding ionizing radiation and allowing for direct multiplanar imaging.

### Disadvantages of Chest MRA:

- With MRA, artifact due to patient motion may have a particularly significant impact on exam quality.
- MRA cannot be performed in patients with certain implanted devices that are not MRI compatible, such as pacemakers.

## Common Diagnostic Indications

Chest MRA indications are contained in common chest MRA, thoracic aorta and great vessel, and pulmonary artery and vein.

### Common Chest MRA

#### Developmental anomalies of the thoracic vasculature

- Examples of congenital thoracic vascular anomalies include but are not limited to the following:
  - Aortic coarctation
  - Double aortic arch
  - Hypoplastic or atretic pulmonary arteries
  - Inferior vena caval interruption
  - Partial anomalous pulmonary venous return
  - Patent ductus arteriosus
  - Persistent left-sided superior vena cava
  - Right-sided aortic arch
  - Total anomalous pulmonary venous return
  - Transposition of the great vessels
  - Truncus arteriosus

#### Post-traumatic vascular injury

#### Subclavian steal

#### Systemic venous thrombosis or occlusion, including superior vena cava (SVC) syndrome

#### Thoracic outlet syndrome

#### Vascular involvement from neoplasm in the chest

# Common Diagnostic Indications

## Thoracic Aorta and Great Vessel

### Atheromatous disease

(All of the following)

- When CT is contraindicated
- Evaluation of the thoracic aorta as a source of distal emboli when transthoracic and/or transesophageal echocardiography are non-diagnostic

### Post-operative or post-procedure evaluation

### Stent graft evaluation, including detection of an endoleak

- Pre-procedure assessment and post-procedure follow-up

### Thoracic aorta evaluation

#### Acute aortic syndrome

(any one of the following)

- Diagnosis and management
- periodic surveillance in patients with established acute aortic syndrome undergoing medical management

**Note:** Initial diagnosis of acute aortic syndrome is considered a medical emergency. This guideline includes aortic rupture, dissection, pseudoaneurysm, mural hematoma, and penetrating ulcer mediastinal hematoma

#### Non-acute thoracic aorta

(any one of the following)

- In patients with suspected thoracic aortic aneurysm
- In patients with confirmed thoracic aortic aneurysm with new or worsening signs/symptoms
- For ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm who have not undergone imaging of the thoracic aorta within the preceding six months
- In patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning)
- For ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year
- In patients with confirmed aortic dissection or thoracic aortic aneurysm who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding six months
- In patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone CTA or MRA of the chest within the preceding 60 days

**Note:** See acute aortic syndrome (section above) for complications of aneurysm including aortic dissection.

## Vasculitis

### Pulmonary Artery and Vein

#### Pulmonary arterial hypertension

#### Pulmonary arteriovenous malformation (AVM)

### Pulmonary embolism

- Rarely requested and used only in selected cases, for example when intravenous iodinated contrast material for a CTA is contraindicated due to significant iodinated contrast allergy, and a diagnostic ventilation/perfusion (V/Q) study cannot be obtained
- For clinically suspected pulmonary embolism or follow-up when recurrent thromboembolism is a concern in patients on adequate medical therapy

### Pulmonary sequestration

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# Magnetic Resonance Imaging (MRI) Breast

## Also referred to as MR Mammography (MRM)



### CPT Codes

- 77058..... MRI of breast, without and/or with contrast material(s); unilateral  
77059..... MRI of breast, without and/or with contrast material(s); bilateral

### Technology Considerations

#### Technique:

- It is strongly recommended that breast MRI examinations be performed with a dedicated breast coil.

#### Limitations:

- Breast MRI is not recommended as a screening technique in patients with average-risk for breast cancer.
- Breast MRI is not recommended to assess suspicious breast lesions in order to avoid a biopsy.
- Breast MRI should not be used to differentiate cysts from solid lesions, which is well evaluated with ultrasound.

#### Additional Comments:

- A bilateral MRI study of the breast is correctly coded to CPT 77059. Requesting two unilateral studies (77058) to perform a bilateral exam is inappropriate. Billing 77058 two times for the same date of service or separately over subsequent days in order to describe a bilateral procedure fragments the service into its component parts and is not allowed.

### Common Diagnostic Indications

Breast MRI indications are contained in diagnostic evaluation and annual screening with breast carcinoma diagnosis and breast implant rupture not requiring a breast carcinoma diagnosis.

#### For Breast Carcinoma: Diagnostic Evaluation

##### BI-RADS category 3 findings

- A single follow-up MRI may be performed at 6 months following a breast MRI with BI-RADS category 3 findings

##### Differentiation of palpable mass(es) from surgical scar tissue

- Following breast surgery, breast reconstruction or radiation therapy

##### Invasion of breast cancer deep to fascia

- MRI evaluation of breast prior to surgical treatment may be useful in both mastectomy and breast conservation candidates to define the relationship of the tumor to the fascia and its extension into the pectoralis major, serratus anterior, and/or intercostal muscles

##### Invasive carcinoma and ductal carcinoma in situ (DCIS)

- To determine the extent of disease and the presence of multifocality and multicentricity

##### Lesion characterization

- When other imaging examinations, such as ultrasound and mammography, and physical examination are inconclusive for the presence of breast cancer, and biopsy could not be performed (e.g., possible distortion on only one mammographic view without a sonographic correlate)

# Common Diagnostic Indications

## Metastatic cancer

- Primary is unknown and suspected to be of breast origin.
- In patients presenting with metastatic disease and/or axillary adenopathy and no mammographic or physical findings of primary breast carcinoma.

## Neoadjuvant chemotherapy

- MR mammography may be performed before, during and after chemotherapy to assess response to treatment and extent of residual disease, prior to surgery.

## Post-lumpectomy with positive margins

- To evaluate for residual disease in patients whose pathology specimens demonstrate close or positive margins for residual disease

## Post-operative tissue reconstruction

- To evaluate suspected cancer recurrence in patients with tissue transfer flaps (rectus, latissimus, dorsi, and gluteal)

## Recurrence of breast cancer

- In women with a prior history of breast cancer and suspicion of recurrence when clinical, mammographic, and/or sonographic findings are inconclusive

## For Breast Carcinoma: Annual Screening

### Individuals who received radiation to the chest between ages 10 and 30 years

### Individuals with a genetic predisposition to breast cancer, in either themselves or a first degree relative, which may include any of the following:

- Bannayan-Riley-Ruvalcaba syndrome
- BRCA1 and BRCA2
- Cowden syndrome
- Li-Fraumeni syndrome

### Individuals known to have any of the following genetic mutations:

- ATM
- CDH1
- CHEK2
- PALB2

### History of lobular carcinoma in situ (LCIS), atypical ductal hyperplasia (ADH) or atypical lobular hyperplasia (ALH) on biopsy

### Lifetime risk ~ 20% or greater

- As defined by BRCAPRO or other models that are largely dependent on family history

## For Breast Implant Rupture: Not Requiring Breast Carcinoma Diagnosis

### Breast MRI is indicated to screen for asymptomatic rupture of a silicone breast implant beginning 3 years after implantation and every other year thereafter

### Evaluation of symptomatic patients with breast implants, for detection of implant rupture

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# Nuclear Cardiology

## Myocardial Perfusion Imaging



### CPT Codes

- 78451..... Myocardial perfusion imaging, tomographic (SPECT) (including attenuation correction, qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
- 78452..... Myocardial perfusion imaging, tomographic (SPECT) (including attenuation correction, qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection
- 78453..... Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); single study, at rest or stress (exercise or pharmacologic)
- 78454..... Myocardial perfusion imaging, planar (including qualitative or quantitative wall motion, ejection fraction by first pass or gated technique, additional quantification, when performed); multiple studies, at rest and/or stress (exercise or pharmacologic) and/or redistribution and/or rest reinjection

### Commonly Used Radiopharmaceuticals

- Thallium-201 Chloride
- Technetium-99m Sestamibi
- Technetium-99m Tetrofosmin

### Uses of Myocardial Perfusion Imaging (MPI)

- The primary use of MPI is in the diagnosis, exclusion or evaluation of obstructive coronary artery disease (CAD).
- MPI is also used for management of established coronary artery disease.
- MPI may be used for assessment of myocardial viability in patients who have had myocardial infarction.

### Imaging Considerations

- A recent EKG is strongly recommended, preferably within 30 days of request for a Myocardial Perfusion Imaging exam. The findings on the resting EKG may be important in determining the need for imaging, the selection of the appropriate imaging protocol and may also show evidence of ischemia at rest or interval myocardial infarction.
- Age, gender and the character of the chest pain provide useful predictors of CAD, as stratified in Table 1 below.

**Table 1\*: Pre-Test Probability of Coronary Artery Disease by Age, Gender and Symptoms**

Very Low < 5% Low Probability < 10%		Intermediate probability 10-90% High Probability > 90%	
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\*Reference for Table 1: Gibbons RJ, Balady GJ, Beasley JW, et al. ACC/AHA Guidelines for Exercise Testing: Executive Summary. Circulation. 1997;96:345-354.

Age (yr)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Non-Anginal Chest Pain	Asymptomatic
30-39	Men	Intermediate	Intermediate	Low	Very Low
	Women	Intermediate	Very Low	Very Low	Very Low
40-49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very Low	Very Low
50-59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very Low
60-69	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

# Imaging Considerations

Myocardial Perfusion Imaging and Stress Echocardiography may provide useful information on Coronary Heart Disease. Comparison data on Sensitivity and Specificity are provided in Table 2 below. Due to regional variation in technical expertise and interpretive proficiency, the clinician should use the diagnostic imaging modality that has been proven most accurate in his/her practices.

**Table 2\*\*: Comparison of Non-Invasive Diagnostic Imaging**

\*\* Reference for Table 2: Zaret BL, Bellar GA. *Clinical Nuclear Cardiology*. 3rd Edition. Philadelphia: Elsevier Mosby Publishers; 2005, page 539

	Nuclear Imaging Sensitivity (%)	Stress Echo Sensitivity (%)	Nuclear Imaging Specificity (%)	Stress Echo Specificity (%)
Exercise (7 studies)	83%	78%	83%	91%
Dobutamine (8 studies)	86%	80%	73%	86%
Adenosine (3 studies)	89%	63%	73%	86%
Dipyridamole (4 studies)	83%	68%	88%	89%

Several clinical indications listed for Myocardial Perfusion Imaging include standard methods of risk assessment, such as the SCORE (Systematic Coronary Risk Evaluation) or the Framingham risk score calculation. These risk calculation systems include consideration of the following factors:

Age	Sex
Abnormal Lipid Profile	Hypertension
Diabetes Mellitus (always = high risk)	Cigarette Smoking

Other coronary risk factors such as family history of premature CAD, coronary artery calcification, C reactive protein levels, obesity, etc., are not included in the standard methods of risk assessment but are thought to contribute to CAD risk.

- Selection of the optimal diagnostic work-up for evaluation or exclusion of coronary artery disease should be made within the context of available studies (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.
- Occasionally, it may be appropriate to do a second non-invasive test for diagnosis or exclusion of CAD when the initially selected test is technically suboptimal and the diagnosis of CAD cannot be established or excluded.
- In order to optimize image quality, imaging protocols may need to be modified in specific patient populations. Thus, patients who are obese may benefit from 2 day imaging protocols and/or prolonged image acquisition times. Similarly, imaging in the prone position may improve accuracy in patients who are obese and women with high likelihood of breast attenuation artifact. Patients whose baseline EKG demonstrates left bundle branch block, may be better suited to pharmacologic stress imaging than to exercise stress protocols.
- Rarely, absolute or relative contraindications to MPI will be encountered. MPI should not be used in pregnant or lactating women. Patients who are unable to remain motionless for several minutes or comprehend simple instructions are not suitable candidates for MPI. Image quality in morbidly obese patients (BMI >40) is usually suboptimal such that consideration should be given to other imaging modalities. If imaging studies using other radioactive tracers have been recently performed, adequate time must elapse to allow for clearance of activity from the heart and surrounding regions.
- For patients who are unable to walk on a treadmill for non-cardiac reasons (orthopedic limitations, claudication, neurological conditions, advanced lung disease, etc.), exercise stress testing is not an option. These patients will require pharmacological testing with echo or nuclear imaging.
- It is anticipated that the evaluation of patients with acute chest pain will occur in the emergency room or in an inpatient setting and MPI performed in these locations is not included in the AIM preauthorization program.

# Common Diagnostic Indications

## Suspected coronary artery disease in asymptomatic patients

- Patients with high-risk of CAD (SCORE) who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years; **OR**
- Patients with moderate or high risk of CAD (SCORE) who have a high risk occupation that would endanger others in the event of a myocardial infarction, for example: airline pilot, law-enforcement officer, firefighter, mass transit operator, bus driver) who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years; **OR**
- Patients with diseases/conditions with which coronary artery disease commonly coexist and who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years:
  - Diabetes mellitus; **OR**
  - Abdominal aortic aneurysm; **OR**
  - Established and symptomatic peripheral vascular disease; **OR**
  - Prior history of cerebrovascular accident (CVA), transient ischemic attack (TIA) or carotid endarterectomy (CEA) or high grade carotid stenosis (>70%); **OR**
  - Chronic renal insufficiency or renal failure; **OR**
- Patients who have undergone cardiac transplantation and have had no evaluation for coronary artery disease within the preceding one (1) year; **OR**
- Patients in whom a decision has been made to treat with interleukin 2
- Patients awaiting solid organ transplantation who have not undergone evaluation for coronary artery disease within the preceding one (1) year

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## Suspected coronary artery disease in symptomatic patients who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding sixty (60) days

- Chest pain
  - With intermediate or high pretest probability of CAD (Table 1); **OR**
  - With low or very low pretest probability of CAD (Table 1) and high risk of CAD (SCORE)
- Atypical symptoms: syncope, shortness of breath (dyspnea), neck, jaw, arm, epigastric or back pain, or sweating (diaphoresis)
  - With moderate or high risk of CAD (SCORE)
- Other symptoms; palpitation, dizziness, lightheadedness, near syncope, nausea, vomiting, anxiety, weakness, fatigue, etc.
  - With high risk of CAD (SCORE)
- Patients with any cardiac symptom who have diseases/conditions with which coronary artery disease commonly coexists such as:
  - Diabetes mellitus; **OR**
  - Abdominal aortic aneurysm; **OR**
  - Established and symptomatic peripheral vascular disease; **OR**
  - Prior history of cerebrovascular accident (CVA), transient ischemic attack (TIA) or carotid endarterectomy (CEA) or high grade carotid stenosis (>70%); **OR**
  - Chronic renal insufficiency or renal failure; **OR**
- Patients who have undergone cardiac transplantation; **OR**
- Patients in whom a decision has been made to treat with Interleukin 2; **OR**
- Patients awaiting solid organ transplantation

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## Established coronary artery disease in asymptomatic patients

- Patients awaiting solid organ transplantation who have not undergone evaluation for coronary artery disease within the preceding one (1) year

## Common Diagnostic Indications

### Established coronary artery disease (diagnosed by previous cardiac catheterization, MPI, cardiac PET, or stress echo) in patients who have new or worsening symptoms

**Note:** If symptoms are typical of myocardial ischemia cardiac catheterization may be more appropriate than MPI

### Established coronary artery disease (diagnosed by previous cardiac catheterization, MPI, cardiac PET, or stress echo) in patients who have not undergone revascularization and have no symptoms or stable symptoms

- No evaluation of CAD (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years
- No evaluation of CAD (MPI, cardiac PET, stress echo, coronary CTA or cardiac catheterization) within the preceding one (1) year in a patient who has undergone cardiac transplantation and has been found to have CAD since transplantation

### Established coronary artery disease in patients who have undergone revascularization

- For evaluation of new or worsening cardiac symptoms
  - If symptoms are typical of myocardial ischemia cardiac catheterization may be more appropriate than MPI; **OR**
- For evaluation of stable patients who have undergone coronary artery bypass grafting more than five (5) years previously and who have not had an evaluation for coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the past two (2) years
  - Stable patients whose revascularization has been incomplete may undergo MPI three (3) years following the procedure and every three (3) years thereafter; **OR**
- For evaluation of stable patients who have undergone percutaneous coronary intervention(PCI) more than three (3) years previously and who have not had an evaluation for coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the past three (3) years when **any of the following** applies
  - The patient has undergone PCI of the left main (LM) coronary artery or the proximal left anterior descending (LAD) coronary artery
  - The patient has undergone PCI of more than one coronary artery
  - The patient has chronic total occlusion of a coronary artery and the vessel on which PCI was performed is supplying collateral flow to the occluded vessel
  - The patient is known to have only one patent coronary artery.
  - Left ventricular ejection fraction LVEF is <35%

### Established coronary artery disease in patients who have had myocardial infarction (ST elevation or non-ST elevation) or unstable angina within the preceding ninety (90) days provided that:

- The patient did not undergo coronary angiography at the time of the acute event; **AND**
- The patient is currently clinically stable

### Established Kawasaki Disease with Coronary Artery Involvement

- Every two year evaluation for confirmed small to medium coronary artery aneurysm
- Annual evaluation for confirmed large (giant) coronary artery aneurysm, multiple or complex aneurysms or coronary artery obstruction confirmed by angiography

# Common Diagnostic Indications

## **Patients with new onset arrhythmias (patient can be symptomatic or asymptomatic)**

This guideline applies to patients with suspected or established CAD

- Patients with sustained (lasting more than 30 seconds) or non-sustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia; **OR**
- Patients with atrial fibrillation or flutter and high or moderate risk of CAD (SCORE); **OR**
- Patients with atrial fibrillation or flutter and established CAD; **OR**
- Patients who have frequent premature ventricular contractions (PVC) defined as more than thirty (30) PVCs per hour on ambulatory EKG (Holter) monitoring
  - It is not clinically indicated to perform MPI for evaluation of infrequent premature atrial or ventricular depolarizations

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## **Patients with new onset congestive heart failure or recently recognized left ventricular systolic dysfunction (patient can be symptomatic or asymptomatic)**

This guideline applies to patients with suspected or established CAD

For patients in this category whose CAD risk (SCORE) is high, cardiac catheterization may be more appropriate than non-invasive evaluation

- Provided that new or worsening CAD has not been excluded as the cause of LV dysfunction/ CHF by any of the following tests: MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization

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## **Patients with abnormal exercise treadmill test (performed without imaging)**

This guideline applies to patients with suspected or established CAD

- Abnormal findings on an exercise treadmill test include (chest pain, ST segment change, abnormal BP response or complex ventricular arrhythmias)

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## **Patients who have undergone recent (within the past 60 days) stress echocardiography**

- When the stress echocardiogram is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
  - It is not appropriate to perform MPI on patients who have had a recent normal or abnormal stress echocardiogram
  - A stress echocardiogram is deemed to be abnormal when there are echocardiographic abnormalities. Electrocardiographic abnormalities without echocardiographic evidence of ischemia are considered to be normal studies

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## **Patients with abnormal findings on cardiac CT / coronary CTA**

### **Symptomatic Patients:**

- With coronary artery calcium score > 400 Agatston units; **OR**
- Intermediate severity coronary stenosis on coronary CTA

**Note:** If symptoms are typical of myocardial ischemia cardiac catheterization may be more appropriate than MPI

**Asymptomatic patients who have not had MPI, stress echo, cardiac PET or cardiac catheterization within the preceding three (3) years:**

- With coronary artery calcium score > 400 Agatston units; **OR**
- Intermediate severity coronary stenosis coronary CTA

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## **Patients with abnormal findings on cardiac catheterization**

- To determine flow limiting significance of intermediate coronary stenosis

# Common Diagnostic Indications

## Myocardial viability evaluation

MPI may be used to evaluate myocardial viability in patients who

- Have established coronary artery disease; **AND**
- Have left ventricular systolic dysfunction (Left Ventricular Ejection Fraction <55%); **AND**
- Are candidates for revascularization

**Note:** *Pharmacologic stress echocardiography with a drug such as dobutamine that increases myocardial contractility is the preferred protocol*

## Pre-operative cardiac evaluation of patients undergoing non-cardiac surgery

This guideline applies to patients undergoing non-emergency surgery

It is assumed that those who require emergency surgery will undergo inpatient pre-operative evaluation

- Patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA function of class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions. It is recommended that these conditions be evaluated and managed per ACC/AHA guidelines prior to considering elective surgery. That evaluation may include MPI

**Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)

- Provided that there are no active cardiac conditions (as outlined above), MPI prior to low-risk surgery is considered not medically necessary

**Intermediate risk surgery** (including but not limited to intraperitoneal and intrathoracic surgery, carotid endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or **High-risk surgery** (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when

- The patient has not had a normal coronary angiogram, SE, MPI, CCTA, Cardiac PET perfusion study or revascularization procedure within the previous one (1) year; **AND**
- At least one of the following applies:
  - Patient has established CAD (prior MI, prior PTCA, stent, or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE or cardiac PET); **OR**
  - Patient has compensated heart failure or prior history of heart failure (CHF); **OR**
  - Patient has diabetes mellitus; **OR**
  - Patient has chronic renal insufficiency or renal failure; **OR**
  - Patient has a history of cerebrovascular disease (TIA, CVA or documented carotid stenosis requiring carotid endarterectomy); **OR**
  - Patient is unable to walk on a treadmill for reasons other than obesity

## Abnormal EKG findings

Some patients have resting EKG findings which would render the interpretation of an exercise EKG test difficult or impossible. In these situations patients who, in the absence of the EKG abnormality, would not meet approval criteria for MPI, may be approved for MPI because exercise EKG testing without imaging would provide little clinically useful data. Patients with the following resting EKG abnormalities are included this category:

- Left bundle branch block; **OR**
- Ventricular paced rhythm; **OR**
- Left ventricular hypertrophy with repolarization abnormality; **OR**
- Digoxin effect; **OR**
- 1 mm ST depression or more on a recent EKG (within the past 30 days); **OR**
- Pre-excitation syndromes (E.G. WPW syndrome)

## Unable to walk on a treadmill for reasons other than obesity

# Nuclear Cardiology: Cardiac Blood Pool Imaging

## Blood Pool Imaging includes MUGA (Multi-Gated Acquisition) & First Pass Radionuclide Ventriculography



### CPT Codes

- 78472..... Gated equilibrium; planar, single study, wall motion plus ejection fraction
- 78473..... Gated equilibrium; planar, multiple studies, wall motion study plus ejection fraction
- 78481..... First pass technique; single study, wall motion study plus ejection fraction
- 78483..... First pass technique; multiple studies, wall motion study plus ejection fraction
- 78494..... Gated equilibrium: SPECT, at rest, wall motion study plus ejection fraction
- 78496..... This code is an add-on code to be used in conjunction with 78472. As such, this code does not require separate review.

### Commonly Used Radiopharmaceuticals

- Technetium-99m

### Imaging Considerations

- Primarily used to evaluate global and regional ventricular function and to determine ejection fraction(s)
- May be used in the evaluation of intracardiac shunting or diastolic function
- First-pass studies display initial transit of the radiotracer bolus passing through the cardiopulmonary and central systemic circulations. Right and/or left ventricular function may be evaluated.
- Equilibrium studies display gated data (MUGA) which is acquired over many cardiac cycles, using a blood pool radiotracer. Both right and left ventricles may be evaluated.
- First pass studies should be acquired on a high count-rate camera in order that images have sufficient temporal resolution. High count-rate cameras are not required for MUGA.
- Studies may be performed at rest and/or during exercise.
- MUGA studies are technically more difficult in patients with irregular heart rhythms. Imaging times may have to be prolonged to acquire adequate data.
- Selection of the optimal diagnostic imaging for cardiac evaluation should be made within the context of other available studies (which include transthoracic echocardiography, transesophageal echocardiography, stress myocardial perfusion imaging, stress echocardiography, cardiac MRI, cardiac CT, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.
- Some disease states and medications interfere with red blood cell labeling. These should be taken into account when selecting the optimal imaging modality.
- In interpretation of this document, the term “clinically stable” is taken to mean that the patient has no new or worsening cardiac symptoms and there are no changes on cardiovascular examination.

# Common Diagnostic Indications

## Evaluation of left ventricular function

**Note:** It is assumed that left ventricular function will be evaluated using a single imaging modality. Thus, if left ventricular function has been evaluated recently by echocardiography reevaluation using blood pool imaging is not necessary

- Initial evaluation of known or suspected heart failure; **OR**
- Reevaluation of patients with known LV dysfunction (systolic or diastolic) in a patient with a deterioration in clinical status; **OR**
- Evaluation of patients with resting EKG abnormalities (LBBB, RBBB with left anterior or posterior hemiblock, L VH, RVH, Q waves suggestive of prior infarction); **OR**
- Reevaluation of patients with known heart failure (systolic or diastolic) in a patient with a change in clinical status; **OR**
- Baseline and serial reevaluation in patients undergoing, planning to undergo or who have undergone therapy with cardiotoxic agents (examples including but not limited to some chemotherapeutic agents for cancer, Novantrone [mitoxantrone] for multiple sclerosis); **OR**
- Screening study for left ventricular dysfunction every two (2) years in clinically stable and first-degree relatives of patients with inherited cardiomyopathy; **OR**
- Evaluation of suspected restrictive, infiltrative or genetic cardiomyopathy; **OR**
- Evaluation of patients with diagnosed or suspected myocarditis; **OR**
- Evaluation of LV function in a patient with known cardiomyopathy being considered for cardiac resynchronization therapy (CRT), implantable defibrillator (AICD) or ventricular assist device (VAD); **OR**
- Initial evaluation for cardiac resynchronization therapy (CRT) device optimization following implantation; **OR**
- Evaluation of a patient being treated with cardiac resynchronization therapy (CRT) with new or persistent signs or symptoms of heart failure for device optimization; **OR**
- Blood pool imaging is indicated for optimization of device settings in patients with ventricular assist device (VAD); **OR**
- When left ventricular dysfunction is suggested by other testing (chest x-ray, elevated BNP) and LV function has not been evaluated by another modality since that testing was performed; **OR**
- Where a clinically significant discrepancy that might influence patient management exists in the evaluation of left ventricular dysfunction by two other imaging modalities, MUGA/First Pass can be used as an arbiter; **OR**
- Pre and post cardiac transplantation

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## Evaluation of right ventricular function

- In patients suspected of having right ventricular dysfunction based on history and/or physical examination; **OR**
- Reevaluation of patients with established right ventricular dysfunction in patients with a change in clinical status; **OR**
- Evaluation of right ventricular function in patients with pulmonary hypertension; **OR**
- Evaluation of right ventricular function in patients with diagnoses known to cause right ventricular dysfunction including but not limited to coronary artery disease, valvular heart disease, left ventricular dysfunction, congenital heart disease, morbid obesity, sleep apnea syndrome, advanced lung disease, pulmonary thromboembolic disease, and right ventricular dysplasia; **OR**
- Evaluation of right ventricular function in patients with myocardial infarction where right ventricular involvement is suspected; **OR**
- Evaluation of right ventricular function in patients who are being evaluated for or have undergone cardiac or lung transplantation

# Common Diagnostic Indications

## Coronary artery disease (CAD) (applies to patients with established coronary artery disease)

- Recent (less than 3 weeks) acute coronary syndrome (myocardial infarction or unstable angina) for initial assessment of LV function
  - This study is usually done prior to discharge
  - Not required if left ventricular function has been assessed using another imaging modality; **OR**
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function during recovery phase (up to six [6] months following acute coronary syndrome); **OR**
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function after the recovery phase (more than six [6] months) in patients who develop new signs or symptoms suggestive of heart failure; **OR**
- Prior myocardial infarction for reevaluation of LV function in patients being considered for AICD or cardiac resynchronization therapy (CRT)

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## Congenital heart disease

- For detection and localization of shunts (ventricular septal defect [VSD], atrial septal defect [ASD], patent ductus arteriosus [PDA], anomalous pulmonary venous drainage)
  - Echocardiography is generally considered to be a preferable imaging modality in this clinical situation
- For evaluation of RV and/or LV function in a patient with established complex congenital heart disease

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## Valvular heart disease

- Established valvular heart disease in patients with new or worsening signs or symptoms
  - In patients with suspected valvular heart disease echocardiography is the appropriate initial imaging modality; **OR**
- Patients with severe asymptomatic aortic regurgitation to assist in optimal timing of aortic valve replacement
  - Rest and stress studies are appropriate in this clinical situation

# Nuclear Cardiology

## Infarct Imaging



### CPT Codes

- 78466..... Planar, infarct avid; qualitative or quantitative
- 78468..... Planar, infarct avid; with ejection fraction by first pass technique
- 78469..... SPECT, infarct avid; with or without quantification

### Radiopharmaceuticals

- Technetium-99m Pyrophosphate

### Imaging Considerations

- Infarct imaging is typically optimal at 48-72 hours post-event
- False positive findings have been attributed to the following conditions:
  - Amyloidosis
  - Cardiac valvular and pericardial calcification
  - Cardiomyopathy
  - Doxorubicin (Adriamycin) Treatment
  - Myocarditis and Pericarditis
  - Prior myocardial infarction, that remains persistently positive
  - Radiation Therapy
  - Ventricular aneurysm
- Selection of the optimal diagnostic imaging for cardiac evaluation should be made within the context of other available studies (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac MRI, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.

### Common Diagnostic Indications

#### **Suspected acute myocardial infarction, which likely occurred within the last 7 days**

- Including interrogation of the following:
  - Negative (past expected peak) cardiac enzymes
  - Abnormal baseline ECG, due to prior myocardial infarction
  - Left bundle branch block

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#### **Differentiation of subendocardial (non-Q-wave) infarction versus ischemia**

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#### **Post-cardioversion**

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#### **Following significant chest trauma or major surgical procedure, with chest pain**

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# Cardiac Echocardiography Stress Echocardiography (SE)



## CPT Codes

- 93350..... Echocardiography, transthoracic during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report
- 93351..... Echocardiography, transthoracic during rest and cardiovascular stress test using treadmill, bicycle exercise and/or pharmacologically induced stress, with interpretation and report; including performance of continuous electrocardiographic monitoring with physician supervision
- 93320..... This code is an add-on code to be used in conjunction with 93350, 93351. As such, this code does not require separate review
- 93321..... This code is an add-on code to be used in conjunction with 93350, 93351. As such, this code does not require separate review
- 93325..... This code is an add-on code to be used in conjunction with 93350, 93351. As such, this code does not require separate review
- 93352..... This code is an add-on code to be used in conjunction with 93350, 93351. As such, this code does not require separate review

## Uses of Stress Echocardiography (SE)

- The primary use of SE is in the diagnosis or exclusion of obstructive coronary artery disease (CAD).
- SE is also used for management of established coronary artery disease.
- SE may be used for assessment of myocardial viability in patients who have had myocardial infarction.
- SE is occasionally used in the evaluation of valvular heart disease, and for the detection and management of occult pulmonary hypertension.

## Imaging Considerations

- A recent EKG is strongly recommended, preferably within 7 days of request for stress echocardiogram. The findings on the resting EKG may help to determine the need for imaging and may also show evidence of ischemia at rest or interval myocardial infarction.
- Unlike MPI, stress echocardiography does not expose the patient to ionizing radiation.
- Age, gender and the character of the chest pain provide useful predictors of CAD, as stratified in Table 1 below.

**Table 1\*: Pre-Test Probability of Coronary Artery Disease by Age, Gender and Symptoms**

Very Low < 5% Low Probability < 10%		Intermediate probability 10-90% High Probability > 90%		
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\*Reference for Table 1: Gibbons RJ, Balady GJ, Beasley JW, et al. ACC/AHA Guidelines for Exercise Testing: Executive Summary. Circulation. 1997;96:345-354.

Age (yr)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Non-Anginal Chest Pain	Asymptomatic
30-39	Men	Intermediate	Intermediate	Low	Very Low
	Women	Intermediate	Very Low	Very Low	Very Low
40-49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very Low	Very Low
50-59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very Low
60-69	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

# Imaging Considerations

Myocardial Perfusion Imaging and Stress Echocardiography may provide useful information on Coronary Heart Disease. Comparison data on Sensitivity and Specificity are provided in Table 2 below. Due to regional variation in technical expertise and interpretive proficiency, the clinician should use the diagnostic imaging modality that has been proven most accurate in his/her practices.

**Table 2\*\*: Comparison of Non-Invasive Diagnostic Imaging**

\*\* Reference for Table 2: Zaret BL, Bellar GA. *Clinical Nuclear Cardiology*. 3rd Edition. Philadelphia: Elsevier Mosby Publishers; 2005, page 539

	Nuclear Imaging Sensitivity (%)	Stress Echo Sensitivity (%)	Nuclear Imaging Specificity (%)	Stress Echo Specificity (%)
Exercise (7 studies)	83%	78%	83%	91%
Dobutamine (8 studies)	86%	80%	73%	86%
Adenosine (3 studies)	89%	63%	73%	86%
Dipyridamole (4 studies)	83%	68%	88%	89%

Several clinical indications listed for Stress Echo include standard methods of risk assessment, such as the SCORE (Systematic Coronary Risk Evaluation) or the Framingham risk score calculation. These risk calculation systems include consideration of the following factors:

Age	Sex
Abnormal Lipid Profile	Hypertension
Diabetes Mellitus (always = high risk)	Cigarette Smoking

Other coronary risk factors such as family history of premature CAD, coronary artery calcification, C reactive protein levels, obesity etc. are not included in the standard methods of risk assessment but are thought to contribute to coronary artery disease risk.

- Selection of the optimal diagnostic work-up for evaluation or exclusion of coronary artery disease should be made within the context of available studies (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.
- Occasionally it may be appropriate to do a second non-invasive test for diagnosis or exclusion of CAD when the initially selected test is technically suboptimal and the diagnosis of CAD cannot be established or excluded.
- SE may be performed using either physical or pharmacologic stress. If physical stress is used, the choice rests between treadmill exercise test and bicycle exercise test. While it is possible to acquire images during exercise in patients undergoing bicycle exercise testing, image quality during treadmill exercise is suboptimal. In this situation, the "stress" images are actually acquired immediately following peak exercise. Thus, the laboratory must be set up in a manner that allows imaging to be completed within 45 to 60 seconds after peak exercise.
- Some patients may not be suitable candidates for SE. Image quality is frequently suboptimal in morbidly obese patients and in those with advanced lung disease. If image quality at rest is inadequate, the test should be canceled and consideration given to an alternative imaging modality.
- For patients who are unable to walk on a treadmill for non-cardiac reasons (orthopedic limitations, claudication, neurological conditions, advanced lung disease, etc. exercise stress testing is not an option. These patients will require pharmacological testing with echo or nuclear imaging.
- It is anticipated that the evaluation of patients with acute chest pain will occur in the emergency room or in an inpatient setting and stress echo performed in these locations is not included in the AIM preauthorization program.

# Common Diagnostic Indications

## Suspected coronary artery disease in asymptomatic patients

- Patients with high-risk of CAD (SCORE) who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years; **OR**
- Patients with moderate or high risk of CAD (SCORE) who have a high risk occupation that would endanger others in the event of a myocardial infarction (for example: airline pilot, law-enforcement officer, firefighter, mass transit operator, bus driver) who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years; **OR**
- Patients with diseases/conditions with which coronary artery disease commonly coexists and who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years:
  - Diabetes mellitus; **OR**
  - Abdominal aortic aneurysm; **OR**
  - Established and symptomatic peripheral vascular disease; **OR**
  - Prior history of cerebrovascular accident (CVA), transient ischemic attack (TIA) or carotid endarterectomy (CEA) or high grade carotid stenosis (>70%); **OR**
  - Chronic renal insufficiency; **OR**
- Patients who have undergone cardiac transplantation and have had no evaluation for coronary artery disease within the preceding one (1) year; **OR**
- Patients in whom a decision has been made to treat with Interleukin 2; **OR**
- Patients awaiting solid organ transplantation who have not undergone evaluation for coronary artery disease within the preceding one (1) year

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## Suspected coronary artery disease in symptomatic patients who have not had evaluation of coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding sixty (60) days

- Chest pain
  - With intermediate or high pretest probability of CAD (Table 1); **OR**
  - With low or very low pretest probability of CAD (Table 1) and high risk of CAD (SCORE)
- Atypical symptoms: syncope, shortness of breath (dyspnea), neck, jaw, arm, epigastric or back pain, sweating (diaphoresis)
  - With moderate or high risk of CAD (SCORE)
- Other symptoms: palpitation, dizziness, lightheadedness, near syncope, nausea, vomiting, anxiety, weakness, fatigue, etc.
  - With high risk of CAD (SCORE)
- Patients with any cardiac symptom who have diseases/conditions with which coronary artery disease commonly coexists such as:
  - Diabetes mellitus; **OR**
  - Abdominal aortic aneurysm; **OR**
  - Established and symptomatic peripheral vascular disease; **OR**
  - Prior history of cerebrovascular accident (CVA), transient ischemic attack (TIA) or carotid endarterectomy (CEA) or high grade carotid stenosis (>70%); **OR**
  - Chronic renal insufficiency or renal failure; **OR**
- Patients who have undergone cardiac transplantation; **OR**
- Patients in whom a decision has been made to treat with Interleukin 2; **OR**
- Patients awaiting solid organ transplantation

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## Established coronary artery disease in asymptomatic patients

- Patients awaiting solid organ transplantation who have not undergone evaluation for coronary artery disease within the preceding one (1) year

## Common Diagnostic Indications

### Established coronary artery disease (diagnosed by previous cardiac catheterization, MPI, cardiac PET, or stress echo) in patients who have new or worsening symptoms

**Note:** If symptoms are typical of myocardial ischemia cardiac catheterization may be more appropriate than SE

### Established coronary artery disease (diagnosed by previous cardiac catheterization, MPI, cardiac PET, or stress echo) in patients who have not undergone revascularization and have no symptoms or stable symptoms

- No evaluation of CAD (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the preceding three (3) years
- No evaluation of CAD (MPI, cardiac PET, stress echo, coronary CTA or cardiac catheterization) within the preceding one (1) year in a patient who has undergone cardiac transplantation and has been found to have CAD since transplantation

### Established coronary artery disease in patients who have undergone revascularization

- For evaluation of new or worsening cardiac symptoms
  - If symptoms are typical of myocardial ischemia cardiac catheterization may be more appropriate than SE; **OR**
- For evaluation of stable patients who have undergone coronary artery bypass grafting more than five (5) years previously and who have not had an evaluation for coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the past two (2) years
  - Stable patients whose revascularization has been incomplete may undergo SE three (3) years following the procedure and every three (3) years thereafter; **OR**
- For evaluation of stable patients who have undergone percutaneous coronary intervention(PCI) more than three (3) years previously and who have not had an evaluation for coronary artery disease (MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization) within the past three (3) years when **any of the following** applies
  - The patient has undergone PCI of the left main (LM) coronary artery or the proximal left anterior descending (LAD) coronary artery
  - The patient has undergone PCI of more than one coronary artery
  - The patient has chronic total occlusion of a coronary artery and the vessel on which PCI was performed is supplying collateral flow to the occluded vessel
  - The patient is known to have only one patent coronary artery.
  - Left ventricular ejection fraction LVEF is <35%

### Established coronary artery disease in patients who have had myocardial infarction (ST elevation or non-ST elevation) or unstable angina within the preceding ninety (90) days provided that

- The patient did not undergo coronary angiography at the time of the acute event; **AND**
- The patient is currently clinically stable

### Established Kawasaki Disease with Coronary Artery Involvement

- Every two year evaluation for confirmed small to medium coronary artery aneurysm
- Annual evaluation for confirmed large (giant) coronary artery aneurysm, multiple or complex aneurysms or coronary artery obstruction confirmed by angiography

# Common Diagnostic Indications

## **Patients with new onset arrhythmias (patient can be symptomatic or asymptomatic)**

This guideline applies to patients with suspected or established CAD

- Patients with sustained (lasting more than 30 seconds) or non-sustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia; **OR**
- Patients with atrial fibrillation or flutter and high or moderate risk of CAD (SCORE); **OR**
- Patients with atrial fibrillation or flutter and established CAD; **OR**
- Patients who have frequent premature ventricular contractions (PVC) defined as more than thirty (30) PVCs per hour on ambulatory EKG (Holter) monitoring
  - It is not appropriate to perform stress echocardiography for evaluation of infrequent premature atrial or ventricular depolarizations

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## **Patients with new onset congestive heart failure or recently recognized left ventricular systolic dysfunction (patient can be symptomatic or asymptomatic)**

This guideline applies to patients with suspected or established CAD

For patients in this category whose CAD risk (SCORE) is high, cardiac catheterization may be more appropriate than non-invasive evaluation

- Provided that new or worsening CAD has not been excluded as the cause of LV dysfunction/ CHF by any of the following tests: MPI, stress echo, cardiac PET, coronary CTA or cardiac catheterization

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## **Patients with abnormal exercise treadmill test (performed without imaging)**

This guideline applies to patients with suspected or established CAD

- Abnormal findings on an exercise treadmill test include (chest pain, ST segment change, abnormal BP response or complex ventricular arrhythmias)

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## **Patients who have undergone recent (within the past 60 days) myocardial perfusion imaging (MPI)**

- When the MPI is technically suboptimal, technically limited, inconclusive, indeterminate, or equivocal, such that myocardial ischemia cannot be adequately excluded
  - It is not appropriate to perform SE on patients who have had a recent normal or abnormal MPI
  - An MPI is deemed to be abnormal when there are abnormalities on the nuclear imaging portion of the test. Electrocardiographic abnormalities without evidence of ischemia on the nuclear imaging portion of the test are considered to be normal studies

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## **Patients with abnormal findings on cardiac CT / coronary CTA**

### **Symptomatic Patients:**

- With coronary artery calcium score > 400 Agatston units; **OR**
- Intermediate severity coronary stenosis on coronary CTA

**Note:** If symptoms are typical of myocardial ischemia, cardiac catheterization may be more appropriate than stress echo

**Asymptomatic patients who have not had MPI, stress echo, cardiac PET or cardiac catheterization within the preceding three (3) years:**

- With coronary artery calcium score > 400 Agatston units; **OR**
- Intermediate severity coronary stenosis coronary CTA

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## **Patients with abnormal findings on cardiac catheterization**

- To determine flow limiting significance of intermediate coronary stenosis

# Common Diagnostic Indications

## Myocardial viability evaluation

Stress Echo may be used to evaluate myocardial viability in patients who

- Have established coronary artery disease; **AND**
- Have left ventricular systolic dysfunction (Left Ventricular Ejection Fraction <55%); **AND**
- Are candidates for revascularization

**Note:** *Pharmacologic stress echocardiography with a drug such as dobutamine that increases myocardial contractility is the preferred protocol*

## Pre-operative cardiac evaluation of patients undergoing non-cardiac surgery

This guideline applies to patients undergoing non-emergency surgery

It is assumed that those who require emergency surgery will undergo in-patient pre-operative evaluation

- Patients with active cardiac conditions such as unstable coronary syndromes (unstable angina), decompensated heart failure (NYHA function of class IV, worsening or new onset heart failure), significant arrhythmias (third degree AV block Mobitz II AV block, uncontrolled supraventricular arrhythmia, symptomatic ventricular arrhythmias, ventricular tachycardia), symptomatic bradycardia or severe stenotic valvular lesions. It is recommended that these conditions be evaluated and managed per ACC/AHA guidelines prior to considering elective surgery. That evaluation may include Stress Echo

**Low-risk surgery** (endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery)

- Provided that there are no active cardiac conditions (as outlined above) Stress Echo prior to low-risk surgery is considered not medically necessary

**Intermediate risk surgery** (including but not limited to intraperitoneal and intrathoracic surgery, carotid endarterectomy, head and neck surgery, orthopedic surgery, prostate surgery, gastric bypass surgery) or **High-risk surgery** (including but not limited to aortic and other major vascular surgery, peripheral vascular surgery) when

- The patient has not had a normal coronary angiogram, SE, MPI, CCTA, Cardiac PET perfusion study or revascularization procedure within the previous one (1) year; **AND**
- At least one of the following applies:
  - Patient has established CAD (prior MI, prior PTCA, stent, or CABG) or presumed CAD (Q waves on EKG, abnormal MPI, SE or cardiac PET); **OR**
  - Patient has compensated heart failure or prior history of heart failure (CHF); **OR**
  - Patient has diabetes mellitus; **OR**
  - Patient has chronic renal insufficiency or renal failure; **OR**
  - Patient has a history of cerebrovascular disease (TIA, CVA or documented carotid stenosis requiring carotid endarterectomy); **OR**
  - Patient is unable to walk on a treadmill for reasons other than obesity

# Common Diagnostic Indications

## Valvular heart disease

- Stress echocardiography may be used in evaluation of asymptomatic patients with any of the following valvular lesions
  - Severe aortic stenosis
  - Severe aortic regurgitation with normal left ventricular size and function
  - Severe mitral stenosis
  - Severe mitral regurgitation with normal left ventricular size and function; **OR**
- Stress echocardiography may be used in evaluation of symptomatic patients with any of the following valvular lesions
  - Aortic stenosis of uncertain degree (due to the presence of co-existent severe left ventricular systolic dysfunction). Pharmacologic stress echocardiography with a drug such as dobutamine that increases myocardial contractility is the preferred protocol
  - Moderate mitral stenosis
  - Moderate mitral regurgitation

## Pulmonary hypertension

- For evaluation of patients with suspected pulmonary hypertension whose resting echocardiogram fails to confirm that diagnosis, such that exercise induced pulmonary hypertension needs to be excluded; **OR**
- For evaluation of right and/or left ventricular function during exercise in patients with established exercise induced pulmonary hypertension

## Hypertrophic obstructive cardiomyopathy

- For the evaluation of dynamic changes during exercise in patients with an established diagnosis of hypertrophic obstructive cardiomyopathy who do not have a resting outflow tract gradient of 50 mm Hg or more

## Abnormal EKG findings

Some patients have resting EKG findings which would render the interpretation of an exercise EKG test difficult or impossible. In these situations patients who, in the absence of the EKG abnormality, would not meet approval criteria for SE, may be approved for SE because exercise EKG testing without imaging would provide little clinically useful data. Patients with the following resting EKG abnormalities are included in this category:

- Left bundle branch block; **OR**
- Ventricular paced rhythm; **OR**
- Left ventricular hypertrophy with repolarization abnormality; **OR**
- Digoxin effect; **OR**
- 1 mm ST depression or more on a recent EKG (within the past 30 days); **OR**
- Pre-excitation syndromes (e.g. WPW syndrome)

## Unable to walk on a treadmill for reasons other than obesity

# Transesophageal Echocardiography (TEE)



## CPT Codes

- 93312..... TEE real-time with image documentation (2-D) (with or without M-mode recording)
- 93313..... Placement of transesophageal probe only
- 93314..... Image acquisition, interpretation and report only
- 93315..... TEE for congenital cardiac anomalies
- 93316..... Placement of transesophageal probe only (congenital cardiac anomalies)
- 93317..... Image acquisition, interpretation and report only (congenital cardiac anomalies)
- 93320..... This code is an add-on code to be used in conjunction with 93312, 93314, 93315, 93317. As such, this code does not require separate review
- 93321..... This code is an add-on code to be used in conjunction with 93312, 93314, 93315, 93317. As such, this code does not require separate review
- 93325..... This code is an add-on code to be used in conjunction with 93312, 93314, 93315, 93317. As such, this code does not require separate review

## Standard Anatomic Coverage

- Heart, proximal great vessels, pericardium

## Imaging Considerations

- In general, it is assumed that TEE is appropriately used as an adjunct or subsequent test to transthoracic echocardiography (TTE) when suboptimal TTE images preclude obtaining a diagnostic study.
- There are some clinical situations for which TEE is a more appropriate initial imaging test than TTE. These situations are outlined below under Common Diagnostic Indications for TEE.
- Since TEE requires conscious sedation, it should only be performed at locations where cardiac monitoring and appropriate equipment for cardiopulmonary resuscitation are readily available.
- Patients with oropharyngeal or esophageal pathology which contraindicates intubation of the esophagus are not suitable candidates for TEE.
- Intraoperative TEE (93318) is beyond the scope of AIMs diagnostic imaging management program and will not be addressed in this document.

## Common Diagnostic Indications

### In patients who have had, or are likely to have suboptimal transthoracic imaging

- When image quality is suboptimal such that the clinical question(s) prompting the TEE has/have not been adequately answered; **OR**
- When it is likely that transthoracic imaging will be suboptimal in the following situations:
  - Previous transthoracic echocardiograms were of suboptimal quality
  - In patients with severe abnormalities of thoracic contour (pectus deformities, severe kyphoscoliosis)
  - In patients who have recently had thoracic surgery where post-operative tenderness or the location of dressings or incisions would preclude imaging from the usual transthoracic locations
  - Following severe chest trauma
  - Following extensive burns to the thorax
  - In patients with a cardiac diagnosis made by TEE who require reevaluation, the results of which would lead to a change in therapy (e.g. resolution of an intracardiac thrombus following anticoagulation)

## Common Diagnostic Indications

### In patients whose clinical situation suggests that TEE may be preferable to transthoracic echocardiography

- In evaluation of suspected acute aortic pathology; **OR**
- In evaluation of valvular structure and function to assess suitability for and assist in planning of surgical or catheter based valvular intervention; **OR**
- To diagnose/manage endocarditis with a moderate or high pretest probability (e.g. bacteremia, especially staph bacteraemia or fungemia); **OR**
- To diagnose/manage endocarditis involving prosthetic heart valves; **OR**
- In evaluation of persistent fever in a patient with an intracardiac device to exclude endocarditis; **OR**
- In evaluation of a patient with atrial fibrillation/flutter to facilitate clinical decision-making with regards to anticoagulation and/or cardioversion and/or ablation
  - TEE is not required when the decision has been made to anticoagulate the patient and not perform cardioversion; **OR**
- In evaluation of a patient who has undergone surgical correction of complex congenital heart disease for the exclusion of intracardiac thrombus; **OR**
- In evaluation for cardiovascular source of embolic event when no non-cardiac source has been identified

# Resting Transthoracic Echocardiography (TTE)



## CPT Codes

- 93303..... Transthoracic echocardiography or congenital cardiac anomalies; complete
- 93304..... Transthoracic echocardiography or congenital cardiac anomalies; follow-up or limited study
- 93306..... Echocardiography, transthoracic, real-time with image documentation (2D), includes M-mode recording, when performed, complete, with spectral Doppler echocardiography, and with color flow Doppler echocardiography
- 93307..... Transthoracic echocardiography; complete, without spectral Doppler echocardiography, or color flow Doppler echocardiography
- 93308..... Transthoracic echocardiography; complete, without spectral Doppler echocardiography, or color flow Doppler echocardiography follow-up or limited study
- 93320..... This code is an add-on code to be used in conjunction with 93303, 93304. As such, this code does not require separate review
- 93321..... This code is an add-on code to be used in conjunction with 93303, 93304, 93308. As such, this code does not require separate review
- 93325..... This code is an add-on code to be used in conjunction with 93303, 93304, 93308. As such, this code does not require separate review

## Standard Anatomic Coverage

- Heart, proximal great vessels, pericardium

## Imaging Considerations

### Advantages of transthoracic echocardiography:

- No risk to the patient
- Minimal patient discomfort
- Widely available
- Extremely portable
- No exposure to ionizing radiation

### Disadvantages of transthoracic echocardiography:

- Image quality suboptimal in some patients
- Less sensitive than transesophageal echocardiography in some clinical situations

### Ordering Issues:

- Transthoracic echocardiography should only be acquired on equipment which has the capability to perform Doppler echocardiography (pulsed-wave and continuous wave with spectral display) and color flow velocity mapping.
- In interpretation of this document, the term "clinically stable" is taken to mean that the patient has no new or worsening cardiac symptoms and there are no changes on cardiovascular examination.

# Common Diagnostic Indications

## Suspected valvular heart disease

- Evaluation of cardiac murmurs when the diagnosis of valvular heart disease has not been established
  - After the diagnosis of valvular heart disease has been established, follow the guidelines for the specific valvular lesion (eg, established aortic stenosis)
- Initial evaluation for mitral valve prolapse when signs or symptoms of mitral valve prolapse are present
- Initial evaluation for bicuspid aortic valve when there is a family history (established diagnosis in a first-degree relative)

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## Established native valvular stenosis (does not apply to congenital valvular stenosis)

- Changing signs or symptoms; **OR**
- Reevaluation of clinically stable patients with moderate or severe stenosis annually; **OR**
- Reevaluation of clinically stable patients with mild stenosis every three (3) years; **OR**
- Assessment of changes in hemodynamic severity and left ventricular function in patients with known aortic stenosis during pregnancy

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## Established native valvular regurgitation

- Changing signs or symptoms; **OR**
- Reevaluation of clinically stable patients with moderate or severe regurgitation annually; **OR**
- Reevaluation of clinically stable patients with mild regurgitation every three (3) years

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## Established bicuspid aortic valve

- Changing signs or symptoms suggesting the development of aortic valve dysfunction; **OR**
- Bicuspid aortic valve and dilated aortic root on prior echo (annual echocardiography is indicated); **OR**
- Bicuspid aortic valve and normal aortic root on prior echo [echo at three (3) yearly intervals is indicated]

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## Established mitral valve prolapse

- Changing signs or symptoms

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## Prosthetic cardiac valves (mechanical or bioprosthetic) and patients who have undergone valve repair

This guideline does not apply to valve replacement or repair for correction of congenital heart disease in childhood – see indication **Evaluation of patients with congenital heart disease**.

- Initial post-operative evaluation of valve function (baseline study); **OR**
- Signs and/or symptoms suggesting dysfunction of a repaired or replaced valve; **OR**
- Annual reevaluation of a patient with a prosthetic or repaired heart valve noted on prior imaging study to have moderate or severe dysfunction (stenosis or regurgitation); **OR**
- Evaluation at three (3) yearly intervals of a patient with a prosthetic or repaired heart valve noted on prior imaging study to have mild dysfunction (stenosis or regurgitation); **OR**
- Annual reevaluation of clinically stable adults (age 19 years or older) who have undergone valve repair or implantation of a bioprosthetic valve more than seven (7) years previously
  - This guideline does not apply to patients with a mechanical valve prosthesis; **OR**
- Following transcatheter aortic valve implantation/replacement (TAVI or TAVR), TTE is appropriate in clinically stable patients on one (1) occasion within the first three (3) months, at one (1) year, and annually thereafter.

# Common Diagnostic Indications

## Evaluation of patients with congenital heart disease

- Evaluation of patients in whom congenital heart disease is suspected based on signs and symptoms (including murmur, cyanosis, unexplained arterial desaturation, abnormal arterial pulses) abnormal EKG, abnormal chest x-ray; **OR**
- Patients with chromosomal abnormalities or major extra cardiac abnormality associated with a high incidence of coexisting cardiac abnormality; **OR**
- Patients with established congenital heart disease (repaired or unrepaired) in whom there is a change in clinical status; **OR**
- Adult patients with a childhood history of congenital heart disease (with or without prior surgical repair) in whom the original diagnosis is uncertain or when the precise nature of the structural abnormalities or hemodynamics is unclear; **OR**
- Annual echocardiography is appropriate in clinically stable patients age six (6) years or older with established complex congenital heart disease (with or without prior surgical repair) in whom surveillance for ventricular function, valvular function or pulmonary artery pressure is important in clinical decision-making
  - This does not include patients with successfully repaired patent ductus arteriosus, small atrial or ventricular septal defects, bicuspid aortic valve or mitral valve prolapse; **OR**
- Echocardiography is appropriate in clinically stable patients age five (5) years or younger with established congenital heart disease (with or without prior surgical repair) in whom surveillance for ventricular function, AV valvular regurgitation or pulmonary artery pressure is important in clinical decision-making; **OR**
- Initial outpatient post-operative evaluation of patients who have undergone surgical or catheter-based procedures to correct congenital heart disease (within 60 days of the procedure); **OR**
- TTE is appropriate every three (3) years in the follow up of patients who have undergone catheter-based closure of atrial or ventricular septal defects; **OR**
- Non adult patients (less than or equal to 18 years old) who are undergoing staged surgical correction of congenital heart disease; **OR**
- Patients in whom a decision to perform surgical or catheter based repair of congenital heart disease has been made and in whom echocardiography will be used to assist with procedural planning

# Common Diagnostic Indications

## Evaluation of ventricular function

**Note:** It is assumed that left ventricular function will be evaluated using a single imaging modality. Thus, if left ventricular function has been evaluated recently by blood pool imaging reevaluation using echocardiography is not necessary.

### Hypertension

- Initial evaluation of patients with an established diagnosis of hypertension; **OR**
- Annual evaluation of non-adult patients (less than or equal to 18 years old) with an established diagnosis of hypertension

### Heart Failure / Cardiomyopathy / Left Ventricular Dysfunction

- Initial evaluation of known or suspected heart failure; **OR**
- Reevaluation of patients with known heart failure (systolic or diastolic) in a patient with a deterioration in clinical status; **OR**
- Reevaluation of patients with known LV dysfunction (systolic or diastolic) in a patient with a deterioration in clinical status; **OR**
- Reevaluation of clinically stable non-adult (age 18 years or younger) patients with left ventricular systolic dysfunction (Left Ventricular ejection fraction <60%) at six (6) monthly intervals; **OR**
- Screening study every two (2) years in clinically stable first-degree relatives of patients with inherited cardiomyopathy {see specific indications for hypertrophic obstructive cardiomyopathy (HOCM) below}; **OR**
- Evaluation of suspected restrictive, infiltrative or genetic cardiomyopathy; **OR**
- Initial evaluation of suspected hypertrophic obstructive cardiomyopathy (HOCM); **OR**
- Reevaluation of known hypertrophic obstructive cardiomyopathy (HOCM) in a patient with a change in clinical status to guide or evaluate therapy; **OR**
- Annual reevaluation non-adult (age 18 years or younger) first-degree relatives of patients with established hypertrophic obstructive cardiomyopathy (HOCM); **OR**
- Evaluation every five (5) years of adult (age 19 years or older) first-degree relatives of patients with established hypertrophic obstructive cardiomyopathy (HOCM); **OR**
- Annual reevaluation of asymptomatic adult (age 19 years or older) patients with known hypertrophic obstructive cardiomyopathy (HOCM); **OR**
- Reevaluation of asymptomatic non-adult (age 18 years or younger) patients with known hypertrophic obstructive cardiomyopathy (HOCM) at six (6) monthly intervals

### Implantable devices

- Evaluation of LV function in a patient with known cardiomyopathy being considered for cardiac resynchronization therapy (CRT), implantable defibrillator (AICD) or ventricular assist device (VAD); **OR**
- Initial evaluation for cardiac resynchronization therapy (CRT) device optimization following implantation; **OR**
- Evaluation of a patient being treated with cardiac resynchronization therapy (CRT) with new or persistent signs or symptoms of heart failure for device optimization; **OR**
- Echocardiography is indicated for optimization of device settings in patients with ventricular assist device (VAD); **OR**
- Echocardiography is indicated for evaluation of signs and/or symptoms suggestive of device related complications in patients with ventricular assist device (VAD)

### Abnormalities on other testing

- Evaluation of patients with resting EKG abnormalities (LBBB, RBBB with left anterior or posterior hemiblock, LVH, RVH, Q waves suggestive of prior infarction); **OR**
- When left ventricular dysfunction is suggested by other testing (chest imaging, elevated BNP) and LV function has not been evaluated by another modality since that testing was performed; **OR**
- Where a significant discrepancy (more than would be expected for the range of error of the methods) exists in the evaluation of left ventricular dysfunction by two other imaging modalities, echocardiography can be used as an arbiter

# Common Diagnostic Indications

## Other

- Pre and post cardiac transplant evaluation; **OR**
- Evaluation of known or suspected myocarditis; **OR**
- Echocardiography to evaluate right ventricular function in patients with disease likely to affect right ventricular function including but not limited to chronic lung diseases and sleep apnea syndrome; **OR**
- Baseline and serial reevaluation in patients undergoing, planning to undergo or who have undergone therapy with cardiotoxic agents (examples including but not limited to some chemotherapeutic agents for cancer, Novantrone® (mitoxantrone) for multiple sclerosis

## Evaluation of patients with cardiac arrhythmias

- In patients who have sustained (lasting more than 30 seconds) or nonsustained (more than 3 beats but terminating within 30 seconds) ventricular tachycardia
- In patients who have sustained (lasting more than 30 seconds) or non-sustained (more than 3 beats but terminating within 30 seconds) supraventricular tachycardia (including but not limited to atrial fibrillation, atrial flutter, atrial tachycardia, AV node reentrant tachycardia, etc.)
- In patients who have frequent premature ventricular contractions (PVC) defined as more than thirty (30) PVCs per hour on ambulatory EKG (Holter) monitoring
  - It is not clinically indicated to perform echocardiography for evaluation of infrequent premature atrial or ventricular depolarizations

## Evaluation of infective endocarditis (native or prosthetic valves)

- Patients with suspected endocarditis (positive blood cultures and/or a new murmur on physical examination)
- Reevaluation of patients with established endocarditis who have any of the following
  - Virulent organism; **OR**
  - Severe hemodynamic lesion; **OR**
  - Aortic involvement; **OR**
  - Persistent bacteremia; **OR**
  - Clinical deterioration

## Evaluation of patients with suspected coronary artery disease

- Chest pain
  - Resting echocardiography may suggest a cause for the chest pain other than myocardial ischemia (mitral valve prolapse) and is therefore a reasonable imaging procedure in patients with chest pain
  - If coronary artery disease is a likely diagnosis and if a resting echocardiogram cannot be performed while the patient is experiencing the pain, a provocative test (exercise or pharmacological stress test with or without imaging as appropriate) is preferable
  - Resting echocardiography has no role in screening for coronary artery disease in asymptomatic patients; **OR**
- Echocardiography is appropriate in the evaluation of patients with suspected aberrant or anomalous coronary origins or coronary artery fistula

# Common Diagnostic Indications

## Evaluation of patients with known coronary artery disease

- Recent (< 3 weeks) acute coronary syndrome (myocardial infarction or unstable angina) and hemodynamic instability or signs or symptoms suggesting a complication of myocardial infarction including but not limited to acute mitral regurgitation, hypoxemia, abnormal chest x-ray, acute ventricular septal rupture, free wall rupture / tamponade, shock, right ventricular involvement, heart failure, or thrombus
  - This study is usually requested on an inpatient; **OR**
- Recent (< 3 weeks) acute coronary syndrome (myocardial infarction or unstable angina) for initial assessment of LV function
  - This study is usually done prior to discharge
  - Not required if left ventricular function has been assessed using a different imaging modality; **OR**
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function during recovery phase {up to six (6) months following acute coronary syndrome}; **OR**
- Prior acute coronary syndrome (myocardial infarction or unstable angina) for reevaluation of ventricular function after the recovery phase {more than six (6) months} in patients who develop new symptoms or signs suggestive of heart failure; **OR**
- Prior myocardial infarction for reevaluation of LV function in patients being considered for AICD or cardiac resynchronization therapy (CRT); **OR**
- Annual echocardiography is appropriate in non-adult patients (less than or equal to 18 years old) with an established diagnosis of aberrant or anomalous coronary origins or coronary artery fistula if the findings on echocardiography will impact clinical decision making; **OR**

## Evaluation of Kawasaki disease

- Echocardiography is appropriate in the evaluation of patients with suspected Kawasaki disease; **OR**
- Echocardiography is appropriate in patients with an established diagnosis of Kawasaki disease at 2–4 weeks and again at 6–8 weeks following diagnosis whether or not there was coronary artery involvement; **OR**
- Echocardiography is appropriate for periodic surveillance up to one year following diagnosis of Kawasaki disease in patients with persistent fever; **OR**
- Echocardiography is appropriate for periodic surveillance up to one year following diagnosis of Kawasaki disease when previous echocardiograms reveal any of the following:
  - Coronary abnormalities
  - Left ventricular dysfunction
  - Pericardial effusion
  - Valvular regurgitation (other than trace or trivial regurgitation)
  - Aortic dilation; **OR**
- Annual echocardiography is appropriate in patients with an established diagnosis of Kawasaki disease who have small or medium sized coronary artery aneurysms; **OR**
- Semiannual (every six months) echocardiography is appropriate in patients with an established diagnosis of Kawasaki disease who have large or giant coronary artery aneurysms or coronary artery obstruction

# Common Diagnostic Indications

## Evaluation of signs, symptoms or abnormal testing

- Echocardiography is appropriate in the evaluation of the following newly recognized symptoms {dyspnea, lightheadedness, syncope, palpitations, reduced functional capacity, orthopnea, paroxysmal nocturnal dyspnea, transient ischemic attack (TIA) or cerebrovascular attack (CVA)}; **OR**
- Echocardiography is appropriate in the evaluation of chest pain not thought to be due to myocardial ischemia or infarction. If myocardial ischemia or infarction is thought to be the cause, resting outpatient echocardiography is not appropriate; **OR**
- Echocardiography is appropriate in the evaluation of the following newly recognized signs suggesting structural heart disease (murmur, cyanosis, ankle edema, ascites, elevation of jugular venous pressure, unexplained weight gain, tachycardia, tachypnea, audible third heart sound, lung crackles suggestive of pulmonary edema); **OR**
- Echocardiography is appropriate in the evaluation of patients who are hemodynamically unstable or hypotensive for unknown reasons; **OR**
- Echocardiography is appropriate in further evaluation of abnormal results from other testing which suggests underlying cardiac disease {abnormal chest imaging suggesting cardiac chamber enlargement, valvular or congenital heart disease or congestive heart failure, abnormal EKG suggesting chamber hypertrophy, valvular or congenital heart disease (LBBB, RBBB with anterior or posterior hemiblock, left or right ventricular hypertrophy or Q waves suggestive of prior infarction) or abnormal laboratory results suggesting congestive heart failure such as elevated B-type natriuretic peptide (BNP)}
  - When other cardiac testing raises concerns of underlying coronary artery disease, provocative testing is recommended over resting echocardiography; **OR**
- Echocardiography is appropriate in the evaluation of respiratory failure of unknown cause; **OR**
- Echocardiography is appropriate annually in the evaluation of patients with syndromes which place them at increased risk for the development of acquired myocardial or aortic diseases (for example, Marfan Syndrome, Ehlers-Danlos Syndrome, Turner Syndrome, etc.); **OR**
- Echocardiography is appropriate in the evaluation of suspected acute rheumatic fever

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## Evaluation of patients with pulmonary embolus

- In patients with known acute pulmonary embolus, echocardiography may be performed as it is useful in guiding initial decision making (thrombectomy, thrombolysis)
  - Echocardiography is not indicated in the initial evaluation of a patient with suspected pulmonary embolism in order to establish the diagnosis; **OR**
- In patients who have had a pulmonary embolus, echocardiography may be performed to evaluate right ventricular function and pulmonary artery pressure. If right ventricular function and pulmonary artery pressure are normal, repeated studies are not necessary

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## Evaluation of patients with pulmonary hypertension

- Echocardiography is indicated for evaluation of suspected pulmonary hypertension; **OR**
- Echocardiography is indicated in follow-up of pulmonary arterial pressures in patients with pulmonary hypertension to evaluate response to treatment; **OR**
- Echocardiography may be performed annually in clinically stable patients with an established diagnosis of pulmonary hypertension; **OR**
- Echocardiography may be performed to evaluate signs or symptoms which may be attributable to worsened pulmonary hypertension

# Common Diagnostic Indications

## Evaluation of aortic disease

- Echocardiography is appropriate on one occasion when ascending aortic aneurysm / dilation or dissection is suspected based on symptoms of chest pain or shortness of breath or abnormal physical findings suggesting these diagnoses
  - Although some providers will use transthoracic echocardiography in evaluation of diseases of the thoracic aorta, transesophageal echocardiography (TEE) is often preferable in this situation
- Echocardiography is indicated annually when pathology of the ascending aorta (aneurysm / dilation or dissection) is suspected because the patient has an established diagnosis of a connective tissue disease or genetic condition which predisposes to ascending aortic pathology including but not limited to Marfan syndrome, Ehlers-Danlos syndrome and familial aortic dilation (this guideline does not apply to surveillance of patients with bicuspid aortic valve – see separate guideline for this condition above)
- Echocardiography is appropriate for evaluation of the ascending aorta in patients with a suspected connective tissue disease or genetic condition which predisposes to ascending aortic pathology including but not limited to Marfan syndrome, Ehlers-Danlos syndrome and familial aortic dilation
- Annual echocardiography is appropriate in patients with an established diagnosis of ascending aortic aneurysm or dissection
  - Annual echocardiographic evaluation is usually sufficient in clinically stable patients but more frequent testing may be appropriate in some situations (e.g. in longitudinal follow-up of large or enlarging thoracic aneurysms, in follow-up of recently diagnosed thoracic aneurysms until stability is established)
- Echocardiography is appropriate in patients with an established diagnosis of ascending aortic aneurysm or dissection who develop new symptoms or signs of aortic aneurysm or dissection.

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## Evaluation of pericardial diseases

- Echocardiography is indicated in the evaluation of suspected pericardial conditions including but not limited to pericardial effusion, pericardial mass, constrictive pericarditis, effusive-constrictive conditions, patients post cardiac surgery or suspected pericardial tamponade
- Echocardiography is indicated in the evaluation of established pericardial conditions including but not limited to moderate and large pericardial effusion, pericardial mass, constrictive pericarditis, effusive-constrictive conditions, patients post cardiac surgery or suspected pericardial tamponade
  - Routine surveillance of known small pericardial effusions with no change in clinical status is not appropriate

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## Evaluation of cardiac masses or cardiac source of embolus

- Echocardiography is indicated in the diagnosis or exclusion of a cardiac source of embolus in a patient who has had or appears to have had a systemic embolic event (although transesophageal echocardiography (TEE) is often preferable in this situation)
- Echocardiography is indicated in the pre- and post-treatment evaluation of cardiac masses (tumor or thrombus)
  - Annual echocardiographic evaluation is usually sufficient in clinically stable patients with cardiac masses (tumors or thrombus) but more frequent testing may be appropriate in some situations (e.g. in longitudinal follow-up of enlarging masses or in follow-up of recently diagnosed masses until stability is established)

# Computed Tomography (CT) Cardiac (Structure)



## CPT Codes

- 75572..... Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology (including 3-D image post-processing, assessment of cardiac function, and evaluation of venous structures if performed)
- 75573..... Computed tomography, heart, with contrast material, for evaluation of cardiac structure and morphology in the setting of congenital heart disease (including 3-D post-processing, assessment of left ventricular cardiac function, right ventricular structure and function and evaluation of venous structures, if performed)

## Standard Anatomic Coverage

- Heart and great vessels within the thorax

## Imaging Considerations

### Advantages of Cardiac CT:

- Rapidly acquired exams, with excellent anatomic detail afforded by most multi-detector CT scanners with 64 or more active detector rows

### Disadvantages of Cardiac CT include:

- Potential complications from use of intravascular iodinated contrast administration (see biosafety issues, below)
- Exposure to ionizing radiation
- Potential factors that may limit the image quality during acquisition of Cardiac CT such as:
  - Uncontrolled atrial or ventricular arrhythmias
  - Inability to image at a desired heart rate, which may occur despite beta blocker administration
  - Inability of the patient to comply with the requirements of scanning (patient motion during image acquisition, inability to comply with breath hold requirements, inability to lie supine, claustrophobia)
  - Because of the radiation exposure issues careful consideration should be given to other imaging modalities in pregnant women and children

### Biosafety Issues:

- Ordering and imaging providers are responsible for considering safety issues prior to the cardiac CT exam. One of the most significant considerations is the requirement for intravascular iodinated contrast material, which may have an adverse effect on patients with a history of documented allergic contrast reactions or atopy, as well as on individuals with renal impairment, who are at greater risk for contrast-induced nephropathy. In addition, radiation safety issues including cumulative exposure to ionizing radiation should be considered.

### Ordering Issues:

- This guideline does not apply to coronary CT angiography (CPT 75574).
- This guideline does not apply to Cardiac CT for quantitation of coronary artery calcification (CPT 75571).
- Selection of the optimal diagnostic work-up for cardiac evaluation should be made within the context of other available studies (which include transthoracic and transesophageal echocardiography and cardiac MRI), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.
- There are uncommon circumstances when both Cardiac CT and Cardiac MRI should be ordered for the same clinical presentation. The specific rationale must be delineated at the time of request.
- In general, follow-up Cardiac CT exams should be performed only when there is a clinical change, with new signs or symptoms, or specific finding(s) requiring imaging surveillance.

# Common Diagnostic Indications

## Congenital heart disease

- For evaluation of suspected or established congenital heart disease in patients whose echocardiogram is technically limited or non-diagnostic; **OR**
- For further evaluation of patients whose echocardiogram suggests a new diagnosis of complex congenital heart disease; **OR**
- For evaluation of complex congenital heart disease in patients who are less than one year post surgical correction; **OR**
- For evaluation of complex congenital heart disease in patients who have new or worsening symptoms and/or a change in physical examination; **OR**
- To assist in surgical planning for patients with complex congenital heart disease; **OR**
- For surveillance in asymptomatic patients with complex congenital heart disease who have not had cardiac MRI or cardiac CT within the preceding year
  - Cardiac MRI or transesophageal echocardiography may be preferable to cardiac CT in order to avoid radiation exposure

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## Cardiomyopathy

- Evaluation of patients with suspected arrhythmogenic right ventricular dysplasia; **OR**
- To assess LV function in patients with suspected or established cardiomyopathy when all other non-invasive imaging is not feasible or technically suboptimal
  - Other modalities providing non-invasive evaluation of LV function include transthoracic and transesophageal echocardiography, blood pool imaging (MUGA or First pass) and cardiac MRI; **OR**
- To assess RV function in patients with suspected RV dysfunction when all other non-invasive imaging is not feasible or technically suboptimal
  - Other modalities providing non-invasive evaluation of RV function include transthoracic and transesophageal echocardiography, blood pool imaging (MUGA or First pass) and cardiac MRI

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## Valvular heart disease

- Evaluation of suspected dysfunction of native or prosthetic cardiac valves when all other cardiac imaging options are not feasible or technically suboptimal
  - Other modalities providing non-invasive evaluation of native or prosthetic valves include transthoracic and transesophageal echocardiography, and cardiac MRI
- Evaluation of established dysfunction of native or prosthetic cardiac valves when all other cardiac imaging options are not feasible or technically suboptimal
  - Other modalities providing non-invasive evaluation of native or prosthetic valves include transthoracic and transesophageal echocardiography, and cardiac MRI

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## Evaluation of patients with established coronary artery disease

- Non-invasive localization of coronary bypass grafts or potential grafts (including internal mammary artery) and/or evaluation of retrosternal anatomy in patients undergoing repeat surgical revascularization

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## Intra-cardiac and para-cardiac masses and tumors

- In patients with a suspected cardiac or para-cardiac mass (thrombus, tumor, etc.) suggested by transthoracic echocardiography, transesophageal echocardiography, blood pool imaging or contrast ventriculography who have not undergone cardiac CT or cardiac MRI within the preceding 60 days; **OR**
- In patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically unstable; **OR**
- In patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically stable and have not undergone cardiac CT or cardiac MRI within the preceding year; **OR**
- In patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who have undergone treatment (chemotherapy, radiation therapy, thrombolysis, anticoagulation or surgery) within the preceding year and have not had cardiac CT or cardiac MRI within the preceding 60 days

# Common Diagnostic Indications

## Cardiac aneurysm and pseudoaneurysm

### Evaluation of pericardial conditions (pericardial effusion, constrictive pericarditis, or congenital pericardial diseases)

- In patients with suspected pericardial constriction; **OR**
- In patients with suspected congenital pericardial disease; **OR**
- In patients with suspected pericardial effusion who have undergone echocardiography deemed to be technically suboptimal in evaluation of the effusion; **OR**
- In patients whose echocardiogram shows a complex pericardial effusion (loculated, containing solid material)

### Evaluation of cardiac venous anatomy

- For localization of the pulmonary veins in patients with chronic or paroxysmal atrial fibrillation/flutter who are being considered for ablation; **OR**
- Coronary venous localization prior to implantation of a biventricular pacemaker

### Evaluation of the thoracic aorta

- In patients with suspected thoracic aortic aneurysm / dilation who have not undergone CT or MRI of the thoracic aorta within the preceding 60 days; **OR**
- In patients with confirmed thoracic aortic aneurysm / dilation with new or worsening signs/symptoms; **OR**
- For ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm / dilation who have not undergone surgical repair and have not had imaging of the thoracic aorta within the preceding six months; **OR**
- In patients with suspected aortic dissection; **OR**
- In patients with confirmed aortic dissection who have new or worsening symptoms; **OR**
- In patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in preoperative planning); **OR**
- For ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year; **OR**
- In patients with confirmed aortic dissection or thoracic aortic aneurysm / dilation who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding six months; **OR**
- In patients who have sustained blunt chest trauma, penetrating aortic trauma or iatrogenic trauma as a result of aortic instrumentation; **OR**
- In patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone cardiac CT or cardiac MRI within the preceding 60 days

# Computed Tomographic Angiography Coronary Arteries (CCTA)



## CPT Codes

75574..... Computed tomographic angiography, heart, coronary arteries and bypass grafts (where present), with contrast material, including 3-D image post-processing (including evaluation of cardiac structure and morphology, assessment of cardiac function, and evaluation of venous structures, if performed)

## Standard Anatomic Coverage

- Cardiac and Coronary Artery Imaging: Coverage may vary, depending on the specific clinical indication as well as prior history of coronary artery bypass graft placement

## Imaging Considerations

### Advantages of CTA:

- Advantages of Coronary Artery CTA
  - Rapidly acquired exams, with excellent anatomic detail afforded by most multi-detector CT scanners with 64 or more active detector rows
  - CTA has a very high negative predictive value (93% to 100%)

### Disadvantages of CTA:

- Disadvantages of Coronary Artery CTA include:
  - Exposure to ionizing radiation (2-3 times higher than the average radiation dose administered to patients undergoing cardiac catheterization)
  - Potential complications from use of intravascular iodinated contrast administration (see biosafety issues, below)
  - Potential factors that may limit the image quality during a Cardiac CT/Coronary Artery CTA exam, such as:
    - Uncontrolled atrial or ventricular arrhythmias
    - Extensive coronary artery calcification which may produce artifact
    - Coronary stent evaluation for possible restenosis, as the stent material itself as well as the quality of the scan and scanner may produce artifacts, limiting the exam
    - Inability to image at a desired heart rate, which may occur despite beta blocker administration
    - Inability of the patient to comply with the requirements of scanning (patient motion during image acquisition, inability to comply with breath hold requirements, inability to lie supine, claustrophobia)
    - Because of the radiation exposure issues, careful consideration should be given to other imaging modalities in pregnant women and children.
    - CCTA images the coronary arteries directly. Therefore, the information provided is anatomical. The presence of coronary stenosis on CCTA (particularly if deemed to be of intermediate severity) does not establish that the lesion has flow limiting significance. Thus, following abnormal CCTA, functional testing may be required to assist in clinical decision-making.

### Biosafety Issues:

- Ordering and imaging providers are responsible for considering safety issues prior to the CCTA exam. One of the most significant considerations is the requirement for intravascular iodinated contrast material, which may have an adverse effect on patients with a history of documented allergic contrast reactions or atopy, as well as on individuals with renal impairment, who are at greater risk for contrast-induced nephropathy. In addition, radiation safety issues including cumulative exposure to ionizing radiation should be considered.

# Imaging Considerations

## Ordering Issues:

- CCTA exams are not covered by most healthcare insurers as a screening study, in the absence of signs, symptoms or known disease
- Selection of the optimal diagnostic work-up for cardiac evaluation should be made within the context of other available studies (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac MRI, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing
- This guideline does not apply to Cardiac CT for quantitation of coronary artery calcification (CPT 75571)
- This guideline does not apply to Cardiac CT for evaluation of cardiac structure (CPT 75572-75573)

Several clinical indications listed for CCTA include standard methods of risk assessment, such as the SCORE (Systematic Coronary Risk Evaluation) or the Framingham risk score calculation. These risk calculation systems include consideration of the following factors:

Age	Sex
Abnormal Lipid Profile	Hypertension
Diabetes Mellitus	Cigarette Smoking

## Common Diagnostic Indications

### Congenital coronary artery anomalies

- For evaluation of suspected congenital anomalies of the coronary arteries

### Congestive heart failure / cardiomyopathy / left ventricular dysfunction

- For exclusion of coronary artery disease in patients with left ventricular ejection fraction <55% in whom coronary artery disease has not been excluded as the etiology of the cardiomyopathy

### Evaluation of patients with suspected coronary artery disease including those with prior abnormal cardiac testing (MPI or stress echo)

- Patients with abnormal MPI or stress echo within the preceding 60 days suspected to be false positive on the basis of low Coronary Heart Disease Risk (using standard methods of risk assessment such as the SCORE risk calculation)
  - In the absence of a contraindication (excluding renal impairment and iodinated contrast agent hypersensitivity) patients with moderate or high Coronary Heart Disease Risk should be referred for coronary arteriography; **OR**
- Patients with equivocal MPI or stress echo within the preceding 60 days who have low or moderate Coronary Heart Disease Risk (using standard methods of risk assessment such as the SCORE risk calculation)
  - In the absence of a contraindication (excluding renal impairment and iodinated contrast agent hypersensitivity) patients with high Coronary Heart Disease Risk should be referred for coronary arteriography
  - The resulting information from the CCTA should facilitate management decisions and not merely add a new layer of testing
- Patients at moderate coronary heart disease risk (using standard methods of risk assessment, such as the SCORE risk calculation) being evaluated for non-coronary artery cardiac surgery (including valvular and ascending aortic surgery) to avoid an invasive angiogram, where all the necessary pre-operative information can be obtained using cardiac CT
- For evaluation of suspected congenital anomalies of the coronary arteries

# Cardiac Computed Tomography (CT) for Quantitative Evaluation of Coronary Calcification

## CPT Codes

75571..... Computed tomography, heart, without contrast material, with quantitative evaluation of coronary artery calcium

## Standard Anatomic Coverage

- Coronary Artery Imaging

## Imaging Considerations

### Advantages of cardiac CT for quantitative evaluation of coronary artery calcification:

- Rapidly acquired exams
- Coronary artery calcification has been shown to correlate with the presence of atherosomatous coronary artery disease

### Disadvantages of cardiac CT for quantitative evaluation of coronary artery calcification:

- Exposure to ionizing radiation
- No role in the evaluation of patients with symptoms potentially due to coronary artery disease
- Not clear that risk stratification data provided by quantitative evaluation of coronary artery calcification impacts patient outcomes

### Biosafety issues:

- Ordering and imaging providers are responsible for considering safety issues prior to performing quantitative evaluation of coronary artery calcification

### Ordering issues:

- Cardiac CT for quantitative evaluation of coronary artery calcification is not covered by most healthcare insurers as a screening study.
- Selection of the optimal diagnostic work-up for cardiac evaluation should be made within the context of other available studies (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac MRI, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.
- This guideline pertains to cardiac CT for quantitative evaluation of coronary artery calcification using either Electron Beam CT (EBCT) or Multi-Detector CT (MDCT).
- This guideline does not apply to coronary CT angiography (CPT 75574).
- This guideline does not apply to cardiac CT for evaluation of cardiac structure and function (CPT 75572-75573).

## Quantitative Evaluation of Coronary Artery Calcification

**The use of cardiac CT for quantitative evaluation of coronary artery calcification has not been conclusively shown to impact patient outcomes and is therefore considered to be not medically necessary in all clinical situations**

# Magnetic Resonance Imaging (MRI) Cardiac



## CPT Codes

- 75557..... Cardiac MRI for morphology and function, without contrast material  
75559..... Cardiac MRI for morphology and function, without contrast material, with stress imaging  
75561..... Cardiac MRI for morphology and function, without contrast material, followed by contrast material  
75563..... Cardiac MRI for morphology and function, without contrast material, followed by contrast material with stress imaging  
75565..... Add-on code to be used in conjunction with 75557, 75559, 75561, and 75563. As such, this code does not require separate review.

## Coding Considerations

Only one procedure in the series 75557–75563 is appropriately reported per session.

## Imaging Considerations

### Patient Compatibility Issues:

- Gating Issues: As with other cardiac imaging modalities, the acquisition of images is frequently gated to the electrocardiogram. Thus, in patients with irregular heart rhythms, image quality may be suboptimal.

### Biosafety Issues:

- Ordering and imaging providers are responsible for considering biosafety issues prior to MRI examination, to ensure patient safety. Among the generally recognized contraindications to MRI exam performance are permanent pacemakers (some newer models are MRI compatible) or implantable cardioverter-defibrillators (ICD), intracranial aneurysm surgical clips that are not compatible with MR imaging, as well as other devices considered unsafe in MRI scanners (including certain implanted materials in the patient as well as external equipment, such as portable oxygen tanks).
- Contrast utilization is at the discretion of the ordering and imaging providers.

### Ordering Issues:

- Selection of the optimal diagnostic work-up for cardiac evaluation should be made within the context of other available studies (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac MRI, cardiac PET imaging and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing.

## Common Diagnostic Indications

### Coronary artery disease

#### Patients who have had a myocardial infarction

- To assess viability of the infarcted myocardium utilizing delayed hyperenhancement (contrast studies) when other studies (myocardial perfusion imaging or stress echocardiography) have yielded equivocal or indeterminate results; **OR**
- To assess LV function post myocardial infarction when there is discordant information from other studies or when other studies are technically suboptimal; **OR**
- To assess mitral valve regurgitation post-myocardial infarction when echocardiography is technically suboptimal; **OR**
- To assess ventricular septal defects post-myocardial infarction when echocardiography is technically suboptimal; **OR**
- To delineate pericardial effusions associated with acute myocardial infarction when echocardiography is technically suboptimal

#### Patients with suspected coronary artery disease

- For evaluation of patients with suspected congenital coronary anomalies

# Common Diagnostic Indications

## Myocarditis

- For the evaluation of patients with suspected myocarditis; **OR**
- For follow-up evaluation LV function of patients with an established diagnosis of myocarditis whose transthoracic echocardiogram is technically suboptimal

## Cardiomyopathy

- To assess LV function in symptomatic patients with suspected or established cardiomyopathy when there is discordant information from other studies or when other studies are technically suboptimal; **OR**
- Annual evaluation for suspected cardiomyopathy in clinically stable patients with an established diagnosis of a chronic and progressive disease (excluding CAD) which may result in cardiomyopathy when echocardiography fails to exclude cardiomyopathy. This guideline applies to infiltrative cardiomyopathies (e.g. sarcoidosis; amyloidosis; hemochromatosis), hypertrophic obstructive cardiomyopathy (HOCM) and non-compaction cardiomyopathy; **OR**
- Reevaluation of clinically stable patients with cardiomyopathy at yearly intervals when echocardiography is technically suboptimal; **OR**
- Evaluation of patients with suspected arrhythmogenic right ventricular dysplasia; **OR**
- For coronary vein mapping in patients with cardiomyopathy for whom cardiac resynchronization therapy (CRT) is planned

## Cardiac aneurysm or pseudoaneurysm

## Congenital heart disease

- For evaluation of suspected congenital anomalies of the coronary arteries; **OR**
- For evaluation of suspected or established congenital heart disease in patients whose echocardiogram is technically limited or nondiagnostic; **OR**
- For further evaluation of patients whose echocardiogram suggests a new diagnosis of complex congenital heart disease; **OR**
- For evaluation of complex congenital heart disease in patients who are less than one year post surgical correction; **OR**
- For evaluation of complex congenital heart disease in patients who have new or worsening symptoms and/or a change in physical examination; **OR**
- To assist in surgical planning for patients with complex congenital heart disease; **OR**
- For surveillance in asymptomatic patients with complex congenital heart disease who have not had cardiac MRI or cardiac CT within the preceding year

## Valvular heart disease

- Following inconclusive echocardiography or when echocardiography is not feasible; **OR**
- When moderate or severe valvular disease diagnosed using other imaging modalities requires further definition and that information is likely to affect subsequent management of the patient
  - To assess valvular lesions and measure regurgitant volume, regurgitant fraction, ejection fraction and ventricular volumes
  - To help determine the timing for valvular surgery

## Intra-cardiac and para-cardiac masses and tumors

- In patients with a suspected cardiac or para-cardiac mass (thrombus, tumor, etc.) suggested by transthoracic echocardiography, transesophageal echocardiography, blood pool imaging or contrast ventriculography who have not undergone cardiac MRI or cardiac CT within the preceding 60 days; **OR**
- In patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically unstable; **OR**
- In patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who are clinically stable and have not undergone cardiac MRI or cardiac CT within the preceding year; **OR**
- In patients with established cardiac or para-cardiac mass (thrombus, tumor, etc.) who have undergone treatment (chemotherapy, radiation therapy, thrombolysis, anticoagulation or surgery) within the preceding year and have not had cardiac MRI or cardiac CT within the preceding 60 days

# Common Diagnostic Indications

## Evaluation of cardiac venous anatomy

- For localization of the pulmonary veins in patients with chronic or paroxysmal atrial fibrillation/flutter who are being considered for ablation; **OR**
- Coronary venous localization prior to implantation of a biventricular pacemaker

## Evaluation of pericardial conditions (pericardial effusion, constrictive pericarditis, or congenital pericardial diseases)

- In patients with suspected pericardial constriction; **OR**
- In patients with suspected congenital pericardial disease; **OR**
- In patients with suspected pericardial effusion (including hemopericardium) who have undergone echocardiography deemed to be technically suboptimal in evaluation of the effusion; **OR**
- In patients whose echocardiogram shows a complex pericardial effusion (loculated, containing solid material)

## Evaluation of the thoracic aorta

- In patients with suspected thoracic aortic aneurysm / dilation who have not undergone CT or MRI of the thoracic aorta within the preceding 60 days; **OR**
- In patients with confirmed thoracic aortic aneurysm / dilation with new or worsening signs/symptoms; **OR**
- For ongoing surveillance of stable patients with confirmed thoracic aortic aneurysm / dilation who have not undergone imaging of the thoracic aorta within the preceding six months; **OR**
- In patients with suspected aortic dissection; **OR**
- In patients with confirmed aortic dissection who have new or worsening symptoms; **OR**
- In patients with confirmed aortic dissection in whom surgical repair is anticipated (to assist in pre-operative planning); **OR**
- For ongoing surveillance of stable patients with confirmed aortic dissection who have not undergone imaging of the thoracic aorta within the preceding year; **OR**
- In patients with confirmed aortic dissection or thoracic aortic aneurysm / dilation who have undergone surgical repair within the preceding year and have not undergone imaging of the thoracic aorta within the preceding six months; **OR**
- In patients who have sustained blunt chest trauma, penetrating aortic trauma or iatrogenic trauma as a result of aortic instrumentation; **OR**
- In patients being evaluated for potential transcatheter aortic valve implantation/replacement (TAVI or TAVR) provided that the patient has not undergone cardiac CT or cardiac MRI within the preceding 60 days

# Positron Emission Tomography (PET) Myocardial Imaging



## CPT Codes

- 78491..... PET myocardial perfusion, single study
- 78492..... PET myocardial perfusion, multiple studies
- 78459..... PET myocardial, metabolic evaluation

## Commonly Used Radiopharmaceuticals

- Ammonia ( $^{13}\text{NH}_3$ )
- Rubidium Chloride ( $^{82}\text{RbCl}$ )
- 2-( $^{18}\text{F}$ ) FLURO-2DEOXY-D-GLUCOSE (FDG)

## Imaging Considerations

- Perfusion PET imaging, using ammonia or rubidium isotopes, is used to differentiate areas of myocardium with normal coronary blood flow from those with abnormal coronary blood flow
- Rest and or stress perfusion PET imaging can be performed
- Metabolic evaluation (to determine myocardial viability) is performed using PET flurodeoxyglucose (FDG) imaging. Metabolic PET imaging has been shown to be useful in selection of patients who are likely to benefit from revascularization
- Perfusion PET imaging and metabolic PET imaging may occasionally be appropriate in the evaluation of myocardial pathologic processes other than coronary artery disease
- Isotopes used in PET imaging require special handling arrangements because of their short half-lives
- While rubidium may be produced in a commercially available on-site generator, ammonia requires cyclotron production
- Selection of the optimal diagnostic imaging for cardiac evaluation should be made within the context of other available modalities (which include treadmill stress test, stress myocardial perfusion imaging, stress echocardiography, cardiac CT, cardiac MRI and invasive cardiac/coronary angiography), so that the resulting information facilitates patient management decisions and does not merely add a new layer of testing

## Requirements for Myocardial PET Imaging

- Perfusion PET imaging is generally (exceptions noted below) to be considered only when a patient has undergone recent nuclear stress testing or stress echocardiography with equivocal results
- When non-invasive imaging is required in morbidly obese patients ( $\text{BMI} > 40$ ), with suspected or established CAD, perfusion PET imaging may be considered as the initial test (because of a higher likelihood of technically suboptimal image quality on nuclear stress testing and stress echocardiography in this patient subgroup)
- Perfusion PET myocardial imaging is not appropriate for screening for coronary artery disease in asymptomatic low risk patients regardless of age or body habitus
- PET metabolic imaging is used in patients with established coronary artery disease and left ventricular systolic dysfunction when determination of myocardial viability will influence the decision regarding revascularization
- PET metabolic imaging of the myocardium provides clinically useful information only when the myocardium is deemed to be nonviable using other imaging modalities (perfusion imaging using thallium / technetium isotopes or echocardiography) or when such imaging modalities are inconclusive regarding the viability status of the myocardium

## Common Diagnostic Indications

### Perfusion PET imaging – for patients who have BMI greater than 40

- Evaluation of symptoms consistent with myocardial ischemia to diagnose or exclude coronary artery disease; **OR**
- Established coronary artery disease with recurrent atypical symptoms
  - Coronary arteriography should be considered in patients with established CAD and typical symptoms; **OR**
- Evaluation of regional myocardial blood flow in patients with multiple vessel coronary artery disease with a view to identifying a culprit lesion for revascularization; **OR**
- Evaluation of asymptomatic patients who by virtue of risk factor status are at high risk of coronary artery disease (SCORE) and who have not undergone cardiac PET or cardiac catheterization within the past three (3) years; **OR**
- Evaluation of asymptomatic patients with established CAD who have not undergone cardiac PET or cardiac catheterization within the past three (3) years

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### Perfusion PET imaging – for patients who have BMI less than 40

- Further evaluation of patients who have had an equivocal nuclear stress test (MPI) or stress echo within the past 60 days

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### Metabolic PET imaging for evaluation of myocardial viability – when all four of the following conditions are met:

- The patient has established coronary artery disease; **AND**
- Left ventricular systolic dysfunction; **AND**
- Viability status is not defined by other testing; **AND**
- Revascularization is being considered

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### Metabolic PET imaging for evaluation of non-coronary cardiac diseases

- Metabolic PET imaging may be used in the diagnosis or management of cardiac sarcoidosis

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# Computed Tomography (CT) Abdomen



## CPT Codes

- 74150..... CT abdomen; without contrast
- 74160..... CT abdomen; with contrast
- 74170..... CT abdomen; without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Diaphragmatic dome to iliac crests
- Scan coverage may vary, depending on the specific clinical indication

## Technology Considerations

- For most gallbladder and hepatobiliary conditions, ascites evaluation and certain renal abnormalities (such as detection of gallstones, hydronephrosis and differentiation of cystic, complex and solid lesions), initial imaging should be considered using ultrasound.
- Verification of cystic lesions in abdominal viscera can usually be well-documented with ultrasound.
- Ultrasound studies may be limited in obese patients.

## Common Diagnostic Indications

This section contains general abdominal, hepatobiliary, pancreatic, gastrointestinal, genitourinary, splenic, and vascular indications.

### General Abdominal

#### Abdominal pain

- Unexplained by any of the following:
  - Clinical findings; **OR**
  - Physical examination; **OR**
  - Other imaging studies

#### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Ascites

- For diagnosis and surveillance, following non-diagnostic ultrasound

#### Congenital anomaly

#### Diffuse, unexplained lower extremity edema

**Note:** For female patients, to exclude an occult lesion causing mass effect, vascular compression, or intraluminal thrombi, ultrasound should be considered as the initial imaging modality

#### Fever of unknown origin

- Lasting more than three weeks with exceptions for immunocompromised patients
- Following standard work-up to localize the source

#### Hematoma / hemorrhage

# Common Diagnostic Indications

## Hernia

- For diagnosis of a hernia with suspected complications or presurgical planning including, but not limited to the following types of hernia:
  - Femoral
  - Internal
  - Inguinal
  - Spigelian (through semilunar line, lateral to rectus abdominis muscle)
  - Ventral

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## Incisional hernia

- For diagnosis of a hernia with suspected complications or presurgical planning

**Note:** *Ultrasound should be considered as the initial imaging modality*

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## Infectious or inflammatory process

- Including but not limited to the following:
  - Abscess
  - Diffuse inflammation / phlegmon
  - Fistula

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## Iron deposition/overload in hemochromatosis

- When MRI is contraindicated; **AND**
- To exclude iron overload in patients with hemochromatosis who are candidates for chelation therapy or phlebotomy

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## Lymphadenopathy

- For initial detection and follow-up

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## Palpable abdominal mass

**Note:** *For pediatric patients, ultrasound should be considered as the initial imaging modality*

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## Post-operative or post-procedure evaluation

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## Preoperative or pre-procedure evaluation

**Note:** *This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.*

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## Retroperitoneal abnormality – fibrosis, inflammation and neoplasm

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## Trauma

- Following significant blunt or penetrating injury to the abdomen

# Common Diagnostic Indications

## Tumor (primary neoplasm or metastatic disease)

Diagnosis, management or surveillance of known or suspected malignancy

**Exclusions—advanced imaging is not indicated in the following scenarios:**

- Breast cancer
  - Staging of low risk breast cancer (stage 2B or less) in the absence of signs or symptoms suggestive of metastatic disease
  - Surveillance of breast cancer in the absence of signs or symptoms of recurrent disease
- Colon cancer
  - Surveillance imaging of colon cancer in remission, **unless one of the following high risk features is present:**
    - Lymphatic or venous invasion
    - Lymph node involvement
    - Perineural invasion
    - Poorly differentiated tumor
    - T4 tumor
    - Associated with bowel obstruction
    - Close, indeterminate or positive margins
    - Fewer than 12 nodes examined at surgery
    - Localized perforation
- Gynecologic malignancies
  - Surveillance imaging in patients with previously treated gynecologic malignancies including ovarian, endometrial, cervical, vaginal or vulvar cancer (**Note:** This exclusion does not apply to sarcoma or other rare histologies not typically associated with these structures).
- Non-Hodgkin's lymphoma
  - Surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy
- Prostate cancer
  - Staging of low risk prostate cancer: Gleason score equal to six (6), PSA less than 10 ng/mL, and stage T1 or T2
  - Follow up or surveillance of prostate cancer following completion of therapy in the absence of a rising PSA

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## Unexplained weight loss – significant weight loss exceeding 10% of desirable body weight, over short time interval (six months or less), after initial evaluation for other causes

### Hepatobiliary

#### Acute cholecystitis

- Evaluation of suspected complications of acute cholecystitis when abdominal ultrasound is non-diagnostic

*Examples include perforation, abscess, gangrenous or hemorrhagic cholecystitis, gallstone ileus and Mirizzi's syndrome*

#### Cirrhosis for evaluation of hepatocellular carcinoma

# Common Diagnostic Indications

## Elevated liver transaminases

- Including alanine transaminase (ALT) and aspartate transaminase (AST)
- Following an abnormal or inconclusive abdominal ultrasound
- In patients on medications known to cause liver transaminase elevation, such as statins for hyperlipidemia, acetaminophen, non-steroidal anti-inflammatory drugs, Dilantin®, protease inhibitors and sulfonamides. These medications should be stopped whenever possible and liver chemistries repeated before performing advanced imaging
- Other causes for elevated liver transaminases include excessive alcohol intake, cirrhosis, hepatitis, hepatic steatosis as well as other hepatic and non-hepatic disorders. Consider additional diagnostic labs such as hepatitis panel and serum alpha fetoprotein, as appropriate

## Focal liver lesions

### Indeterminate lesions (not biopsied and not fully characterized by prior imaging)

- Initial evaluation of an indeterminate lesion identified on prior imaging when any of the following are present:
  - Size > 1 cm in diameter
  - Multiple lesions
  - Known malignancy
  - Known cirrhosis
  - Chronic hepatitis
  - Sclerosing cholangitis
  - Primary biliary cirrhosis
  - Hemochromatosis
  - Hemosiderosis
  - Oral contraceptive use
  - Anabolic steroid use
- Follow up or surveillance at 3 to 6 months when any of the above risk factors are present, or when the lesion is enhancing, poorly defined or increasing in size

### Benign lesions (biopsy-proven or fully characterized by imaging)

- Follow up when symptoms suggest a change in size or character
- Periodic evaluation of known adenoma

## Hepatomegaly

- For clinically suspected or worsening hepatic enlargement

**Note:** Ultrasound should be considered as the initial imaging modality

## Jaundice

- With abnormal liver function tests (transaminases) and unexplained icterus, following an abdominal ultrasound
- CT imaging used to evaluate for diffuse or multifocal parenchymal liver disease as well as biliary obstruction

## Pancreatic

### Acute pancreatitis

- With suspected complications including:
  - Pancreatic necrosis
  - Abscess
  - Pseudocyst
  - Peri-pancreatic fluid

**Note:** Patients with mild acute, uncomplicated pancreatitis usually do not require cross-sectional imaging, aside from ultrasound identification of gallstones and/or biliary ductal calculi, as a potential cause

# Common Diagnostic Indications

## Known pancreatic mass

- CT pancreas with pancreatic protocol is indicated

**Note:** MRI pancreas may be performed as an alternative study

## Pancreatic pseudocyst

- With prior history of pancreatitis or pancreatic trauma

**Note:** For a patient with a known pancreatic pseudocyst requiring follow-up surveillance, ultrasound should be considered as the initial imaging modality

## Gastrointestinal

### Appendiceal or peri-appendiceal mass – unexplained on physical exam and other imaging studies

## Appendicitis

### Diagnosis

- Male patients or non-pregnant female patients
- Following a non-diagnostic ultrasound in pregnant patients when MRI is contraindicated or unavailable

### Management

- Failure of non-operative therapy
- Complications of appendicitis

## Bowel obstruction

## Diverticulitis

## Enteritis and/or colitis

## Inflammatory bowel disease (IBD)

### Diagnosis

- Evaluation of suspected Crohn's disease following non-diagnostic upper and lower endoscopy

### Management

- Evaluation of new or worsening symptoms to confirm exacerbation or evaluate for complications, including stricture, abscess or fistula

## Ischemic bowel

## Genitourinary

## Acute pyelonephritis

- In a patient with any of the following:
  - Diabetes; **OR**
  - History of renal calculi; **OR**
  - History of renal surgery; **OR**
  - Absence of response after 72 hours of therapy

## Adrenal lesion

- Following a non-diagnostic ultrasound in neonate patients
- For characterization of an indeterminate adrenal mass identified on prior imaging – such as a benign adenoma versus a metastatic deposit; **OR**
- When there is biochemical evidence of an adrenal endocrine abnormality

# Common Diagnostic Indications

## Hematuria

### Hydronephrosis

- Evaluation for possible obstructing ureteral or urinary bladder lesion
- When ultrasound is non-diagnostic or abnormal and unexplained, requiring further evaluation

### Renal cyst

- Following a non-diagnostic ultrasound

**Note:** A simple renal cyst which has benign characteristics on ultrasound may not require advanced imaging or surveillance

### Renal lesion

- Characterization of indeterminate lesion, particularly a mass, demonstrated on prior imaging

**Note:** For pediatric patients, ultrasound should be considered as the initial imaging modality

### Renal neoplasm

- For diagnosis, initial staging and pre-operative evaluation, re-staging and treatment monitoring

**Note:** For pediatric patients, ultrasound should be considered as the initial imaging modality

## Undescended testicle (cryptorchidism)

### Urinary tract calculi

Initial evaluation of suspected renal or ureteral calculi in patients with no history of nephrolithiasis

#### Suspected recurrence

- History of radiolucent calculus
- History of radiopaque calculus and atypical presentation
- History of radiopaque calculus and typical presentation, following non-diagnostic ultrasound

#### Management and follow up

- In patients planning to undergo treatment with percutaneous nephrolithotomy, ureteroscopy or shock wave lithotripsy, when CT has not been performed within the preceding 30 days
- Symptomatic patients with known radiolucent calculi
- Symptomatic patients with radiopaque calculi, following non-diagnostic KUB or ultrasound
- Asymptomatic patients with known radiolucent calculi, persistent hydronephrosis on ultrasound, and treatment involving either shock wave lithotripsy or ureteroscopic stone extraction

#### Pregnancy

- Diagnosis or management, following non-diagnostic ultrasound or KUB

### Worsening renal function

- Following a non-diagnostic ultrasound

**Note:** Non-contrast evaluation is indicated in individuals with worsening renal function, as contrast administration may potentially worsen renal function in these patients.

## Splenic

### Indeterminate splenic lesion on prior imaging, such as ultrasound

**Note:** Splenic hemangioma is the most common benign splenic tumor and may be followed with splenic ultrasound.

### Splenic hematoma

- Parenchymal
- Subcapsular
- Peri-splenic

# Common Diagnostic Indications

## Splenomegaly

- For clinically suspected or worsening splenic enlargement

**Note:** Ultrasound should be considered as the initial imaging modality

## Vascular

### Aneurysm of the abdominal aorta

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the abdominal aorta
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Pre-operative assessment or prior to percutaneous endovascular stent graft placement
- Annual post-operative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging has been performed for this indication within the preceding 60 days

### Aortic dissection

- May evaluate with either CT or CTA
  - Usually results from subdiaphragmatic extension of a thoracic aortic dissection

### Thrombosis in the systemic and portal venous circulations

- Following initial evaluation with inconclusive Doppler ultrasound

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# Magnetic Resonance Imaging (MRI) Abdomen



## CPT Codes

- 74181..... MRI of abdomen, without contrast
- 74182..... MRI of abdomen, with contrast
- 74183..... MRI of abdomen, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication for the abdominal MRI. General landmarks extend from the diaphragmatic dome to the iliac crests

## Technology Considerations

- Abdominal MRI studies are usually targeted for further evaluation of indeterminate or questionable findings, identified on more standard imaging exams such as ultrasound and CT.
- For evaluation of vascular abnormalities such as renal artery stenosis and celiac/superior mesenteric artery stenosis (in chronic mesenteric ischemia), Doppler ultrasound, MRA or CTA should be considered as the preferred imaging modalities.
- The CPT code assignment for an MRI procedure is based on the anatomic area imaged. Requests for multiple MRI imaging of the same anatomic area to address patient positional changes, additional sequences or equipment are not allowed. These variations or extra sequences are included within the original imaging request.

## Common Diagnostic Indications

### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Appendicitis

##### Diagnosis and management

- In pregnant patients, following a non-diagnostic ultrasound

**Note:** This guideline is intended only for pregnant patients

#### Congenital anomaly

#### Contraindication to CT (contrast allergy, renal disease, pregnancy)

- Iodinated contrast risks (i.e., allergy, renal disease)
  - Patient meets appropriateness criteria for CT, and MRI has been shown to have superior diagnostic accuracy to non-contrast CT
- Pregnancy
  - MRI is a reasonable alternative for the requested indication

#### Diffuse liver disease

- Following an inconclusive or abnormal abdominal ultrasound or CT
- Including the following hepatic disorders:
  - Cirrhosis
  - Chronic hepatitis

# Common Diagnostic Indications

## Focal liver lesions

### Indeterminate lesions (not biopsied and not fully characterized by prior imaging)

- **Initial evaluation** of an indeterminate lesion identified on prior imaging when any of the following are present:
  - Size > 1 cm in diameter
  - Multiple lesions
  - Known malignancy
  - Known cirrhosis
  - Chronic hepatitis
  - Sclerosing cholangitis
  - Primary biliary cirrhosis
  - Hemochromatosis
  - Hemosiderosis
  - Oral contraceptive use
  - Anabolic steroid use
- **Follow up or surveillance** at 3 to 6 months when any of the above risk factors are present, or when the lesion is enhancing, poorly defined or increasing in size

### Benign lesions (biopsy-proven or fully characterized by imaging)

- Follow up when symptoms suggest a change in size or character
- Periodic evaluation of known adenoma

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## Indeterminate abdominal mass

- For further evaluation and characterization of indeterminate lesions arising in the solid abdominal viscera and surrounding anatomic structures, including but not limited to the following anatomic sites:
  - Adrenal – characterization of an adrenal mass, including differentiation of adrenal adenoma from metastasis
  - Assess vascular invasion or compression by pelvic or renal tumor
  - Kidney – evaluation of an indeterminate renal mass
  - Other abdominal and retroperitoneal anatomic structures
  - Pancreas
  - Spleen

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## Infectious or inflammatory process

- CT is usually the initial imaging modality of choice for infectious and inflammatory conditions
- Including but not limited to the following:
  - Abscess
  - Diffuse inflammation / phlegmon

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## Inflammatory bowel disease (IBD)

### Diagnosis

- Evaluation of suspected Crohn's disease following non-diagnostic upper and lower endoscopy

### Management

- Evaluation of new or worsening symptoms to confirm exacerbation or evaluate for complications, including stricture, abscess or fistula

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## Iron deposition/overload in hemochromatosis

- To exclude iron overload in patients with hemochromatosis who are candidates for chelation therapy or phlebotomy

# Common Diagnostic Indications

## Lymphadenopathy

- When abdominal CT is non-diagnostic
- May be useful for differentiating enlarged lymph nodes from vascular structures (with flow void on MRI), as follow-up from an unenhanced abdominal CT exam

## Tumor (primary neoplasm or metastatic disease)

Management of biopsy-proven malignancy, when MRI is needed to guide treatment in either of the following scenarios:

- CT is contraindicated or expected to be suboptimal (due to contrast allergy or anticipated contrast nephrotoxicity)
- Evidence-based literature has shown MRI to have superior diagnostic accuracy to CT.

**Exclusions—advanced imaging is not indicated in the following scenarios:**

- Breast cancer
  - Staging of low risk breast cancer (stage 2B or less) in the absence of signs or symptoms suggestive of metastatic disease
  - Surveillance of breast cancer in the absence of signs or symptoms of recurrent disease
- Colon cancer
  - Surveillance imaging of colon cancer in remission, **unless one of the following high risk features is present:**
    - Lymphatic or venous invasion
    - Lymph node involvement
    - Perineural invasion
    - Poorly differentiated tumor
    - T4 tumor
    - Associated with bowel obstruction
    - Close, indeterminate or positive margins
    - Fewer than 12 nodes examined at surgery
    - Localized perforation
- Gynecologic malignancies
  - Surveillance imaging in patients with previously treated gynecologic malignancies including ovarian, endometrial, cervical, vaginal or vulvar cancer (**Note:** This exclusion does not apply to sarcoma or other rare histologies not typically associated with these structures).
- Non-Hodgkin's lymphoma
  - Surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy
- Prostate cancer
  - Staging of low risk prostate cancer: Gleason score equal to six (6), PSA less than 10 ng/mL, and stage T1 or T2
  - Follow up or surveillance of prostate cancer following completion of therapy in the absence of a rising PSA

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

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# Magnetic Resonance Cholangiopancreatography (MRCP) Abdomen



## CPT Codes

74181..... MRI of abdomen, without contrast

## Standard Anatomic Coverage

- Magnetic resonance cholangiopancreatography (MRCP) is used to evaluate the biliary and pancreatic ductal systems non-invasively and is covered under CPT code 74181, abdominal MRI without contrast.

## Technology Considerations

- MRCP studies are usually targeted for further evaluation of indeterminate or questionable findings, identified on more standard imaging exams such as ultrasound and CT.
- When magnetic resonance cholangiopancreatography (MRCP) is requested in addition to a MRI of the abdomen, only one MRI abdomen code should be allowed. Additional sequences obtained for MRCP are considered part of the primary procedure.
- MRCP is performed using heavily T2-weighted images to display hyperintense signal from static or slowly-moving fluid-filled structures.
- Advantages of MRCP when compared with ERCP include non-invasive imaging technique, no ionizing radiation, no anesthesia required, often better anatomic visualization proximal to a ductal obstruction, may detect extra-ductal abnormalities not evident by ERCP
- Disadvantages of MRCP when compared with ERCP include limited spatial resolution and therefore less sensitive exam for detection of more subtle abnormalities, only provides diagnostic information compared with ERCP which has both diagnostic and therapeutic capabilities, as a consequence, MRCP may result in a delay for needed therapeutic interventions performed with ERCP (such as sphincterotomy, stone extraction, stent placement), susceptibility artifact on MRI may occur (for example, from metallic foreign bodies/surgical clips in the right upper abdominal quadrant) and result in image degradation.
- MRCP is appropriate in cases of incomplete or failed ERCP or when ERCP cannot be safely performed (e.g., following pancreatic ductal trauma or a significant allergy to iodinated contrast material) or when ERCP is precluded by anatomic considerations such as a biliary-enteric surgical anastomosis.
- Significant upper abdominal ascites and large cystic/fluid-filled structures may impede visualization of the pancreatic and biliary ductal systems with MRCP.

## Common Diagnostic Indications

### Biliary tract dilatation, biochemical evidence of biliary obstruction and/or unexplained RUQ pain

- Including but not limited to the detection of:
  - Choledocholithiasis
  - Benign stricture
  - Mass lesion (benign or malignant)
  - Fistula

### High clinical suspicion for choledocholithiasis in a patient who is post-cholecystectomy

### Primary sclerosing cholangitis

### Recurrent acute pancreatitis of unknown etiology

- To identify possible causes such as congenitally aberrant ductal anatomy (e.g., choledochal cyst, pancreas divisum and annular pancreas)

## Common Diagnostic Indications

### Suspected biliary and/or pancreatic ductal abnormalities

## References

1. Fayad LM, Kowalski T, Mitchell DG. MR cholangiopancreatography: evaluation of common pancreatic disease. *Radiol Clin North Am.* 2003;41(1):97-114.

# CT/MR Angiography (CTA/MRA) Abdomen



## CPT Codes

74175..... Computed tomographic angiography, abdomen, with contrast material(s), including non-contrast images, if performed, and image post-processing

74185..... Magnetic resonance angiography, abdomen; without or with contrast

## Standard Anatomic Coverage

- Anatomic coverage for CPT codes 74175 (CTA) and 74185 (MRA) includes the major arterial and/or venous structures in the abdomen, from the diaphragmatic dome through the iliac crests.

## Technology Considerations

- For CTA of the abdominal aorta and iliofemoral vasculature with lower extremity runoff, use CPT code 75635
- For MRA of the abdominal aorta and iliofemoral vasculature, with lower extremity runoff, use the following CPT codes: CPT 74185 MRA Abdomen x 1 and CPT 73725 MRA Lower Extremities x 2.
- Doppler ultrasound examination is an excellent means to identify a wide range of vascular abnormalities, both arterial and venous in origin. This well-established modality should be considered in the initial evaluation of many vascular disorders listed below.
- CTA of the abdomen is an alternative exam in patients who cannot undergo MRA.

## Common Diagnostic Indications

### Aneurysm of the abdominal aorta

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the abdominal aorta
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Pre-operative assessment or prior to percutaneous endovascular stent graft placement
- Annual post-operative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging has been performed for this indication within the preceding 60 days

### Arteriovenous malformation (AVM) or arteriovenous fistula (AVF)

*Note: For renal or superficial AVM, ultrasound should be considered as the first imaging modality*

### Dissection

Of the abdominal aorta and/or branch vessel

### Hematoma / hemorrhage

Of the abdominal aorta and/or branch vessel

### Mesenteric ischemia

- May have an acute or chronic and progressive (intestinal or abdominal angina) presentation

### Portal hypertension

# Common Diagnostic Indications

## Preoperative or pre-procedure evaluation

*Note: This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.*

## Prior to resection of pelvic neoplasm

### Pseudoaneurysm

Of the abdominal aorta and/or branch vessel

### Renal artery stenosis

- Suspected renovascular hypertension from renal artery stenosis with at least one of the following
  - Refractory hypertension, in patients receiving therapeutic doses of three (3) or more anti-hypertensive medications with documentation of at least two (2) abnormal serial blood pressure measurements
  - Hypertension with renal failure or progressive renal insufficiency
  - Accelerated or malignant hypertension
  - Abrupt onset of hypertension
  - Hypertension developing in patients younger than 30 years of age
- Deteriorating renal function on angiotensin converting enzyme inhibition
- Abdominal bruit, suspected to originate in the renal artery
- Generalized arteriosclerotic occlusive disease with hypertension
- Unilateral small renal size (greater than 1.5 cm difference in renal size on ultrasound)
- Following an abnormal renal Doppler ultrasound suggestive of renal artery stenosis
- Recurrent, unexplained episodes of “flash” pulmonary edema

**Note:** *Doppler ultrasound examination of the renal arteries has been shown in the peer-reviewed literature to be efficacious and cost-efficient in detecting renal artery stenosis. However, it is less sensitive than CTA/MRA for detection of renovascular hypertension*

### Stenosis or occlusion of the abdominal aorta or branch vessels

- Due to:
  - Atherosclerosis
  - Thromboembolism
  - Other causes

## Surgical planning for a kidney donor

## Surgical planning for renal tumor resection

## Suspected leak following abdominal aortic surgery

## Traumatic vascular injury

## Unexplained blood loss in the abdomen

## Vascular anatomic delineation for other surgical and interventional procedures

- Including but not limited to the following clinical scenarios:
  - For surgical porto-systemic shunt placement or TIPS (transjugular intrahepatic porto-systemic shunt)
  - For hepatic chemo-embolization procedure
  - For vascular delineation prior to operative resection of an abdominal neoplasm
  - For pre- and post-procedure evaluation of bypass grafts, stents and vascular anastomoses

# Common Diagnostic Indications

## Vascular evaluation of lower extremity claudication

- CPT Coding for abdominal aortic and run-off evaluation, which involves image post-processing for three-dimensional reconstructions, should follow:
  - For CTA: 75635 - CTA of abdominal aorta and bilateral iliofemoral lower extremity run-off without contrast, followed by re-imaging with contrast
  - For MRA: 74185 - abdominal MRA and 73725 - bilateral lower extremity MRAs
- Either CTA or MRA is indicated in a patient with classic presenting symptoms of claudication from peripheral arterial disease, such as diminished/absent peripheral pulses and cramping pain in the legs (particularly in the thighs and calves) when walking, which disappears at rest. Other clinical findings which support non-invasive assessment with CTA or MRA include lower extremity cutaneous ulcers and gangrene.
- In the absence of classic peripheral symptoms of claudication, then obtain a vascular surgical consultation and perform lower extremity non-invasive arterial evaluation, which may include the following: segmental systolic pressure measurements, segmental limb plethysmography, continuous wave Doppler and duplex ultrasonography. Ankle brachial indices (ABI) of < 0.9 may undergo advanced imaging. Rest pain or severe occlusive disease typically occurs with ABI < 0.5

## Vascular invasion or compression by an abdominal tumor

### Vasculitis

## Venous thrombosis or occlusion

Evaluation of suspected thrombosis or occlusion of major abdominal vessels, including portal and systemic venous systems

- Ultrasound is required as the initial study to evaluate the following:
  - Hepatic or portal vein thrombosis
  - Renal vein thrombosis
  - Splenic vein thrombosis

*Note:* Ultrasound is not required for suspected thrombosis of the IVC or other venous structures in the abdomen and pelvis.

## Visceral artery aneurysms

- Diagnosis, management, and surveillance of visceral artery aneurysms including:
  - Renal
  - Celiac
  - Splenic
  - Hepatic
  - Superior/inferior mesenteric and their branches

## References

1. Anderson JL, Halperin JL, Albert N, et al. Management of Patients With Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations): A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2013;61(14):1555-1570.
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# CT Angiography (CTA) Abdominal Aorta and Bilateral Iliofemoral Lower Extremity Run-Off



## CPT Codes

75635..... Computed tomographic angiography, abdominal aorta and bilateral iliofemoral lower extremity runoff, with contrast material(s), including non-contrast images, if performed, and image post-processing

## Standard Anatomic Coverage

- Anatomic coverage for CPT code 75635 (CTA) includes the abdominal aorta and bilateral iliofemoral vasculature, in addition to lower extremity run-off to the level of the popliteal regions at the knees and often extending through the calf vasculature to the ankle and foot regions.

## Technology Considerations

- Doppler ultrasound examination is an excellent means to identify a wide range of vascular abnormalities, both arterial and venous in origin. This well-established modality should be considered in the initial evaluation of many vascular disorders listed below.
- CTA of the abdomen is an alternative exam for patients who cannot undergo MRA.
- Additional, separate requests for a CTA of the pelvis and/or the lower extremities, along with CPT code 75635, are inappropriate.

## Common Diagnostic Indications

### Aneurysm of abdominal aorta or branch vessel

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the abdominal aorta or branch vessel
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Pre-operative assessment or prior to percutaneous endovascular stent graft placement
- Annual post-operative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging of the abdomen or pelvis has been performed for this indication within the preceding 60 days

### Critical ischemia of lower extremities

- For example, in diabetic vascular disease with ischemic ulcers or gangrene

### Dissection

Of the abdominal aorta and/or branch vessel

### Hemorrhage

# Common Diagnostic Indications

## Peripheral arterial disease

- Evaluation of peripheral arterial disease of the lower extremities following non-invasive confirmation (ankle brachial index, toe-brachial index, segmental pressure examination, or duplex ultrasound) in patients with claudication or critical limb ischemia who have no contraindication to revascularization
- Evaluation of peripheral arterial disease of the lower extremities following non-invasive confirmation (ankle brachial index, toe-brachial index, segmental pressure examination, or duplex ultrasound) in patients with ischemic ulceration who have no contraindication to revascularization
- Periodic follow up of patients who have undergone lower extremity revascularization when non-invasive evaluation (ankle brachial index, toe-brachial index, segmental pressure examination, or duplex ultrasound) suggests recurrent stenosis or occlusion
- Following vascular procedures (angiography or revascularization) or trauma involving the lower extremity when non-invasive evaluation suggests a complication (dissection, pseudoaneurysm, external compression, etc.) and CTA will be used to direct subsequent management

## Post-operative or post-procedure evaluation

## Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

## Pseudoaneurysm

Of the abdominal aorta and/or branch vessel

## Thromboembolism

## Traumatic vascular injury

# References

1. Anderson JL, Halperin JL, Albert N, et al. Management of Patients With Peripheral Artery Disease (Compilation of 2005 and 2011 ACCF/AHA Guideline Recommendations): A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2012;61(14):1555-1570.
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3. Macedo TA, Stanson AW, Oderich GS, et al. Infected aortic aneurysms: imaging findings. *Radiology.* 2004;231(1):250-257.
4. Martin ML, Tay KH, Flak B, et al. Multidetector CT Angiography of the aortoiliac system and lower extremities: a prospective comparison with digital subtraction angiography. *AJR Am J Roentgenol.* 2003;180(4):1085-1091.

# Computed Tomography (CT) Pelvis



## CPT Codes

- 72192..... CT of pelvis, without contrast
- 72193..... CT of pelvis, with contrast
- 72194..... CT of pelvis without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Iliac crests to ischial tuberosities
- Coverage may vary, depending on the specific clinical indication for the exam

## Technology Considerations

- Consider using ultrasound for indications such as differentiation of cystic, complex and solid lesions and initial ascites evaluation.
- Verification of cystic lesions in the pelvis is usually well-established with ultrasound.
- Ultrasound studies may be limited in obese patients.

## Common Diagnostic Indications

This section contains general pelvic, intestinal, genitourinary, vascular, and osseous indications.

### General Pelvic

#### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

##### Ascites

- For diagnosis and surveillance, following non-diagnostic ultrasound

##### Congenital anomaly

##### Diffuse, unexplained lower extremity edema

**Note:** For female patients, to exclude an occult lesion causing mass effect, vascular compression, or intraluminal thrombi, ultrasound should be considered as the initial imaging modality

##### Fever of unknown origin

- Lasting more than three weeks with exceptions for immunocompromised patients
- Following standard work-up to localize the source

##### Hematoma / hemorrhage

##### Hernia

- For diagnosis of a hernia with suspected complications or presurgical planning including, but not limited to the following types of hernia:
  - Femoral
  - Internal
  - Inguinal
  - Spigelian (through semilunar line, lateral to rectus abdominis muscle)
  - Ventral

# Common Diagnostic Indications

## Incisional hernia

- For diagnosis of a hernia with suspected complications or presurgical planning

**Note:** *Ultrasound should be considered as the initial imaging modality*

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## Infectious or inflammatory process

- Including but not limited to the following:
  - Abscess
  - Diffuse inflammation / phlegmon
  - Fistula
  - Recurrent cystitis (male with at least two episodes or female with failed antibiotic therapy)

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## Lymphadenopathy

- For initial detection and follow-up

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## Palpable pelvic mass

- When palpable pelvic mass requires further evaluation following pelvic ultrasound in female patients
- Male patients

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## Pelvic pain

- For female patients, following non-diagnostic transabdominal and transvaginal pelvic ultrasound
- Unexplained by any of the following:
  - Clinical findings; **OR**
  - Physical examination; **OR**
  - Other imaging studies

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## Post-operative or post-procedure evaluation

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## Preoperative or pre-procedure evaluation

**Note:** *This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.*

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## Retroperitoneal abnormality – fibrosis, inflammation and neoplasm

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## Trauma

- Following significant blunt or penetrating injury to the pelvis

# Common Diagnostic Indications

## Tumor (primary neoplasm or metastatic disease)

Diagnosis, management or surveillance of known or suspected malignancy

**Exclusions—advanced imaging is not indicated in the following scenarios:**

- Breast cancer
  - Staging of low risk breast cancer (stage 2B or less) in the absence of signs or symptoms suggestive of metastatic disease
  - Surveillance of breast cancer in the absence of signs or symptoms of recurrent disease
- Colon cancer
  - Surveillance imaging of colon cancer in remission, **unless one of the following high risk features is present:**
    - Lymphatic or venous invasion
    - Lymph node involvement
    - Perineural invasion
    - Poorly differentiated tumor
    - T4 tumor
    - Associated with bowel obstruction
    - Close, indeterminate or positive margins
    - Fewer than 12 nodes examined at surgery
    - Localized perforation
- Gynecologic malignancies
  - Surveillance imaging in patients with previously treated gynecologic malignancies including ovarian, endometrial, cervical, vaginal or vulvar cancer (**Note:** This exclusion does not apply to sarcoma or other rare histologies not typically associated with these structures).
- Non-Hodgkin's lymphoma
  - Surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy
- Prostate cancer
  - Staging of low risk prostate cancer: Gleason score equal to six (6), PSA less than 10 ng/mL, and stage T1 or T2
  - Follow up or surveillance of prostate cancer following completion of therapy in the absence of a rising PSA

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## Unexplained weight loss – significant weight loss exceeding 10% of desirable body weight, over short time interval (six months or less) after initial evaluation for other causes

### Intestinal

#### Appendiceal or peri-appendiceal mass – unexplained on physical exam and other imaging studies

##### Appendicitis

**Diagnosis**

- Male patients or non-pregnant female patients
- Following a non-diagnostic ultrasound in pregnant patients when MRI is contraindicated or unavailable

**Management**

- Failure of non-operative therapy
- Complications of appendicitis

#### Bowel obstruction

# Common Diagnostic Indications

## Diverticulitis

## Enteritis and/or colitis

## Inflammatory bowel disease (IBD)

### Diagnosis

- Evaluation of suspected Crohn's disease following non-diagnostic upper and lower endoscopy

### Management

- Evaluation of new or worsening symptoms to confirm exacerbation or evaluate for complications, including stricture, abscess or fistula

## Ischemic bowel

## Genitourinary

## Hematuria

## Hydronephrosis

- Evaluation for possible obstructing ureteral or urinary bladder lesion
- When ultrasound is non-diagnostic or abnormal and unexplained, requiring further evaluation

## Undescended testicle (cryptorchidism)

## Urinary tract calculi

Initial evaluation of suspected renal or ureteral calculi in patients with no history of nephrolithiasis

### Suspected recurrence

- History of radiolucent calculus
- History of radiopaque calculus and atypical presentation
- History of radiopaque calculus and typical presentation, following non-diagnostic ultrasound

### Management and follow up

- In patients planning to undergo treatment with percutaneous nephrolithotomy, ureteroscopy or shock wave lithotripsy, when CT has not been performed within the preceding 30 days
- Symptomatic patients with known radiolucent calculi
- Symptomatic patients with radiopaque calculi, following non-diagnostic KUB or ultrasound
- Asymptomatic patients with known radiolucent calculi, persistent hydronephrosis on ultrasound, and treatment involving either shock wave lithotripsy or ureteroscopic stone extraction

### Pregnancy

- Diagnosis or management, following non-diagnostic ultrasound or KUB

# Common Diagnostic Indications

## Vascular

### Aneurysm of iliac and femoral vessels

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the iliac or femoral vessels
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Pre-operative assessment or prior to percutaneous endovascular stent graft placement
- Annual postoperative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging has been performed for this indication within the preceding 60 days

### Aorto-iliac dissection

- May evaluate with either CT or CTA

### Thrombosis in the systemic and portal venous circulations

- Following initial evaluation with inconclusive Doppler ultrasound

## Osseous

### Acute pelvic trauma, for fracture evaluation

- Radiographs should be performed prior to CT

### Hip osteonecrosis

- When the patient is unable to undergo hip MRI or radionuclide bone scintigraphy, which are more sensitive modalities than hip CT, in individuals with normal hip films or inconclusive radiographic evidence of hip osteonecrosis
- In known hip osteonecrosis and femoral head collapse by radiography, CT may help in the preoperative planning, to define the location and extent of disease in patients with painful hips

### Osseous tumor evaluation in the pelvis

- MRI or radionuclide bone scintigraphy may be more appropriate for detection of skeletal metastases and primary bone tumors unless otherwise contraindicated

### Osteoid osteoma

- Requires negative or inconclusive hip radiographs prior to CT imaging

### Sacroiliitis

- Following sacroiliac joint radiographs

### Stress / insufficiency fracture in the pelvis

- Radiographs are a required first step before other imaging is performed
  - Subsequent advanced imaging often includes MRI or radionuclide bone scan as the next step

### Suspicion of pelvic osteomyelitis or septic arthritis

- When the patient is unable to undergo hip MRI or radionuclide bone scintigraphy

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# Magnetic Resonance Imaging (MRI) Pelvis



## CPT Codes

- 72195..... MRI of pelvis, without contrast
- 72196..... MRI of pelvis, with contrast
- 72197..... MRI of pelvis, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Iliac crests to ischial tuberosities
- Coverage may vary, depending on the specific clinical indication for the exam

## Technology Considerations

- Depending on the patient's presenting signs and symptoms, pelvic imaging should be directed to the most appropriate modality for clinical work-up.
- Diagnostic evaluation of the pelvis may be performed with pelvic ultrasound (trans-abdominal and trans-vaginal), which is the initial imaging modality for most gynecologic abnormalities. Transabdominal pelvic sonography is also used for urinary bladder assessment, such as post-void residual urine volume. Endoscopy and barium examinations are well established procedures for intestinal evaluation. Cystoscopy is often used for lower urinary tract assessment, pelvic CT or MRI.
- Verification of cystic lesions in the pelvis is usually well-established with ultrasound.
- Ultrasound studies may be limited in obese patients.
- CPT code assignment for an MRI procedure is based on the anatomic area imaged. Authorization requests for multiple MR imaging of the same anatomic area to address patient positional changes, additional sequences or equipment are not allowed.

## Common Diagnostic Indications

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

### Adenomyosis of the uterus following pelvic ultrasound

### Adnexal mass(es) following pelvic ultrasound

- Usually performed to further evaluate problematic cases which are initially detected on pelvic ultrasound. Some uses of pelvic MRI in adnexal lesion evaluation include: differentiation of an ovarian mass from an exophytic or pedunculated fibroid; more confident identification of an ovarian dermoid/teratoma, following an ultrasound or other imaging exam; and demonstration of findings to suggest malignancy in some adnexal masses.
- Includes assessment of suspected hemorrhagic cystic lesions and tumors

### Appendicitis

#### Diagnosis and management

- In pregnant patients, following a non-diagnostic ultrasound

**Note:** This guideline is intended only for pregnant patients

### Bilateral hip osteonecrosis (avascular necrosis; aseptic necrosis)

- MRI is the modality of choice for evaluation of osteonecrosis, particularly when there is clinical suspicion with hip pain and negative or inconclusive hip radiographs

### Bladder or urethral diverticula

# Common Diagnostic Indications

## Congenital anomaly

### Contraindication to CT (contrast allergy, renal disease, pregnancy)

- Iodinated contrast risks (i.e., allergy, renal disease)
  - Patient meets appropriateness criteria for CT, and MRI has been shown to have superior diagnostic accuracy to non-contrast CT
- Pregnancy
  - MRI is a reasonable alternative for the requested indication

## Endometriosis

- Following pelvic ultrasound

## Infectious or inflammatory process of the soft tissues

- CT is usually the imaging modality of choice for infectious and inflammatory conditions
- Including but not limited to the following:
  - Abscess
  - Diffuse inflammation

## Inflammatory bowel disease (IBD)

### Diagnosis

- Evaluation of suspected Crohn's disease following non-diagnostic upper and lower endoscopy

### Management

- Evaluation of new or worsening symptoms to confirm exacerbation or evaluate for complications, including stricture, abscess or fistula

## Lymphadenopathy

- When pelvic CT is non-diagnostic
- May be useful for differentiating enlarged lymph nodes from vascular structures (with flow void on MRI), as follow-up from an unenhanced pelvic CT exam

## Obstetrical abnormalities pelvimetry or obstetrical complications

## Osteomyelitis or septic arthritis

## Pelvic floor disorders associated with urinary or bowel incontinence

## Pelvic venous thrombosis evaluation

## Sacral insufficiency fracture

## Sacroiliitis

- Following sacroiliac joint radiographs

# Common Diagnostic Indications

## Axial Spondyloarthropathy (SpA)

### Diagnosis of Spondyloarthropathy (SpA)

- Negative or equivocal radiographs for sacroiliitis (Grade 0-2) **AND**
- Back pain has persisted for at least three months **AND**
- Clinical evidence for inflammatory back pain defined as at least four of the following five features:
  - Age less than 40
  - Insidious onset
  - Improvement with exercise
  - No improvement with rest
  - Pain at night which improves on getting up

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## Management of Spondyloarthropathy

### Therapy response in patients with ankylosing spondylitis

- Baseline study prior to treatment when the diagnosis of AS is based on radiographic findings
- Evaluate therapy response in patients with ankylosing spondylitis and all of the following:
  - Established diagnosis of ankylosing spondylitis
  - No response to therapy
  - At least three months of tumor necrosis factor (TNF) inhibitor therapy

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## Significant pelvic injury

- Following pelvic or sacral radiographs

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## Sports hernia (athletic pubalgia)

### (All of the following)

- Pain persists at least 6 weeks
- Non-diagnostic radiographs
- Following a trial of conservative therapy that lasts at least 6 weeks
- Patient is a surgical candidate
- Pain is insidious, progressive, worsens with valsalva or movement
- No detectable inguinal or ventral hernia on exam

**Note:** *Groin pain can be sometime be referred from the hip. See separate guideline for femoral neck stress fracture if that is of concern.*

# Common Diagnostic Indications

## Tumor (primary neoplasm or metastatic disease)

### Diagnosis

- Evaluation of suspected prostate cancer in patients with a rising PSA and negative transrectal ultrasound biopsy (TRUS)

**Management of biopsy-proven malignancy, when MRI is needed to guide treatment in either of the following scenarios:**

- CT is contraindicated or expected to be suboptimal (due to contrast allergy or anticipated contrast nephrotoxicity)
- Evidence-based literature has shown MRI to have superior diagnostic accuracy to CT.

**Exclusions—advanced imaging is not indicated in the following scenarios:**

- Breast cancer
  - Staging of low risk breast cancer (stage 2B or less) in the absence of signs or symptoms suggestive of metastatic disease
  - Surveillance of breast cancer in the absence of signs or symptoms of recurrent disease
- Colon cancer
  - Surveillance imaging of colon cancer in remission, **unless one of the following high risk features is present:**
    - Lymphatic or venous invasion
    - Lymph node involvement
    - Perineural invasion
    - Poorly differentiated tumor
    - T4 tumor
    - Associated with bowel obstruction
    - Close, indeterminate or positive margins
    - Fewer than 12 nodes examined at surgery
    - Localized perforation
- Gynecologic malignancies
  - Surveillance imaging in patients with previously treated gynecologic malignancies including ovarian, endometrial, cervical, vaginal or vulvar cancer (**Note:** This exclusion does not apply to sarcoma or other rare histologies not typically associated with these structures).
- Non-Hodgkin's lymphoma
  - Surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy
- Prostate cancer
  - Staging of low risk prostate cancer: Gleason score equal to six (6), PSA less than 10 ng/mL, and stage T1 or T2
  - Follow up or surveillance of prostate cancer following completion of therapy in the absence of a rising PSA

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## Undescended testicle (cryptorchidism)

## Uterine artery embolization procedures

- Often performed for treatment of persistent bleeding from uterine fibroids

## MRI is generally not indicated in the following clinical situations

The indications listed in this section generally do not require advanced imaging using MRI. If there are circumstances that require MRI imaging, a peer-to-peer discussion may be required.

## Piriformis syndrome

**Note:** Advanced imaging is generally not indicated.

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## CPT Codes

74712..... Magnetic resonance (eg, proton) imaging, fetal, including placental and maternal pelvic imaging when performed; single or first gestation

74713..... each additional gestation (List separately in addition to code for primary procedure)

## Standard Anatomic Coverage

- Field of view should be tailored to fetal and maternal size.
- Single shot fast spin echo and other rapid acquisition sequences are important to minimize the effects of fetal motion.

## Technology Considerations

- Ultrasound is the gold standard and primary imaging modality for assessment of the fetus.
- MRI is reserved as a problem solving tool in select circumstances for further assessment of abnormalities detected or incompletely characterized on ultrasound.
- MRI should generally be done without contrast as gadolinium is considered a category C drug.
- The long-term effects of MRI on the fetus are unknown; however, no adverse effects have been found to date.

## Common Diagnostic Indications

### Assessment prior to fetal intervention

- Following non-diagnostic ultrasound

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### Complication of monochorionic twins

- Following non-diagnostic ultrasound (**any one♦ of the following**)
  - Anatomy of conjoined twins
  - Demise of a monochorionic cotwin

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### Congenital anomaly of the abdomen and pelvis

- Following non-diagnostic ultrasound (**any one♦ of the following**)
  - Abdominal mass
  - Bowel obstruction
  - Genitourinary anomaly except rectourethral fistula

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### Congenital anomaly of the chest

- Following non-diagnostic ultrasound (**any one♦ of the following**)
  - Congenital diaphragmatic hernia
  - Congenital pulmonary airway malformation
  - Pleural effusion

# Common Diagnostic Indications

## Congenital anomaly of the head and neck

- Following non-diagnostic ultrasound (**any one♦ of the following**)
  - Agenesis of the corpus callosum
  - Cleft palate
  - Cortical malformation
  - Dandy-Walker syndrome
  - Encephalocele
  - Holoprosencephaly
  - Infarct, hemorrhagic or non-hemorrhagic
  - Intracranial mass
  - Meningocele/encephalocele
  - Neck mass
  - Posterior fossa anomaly
  - Vascular malformation, including vein of Galen
  - Ventriculomegaly
  - Vermian hypoplasia

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## Congenital anomaly of the spine

- Following non-diagnostic ultrasound (**any one♦ of the following**)
  - Caudal regression
  - Congenital anomaly of the vertebrae
  - Neural tube defect
  - Sacrococcygeal teratoma

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## Placental complication

- Following non-diagnostic ultrasound (**any one♦ of the following**)
  - Abruptio
  - Accreta
  - Gestational trophoblastic disease
  - Previa

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# CT/MR Angiography (CTA/MRA) Pelvis



## CPT Codes

- 72191..... Computed tomographic angiography, pelvis, with contrast material(s), including non-contrast images, if performed, and image post-processing  
72198..... Magnetic resonance angiography, pelvis; without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Iliac crests to ischial tuberosities
- Scan coverage may vary, depending on the specific clinical indication for the exam

## Technology Considerations

- Doppler ultrasound examination is an excellent means to identify a wide range of vascular abnormalities, both arterial and venous in origin. This well-established modality should be considered in the initial evaluation of many vascular disorders listed below.
- MRA should also be considered in patients with a history of either previous contrast reaction to intravascular administration of iodinated radiographic contrast material or atopy.
- CTA of the pelvis is an alternative exam in patients who cannot undergo MRA.
- Requests for pelvic CTA or MRA in addition to a request for a MRA or CTA abdominal aorta and bilateral iliofemoral lower extremity runoff study are not allowed.

## Common Diagnostic Indications

### Aneurysm of the iliac or femoral vessels

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the iliac or femoral vessels
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Pre-operative assessment or prior to percutaneous endovascular stent graft placement
- Annual post-operative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging has been performed for this indication within the preceding 60 days

### Arteriovenous malformation (AVM) or arteriovenous fistula (AVF)

**Note:** For renal or superficial AVM, ultrasound should be considered as the first imaging modality

### Dissection

Of the iliac arteries or branches

### Hematoma / hemorrhage

Of the iliac arteries or branches

### Mesenteric ischemia

- May have an acute or chronic and progressive (intestinal or abdominal angina) presentation

# Common Diagnostic Indications

## Pseudoaneurysm

Of the iliac arteries or branches

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**Stenosis or occlusion of the lower abdominal aorta, iliac arteries or other branch vessels in the pelvis**

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**Surgical planning for a kidney donor**

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**Suspected leak following abdominal aortic surgery**

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**Traumatic vascular injury**

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**Unexplained blood loss in the pelvis**

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## Vascular anatomic delineation for other surgical and interventional procedures

- For vascular delineation prior to operative resection of a pelvic neoplasm
  - For pre- and post-procedure evaluation of bypass grafts, stents and vascular anastomoses
- 

**Vascular invasion or compression by a pelvic tumor**

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**Vasculitis**

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## Venous thrombosis or occlusion

- Following initial evaluation with inconclusive Doppler ultrasound
- 

## Visceral artery aneurysms

- Diagnosis, management, and surveillance of visceral artery aneurysms including:
    - Superior/inferior mesenteric and their branches
- 

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# Computed Tomography (CT) Abdomen and Pelvis Combination



## CPT Codes

- 74176..... CT of abdomen and pelvis, without contrast
- 74177..... CT of abdomen and pelvis, with contrast
- 74178..... CT of abdomen and pelvis, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Diaphragmatic dome through pubic symphysis
- Scan coverage may vary, depending on the specific clinical indication

## Technology Considerations

- Verification of cystic lesions in the abdominal and pelvis is usually well-established with ultrasound.
- For abdominal symptoms in the pediatric population abdominal ultrasound frequently provides diagnostic information without incurring radiation exposure from CT.

## Common Diagnostic Indications

This section contains general abdominal and pelvic, gastrointestinal, genitourinary, and vascular indications.

### General Abdominal and Pelvic

#### Abdominal / pelvic pain

- Unexplained by any of the following:
  - Clinical findings; **OR**
  - Physical examination; **OR**
  - Other imaging studies

#### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Ascites

- For diagnosis and surveillance, following non-diagnostic ultrasound

#### Congenital anomaly

#### Diffuse, unexplained lower extremity edema

**Note:** For female patients, to exclude an occult lesion causing mass effect, vascular compression, or intraluminal thrombi, ultrasound should be considered as the initial imaging modality

#### Fever of unknown origin

- Lasting more than three weeks with exceptions for immunocompromised patients
- Following standard work-up to localize the source

#### Hematoma / hemorrhage

# Common Diagnostic Indications

## Hernia

- For diagnosis of a hernia with suspected complications or presurgical planning including, but not limited to the following types of hernia:
  - Femoral
  - Internal
  - Inguinal
  - Spigelian (through semilunar line, lateral to rectus abdominis muscle)
  - Ventral

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## Incisional hernia

- For diagnosis of a hernia with suspected complications or presurgical planning

**Note:** *Ultrasound should be considered as the initial imaging modality*

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## Infectious or inflammatory process

- Including but not limited to the following:
  - Abscess
  - Diffuse inflammation / phlegmon
  - Fistula
  - Recurrent cystitis (male with at least two episodes or female with failed antibiotic therapy)

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## Lymphadenopathy

- For initial detection and follow-up

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## Palpable abdominal / pelvic mass

- When palpable pelvic mass requires further evaluation following pelvic ultrasound in female patients

**Note:** *For pediatric patients, ultrasound should be considered as the initial imaging modality.*

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## Post-operative or post-procedure evaluation

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## Preoperative or pre-procedure evaluation

**Note:** *This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.*

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## Retroperitoneal abnormality – fibrosis, inflammation and neoplasm

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## Trauma

- Following significant blunt or penetrating injury to the abdomen

# Common Diagnostic Indications

## Tumor (primary neoplasm or metastatic disease)

Diagnosis, management or surveillance of known or suspected malignancy

Exclusions—advanced imaging is not indicated in the following scenarios:

- Breast cancer
  - Staging of low risk breast cancer (stage 2B or less) in the absence of signs or symptoms suggestive of metastatic disease
  - Surveillance of breast cancer in the absence of signs or symptoms of recurrent disease
- Colon cancer
  - Surveillance imaging of colon cancer in remission, **unless one of the following high risk features is present:**
    - Lymphatic or venous invasion
    - Lymph node involvement
    - Perineural invasion
    - Poorly differentiated tumor
    - T4 tumor
    - Associated with bowel obstruction
    - Close, indeterminate or positive margins
    - Fewer than 12 nodes examined at surgery
    - Localized perforation
- Gynecologic malignancies
  - Surveillance imaging in patients with previously treated gynecologic malignancies including ovarian, endometrial, cervical, vaginal or vulvar cancer (**Note:** This exclusion does not apply to sarcoma or other rare histologies not typically associated with these structures).
- Non-Hodgkin's lymphoma
  - Surveillance imaging of non-Hodgkin's lymphoma for a patient in remission and there has been at least two (2) years since the most recent course of chemotherapy
- Prostate cancer
  - Staging of low risk prostate cancer: Gleason score equal to six (6), PSA less than 10 ng/mL, and stage T1 or T2
  - Follow up or surveillance of prostate cancer following completion of therapy in the absence of a rising PSA

**Note:** Surveillance applies to patients with no signs or symptoms of recurrent or persistent disease.

## Unexplained weight loss – significant weight loss exceeding 10% of desirable body weight, over short time interval (six months or less), after initial evaluation for other causes

### Gastrointestinal

#### Appendiceal or peri-appendiceal mass – unexplained on physical exam and other imaging studies

##### Appendicitis

Diagnosis

- Male patients or non-pregnant female patients
- Following a non-diagnostic ultrasound in pregnant patients when MRI is contraindicated or unavailable

Management

- Failure of non-operative therapy
- Complications of appendicitis

### Bowel obstruction

# Common Diagnostic Indications

## Diverticulitis

## Enteritis and/or colitis

## Inflammatory bowel disease (IBD)

### Diagnosis

- Evaluation of suspected Crohn's disease following non-diagnostic upper and lower endoscopy

### Management

- Evaluation of new or worsening symptoms to confirm exacerbation or evaluate for complications, including stricture, abscess or fistula

## Ischemic bowel

## Genitourinary

### Acute pyelonephritis

- In a patient with any of the following:
  - Diabetes; **OR**
  - History of renal calculi; **OR**
  - History of renal surgery; **OR**
  - Absence of response after 72 hours of therapy

## Hematuria

### Hydronephrosis

- Evaluation for possible obstructing ureteral or urinary bladder lesion
- When ultrasound is non-diagnostic or abnormal and unexplained, requiring further evaluation

### Renal neoplasm

- For diagnosis, initial staging and pre-operative evaluation, re-staging and treatment monitoring

**Note:** For pediatric patients, ultrasound should be considered as the initial imaging modality.

## Undescended testicle (cryptorchidism)

# Common Diagnostic Indications

## Urinary tract calculi

Initial evaluation of suspected renal or ureteral calculi in patients with no history of nephrolithiasis

### Suspected recurrence

- History of radiolucent calculus
- History of radiopaque calculus and atypical presentation
- History of radiopaque calculus and typical presentation, following non-diagnostic ultrasound

### Management and follow up

- In patients planning to undergo treatment with percutaneous nephrolithotomy, ureteroscopy or shock wave lithotripsy, when CT has not been performed within the preceding 30 days
- Symptomatic patients with known radiolucent calculi
- Symptomatic patients with radiopaque calculi, following non-diagnostic KUB or ultrasound
- Asymptomatic patients with known radiolucent calculi, persistent hydronephrosis on ultrasound, and treatment involving either shock wave lithotripsy or ureteroscopic stone extraction

### Pregnancy

- Diagnosis or management, following non-diagnostic ultrasound or KUB

## Worsening renal function

- Following a non-diagnostic ultrasound

**Note:** Non-contrast evaluation is indicated in individuals with worsening renal function, as contrast administration may potentially worsen renal function in these patients.

## Vascular

### Aneurysm of the abdominal aorta, iliac or femoral vessels

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the abdominal aorta, iliac or femoral vessels
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Pre-operative assessment or prior to percutaneous endovascular stent graft placement
- Annual post-operative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging has been performed for this indication within the preceding 60 days

### Aorto-iliac dissection

- May evaluate with either CT or CTA
  - Usually results from subdiaphragmatic extension of a thoracic aortic dissection

### Thrombosis in the systemic and portal venous circulations

- Following initial evaluation with inconclusive Doppler ultrasound

## References

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# CT Angiography (CTA) Abdomen and Pelvis Combination



## CPT Codes

74174..... Computed tomographic angiography, abdomen and pelvis, with contrast material(s), including noncontrast images, if performed, and image postprocessing

## Standard Anatomic Coverage

- Anatomic coverage for CPT code 74174 (CTA abdomen and pelvis combination) includes the major arterial and/or venous structures in the abdomen, from the diaphragmatic dome to the ischial tuberosities.
- Coverage for an abdominal CTA generally includes the abdominal aorta and these visceral arteries (aortic branches):
  - Renal arteries
  - Celiac artery
  - Splenic artery
  - Hepatic artery
  - Superior mesenteric artery
- Coverage for a pelvic CTA includes the aortic bifurcation and these arteries:
  - Common iliac artery
  - Internal iliac artery (aka hypogastric) and its branches
  - External iliac artery
- Full evaluation of the superior and inferior mesenteric artery generally requires both CTA abdomen and pelvis.
- Complete evaluation of the femoral artery generally requires CT angiography with iliofemoral lower extremity runoff (CPT 75635).

## Technology Considerations

- For CTA of the abdominal aorta and iliofemoral vasculature with lower extremity runoff, use CPT code 75635
- Doppler ultrasound examination is an excellent means to identify a wide range of vascular abnormalities, both arterial and venous in origin. This well-established modality should be considered in the initial evaluation of many vascular disorders listed below.
- CTA is an alternative exam in patients who cannot undergo MRA.
- Requests for a combination CTA abdomen and pelvis study in addition to a request for a CTA abdominal aorta and bilateral iliofemoral lower extremity runoff study are not allowed
- The primary reason to combine CTA's of the abdomen and pelvis is to evaluate for a vascular disease that affects both the abdominal aorta (covered by the CTA abdomen) and the iliac arteries (covered by CTA pelvis). Some examples include ischemia, occlusion, aneurysm, trauma, vasculitis.
- Aortic stent grafts often cover the infrarenal abdominal aorta and proximal iliac arteries. CTA abdomen and pelvis should be used to evaluate complications such as endoleak in these cases.
- Aortic dissection will often be requested at a CTA chest (CPT 71275) and abdomen. Pelvis is not required.

# Common Diagnostic Indications

## Aneurysm of the abdominal aorta, iliac or femoral vessels

- Following inconclusive ultrasound in patients with suspected aneurysm/dilation of the abdominal aorta, iliac or femoral vessels
- Follow-up imaging of patients with an established aneurysm/dilation when most recent ultrasound imaging is inconclusive
- Preoperative assessment or prior to percutaneous endovascular stent graft placement
- Annual post-operative surveillance of stable patients who have undergone open surgical repair when most recent ultrasound imaging is inconclusive
- Post-operative surveillance of stable patients who have been treated with endovascular stent graft
- Suspected complication of an aneurysm/dilation, such as aneurysmal rupture or infection—requiring urgent imaging
- Prior to transcatheter aortic valve implantation/replacement (TAVI or TAVR), unless advanced imaging has been performed for this indication within the preceding 60 days

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## Arteriovenous malformation (AVM) or arteriovenous fistula (AVF)

**Note:** For renal or superficial AVM, ultrasound should be considered as the first imaging modality

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### Dissection

Of the abdominal aorta and/or branch vessel

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### Hematoma / hemorrhage

Of the abdominal aorta and/or branch vessel

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### Mesenteric ischemia

- May have an acute or chronic and progressive (intestinal or abdominal angina) presentation
- 

### Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

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### Prior to resection of pelvic neoplasm

### Pseudoaneurysm

Of the abdominal aorta and/or branch vessel

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### Stenosis or occlusion of the abdominal aorta or branch vessels

- Due to:
    - Atherosclerosis
    - Thromboembolism
    - Other causes
- 

### Suspected leak following abdominal aortic surgery or intervention (endoleak)

### Traumatic vascular injury

### Unexplained blood loss in the abdomen

### Vascular anatomic delineation for other surgical and interventional procedures

- Including but not limited to the following clinical scenarios:
    - For vascular delineation prior to operative resection of an abdominal neoplasm
    - For pre- and post-procedure evaluation of bypass grafts, stents and vascular anastomoses
- 

### Vascular invasion or compression by an abdominal tumor

# Common Diagnostic Indications

## Vasculitis

### Venous thrombosis or occlusion

Evaluation of suspected thrombosis or occlusion of major abdominal vessels, including portal and systemic venous systems

- Ultrasound is required as the initial study to evaluate the following:
  - Hepatic or portal vein thrombosis
  - Renal vein thrombosis
  - Splenic vein thrombosis

**Note:** Ultrasound is not required for suspected thrombosis of the IVC or other venous structures in the abdomen and pelvis.

### Visceral artery aneurysms

- Diagnosis, management, and surveillance of visceral artery aneurysms including:
  - Renal
  - Celiac
  - Splenic
  - Hepatic
  - Superior/inferior mesenteric and their branches

## References

1. Holmes DR Jr, Mack MJ, Kaul S, et al. 2012 ACCF/AATS/SCAI/STS expert consensus document on transcatheter aortic valve replacement. *J Am Coll Cardiol.* 2012 Mar 27;59(13):1200-1254.
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# Computed Tomography (CT) CT Colonography (Virtual Colonoscopy)



## CPT Codes

- 74261..... Diagnostic CT colonography without contrast
- 74262..... Diagnostic CT colonography with contrast including non-contrast images if performed
- 74263..... Screening CT colonography including image post-processing

## Standard Anatomic Coverage

- Use of helical CT and reconstruction algorithms to provide endoluminal visualization of the colon, as well as anatomic depiction throughout much of the abdomen and pelvis. Both 2D and 3D reconstructions are routinely used for colonic evaluation. Colonic preparation is required, similar to standard fiberoptic colonoscopy. Another similarity to fiberoptic colonoscopy is the requirement for air insufflation to distend the colon

## Technology Considerations

- CPT codes for CT of the abdomen (74150–74170) and CT of the Pelvis (72192–72194) should not be used when a CT colonography exam is requested.
- Depending on the presenting signs and symptoms, other studies such as fiberoptic colonoscopy and barium examination may be helpful for evaluation of the colon.
- CT colonography requires cleansing bowel preparation and air insufflation for colonic distention, similar to fiberoptic colonoscopy.

## Common Diagnostic Indications

This section contains indications for diagnostic CT colonography (74261, 74262) and for screening CT colonography (74263).

### Indications for Diagnostic CT Colonography (74261, 74262)

#### Coagulopathy

#### Complications from prior fiberoptic colonoscopy

#### Diverticulitis, with increased risk of perforation

#### Failed or incomplete fiberoptic colonoscopy of the entire colon, due to inability to pass the colonoscope proximally. Failure to advance the colonoscope may be secondary to:

- Obstructing neoplasm
- Spasm
- Redundant colon
- Altered anatomy or scarring from previous surgery
- Stricture
- Extrinsic compression

#### Increased sedation risk

- For example, COPD or previous adverse reaction to anesthesia

#### Known colonic obstruction, when standard fiberoptic colonoscopy is contraindicated

#### Lifetime or long-term anticoagulation, with increased patient risk if discontinued

## Common Diagnostic Indications

### Indication for Screening CT Colonography (74263)

**As an alternative to either conventional (optical) colonoscopy or double contrast barium enema for colorectal cancer screening, in individuals beginning at the age of 50 years and at a frequency of every 5 years**

## References

1. Chung DJ, Huh KC, Choi WJ, Kim JK. CT colonography using 16-MDCT in the evaluation of colorectal cancer. *AJR Am J Roentgenol.* 2005;184(1):98-103.
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# Computed Tomography (CT) Cervical Spine



## CPT Codes

- 72125..... CT of cervical spine, without contrast
- 72126..... CT of cervical spine, with contrast
- 72127..... CT of cervical spine, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Entire cervical spine (C1-C7), from the craniocervical junction through the T1 vertebra
- Axial images are routinely obtained, with capability for coronal and sagittal reconstructions

## Imaging Considerations

- MRI is the modality of choice for most cervical spine imaging indications, unless contraindicated or not tolerated by the patient (for example, secondary to claustrophobia)
- CT is the preferred technique for certain clinical scenarios such as suspected fracture, follow-up of known fracture, osseous tumor evaluation and congenital vertebral defects, as well as procedures such as cervical spine CT myelography
- Do not use CT cervical spine for imaging of the soft tissues of the neck. See CPT codes 70490-70492 CT soft tissue neck for this service

## Common Diagnostic Indications

MRI is the preferred modality for most cervical spine imaging, except for a few indications which include CT evaluation of bony abnormalities (such as suspected fracture or fracture follow-up; osseous tumor assessment; developmental vertebral abnormalities) and CT myelography

### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Fracture evaluation

- Following initial evaluation with radiographs

#### Post-myelogram CT or CT following other cervical spine interventional procedure

#### Post-trauma

- Neurologic deficit with possible spinal cord injury
- Progressively worsening pain

#### Significant acute trauma to the cervical spine region

### When the patient's condition meets the cervical spine MRI guidelines, but there is either a contraindication to MRI or the patient cannot tolerate MRI examination (for example, due to claustrophobia)

For most other indications, MRI is the preferred modality for advanced cervical spine imaging, unless contraindicated

#### Chiari malformation (Arnold-Chiari malformation)

# Common Diagnostic Indications

## Congenital spine anomalies

- Cervical spine dysraphism and other congenital anomalies involving the cervical spine and/or spinal cord
- Congenital vertebral defects for assessment of bony defects such as segmentation and fusion anomalies

## Infectious process

- Including but not limited to the following:
  - Abscess
  - Osteomyelitis
  - Discitis

## Neck pain without neurologic or radicular features

**Note:** This guideline does not apply to patients with known or suspected malignancy, infection, or underlying conditions which predispose to instability at the craniocervical junction.

**Diagnosis of the etiology of neck pain in patients who are willing and able to undergo spine surgery or epidural steroid injection (ESI) when both of the following criteria are met:**

- Lack of improvement or worsening during a six (6) week course of therapy with at least two (2) different forms of treatment
- Cervical spine X-ray is negative or does not clearly explain the cause of the patient's symptoms.

## Neck pain with radiculopathy

**Note:** This guideline does not apply to patients with known or suspected malignancy, infection, myelopathy, or underlying conditions which predispose to instability at the craniocervical junction.

**Diagnosis of the etiology of cervical nerve root compression in patients who are willing and able to undergo spine surgery or cervical epidural steroid injection (ESI) when either of the following criteria are met:**

- Documented abnormality on neurological exam in a dermatome/radicular distribution that has not previously been imaged or has progressed since a prior imaging study has been performed
- Lack of improvement or worsening during a six (6) week course of therapy with at least two (2) different forms of treatment

## Post-operative or post-procedure evaluation

### Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

## Rheumatoid arthritis

- For suspected cervical subluxation in a patient with confirmed rheumatoid arthritis

## Severe scoliosis, for the following patient populations:

- In patients with a high risk for neural axis abnormalities, such as infantile and juvenile idiopathic scoliosis and congenital scoliosis; **OR**
- With adolescent idiopathic scoliosis and atypical findings (pain, rapid progression, development of neurologic signs/symptoms); **OR**
- With scoliosis related to other pathologic processes such as neurofibromatosis; **OR**
- For pre-operative evaluation of severe scoliosis

# Common Diagnostic Indications

## Spondyloarthropathies

**Note:** Including but not limited to: ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, juvenile-onset spondyloarthritis

- For diagnosis following non-diagnostic work-up including but not limited to:
  - Radiographs
  - Standard laboratory work-up for spondyloarthropathy

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## Syringohydromyelia (syrinx)

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### Tumor evaluation

- Including but not limited to the following:
  - Primary or metastatic neoplasm involving the vertebrae
  - Tumor spread within the spinal canal
  - Spinal cord neoplasm

## References

1. Abbed KM, Coumans JV. Cervical radiculopathy: pathophysiology, presentation, and clinical evaluation. *Neurosurgery*. 2007 Jan;60(1 Suppl 1):S28-34.
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17. Rhee JM, Yoon T, Riew KD. Cervical radiculopathy. *J Am Acad Orthop Surg*. 2007 Aug;15(8):486-94.
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# Magnetic Resonance Imaging (MRI) Cervical Spine



## CPT Codes

72141..... MRI of cervical spine, without contrast

72142..... MRI of cervical spine, with contrast

72156..... MRI of cervical spine, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Entire cervical spine (C1-C7), from the craniocervical junction through the T1 vertebra
- Axial images are routinely obtained, with capability for coronal and sagittal reconstructions

## Imaging Considerations

- For most cervical spine abnormalities, MRI is the examination of choice
- CT of the cervical spine is often reserved for suspected fracture, follow-up of a known fracture, osseous tumor evaluation, congenital vertebral defects and procedures such as cervical spine CT myelography
- In most other clinical situations, MRI is the preferred modality for cervical spine imaging, unless contraindicated [due to pacemaker, implantable cardioverter-defibrillator (ICD), and other non-compatible devices unsafe for use in an MRI scanner] or not tolerated by the patient (usually secondary to claustrophobia)
- The CPT code assignment for an MRI procedure is based on the anatomic area imaged. Authorization requests for multiple MRI imaging of the same anatomic area to address patient positional changes, additional sequences or equipment are not allowed. These variations or extra sequences are included within the original imaging request

## Common Diagnostic Indications

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

### **Chiari malformation (Arnold-Chiari malformation)**

#### **Congenital spine anomalies**

- Cervical spine dysraphism and other congenital anomalies involving the cervical spine and/or spinal cord
- Congenital vertebral defects for assessment of bony defects such as segmentation and fusion anomalies

#### **Fracture evaluation**

- Following initial evaluation with radiographs

#### **Infectious process**

- Including but not limited to the following:
  - Abscess
  - Osteomyelitis
  - Discitis

#### **Multiple sclerosis and other white-matter diseases**

- Initial diagnosis; **OR**
- Periodic scans to assess asymptomatic progression in multiple sclerosis during the course of disease; **OR**
- Tracking the progress of multiple sclerosis to establish a prognosis or evaluation of response to treatment; **OR**
- To evaluate changes in neurologic signs and symptoms

# Common Diagnostic Indications

## Myelopathy

### Neck pain without neurologic or radicular features

**Note:** This guideline does not apply to patients with known or suspected malignancy, infection, or underlying conditions which predispose to instability at the craniocervical junction.

Diagnosis of the etiology of neck pain in patients who are willing and able to undergo spine surgery or epidural steroid injection (ESI) when both of the following criteria are met:

- Lack of improvement or worsening during a six (6) week course of therapy with at least two (2) different forms of treatment
- Cervical spine X-ray is negative or does not clearly explain the cause of the patient's symptoms.

### Neck pain with radiculopathy

**Note:** This guideline does not apply to patients with known or suspected malignancy, infection, myelopathy, or underlying conditions which predispose to instability at the craniocervical junction.

Diagnosis of the etiology of cervical nerve root compression in patients who are willing and able to undergo spine surgery or cervical epidural steroid injection (ESI) when either of the following criteria are met:

- Documented abnormality on neurological exam in a dermatome/radicular distribution that has not previously been imaged or has progressed since a prior imaging study has been performed
- Lack of improvement or worsening during a six (6) week course of therapy with at least two (2) different forms of treatment

## Post-operative or post-procedure evaluation

### Post-trauma

- Neurologic deficit with possible spinal cord injury
- Progressively worsening pain

## Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

### Rheumatoid arthritis

- For suspected cervical subluxation in a patient with confirmed rheumatoid arthritis

### Severe scoliosis, for the following patient populations:

- In patients with a high risk for neural axis abnormalities, such as infantile and juvenile idiopathic scoliosis and congenital scoliosis; **OR**
- With adolescent idiopathic scoliosis and atypical findings (pain, rapid progression, development of neurologic signs/symptoms); **OR**
- With scoliosis related to other pathologic processes such as neurofibromatosis; **OR**
- For pre-operative evaluation of severe scoliosis

## Significant acute trauma to the cervical spine region

### Spinal cord infarct

# Common Diagnostic Indications

## Spondyloarthropathies

- For diagnosis following non-diagnostic work-up including but not limited to:
  - Radiographs
  - Standard laboratory work-up for spondyloarthropathy

**Note:** Including but not limited to ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, juvenile-onset spondyloarthritis

## Syringohydromyelia (syrinx)

### Tumor evaluation

- Including but not limited to the following:
  - Primary or metastatic neoplasm involving the vertebrae
  - Tumor spread within the spinal canal
  - Spinal cord neoplasm

## References

1. Abbed KM, Coumans JV. Cervical radiculopathy: pathophysiology, presentation, and clinical evaluation. *Neurosurgery*. 2007 Jan;60(1 Suppl 1):S28-34.
2. Ahn NU, Ahn UM, Ipsen B. Mechanical neck pain and cervicogenic headache. *Neurosurgery*. 2007 Jan;60(1 Suppl 1):S21-7.
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# Computed Tomography (CT) Thoracic Spine



## CPT Codes

- 72128..... CT of thoracic spine, without contrast
- 72129..... CT of thoracic spine, with contrast
- 72130..... CT of thoracic spine, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Entire thoracic spine (T1-T12), from the cervicothoracic region through the thoracolumbar junction
- Axial images are routinely obtained, with capability for coronal and sagittal reconstructions

## Imaging Considerations

- Advanced diagnostic imaging of the thoracic spine is indicated in selected clinical scenarios and is performed significantly less often than in the lumbar and cervical regions
- MRI is the modality of choice for most thoracic spine imaging indications, unless contraindicated or not tolerated by the patient (for example, secondary to claustrophobia)
- CT is the preferred technique for certain clinical scenarios such as suspected fracture, osseous tumor evaluation, congenital vertebral defects and interventional procedures such as CT myelography
- Authorization request for re-imaging, due to technically limited exams, is the responsibility of the imaging provider

## Common Diagnostic Indications

MRI is the preferred modality for most thoracic spine imaging, except for a few indications which include CT evaluation of bony abnormalities (such as suspected fracture or fracture follow-up; occasional osseous tumor assessment; developmental vertebral abnormalities) and CT myelography

### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Fracture evaluation

- Following initial evaluation with radiographs

#### Post-myelogram CT or CT following other thoracic spine interventional procedure

#### Post-trauma

- Neurologic deficit with possible spinal cord injury
- Progressively worsening pain

### When the patient's condition meets the thoracic spine MRI guidelines, but there is either a contraindication to MRI or the patient cannot tolerate MRI examination (for example, due to claustrophobia)

For most other indications, MRI is the preferred modality for advanced thoracic spine imaging, unless contraindicated

#### Congenital spine anomalies

- Thoracic spine dysraphism and other congenital anomalies involving the thoracic spine and/or spinal cord
- Congenital vertebral defects for assessment of bony defects such as segmentation and fusion anomalies

# Common Diagnostic Indications

## Infectious process

- Including but not limited to the following:
  - Abscess
  - Osteomyelitis
  - Discitis

## Mid-back pain with signs of compression

- In a patient with mid-back or radicular pain and red flag signs including:
  - Reflex abnormality
  - Objective muscle weakness
  - Objective sensory abnormality in the thoracic dermatome distribution
  - Spasticity

**Note:** Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated<sup>1-4</sup>

## Non-specific mid-back pain

- In a patient where focused history and physical exam suggest non-specific thoracic pain and/or referred posterior chest pain and all of the following are met:
  - Patient is a potential candidate for surgery or epidural steroid injection; **AND**
  - Patient has, following clinical examination, completed a minimum of 4-6 consecutive weeks of physician supervised conservative therapy for the current episode of pain, including but not limited to any of the following:
    - NSAIDs
    - Muscle relaxants
    - Steroids
    - Physical therapy; **AND**
  - After trial of conservative therapy as listed above, patient fails to show substantial improvement on clinical re-evaluation; **OR**
- Mid-back pain not meeting the above criteria but associated with “red flag” symptoms such as unexplained weight loss, history of malignant disease, fever, drug abuse, or tuberculosis, abnormal labs suggestive of malignancy such as abnormal serum or urine electrophoresis, elevated prostate specific antigen (PSA)

## Post-operative or post-procedure evaluation

## Preoperative or pre-procedure evaluation

**Note:** This indication is for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline.

## Severe scoliosis, including the following patient populations:

- In patients with a high risk for neural axis abnormalities, such as infantile and juvenile idiopathic scoliosis and congenital scoliosis; **OR**
- With adolescent idiopathic scoliosis and atypical findings (pain, rapid progression, development of neurologic signs/symptoms); **OR**
- With scoliosis related to other pathologic processes such as neurofibromatosis; **OR**
- For pre-operative evaluation of severe scoliosis

## Spondyloarthropathies

**Note:** Including but not limited to: ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, juvenile-onset spondyloarthritis

- For diagnosis following non-diagnostic work-up including but not limited to:
  - Radiographs
  - Standard laboratory work-up for spondyloarthropathy

## Syringohydromyelia (syrinx)

# Common Diagnostic Indications

## Tumor evaluation

- Including but not limited to the following:
  - Primary or metastatic neoplasm involving the vertebrae
  - Tumor spread within the spinal canal
  - Spinal cord neoplasm

## References

1. American Association of Neuromuscular and Electrodiagnostic Medicine. *Choosing Wisely : Five Things Patients and Physicians Should Question*. ABIM Foundation; February 10, 2015. Available at [www.choosingwisely.org](http://www.choosingwisely.org).
2. England JD, Gronseth GS, Franklin G, et al. Practice Parameter: evaluation of distal symmetric polyneuropathy: role of laboratory and genetic testing (an evidence-based review). *Neurology*. 2009;72(2):185-192.
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4. England JD, Gronseth GS, Franklin G, et al. Distal symmetric polyneuropathy: a definition for clinical research: report of the American Academy of Neurology, the American Association of Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation. *Neurology*. 2005;64(2):199-207.

# Magnetic Resonance Imaging (MRI) Thoracic Spine



## CPT Codes

72146..... MRI of thoracic spine, without contrast

72147..... MRI of thoracic spine, with contrast

72157..... MRI of thoracic spine, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Entire thoracic spine (T1-T12), from the cervicothoracic region through the thoracolumbar junction
- Imaging planes generally include sagittal and axial/oblique axial (parallel with the disc spaces) views

## Imaging Considerations

- Advanced imaging of the thoracic spine is indicated in selected clinical scenarios and is performed significantly less often than in the cervical and lumbar regions
- CT is the preferred technique for certain indications, including fracture detection, follow-up of a known fracture, osseous tumor assessment, congenital vertebral defects and for interventional procedures, such as CT myelography
- In most other clinical situations, MRI is the modality of choice for thoracic spine imaging, unless contraindicated or not tolerated by the patient (for example, secondary to claustrophobia)
- The CPT code assignment for an MRI procedure is based on the anatomic area imaged. Requests for multiple MRI imaging of the same anatomic area to address patient positional changes, additional sequences or equipment are not allowed. These variations or extra sequences are included within the original imaging request

## Common Diagnostic Indications

### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Congenital spine anomalies

- Thoracic spine dysraphism and other congenital anomalies involving the thoracic spine and/or spinal cord
- Congenital vertebral defects for assessment of bony defects such as segmentation and fusion anomalies

#### Fracture evaluation

- Following initial evaluation with radiographs

#### Infectious process

- Including but not limited to the following:
  - Abscess
  - Osteomyelitis
  - Discitis

#### Mid-back pain with signs of compression

- In a patient with mid-back or radicular pain and red flag signs including:
  - Reflex abnormality
  - Objective muscle weakness
  - Objective sensory abnormality in the thoracic dermatome distribution
  - Spasticity

**Note:** Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated<sup>1-4</sup>

# Common Diagnostic Indications

## Multiple sclerosis and other white-matter diseases

- Initial diagnosis; **OR**
- Periodic scans to assess asymptomatic progression in multiple sclerosis during the course of disease; **OR**
- Tracking the progress of multiple sclerosis to establish a prognosis or evaluation of response to treatment; **OR**
- To evaluate changes in neurologic signs and symptoms

## Myelopathy

### Non-specific mid-back pain

- In a patient where focused history and physical exam suggest non-specific thoracic pain and/or referred posterior chest pain and all of the following are met:
  - Patient is a potential candidate for surgery or epidural steroid injection; **AND**
  - Patient has, following clinical examination, completed a minimum of 4-6 consecutive weeks of physician supervised conservative therapy for the current episode of pain, including but not limited to any of the following:
    - NSAIDs
    - Muscle relaxants
    - Steroids
    - Physical therapy; **AND**
  - After trial of conservative therapy as listed above, patient fails to show substantial improvement on clinical re-evaluation; **OR**
- Mid-back pain not meeting the above criteria but associated with “red flag” symptoms such as unexplained weight loss, history of malignant disease, fever, drug abuse, or tuberculosis, abnormal labs suggestive of malignancy such as abnormal serum or urine electrophoresis, elevated prostate specific antigen (PSA)

## Post-operative or post-procedure evaluation

### Post-trauma

- Neurologic deficit with possible spinal cord injury
- Progressively worsening pain

### Pre-operative or pre-procedure evaluation

**Note:** This indication is to be used for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

### Severe scoliosis, for the following patient populations:

- In patients with a high risk for neural axis abnormalities, such as infantile and juvenile idiopathic scoliosis and congenital scoliosis; **OR**
- With adolescent idiopathic scoliosis and atypical findings (pain, rapid progression, development of neurologic signs/symptoms); **OR**
- With scoliosis related to other pathologic processes such as neurofibromatosis; **OR**
- For pre-operative evaluation of severe scoliosis

## Spinal cord infarct

### Spondyloarthropathies

- For diagnosis following non-diagnostic work-up including but not limited to:
  - Radiographs
  - Standard laboratory work-up for spondyloarthropathy

**Note:** Including but not limited to: ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, juvenile-onset spondyloarthritis

# Common Diagnostic Indications

## Syringohydromyelia (syrinx)

### Tumor evaluation

- Including but not limited to the following:
  - Primary or metastatic neoplasm involving the vertebrae
  - Tumor spread within the spinal canal
  - Spinal cord neoplasm

## References

1. American Association of Neuromuscular and Electrodiagnostic Medicine. *Choosing Wisely : Five Things Patients and Physicians Should Question*. ABIM Foundation; February 10, 2015. Available at [www.choosingwisely.org](http://www.choosingwisely.org).
2. England JD, Gronseth GS, Franklin G, et al. Practice Parameter: evaluation of distal symmetric polyneuropathy: role of laboratory and genetic testing (an evidence-based review). *Neurology*. 2009;72(2):185-192.
3. Tracy JA, Dyck PJB. Investigations and treatment of chronic inflammatory demyelinating polyradiculoneuropathy and other inflammatory demyelinating polyneuropathies. *Curr Opin Neurol*. 2010;23(3):242-248.
4. England JD, Gronseth GS, Franklin G, et al. Distal symmetric polyneuropathy: a definition for clinical research: report of the American Academy of Neurology, the American Association of Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation. *Neurology*. 2005;64(2):199-207.

# Computed Tomography (CT) Lumbar Spine



## CPT Codes

- 72131..... CT of lumbar spine, without contrast
- 72132..... CT of lumbar spine, with contrast
- 72133..... CT of lumbar spine, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Entire lumbar spine (L1-L5), from the thoracolumbar region through the lumbosacral junction
- Axial images are routinely obtained, with capability for coronal and sagittal reconstructions

## Imaging Considerations

- CT of the lumbar spine is often reserved for suspected fracture, follow-up of a known fracture, skeletal abnormalities such as spondylolysis and spondylolisthesis in operative candidates, congenital vertebral defects, osseous tumor evaluation, and procedures such as lumbar CT myelography
- For most other lumbar spine abnormalities, MRI is the modality of choice, unless contraindicated or not tolerated by the patient (for example, secondary to claustrophobia)

## Common Diagnostic Indications

MRI is the preferred modality for most lumbar spine advanced imaging, except for a few indications which include CT evaluation of bony abnormalities (such as suspected fracture or fracture follow-up; skeletal abnormalities such as spondylolysis and spondylolisthesis in operative candidates; osseous tumor assessment; developmental vertebral abnormalities) as well as lumbar CT myelography

### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Fracture evaluation

- Following initial evaluation with radiographs

#### Post-trauma

- Neurologic deficit with possible spinal cord injury
- Progressively worsening pain

#### Post-myelogram CT or CT following other lumbar spine interventional procedure

#### Spondylolysis and spondylolisthesis

- Following non-diagnostic or abnormal lumbar spine radiographs (including oblique views) which require additional clarification to direct treatment in an operative candidate

### When the patient's condition meets the lumbar spine MRI guidelines, but there is either a contraindication to MRI or the patient cannot tolerate MRI examination (for example, due to claustrophobia)

# Common Diagnostic Indications

For most other indications, MRI is the preferred modality for advanced lumbar spine imaging, unless contraindicated

## Congenital spine anomalies

- Lumbar spine dysraphism and other congenital anomalies involving the lumbar spine and/or lower spinal cord (Conus Medullaris). filum terminale or nerve roots, when MRI is contraindicated
- Congenital vertebral defects for assessment of bony defects such as segmentation and fusion anomalies

## Infectious process

- Including but not limited to the following:
  - Abscess
  - Arachnoiditis
  - Discitis
  - Osteomyelitis

## Low back pain with signs of cauda equina compression<sup>1</sup>

- In a patient with low back or radicular pain and red flag signs including:
  - Severe bilateral sciatica, especially L5-S1 distribution
  - Saddle or genital sensory disturbance
  - Bladder, bowel or sexual dysfunction

**Note:** *The diagnosis of acute cord compression is often considered a medical emergency and typically not managed by elective outpatient imaging*

## Low back pain with signs of radicular compression

- In a patient with low back or radicular pain and neurologic findings related to the lumbar spine such as:
  - Reflex abnormality
  - Objective muscle weakness
  - Objective sensory abnormality in the lumbar dermatome distribution
  - Spasticity

**Note:** *Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated<sup>2-5</sup>*

## Non-specific low back pain

- In a patient where focused history and physical exam suggest non-specific lumbar pain and/or referred buttock or lower extremity pain and all of the following are met:
  - Patient is a potential candidate for surgery or epidural steroid injection; **AND**
  - Patient has, following clinical examination, completed a minimum of six (6) consecutive weeks of physician supervised conservative therapy for the current episode of pain, including but not limited to any of the following:
    - NSAIDs
    - Muscle relaxants
    - Steroids
    - Physical therapy; **AND**
  - After trial of conservative therapy as listed above, patient fails to show substantial improvement on clinical re-evaluation; **OR**
- Low back pain not meeting the above criteria but associated with “red flag” symptoms such as unexplained weight loss, history of malignant disease, fever, drug abuse, or tuberculosis, abnormal labs suggestive of malignancy such as abnormal serum or urine electrophoresis, elevated prostate specific antigen (PSA)

## Post-operative or post-procedure evaluation

### Preoperative or pre-procedure evaluation

**Note:** *This indication is for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline.*

# Common Diagnostic Indications

## Severe scoliosis, including the following patient populations:

- With high risk for neural axis abnormalities, such as infantile and juvenile idiopathic scoliosis and congenital scoliosis; **OR**
- With adolescent idiopathic scoliosis and atypical findings (pain, rapid progression, development of neurologic signs/symptoms); **OR**
- With scoliosis related to other pathologic processes, such as neurofibromatosis; **OR**
- For pre-operative evaluation of severe scoliosis

## Spondyloarthropathies

**Note:** Including but not limited to: ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, juvenile-onset spondyloarthritis

- For diagnosis following non-diagnostic work-up including but not limited to:
  - Radiographs
  - Standard laboratory work-up for spondyloarthropathy

## Tethered cord

## Tumor evaluation

- Including but not limited to the following:
  - Primary or metastatic neoplasm involving the vertebrae
  - Tumor spread within the spinal canal
  - Spinal cord neoplasm

# References

- Gardner A, Gardner E, Morley T. Cauda equina syndrome: a review of the current clinical and medico-legal position. Eur Spine J. 2011;20(5):690-697.
- American Association of Neuromuscular and Electrodiagnostic Medicine. Choosing Wisely : Five Things Patients and Physicians Should Question. ABIM Foundation; February 10, 2015. Available at [www.choosingwisely.org](http://www.choosingwisely.org).
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- Tracy JA, Dyck PJB. Investigations and treatment of chronic inflammatory demyelinating polyradiculoneuropathy and other inflammatory demyelinating polyneuropathies. Curr Opin Neurol. 2010;23(3):242-248.
- England JD, Gronseth GS, Franklin G, et al. Distal symmetric polyneuropathy: a definition for clinical research: report of the American Academy of Neurology, the American Association of Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation. Neurology. 2005;64(2):199-207.

# Magnetic Resonance Imaging (MRI) Lumbar Spine



## CPT Codes

- 72148..... MRI of lumbar spine, without contrast
- 72149..... MRI of lumbar spine, with contrast
- 72158..... MRI of lumbar spine, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Entire lumbar spine (L1-L5), from the thoracolumbar region through the lumbosacral junction
- Imaging planes generally include sagittal and axial/oblique axial (parallel with disc spaces) views

## Imaging Considerations

- For most other lumbar spine abnormalities, MRI is the modality of choice, unless contraindicated or not tolerated by the patient (for example, secondary to claustrophobia)
- Lumbar spine CT is often reserved for suspected fracture, follow-up of a known fracture, skeletal abnormalities such as spondylolysis and spondylolisthesis in operative candidates, congenital vertebral defects, osseous tumor evaluation, and procedures such as lumbar CT myelography
- For the majority of patients with acute low back pain, symptoms and/or physical exam findings will improve or resolve during a trial of conservative treatment and diagnostic imaging is not necessary
- The spinal cord normally ends at L1-L2, which is seen on thoracic MRI. If the conus medullaris is not seen on thoracic spine imaging, the spinal cord is presumed to be tethered and lumbar MRI is appropriate
- Definitive diagnosis is not achieved in as many as 85% of patients with low back pain
- The CPT code assignment for an MRI procedure is based on the anatomic area imaged. Requests for multiple MRI imaging of the same anatomic area to address patient positional changes, additional sequences or equipment are not allowed. These variations or extra sequences are included within the original imaging request

## Common Diagnostic Imaging

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

### Congenital spine anomalies

- Lumbar spine dysraphism and other congenital anomalies involving the lumbar spine and/or lower spinal cord (conus medullaris), filum terminale or nerve roots
- Congenital vertebral defects for assessment of bony defects such as segmentation and fusion anomalies

### Fracture evaluation

- Following initial evaluation with radiographs

### Infectious process

- Including but not limited to the following:
  - Abscess
  - Arachnoiditis
  - Discitis
  - Osteomyelitis

# Common Diagnostic Indications

## Low back pain with signs of cauda equina compression<sup>1</sup>

- In a patient with low back or radicular pain and red flag signs including:
  - Severe bilateral sciatica, especially L5-S1 distribution
  - Saddle or genital sensory disturbance
  - Bladder, bowel or sexual dysfunction

**Note:** The diagnosis of acute cord compression is often considered a medical emergency and typically not managed by elective outpatient imaging

## Low back pain with signs of radicular compression

- In a patient with low back or radicular pain and neurologic findings related to the lumbar spine such as:
  - Reflex abnormality
  - Objective muscle weakness
  - Objective sensory abnormality in the lumbar dermatome distribution
  - Spasticity

**Note:** Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated<sup>5-8</sup>

## Myelopathy involving the lower spinal cord

### Non-specific low back pain<sup>2-4</sup>

- In a patient where focused history and physical exam suggest non-specific lumbar pain and/or referred buttock or lower extremity pain and all of the following are met:
  - Patient is a potential candidate for surgery or epidural steroid injection; **AND**
  - Patient has, following clinical examination, completed a minimum of six (6) consecutive weeks of physician supervised conservative therapy for the current episode of pain, including but not limited to any of the following:
    - NSAIDs
    - Muscle relaxants
    - Steroids
    - Physical therapy; **AND**
  - After trial of conservative therapy as listed above, patient fails to show substantial improvement on clinical re-evaluation; **OR**
- Low back pain not meeting the above criteria but associated with “red flag” symptoms such as unexplained weight loss, history of malignant disease, fever, drug abuse, or tuberculosis, abnormal labs suggestive of malignancy such as abnormal serum or urine electrophoresis, elevated prostate specific antigen (PSA)

## Post-operative or post-procedure evaluation

### Post-trauma

- Neurologic deficit with possible spinal cord injury
- Progressively worsening pain

## Pre-operative or pre-procedure evaluation

**Note:** This indication is to be used for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

### Severe scoliosis, for the following patient populations:

- In patients with a high risk for neural axis abnormalities, such as infantile and juvenile idiopathic scoliosis and congenital scoliosis; **OR**
- With adolescent idiopathic scoliosis and atypical findings (pain, rapid progression, development of neurologic signs/symptoms); **OR**
- With scoliosis related to other pathologic processes such as neurofibromatosis; **OR**
- For pre-operative evaluation of severe scoliosis

# Common Diagnostic Indications

## Spinal cord infarct

### Spondyloarthropathies

- For diagnosis following non-diagnostic work-up including but not limited to:
  - Radiographs
  - Standard laboratory work-up for spondyloarthropathy

**Note:** Including but not limited to: ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, juvenile-onset spondyloarthritis

### Spondylolysis and spondylolisthesis

- Following non-diagnostic or abnormal lumbar spine radiographs (including oblique views) which require additional clarification to direct treatment, in an operative candidate

## Tethered cord

### Tumor evaluation

- Including but not limited to the following:
  - Primary or metastatic neoplasm involving the vertebrae
  - Tumor spread within the spinal canal
  - Spinal cord neoplasm

## References

1. Gardner A, Gardner E, Morley T. Cauda equina syndrome: a review of the current clinical and medico-legal position. *Eur Spine J.* 2011;20(5):690-697.
2. American College of Physicians. *Choosing Wisely: Five Things Physicians and Patients Should Question*. Philadelphia, PA: ABIM Foundation; April 4, 2012. Available at [http://choosingwisely.org/wp-content/uploads/2012/04/5things\\_12\\_factsheet\\_Amer\\_College\\_Phys.pdf](http://choosingwisely.org/wp-content/uploads/2012/04/5things_12_factsheet_Amer_College_Phys.pdf). Accessed May 15, 2012
3. North American Spine Society. *Choosing Wisely: Five Things Physicians and Patients Should Question*. Philadelphia, PA: ABIM Foundation; October 9, 2013. Available at <http://www.choosingwisely.org/societies/north-american-spine-society/> Accessed October 10, 2015.
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# MR Angiography (MRA) Spinal Canal



## CPT Codes

72159..... Magnetic resonance angiography of spinal canal

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication for the spinal canal MRA
- General landmarks extend from the cranio-cervical junction through the lumbosacral region

## Imaging Considerations

- MRA of the spinal canal is an infrequently requested exam. Potential applications which have been described include evaluation of spinal arteriovenous fistula (AVF) and arteriovenous malformation (AVM). These vascular lesions are usually detected by MRI or myelography. Intra-arterial digital subtraction angiography (DSA) of the spinal vasculature may be necessary to define the precise location and type of vascular abnormality
- MRI of the spinal canal CPT 72159 includes imaging of the entire spinal canal. Requests for multiple exams to address each anatomic area of the spinal canal are inappropriate

## Magnetic Resonance Angiography of the Spinal Canal

- MR Angiography (MRA) of the spinal canal is an evolving technology under clinical development. This clinical application of MRA and its impact on health outcomes will continue to undergo review, as new evidence-based studies are published. At this point, medically necessary applications are limited (see below). Interval routine coverage for MR angiography of the spinal canal is not generally available and is not considered medically appropriate at this time

## Diagnostic Indications

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

**Post-operative or post-procedure evaluation**

**Preoperative or pre-procedure evaluation**

**Note:** *This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.*

# Spine Bibliography



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# Computed Tomography (CT) Upper Extremity



## CPT Codes

- 73200..... CT upper extremity, without contrast
- 73201..... CT upper extremity, with contrast
- 73202..... CT upper extremity, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication for the exam and varies considerably, based on anatomic considerations (from shoulder through fingers) and clinical manifestations
- Depending on the protocol used, the CT data acquisition(s) may allow for diagnostic multi-planar reconstructions through the region of interest

## Imaging Considerations

- Conventional radiographs should be obtained before advanced imaging
- CT is often the preferred modality for evaluation of displaced fractures and subluxations, whereas stress fractures and some incomplete and non-displaced fractures may be better imaged with MRI or radionuclide bone scintigraphy
- If radiographic findings are typical of osteomyelitis, advanced imaging may not be necessary
- In osteomyelitis, CT may be helpful in defining bone sequestra
- For evaluation of musculoskeletal tumors, MRI is generally preferred over CT, unless there is a contraindication to performance of an MRI exam
- Use of contrast (intravenous or intra-articular for CT arthrogram) is at the discretion of both the ordering and imaging physicians
- Brachial plexus imaging: MRI, when not contraindicated, is the preferred imaging modality for brachial plexus. The brachial plexus is a network of nerves in the neck, passing under the clavicle and into the axilla. Assign either a CT or MRI of the upper extremity for imaging the brachial plexus

## Common Diagnostic Indications

### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### Chronic shoulder pain

- In a patient where focused history and physical exam suggest non-specific upper extremity pain, rotator cuff tendinopathy, adhesive capsulitis or subacromial impingement syndrome; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- Patient has completed a minimum of six (6) consecutive weeks of physician supervised conservative treatment for the current episode of pain, including but not limited to:
  - Physical therapy (home exercise only if physical therapy is not available); **AND**
- After trial of conservative treatment as listed above, patient fails to show substantial improvement on clinical reevaluation

### CT accompanying an arthrogram (CT arthrography)

#### Fracture evaluation

- To confirm a suspected (occult) fracture following initial radiographs; **OR**
- To define the extent of an acute fracture and position of fracture fragments; **OR**
- To assess fracture healing for delayed union or non-union

# Common Diagnostic Indications

## Hemarthrosis (bloody joint effusion)

- Documented by arthrocentesis except in cases when arthrocentesis is contraindicated (e.g. non-traumatic causes of hemarthrosis such as sickle cell, anticoagulant, or hemophilia)

## Infectious process

- In a patient where focused history and physical exam suggest an underlying soft tissue infection when:
  - Patient is unresponsive to treatment including but not limited to antibiotics or incision/drainage
- Abscess - to determine the location and extent for surgical treatment
- Osteomyelitis – following non-diagnostic radiographs and when MRI is contraindicated
- Fasciitis

## Intra-articular loose body, including synovial osteochondromatosis

## Neuropathic osteodystrophy (Charcot joint)

- Following conventional radiographs, when there is need for additional diagnostic information from a CT exam to direct treatment decisions (such as concern for an underlying infectious process)

## Osteonecrosis [avascular necrosis (AVN); aseptic necrosis]

- Requires initial plain films, prior to advanced imaging
- MRI is often the preferred imaging modality, particularly for evaluation in the early stages of osteonecrosis
- Common anatomic locations for osteonecrosis in the upper extremity are:
  - Humeral head
  - Radial head
  - Carpal navicular bone
  - Lunate bone (lunate osteonecrosis also referred to as Kienbock's disease)

## Post-operative or post-procedure evaluation

### Pre-operative or pre-procedure evaluation

**Note:** This indication is to be used for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

### Pre-operative evaluation of anterior glenohumeral instability

- Radiography insufficient for presurgical planning; **AND**
- Recurrent anterior shoulder dislocation; **OR**
- First time dislocation
  - Young and at high risk for recurrence<sup>1-2</sup>

### Septic arthritis - when MRI is contraindicated

- When any of the following risk factors are present:
  - Underlying joint disease
  - Joint prosthesis
  - IV drug abuse
  - Diabetes
  - Presence of cutaneous ulcers; **OR**
- Pre-operative planning

### Significant trauma

- Usually preceded by initial plain film radiographs

# Common Diagnostic Indications

## Soft tissue mass

(any one of the following)

- Soft-tissue evaluation when prominent calcifications are seen on radiograph;
- Spontaneous soft tissue hemorrhage with or without palpable mass
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging
- Following a non-diagnostic radiograph to evaluate a palpable mass found on physical exam

**Note:** *MRI is typically preferred in the evaluation of soft tissue masses*

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## Tumor evaluation: primary neoplasm or metastatic disease

(any one of the following)

- Biopsy-proven malignancy
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging

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**When the patient's condition meets the upper extremity MRI guidelines, but there is either a contraindication to MRI or the patient cannot tolerate MRI examination (for example, due to claustrophobia)**

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# Magnetic Resonance Imaging (MRI) Upper Extremity (Any Joint)



## CPT Codes

73221..... MRI upper extremity, any joint, without contrast

73222..... MRI upper extremity, any joint, with contrast

73223..... MRI upper extremity, any joint, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication for the exam and varies considerably, based on anatomic (from shoulder joint through hand/digits) and clinical considerations
- MRI routinely provides multi-planar imaging through the region of interest

## Imaging Considerations

- Conventional radiographs should be obtained before advanced imaging
- Use of contrast (intravenous or intra-articular) is at the discretion of both the ordering and imaging physicians
- CT is often the preferred modality for evaluation of displaced fractures and subluxations, whereas stress fractures and some incomplete and non-displaced fractures may be better imaged with MRI or radionuclide bone scintigraphy
- MRI is used more often to evaluate internal derangements of the joints and related tendinous, ligamentous and cartilaginous structures
- MRI is also useful for evaluation of possible osteomyelitis, despite negative or non-diagnostic plain films and/or triple-phase bone scintigraphy. One exception for osteomyelitis is detection of bone sequestra, which may be better depicted with CT
- If radiographic findings are typical of osteomyelitis, advanced imaging may not be necessary
- For evaluation of musculoskeletal tumors, MRI is generally preferred over CT, unless there is a contraindication to performance of an MRI exam
- For suspected osteonecrosis, MRI is often more sensitive than CT and bone scintigraphy
- Implanted surgical hardware, including joint prostheses, may produce sufficient local artifact to preclude adequate imaging through the region containing hardware

## Common Diagnostic Indications

This section contains general upper extremity, shoulder, elbow, and wrist and hand joint indications.

### General Upper Extremity

#### Abnormalities detected on other imaging studies which require additional clarification to direct treatment

#### EMG-proven entrapment neuropathy after conservative therapy to direct treatment

- Suspected entrapment neuropathy, cubital tunnel detail, and/or carpal tunnel are not considered medically necessary

#### Fracture evaluation<sup>12</sup>

(Any one of the following)

- To confirm a suspected occult/stress fracture following non-diagnostic initial radiographs at high risk sites:
  - Scaphoid
  - Lunate
- To define the extent of an acute fracture when surgery is being considered
- To assess fracture healing for delayed union or non-union, when repeat radiographs are non-diagnostic

# Common Diagnostic Indications

## Hemarthrosis (bloody joint effusion)

- Documented by arthrocentesis except in cases when arthrocentesis is contraindicated (e.g. non-traumatic causes of hemarthrosis such as sickle cell, anticoagulant, or hemophilia)

## Infectious process

- In a patient where focused history and physical exam suggest a underlying soft tissue infection when:
  - Patient is unresponsive to treatment including but not limited to antibiotics or incision/drainage
- Abscess – to determine the location and extent for surgical treatment
- Osteomyelitis – following non-diagnostic radiographs
- Fasciitis

## Intraarticular loose body

- Following non-diagnostic radiographs

**Note:** Includes synovial osteochondromatosis

## Ligament and tendon injuries

- In a patient following a focused history and physical exam; **AND**
- After a trial of conservative treatment (that may include physical therapy, for the current episode of pain); **AND**
- Patient fails to show substantial improvement on clinical reevaluation

## MRI accompanying an arthrogram (MR arthrography)

## Neuropathic osteodystrophy (Charcot joint)

- Following conventional radiographs, when there is need for additional diagnostic information from an MRI exam to direct treatment decisions (such as concern for an underlying infectious process)

## Non-specific upper extremity pain

- In a patient where focused history and physical exam suggest non-specific upper extremity pain; **AND**
- Following normal or non-diagnostic conventional radiographs; **AND**
- Atraumatic; **AND**
- At least one of the following:
  - Significant weakness; **OR**
  - No improvement following clinical re-evaluation after a minimum of six (6) consecutive weeks of physician supervised conservative treatment for the current episode of pain, including but not limited to:
    - NSAIDs or steroids (oral or injection) – unless contraindicated
    - Physical therapy (home exercise only if physical therapy is not available)

**Note:** For suspicion of specific etiology, especially red flag conditions such as tumor, infection and acute trauma, please refer to the corresponding indication

## Osteochondral lesion

## Osteonecrosis [avascular necrosis (AVN); aseptic necrosis]

- Requires initial plain films, prior to advanced imaging
- Common anatomic locations for osteonecrosis in the upper extremity are:
  - Humeral head
  - Radial head
  - Carpal navicular bone
  - Lunate bone (lunate osteonecrosis also referred to as Kienbock's disease)

## Pigmented Villonodular synovitis (PVNS)

# Common Diagnostic Indications

## Post-operative or post-procedure evaluation

## Pre-operative or pre-procedure evaluation

**Note:** This indication is to be used for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

### Septic arthritis

- When any of the following risk factors are present:
  - Underlying joint disease
  - Joint prosthesis
  - IV drug abuse
  - Diabetes
  - Presence of cutaneous ulcers; **OR**
- Pre-operative planning

### Significant trauma

- Usually preceded by initial plain film radiographs

### Soft tissue mass

(any one of the following)

- Soft-tissue evaluation when prominent calcifications are seen on radiograph
- Spontaneous soft tissue hemorrhage with or without palpable mass
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging
- Following a non-diagnostic radiograph to evaluate a palpable mass found on physical exam

## Tumor evaluation: primary neoplasm or metastatic disease

(any one of the following)

- Biopsy-proven malignancy
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging

## Shoulder Joint Imaging

### Anterior glenohumeral instability/labral tear

#### Diagnosis of anterior glenohumeral instability/anterior labral tear

- Recurrent anterior shoulder dislocation<sup>2</sup> **OR**
- First time dislocation
  - Young and at high risk for recurrence<sup>3</sup>

### Acute shoulder pain

- Following non-diagnostic conventional radiographs; **AND**
- In a patient who is a candidate for corticosteroid or anesthetic injection and one of the following:
  - Suspected bursitis; **OR**
  - Suspected long head of biceps tenosynovitis

### Chronic shoulder pain

- In a patient where focused history and physical exam suggest non-specific upper extremity pain, adhesive capsulitis or subacromial impingement syndrome; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- Patient has completed a minimum of six (6) consecutive weeks of physician supervised conservative treatment for the current episode of pain, including but not limited to:
  - Physical therapy (home exercise only if physical therapy is not available); **AND**
- After trial of conservative treatment as listed above, patient fails to show substantial improvement on clinical re-evaluation

# Common Diagnostic Indications

## Rotator Cuff Tear

### Diagnosis of acute rotator cuff tear

#### (All of the following)

- Following non-diagnostic radiographs and/or ultrasound
- At least one (1) positive sign to support the diagnosis of rotator cuff tear (see **Table 1**)
- No improvement after an initial trial of conservative therapy, including 4 weeks of physical therapy, unless the patient is at high risk for an acute full thickness rotator cuff tear (see **Table 2**)

### Diagnosis of chronic rotator cuff tear

#### (All of the following)

- At least one (1) positive sign to support the diagnosis of rotator cuff tear (see **Table 1**)
- Following non-diagnostic radiograph and/or ultrasound
- Symptoms have persisted for more than 3 months despite optimal medical management

### Management of rotator cuff tear

- Post-operative <sup>5</sup>
  - Suspicion of recurrent rotator cuff tear
  - Post-surgical complication

**Note:** For patients who have not had surgery when there is a concern for recurrent rotator cuff tear, see the diagnosis of rotator cuff tear guideline. Ultrasound, radiographs, or CT arthrography are generally preferred in the evaluation of recurrent rotator cuff tear after total shoulder arthroplasty

**Table 1: Findings suggestive of a rotator cuff tear include but are not limited to the following:** <sup>12</sup>

Positive (elicits weakness and/or pain) for at least one of the following:		
<ul style="list-style-type: none"><li>• Apley scratch test</li><li>• Apprehension</li><li>• Belly press/belly off</li><li>• Cross body</li><li>• Drop arm/sign</li><li>• Empty can / Full can</li></ul>	<ul style="list-style-type: none"><li>• External rotation lag sign</li><li>• Hawkins-Kennedy</li><li>• Hornblower</li><li>• Infraspinatus muscle strength test</li><li>• Jobe's test</li></ul>	<ul style="list-style-type: none"><li>• Lift off</li><li>• Neer</li><li>• Painful arc</li><li>• Patte</li><li>• Resisted abduction</li></ul>

**Table 2: High risk patients have at least one of the following symptoms to suggest either an acute full thickness rotator cuff tear or an alternative etiology for acute shoulder pain**

<ul style="list-style-type: none"><li>• Acute traumatic event</li><li>• Positive drop arm</li><li>• Profound loss of strength</li><li>• Loss of sensation</li></ul>	<ul style="list-style-type: none"><li>• Decreased pulse</li><li>• Plateau in therapy response</li><li>• Worsening of symptoms during therapy</li><li>• At least two signs of a SLAP tear</li></ul>
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# Common Diagnostic Indications

## Superior Labrum Anterior Posterior (SLAP) tears

### Diagnosis of SLAP tears

- Clinical findings of a SLAP tear (see Table 3) and one of the following:
  - Symptoms do not improve or worsen after 4 weeks of conservative therapy
  - High risk patient defined as (see Table 4)

### Management of Labral tears

- Pre-operative
  - Labral tear established by a modality other than MRI; **OR**
  - More than 1 year between MRI and surgical evaluation
- Post-operative
  - No clinical improvement; **AND**
  - At least three months after surgery

**Table 3: Clinical findings of a SLAP tear may include but are not limited to the following:**<sup>6-8</sup>

Pain exacerbated by overhead activity or heavy lifting
Popping or locking of the shoulder
Signs of shoulder instability: <ul style="list-style-type: none"><li>Speed's biceps tendon test</li><li>O'Brien's test</li><li>Compression-Rotation test</li><li>Yergason's test</li></ul>

**Table 4: Patients at High Risk for SLAP tears:**

- Acute trauma; **AND**
- Under 45 years of age; **OR**
- Evidence of suprascapular nerve entrapment including but not limited to
  - Posterolateral shoulder pain; **OR**
  - Supraspinatus and/or infraspinatus weakness; **OR**
  - Supraspinatus and/or infraspinatus atrophy

## Suspected occult shoulder fracture

- With high clinical suspicion and negative or inconclusive shoulder radiographs

## Elbow Imaging

### Biceps tendon rupture

- At insertion onto radial tuberosity

## Capitellar osteochondritis

### Epicondylitis

- In a patient following a focused history and physical exam; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- After a trial of conservative treatment (that may include physical therapy for strengthening); **AND**
- Patient fails to show substantial improvement on clinical re-evaluation

**Note:** Epicondylitis is generally considered a clinical diagnosis and imaging usually does not change management. Specialist evaluation should be strongly considered prior to advanced imaging

## Ulnar collateral ligament tear

# Common Diagnostic Indications

## Suspected occult elbow fracture

- With high clinical suspicion and negative or inconclusive elbow radiographs

## Triceps tendon rupture

- From olecranon insertion site

## Additional Indications for Wrist and Hand Imaging

### Scaphoid fracture

### Triangular fibrocartilage complex (TFCC) tear

### Ulnar collateral ligament tear (gamekeeper's thumb)

## MRI is not indicated in the following clinical situations

The indications listed in this section do not require advanced imaging using MRI. If there are circumstances that require MRI imaging, a peer-to-peer discussion may be required.

### Subacromial impingement<sup>9-11</sup>

**Note:** *Imaging is not indicated unless there is concern for a rotator cuff tear*

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# Magnetic Resonance Imaging (MRI) Upper Extremity (Non-Joint)



## CPT Codes

- 73218..... MRI upper extremity, non-joint, without contrast
- 73219..... MRI upper extremity, non-joint, with contrast
- 73220..... MRI upper extremity, non-joint, without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication for the exam and varies considerably, based on anatomic (from shoulder joint through hand/digits) and clinical considerations
- MRI routinely provides multi-planar imaging through the region of interest

## Imaging Considerations

- Conventional radiographs should be obtained before advanced imaging
- CT is often the preferred modality for evaluation of displaced fractures and subluxations, whereas stress fractures and some incomplete or non-displaced fractures may be better imaged with MRI or radionuclide bone scintigraphy
- MRI is often the preferred modality for evaluation of soft tissue abnormalities and for interrogation of possible osteomyelitis, despite negative or non-diagnostic plain films and/or triple-phase bone scintigraphy. One exception for osteomyelitis is detection of bone sequestra, which may be better depicted with CT
- If radiographic findings are typical of osteomyelitis, advanced diagnostic imaging may not be necessary
- Use of contrast is at the discretion of both the ordering and imaging physicians
- Brachial Plexus Imaging: MRI, when not contraindicated is the preferred imaging modality for brachial plexus. The brachial plexus is a network of nerves in the neck, passing under the clavicle and into the axilla. Assign either a CT or MRI of the upper extremity (non-joint) for imaging the brachial plexus

## Common Diagnostic Indications

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

**Brachial plexopathy**

**Brachial plexus mass**

**EMG-proven entrapment neuropathy after conservative therapy to direct treatment**

- Suspected entrapment neuropathy, cubital tunnel detail, and/or carpal tunnel are not considered medically necessary

**Fracture evaluation**

(Any one of the following)

- To confirm a suspected occult/stress fracture following non-diagnostic initial radiographs at high risk sites:
  - Scaphoid
  - Lunate
- To define the extent of an acute fracture when surgery is being considered
- To assess fracture healing for delayed union or non-union, when repeat radiographs are non-diagnostic

# Common Diagnostic Indications

## Infectious process

- In a patient where focused history and physical exam suggest an underlying soft tissue infection when:
  - Patient is unresponsive to treatment including but not limited to antibiotics or incision/drainage
- Abscess - to determine the location and extent for surgical treatment
- Osteomyelitis – following non-diagnostic radiographs
- Fasciitis

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## Myositis

- To determine optimal location for biopsy; **OR**
- To monitor treatment response

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## Persistent upper extremity pain – unresponsive to six (6) weeks of conservative treatment

- In a patient where focused history and physical exam suggest non-specific upper extremity pain; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- Patient has completed a minimum of six (6) consecutive weeks of physician supervised conservative treatment for the current episode of pain, including but not limited to:
  - NSAIDs or steroids (oral or injection) – unless contraindicated; **OR**
  - Physical therapy (home exercise only if physical therapy is not available); **AND**
- After trial of conservative treatment as listed above, patient fails to show substantial improvement on clinical re-evaluation

*Note:* For suspicion of specific etiology, please refer to corresponding indication

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## Post-operative or post-procedure evaluation

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## Pre-operative or pre-procedure evaluation

*Note:* This indication is to be used for pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline.

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## Septic arthritis

- When there is a clinical consideration of contiguous spread of infection into the adjacent soft-tissues of the joint, which would not normally be included on an MRI joint exam; **AND**
- For cases of known septic arthritis, MRI may be used when any of the following risk factors are present:
  - Underlying joint disease
  - Joint prosthesis
  - IV drug abuse
  - Diabetes
  - Presence of cutaneous ulcers; **OR**
- Pre-operative planning

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## Significant trauma

- Usually preceded by initial plain film radiographs

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## Soft tissue mass

(any one of the following)

- Soft-tissue evaluation when prominent calcifications are seen on radiograph
- Spontaneous soft tissue hemorrhage with or without palpable mass
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging
- Following a non-diagnostic radiograph to evaluate a palpable mass found on physical exam

## Common Diagnostic Indications

### Tumor evaluation: primary neoplasm or metastatic disease

(any one of the following)

- Biopsy-proven malignancy
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging

### Ulnar collateral ligament tear (gamekeeper's thumb)

## References

1. Lakkaraju A, Sinha R, Garikipati R, Edward S, Robinson P. Ultrasound for initial evaluation and triage of clinically suspicious soft-tissue masses. *Clin Radiol.* 2009 Jun;64(6):615-621.

# CT Angiography (CTA) and MR Angiography (MRA) Upper Extremity



## CPT Codes

- 73206..... Computed tomographic angiography, upper extremity, with contrast material(s), including non-contrast images, if performed, and image post-processing  
73225..... Magnetic resonance angiography, upper extremity, without and with contrast

## Standard Anatomic Coverage

- Depends on the specific anatomic area of interest, from the axillary region through the hand and digits

## Imaging Considerations

- CT and MR angiographic techniques include arterial and/or venous assessment, depending on the clinical indication
- Other generally available non-invasive arterial studies of the upper extremity circulation should be considered prior to advanced diagnostic imaging with CTA or MRA. These include segmental systolic pressure measurements, plethysmographic analysis, continuous wave Doppler and/or duplex ultrasonography
- CT angiography utilizes the data obtained from standard CT imaging. A request for a CT exam in addition to a CT Angiography of the same anatomic area during the same imaging session is inappropriate
- For MR arthrography of the upper extremity, see CPT codes 73221-73223
- For imaging the brachial plexus, see CT upper extremity or MRI upper extremity, non-joint

## Common Diagnostic Indications

### Aneurysm / dilation

### Arterial entrapment syndrome

### Arterio-venous malformation (AVM) or fistula (AVF)

### Dialysis graft evaluation

- Following duplex Doppler assessment

### Dissection

### Intramural hematoma

### Post-operative or post-procedure evaluation

### Preoperative or pre-procedure evaluation

*Note:* This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

### Raynaud's syndrome

### Steno-occlusive disease

- Usually atherosclerotic in origin

### Thromboembolic disease – arterial or venous

### Vascular invasion or compression by a musculoskeletal neoplasm

### Vasculitis

# Computed Tomography (CT) Lower Extremity



## CPT Codes

- 73700..... CT lower extremity without contrast
- 73701..... CT lower extremity with contrast
- 73702..... CT lower extremity without contrast, followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage depends on the anatomic area of concern and varies considerably, based on anatomic (from hip through toes) and clinical considerations
- Depending on the protocol used, the CT data acquisition(s) may allow for diagnostic multi-planar reconstructions through the region of interest

## Imaging Considerations

- Conventional radiographs should be obtained before advanced imaging
- CT is often the preferred modality for evaluation of displaced fractures and subluxations, whereas stress fractures and some incomplete and non-displaced fractures may be better imaged with MRI or radionuclide bone scintigraphy
- If radiographic findings are typical of osteomyelitis, advanced imaging may not be necessary
- In osteomyelitis, CT may be helpful in defining bony sequestra
- Use of contrast (intravenous and intra-articular) is at the discretion of both the ordering and imaging physicians

## Common Diagnostic Indications

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

### CT accompanying an arthrogram (CT arthrography)

#### Fracture evaluation

- To confirm a suspected (occult) fracture following initial radiographs; **OR**
- To define the extent of an acute fracture and position of fracture fragments; **OR**
- To assess fracture healing for delayed union or non-union

#### Hemarthrosis (bloody joint effusion)

- Documented by arthrocentesis except in cases when arthrocentesis is contraindicated (e.g. non-traumatic causes of hemarthrosis such as sickle cell, anticoagulant, or hemophilia)

#### Infectious process

- In a patient where focused history and physical exam suggest an underlying soft tissue infection when:
  - Patient is unresponsive to treatment including but not limited to antibiotics or incision/drainage
- Abscess – to determine the location and extent for surgical treatment
- Osteomyelitis – following non-diagnostic radiographs and when MRI is contraindicated
- Fasciitis

#### Neuropathic osteodystrophy (Charcot joint)

- Following conventional radiographs, when there is need for additional diagnostic information from a CT exam to direct treatment decisions (such as concern for an underlying infectious process)

# Common Diagnostic Indications

## Osteonecrosis [avascular necrosis (AVN); aseptic necrosis]

- Requires initial plain films, prior to advanced imaging
- MRI is often the preferred imaging modality, particularly for evaluation during the early stages of osteonecrosis

## Persistent lower extremity pain (excluding knee joint)

- In a patient where focused history and physical exam suggest non-specific lower extremity pain; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- After a trial of conservative treatment (that may include physical therapy, NSAIDs, steroids unless contraindicated, for this current episode of pain); **AND**
- Patient fails to show substantial improvement on clinical re-evaluation

**Note:** For suspicion of specific etiology, please refer to corresponding indication

## Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline.

## Preoperative or pre-procedure evaluation

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

**Exclusion:** This indication does not apply to preoperative evaluation for primary total knee arthroplasty for osteoarthritis.

## Septic arthritis - when MRI is contraindicated

- When any of the following risk factors are present:
  - Underlying joint disease
  - Joint prosthesis
  - IV drug abuse
  - Diabetes
  - Presence of cutaneous ulcers; **OR**
- Pre-operative planning

## Significant trauma

- Usually preceded by initial plain film radiographs

## Tarsal coalition

- Following foot radiographs

## Soft tissue mass

(any one of the following)

- Soft-tissue evaluation when prominent calcifications are seen on radiograph
- Spontaneous soft tissue hemorrhage with or without palpable mass
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging
- Following a non-diagnostic radiograph to evaluate a palpable mass found on physical exam

**Note:** MRI is typically preferred in the evaluation of soft tissue masses

## Tumor evaluation: primary neoplasm or metastatic disease

(any one of the following)

- Biopsy-proven malignancy
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging

**When the patient's condition meets the lower extremity MRI guidelines, but there is either a contraindication to MRI or the patient cannot tolerate MRI examination (for example, due to claustrophobia)**

## References

1. Lakkaraju A, Sinha R, Garikipati R, Edward S, Robinson P. Ultrasound for initial evaluation and triage of clinically suspicious soft-tissue masses. *Clin Radiol.* 2009 Jun;64(6):615-621.
2. Ward EE, Jacobson JA, Fessell DP, et al. Sonographic detection of Baker's cysts: comparison with MRI. *AJR Am J Roentgenol.* 2001;176:373-380.

# Magnetic Resonance Imaging (MRI) Lower Extremity (Joint & Non-Joint)



## CPT Codes

- 73718..... MRI lower extremity, other than joint, without contrast
- 73719..... MRI lower extremity, other than joint, with contrast
- 73720..... MRI lower extremity, other than joint, without contrast followed by re-imaging with contrast
- 73721..... MRI lower extremity, any joint, without contrast
- 73722..... MRI lower extremity, any joint, with contrast
- 73723..... MRI lower extremity, any joint, without contrast followed by re-imaging with contrast

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication and varies considerably, based on anatomic and clinical considerations. If medically appropriate, an MRI exam may be requested for each major area of the right and left lower extremities: hip, thigh, knee, lower leg (calf), ankle, or foot (includes toes)
- Routine MRI examinations provide multi-planar imaging of the joint or non-joint region(s) of interest

## Imaging Considerations

- Conventional radiographs should be obtained before advanced imaging
- Use of contrast (intravenous and intra-articular) is at the discretion of both the ordering and imaging physicians
- CT is often the preferred modality for evaluation of displaced fractures and subluxations, whereas stress fractures and some incomplete and non-displaced fractures may be better imaged with MRI or radionuclide bone scintigraphy
- MRI is often used to evaluate soft tissue abnormalities and to interrogate for possible osteomyelitis, despite negative or non-diagnostic plain films and/or triple-phase bone scintigraphy. One exception for osteomyelitis is detection of bone sequestra, which may be better depicted with CT
- If radiographic findings are typical of osteomyelitis, advanced imaging may not be necessary
- For suspected osteonecrosis, MRI is often more sensitive than CT or bone scintigraphy
- Implanted surgical hardware, including joint prostheses, may produce sufficient local artifact to preclude adequate imaging through the region containing hardware
- For suspected Baker's cysts, ultrasound should be performed before advanced imaging exams

## Common Diagnostic Indications

This section contains general lower extremity, hip, knee, and ankle and foot indications.

### General Lower Extremity

**Abnormalities detected on other imaging studies which require additional clarification to direct treatment**

# Common Diagnostic Indications

## Fracture evaluation<sup>5-12</sup>

(Any one of the following)

- To confirm a suspected occult/stress fracture following non-diagnostic initial radiographs at high risk sites:
  - Femoral neck/proximal femur
  - Tibia (anterior/lateral)
  - Patella
  - Medial malleolus
  - Talus
  - Navicular
  - Metatarsal base (second and fifth digits)
  - Great toe sesamoid
- To define the extent of an acute fracture when surgery is being considered
- To assess fracture healing for delayed union or non-union, when repeat radiographs are non-diagnostic

## Hemarthrosis (bloody joint effusion)

- Documented by arthrocentesis except in cases when arthrocentesis is contraindicated (e.g. non-traumatic causes of hemarthrosis such as sickle cell, anticoagulant, or hemophilia)

## Infectious process

- In a patient where focused history and physical exam suggest an underlying soft tissue infection when:
  - Patient is unresponsive to treatment including but not limited to antibiotics or incision/drainage
- Abscess - to determine the location and extent for surgical treatment
- Osteomyelitis – following non-diagnostic radiographs
- Fasciitis

## Intraarticular loose body

- Following non-diagnostic radiographs

**Note:** Includes synovial osteochondromatosis

## MRI accompanying an arthrogram (MR arthrography)

## Myositis

- To determine optimal location for biopsy; **OR**
- To monitor treatment response

## Osteochondral lesion

## Osteonecrosis [avascular necrosis (AVN); aseptic necrosis]

- Requires initial plain films, prior to advanced imaging
- MRI is often the preferred imaging modality, particularly for evaluation during the early stages of osteonecrosis

## Persistent lower extremity pain (excluding knee joint)

- In a patient where focused history and physical exam suggest non-specific lower extremity pain; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- After a trial of conservative treatment (that may include physical therapy, NSAIDs, steroids unless contraindicated, for this current episode of pain); **AND**
- Patient fails to show substantial improvement on clinical re-evaluation

**Note:** For suspicion of specific etiology, please refer to corresponding indication

## Pigmented Villonodular synovitis (PVNS)

# Common Diagnostic Indications

## Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline. This guideline does not include post-operative knee replacement for osteoarthritis

## Preoperative or pre-procedure evaluation, for conditions other than knee replacements for osteoarthritis

**Note:** For preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

**Exclusion:** This indication does not apply to preoperative evaluation for primary total knee arthroplasty for osteoarthritis.

Radiographs are typically sufficient for the preoperative evaluation for osteoarthritis prior to total knee arthroplasty.

### Septic arthritis

- When any of the following risk factors are present:
  - Underlying joint disease
  - Joint prosthesis
  - IV drug abuse
  - Diabetes
  - Presence of cutaneous ulcers; **OR**
- Pre-operative planning

### Significant trauma

- Usually preceded by initial plain film radiographs

### Soft tissue mass

(any one of the following)

- Soft-tissue evaluation when prominent calcifications are seen on radiograph;
- Spontaneous soft tissue hemorrhage with or without palpable mass
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging
- Evaluation of a palpable soft tissue mass (excluding posterior knee masses) on physical examination following a non-diagnostic radiograph
- Evaluation of a palpable posterior knee mass on physical examination following a non-diagnostic radiograph AND a non-diagnostic ultrasound

## Tumor evaluation: primary neoplasm or metastatic disease

(any one of the following)

- Biopsy-proven malignancy
- Surveillance, without pathologic tissue confirmation, of an unexplained mass identified on prior imaging

## Hip Joint

### Labral tear

### Occult hip fracture

- With high clinical suspicion and negative or inconclusive hip radiographs

## Knee Joint

### Chondromalacia patella (patellofemoral pain syndrome)<sup>3</sup>

- In a patient following a focused history and physical exam; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- Patient has completed a minimum of four (4) consecutive weeks of physician supervised conservative treatment for the current episode of pain; **AND**
- Patient fails to show substantial improvement on clinical re-evaluation

# Common Diagnostic Indications

## Ligament tear

- In a patient where focused history and physical exam suggests a ligament tear; **AND**
- Patient has completed a minimum of four (4) consecutive weeks of physician supervised conservative treatment for the current episode of pain, including but not limited to:
  - Physical therapy (home exercise only if physical therapy is not available); **AND**
- After trial of conservative treatment as listed above, patient fails to show substantial improvement on clinical re-evaluation; **OR**
- For pre-operative evaluation, based on physical exam findings which may include one of the following:
  - Positive Lachman test; **OR**
  - Positive pivot shift test; **OR**
  - Positive anterior or posterior drawer test; **OR**
  - Positive medial or lateral stress tests

## Meniscal tear/injury

- In a patient where focused history and physical exam suggests a meniscal tear; **AND**
- Patient has completed a minimum of four (4) consecutive weeks of physician supervised conservative treatment for the current episode of pain, including but not limited to:
  - NSAIDs or steroids (oral or injection) – unless contraindicated; **AND**
  - Physical therapy (home exercise only if physical therapy is not available); **AND**
- After trial of conservative treatment as listed above, patient fails to show substantial improvement on clinical re-evaluation; **OR**
- For pre-operative evaluation, based on physical exam findings which may include one of the following:
  - Positive McMurray test with minimal knee flexion; **OR**
  - A severe twisting injury after which activity could not be resumed; **OR**
  - An anterior cruciate ligament tear is present; **OR**
  - Locking; **OR**
  - Swelling and symptoms develop immediately after an acute injury; **OR**
  - Inability to bear weight; **OR**
  - Inability to fully extend knee

## Osteochondritis dissecans<sup>4</sup>

## Post-operative evaluation following repair of a ligamentous or tendinous tear, with new symptoms

### Ankle and Foot

#### Acute and chronic tendon injuries

- In a patient following a focused history and physical exam; **AND**
- Following non-diagnostic conventional radiographs; **AND**
- After a trial of conservative treatment (that may include physical therapy, for the current episode of pain); **AND**
- Patient fails to show substantial improvement on clinical re-evaluation

#### Acute tendon rupture

- For pre-operative evaluation based on
  - Severe muscle weakness from the involved tendon; **OR**
  - Non-diagnostic X-ray for bone avulsion; **OR**
  - Non-diagnostic ultrasound evaluation

# Common Diagnostic Indications

## Diabetic foot disease

- Osteomyelitis – following non-diagnostic radiographs

## Morton's neuroma

- When the diagnosis is not clear on physical examination or ultrasound

## Neuropathic osteodystrophy (Charcot joint)

- Following foot radiographs, when there is need for additional diagnostic information from an MRI exam to direct treatment decisions (such as concern for an underlying infectious process)

## Plantar fasciitis

- For pre-operative evaluation following a failure of six (6) months of physician supervised conservative treatment

## Tarsal coalition

- Following foot radiographs

**Note:** CT may be preferred for bony coalition

## Tarsal tunnel

- Following EMG nerve conduction study if not responsive to four weeks of conservative treatment
- Neuropathy secondary to entrapment or compression of the posterior tibial nerve or its branches in the fibro-osseous tunnel, deep to the flexor retinaculum

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# CT Angiography (CTA) and MR Angiography (MRA) Lower Extremity



## CPT Codes

- 73706..... Computed tomographic angiography, lower extremity, with contrast material(s), including noncontrast images, if performed, and image postprocessing  
73725..... Magnetic resonance angiography, lower extremity, without and with contrast

## Standard Anatomic Coverage

- Depends on the area of interest and may extend from the iliofemoral regions through the feet

## Imaging Considerations

- Other generally available non-invasive arterial studies of the lower extremity circulation should be considered prior to advanced diagnostic imaging with CTA or MRA. These may include segmental systolic pressure measurements, plethysmographic analysis, continuous wave Doppler and/or duplex ultrasonography of the lower extremity arterial or venous circulations
- MRA should also be considered in patients with a history of either previous contrast reaction to intravascular administration of iodinated radiographic contrast material or atopy
- CT angiography utilizes the data obtained from standard CT imaging. An authorization request for a CT exam in addition to a CT angiography of the same anatomic area during the same imaging session is inappropriate
- A request for a CT lower extremity venogram is a request for a CTA of the lower extremity. A quick look at the vasculature of the lower extremity at the time of a CT or CTA of the chest for pulmonary embolism evaluation should not be separately entered or reported

## Common Diagnostic Indications

**Aneurysm / dilation**

**Arterial entrapment syndrome**

**Arteriovenous malformation (AVM) or fistula (AVF)**

**Critical ischemia**

- For example, in diabetic vascular disease with ischemic ulcers or gangrene

**Dissection**

**Intramural hematoma**

**Post-operative or post-procedure evaluation**

**Preoperative or pre-procedure evaluation**

**Note:** This indication is for preoperative evaluation of conditions not specifically referenced elsewhere in this guideline.

**Thromboembolic disease – arterial or venous**

# Common Diagnostic Indications

## Vascular assessment for lower extremity claudication

- CPT coding for abdominal aortic and run-off evaluation, which involves image post-processing for three-dimensional reconstructions, should follow:
  - For CTA: 75635 - CTA of abdominal aorta and bilateral iliofemoral lower extremity run-off without contrast, followed by re-imaging with contrast
  - For MRA: 74185 - abdominal MRA and 73725 - bilateral lower extremity MRAs
- Either CTA or MRA is indicated in a patient with classic presenting symptoms of claudication from peripheral arterial disease, such as diminished / absent peripheral pulses and cramping pain in the legs (particularly in the thighs and calves) when walking, which disappears at rest
- In the absence of classic peripheral symptoms of claudication, then obtain a vascular surgical consultation and perform lower extremity non-invasive arterial evaluation, which may include the following: segmental systolic pressure measurements, segmental limb plethysmography, Continuous wave Doppler and duplex ultrasonography. Ankle brachial indices (ABI) of < 0.9 may undergo advanced imaging. Rest pain or severe occlusive disease typically occurs with ABI < 0.5

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## Vascular invasion or compression by a musculoskeletal neoplasm

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### Vasculitis

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### Venous compression, due to surrounding mass effect

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### Venous thrombosis

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# Positron Emission Tomography (PET)

## PET Applications including

### Oncologic Tumor Imaging



## CPT Codes

### Dedicated PET Imaging:

- 78811..... PET imaging, limited area
- 78812..... PET imaging, skull to mid-thigh
- 78813..... PET imaging, whole body

### PET/CT Imaging:

- 78814..... PET imaging, with concurrently acquired CT for attenuation correction and anatomic localization; limited area
- 78815..... PET imaging, with concurrently acquired CT for attenuation correction and anatomic localization; skull base to mid-thigh
- 78816..... PET imaging, with concurrently acquired CT for attenuation correction and anatomic localization; whole body

## Commonly Used Radiopharmaceutical/Scanner

- 2-(fluorine-18) fluoro-2-deoxy-d-glucose (FDG), performed on a dedicated PET or integrated (hybrid) PET/CT scanner
- Radiopharmaceuticals other than 2-(fluorine-18) fluoro-2-deoxy-d-glucose (FDG) are still under active investigation.

## Technology Considerations

The use of PET is generally limited to clinical situations in which tissue confirmation of malignancy has been established and standard imaging has not provided sufficient information to guide treatment decisions.

Standard imaging usually consists of CT or MRI, but may include xray, bone scan or ultrasound. In the majority of situations where residual or recurrent disease is of concern, biopsy remains the most reliable method of confirmation. In addition, timing of PET with regard to radiation treatment and other forms of therapy is critical, as the inflammatory response may lead to false positive findings.

Based on these considerations and the considerable nuance that exists across tumor types, peer-to-peer discussions will often be necessary to determine appropriateness of PET imaging.

Routine surveillance with PET or other imaging studies in asymptomatic patients has not been shown to improve survival or impact the ability to palliate recurrent disease, and is therefore not recommended.

## Common Diagnostic Indications

### Bladder, renal pelvis and ureter

- Initial treatment strategy
    - Evaluation of stage II or stage III bladder cancer prior to surgery
  - Subsequent treatment strategy
    - Evaluation of objective signs or symptoms of disease when CT or MRI has not clearly demonstrated recurrence or progression
- Note:** PET is not indicated in bladder tumors which have not invaded the muscle (stage < cT2).

### Bone/cartilage and connective/other soft tissue

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

## Common Diagnostic Indications

**Brain and spinal cord – (applies to full body PET)** (If metabolic PET for Brain imaging is desired, please direct to PET – Brain Imaging, CPT code 78608)

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

**Note:** Standard PET (body) imaging is sometimes used as staging, particularly for CNS lymphoma, or metastatic disease detected in the central nervous system. Primary brain tumors traditionally are imaged utilizing metabolic Brain FDG-PET scanning.

### Breast cancer, invasive (male and female)

- Initial treatment strategy when a diagnosis of invasive breast cancer has been established and **any of the following apply:**
  - Locally advanced disease (stage IIIA-IIIC) has been established and standard imaging does not clearly demonstrate metastatic disease
  - Symptom-directed staging has been performed and is equivocal or suspicious for metastatic disease
  - Standard imaging studies are equivocal or non-diagnostic for the extent of known metastatic disease
- Subsequent treatment strategy
  - Detection of recurrent or progressive disease, when standard imaging is equivocal or non-diagnostic
  - Suspected worsening of disease based on objective signs or symptoms (such as rising tumor markers), when standard imaging has been performed and does not clearly identify site of recurrence or progression

**Note:** Standard imaging includes CT or MRI and bone scan, and may also include ultrasound when liver involvement is suspected. In the setting of bone-only metastatic disease, evaluation for progression or regression may be best imaged by PET.

### Cervix

- Initial treatment strategy
  - After definitive diagnosis of cervical cancer has been made
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

# Common Diagnostic Indications

## Colorectal cancer

- Initial treatment strategy—Detection of metastatic disease when **all of the following** are true:
  - Standard imaging has been performed (CT or ultrasound) and suggests resectable metastatic disease.
  - Lesion(s) is/are greater than 1 cm in diameter.
  - Lesion(s) is/are in a location not amenable to biopsy, or biopsy is considered high risk.
  - Confirmation of metastatic disease will impact the decision to proceed with curative surgery

**Note:** A negative standard workup is considered sufficient for staging. In patients who cannot undergo contrast-enhanced CT due to contrast allergy or renal disease, PET may be utilized if the patient has potentially curable disease.

- Radiation planning—Rectal cancer only
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - CT is equivocal for metastatic disease and lesion(s) is/are greater than 1 cm in diameter.
  - CT demonstrates potentially surgically curable recurrence.
  - CT does not demonstrate a focus of recurrence but CEA level is rising.
  - Signs or symptoms are suggestive of recurrence and CT with contrast is contraindicated.

**Note:** PET is not appropriate to assess response to chemotherapy due to an unacceptably high rate of false positive and false negative studies.

## Digestive system, including small intestine, liver, biliary, peritoneum, GI stromal tumors (GIST), and anal cancers—excludes colorectal, esophageal, gastric and gastroesophageal junction cancers, and pancreatic adenocarcinoma

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

**Note:** Alternative imaging modalities should be considered in those tumor types for which falsely negative PET or PET/CT results are commonly reported, including mucinous neoplasia, islet cell tumors, carcinoid tumors, other well-differentiated neuroendocrine tumors, and well-differentiated hepatocellular tumors. PET should be used with caution.

## Endocrine non-thyroid (includes pituitary and adrenal)

- Initial treatment
- Subsequent treatment
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

# Common Diagnostic Indications

## Esophageal and gastroesophageal junction cancers

- Initial treatment strategy
  - Standard imaging has been performed and has not demonstrated metastatic disease
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Assessment of response to chemoradiation, (as definitive treatment or prior to surgery) when performed at least 5 weeks after completion of therapy; **OR**,
  - Evaluation of suspected recurrence based on signs or symptoms, when standard modalities are equivocal for recurrent disease

## Gastric cancer

- Initial treatment strategy—Detection of metastatic disease in tumors initially staged **1B or higher** when all of the following are true:
  - Standard imaging has been performed and has not clearly demonstrated metastatic disease.
  - Patient is a candidate for curative surgery.
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - To determine resectability of residual disease following completion of primary (neoadjuvant) treatment, when follow-up evaluation with standard modalities does not demonstrate metastatic disease
  - Evaluation of suspected recurrence based on signs or symptoms, when standard modalities are equivocal for recurrent disease

**Note:** Standard evaluation includes endoscopic ultrasound and contrast-enhanced CT scan.

## Head and neck, including lip, oral cavity, pharynx, larynx, nasal cavity, ear, sinuses, eye, or occult head and neck primary

- Initial treatment strategy
  - Evaluation of Stage III and IV cancers (tumors greater than 4 cm in size, or any evidence of regional node involvement) of the oral cavity, oropharynx, hypopharynx, nasopharynx, larynx and sinus
  - Following biopsy suggestive of a head and neck primary tumor (squamous cell cancer, adenocarcinoma, or anaplastic undifferentiated epithelial tumor) when CT or MRI evaluation of the neck has not detected a primary site of tumor
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Evaluation of disease following clinical response to treatment, no sooner than 12 weeks after completion of therapy
  - Evaluation of suspected recurrence based on signs or symptoms, when CT or MRI is equivocal or non-diagnostic for recurrent disease
  - Follow up of an equivocal post-treatment PET scan, no sooner than 4 weeks after the study, to determine need for further intervention such as neck dissection

**Note:** PET is not generally indicated for evaluation of lip and salivary gland cancers, regardless of stage.

# Common Diagnostic Indications

## Kidney cancer

- Initial treatment strategy
  - Evaluation of the extent of disease when curative resection of primary tumor or limited metastatic disease is planned, and standard imaging is equivocal for additional sites of disease.
- Subsequent treatment strategy—Evaluation of suspected recurrence when **all of the following** are true:
  - Standard imaging is equivocal for recurrent disease.
  - Biopsy cannot be performed.
  - Tumor has been shown to be PET avid (if a prior PET scan has been performed).

**Note:** *Bone scan and brain MRI should be performed for clinical suspicion of metastatic disease in renal cell carcinoma, as false negative PET results are commonly reported for this tumor type.*

## Lung cancer

### Pulmonary nodule

- Evaluation of a solitary pulmonary nodule when **all of the following** features are present:
  - Nodule is well-demarcated, solid or part solid, and lacks a benign calcification pattern.
  - Size is greater than 8 mm but less than 3 cm in greatest diameter
  - Nodule is surrounded by aerated lung parenchyma
  - There is no associated adenopathy, atelectasis or pleural effusion

### Non-small cell lung cancer

- Initial treatment strategy
  - Diagnosis in patients with a strong clinical or radiographic suspicion of non-small cell lung cancer
  - Evaluation of the extent of disease following biopsy confirmation of non-small cell lung cancer
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Evaluation following induction or neoadjuvant therapy to determine eligibility for resection
  - Restaging following completion of adjuvant therapy
  - Evaluation of signs or symptoms of disease when CT or MRI has not clearly demonstrated recurrence or progression
  - Differentiation of tumor from benign conditions (atelectasis, consolidation, or radiation fibrosis) when CT clearly delineates the abnormal findings

**Note:** *Areas previously treated with radiation therapy can remain FDG avid for up to 2 years.*

### Small cell lung cancer

- Initial treatment strategy
  - Prior to definitive therapy when standard imaging suggests limited stage disease
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Evaluation of suspected worsening of disease when standard imaging is equivocal for recurrence or progression

# Common Diagnostic Indications

## Lymphoma

### Suspected lymphoma

- Initial evaluation of suspected lymphoma when lymph nodes are not amenable to biopsy

**Note:** PET scan prior to histologic determination is not routinely recommended, as PET-avid lymphadenopathy can result from both benign and other malignant processes.

### Chronic lymphocytic leukemia (CLL) or Small lymphocytic lymphoma (SLL)

- Suspicion of Richter's transformation when PET is utilized to direct biopsy

**Note:** Suspicion of Richter's transformation is most commonly based on a presentation of rapidly enlarging lymph nodes, onset of B symptoms, hepatosplenomegaly, and elevated serum lactate dehydrogenase (LDH) levels.

### Hodgkin's lymphoma

- Initial treatment strategy (often performed as an adjunct to CT chest/abdomen/pelvis)
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Evaluation of response following 2–4 cycles of treatment
  - Post-treatment evaluation
  - Evaluation of suspected recurrence or progression of disease based on standard imaging or objective signs/symptoms

**Note:** For post-treatment evaluation, PET should not be performed sooner than 3 weeks following completion of all cycles of chemotherapy, or sooner than 12 weeks following completion of radiation therapy.

### Low grade/indolent non-Hodgkin's lymphoma or lymphoproliferative disorders (other than CLL/SLL)

- Initial treatment strategy
  - Evaluation of suspected transformation to a more aggressive lymphoma based on clinical signs or symptoms
  - Prior to initiation of therapy
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Post-treatment response evaluation, when initial PET scan has demonstrated FDG uptake
  - Evaluation of suspected recurrence or progression of disease based on standard imaging, when there is an indication to resume systemic treatment
  - Evaluation of suspected transformation to a more aggressive lymphoma based on clinical signs or symptoms

**Note:** For post-treatment evaluation, PET should not be performed sooner than 3 weeks following completion of all cycles of chemotherapy, or sooner than 12 weeks following completion of radiation therapy.

### Intermediate or High grade (aggressive) non-Hodgkin's lymphoma and other subtypes

- Initial treatment strategy (often performed as an adjunct to CT chest/abdomen/pelvis)
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Evaluation of response following 2–4 cycles of treatment of stage III and IV disease, when standard imaging has not clearly demonstrated progression or regression of disease
  - Post-treatment evaluation
  - Evaluation of suspected recurrence or progression of disease based on standard imaging or objective signs/symptoms

# Common Diagnostic Indications

## Myeloma

- Initial treatment strategy
  - Differentiation of smoldering myeloma from active myeloma when skeletal survey and/or whole body MRI is negative for bone involvement
- Subsequent treatment strategy
  - When routine evaluation with laboratory findings or bone survey suggests recurrence or progression of disease

**Note:** Routine follow-up evaluation includes quantitative immunoglobulins and M protein (serum and urine), routine CBC, kidney function, and calcium levels, and bone surveys. Additional evaluation may also include bone marrow aspirate and biopsy, serum free light chain assays, MRI, and flow cytometry.

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## Neuroendocrine tumor, particularly poorly differentiated disease

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

**Note:** Alternative imaging modalities, such as octreotide scans, should be considered in those tumor types for which falsely negative PET or PET/CT results are commonly reported, including well-differentiated neuroendocrine tumors. PET should be used with caution.

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## Other cancers not listed

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

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## Ovarian cancer (epithelial)

- Initial treatment strategy
  - Evaluation of indeterminate lesions detected by other imaging modalities, including ultrasound and CT or MRI, when additional information is required to guide management
- Subsequent treatment strategy
  - Evaluation of objective evidence of recurrent disease (such as rising tumor markers or increasing ascites) when CT or MRI does not clearly demonstrate recurrence or progression.

# Common Diagnostic Indications

## Pancreatic adenocarcinoma

- Initial treatment strategy—Detection of extra-pancreatic disease in patients who are candidates for resection when **all of the following** are true:
  - Dedicated, high quality imaging of the pancreas has been performed (see Note below)
  - Extra-pancreatic disease has not been clearly identified
  - **Any of the following** high-risk features are present
    - CA 19-9 level greater than 100 U/ml
    - Primary tumor greater than 2 cm in size
    - Enlarged regional nodes
    - Tumor is considered borderline resectable
- Radiation planning
  - Prior to initiation of radiation therapy

**Note:** Standard, high quality dedicated imaging evaluation of the pancreas includes a dedicated pancreatic protocol CT scan (multi-detector computed tomography angiography using a dual-phase pancreatic protocol, with images obtained in the pancreatic and portal venous phase of contrast enhancement) or MRI if CT is contraindicated. MRI may also be used to clarify CT-indeterminate liver lesions or suspected pancreatic tumors not visible on CT.

## Paraneoplastic syndrome including neurologic syndrome

- PET or PET/CT is indicated for initial evaluation of individuals with paraneoplastic syndrome

## Prostate adenocarcinoma

Not medically necessary for any indication

**Note:** FDG-PET/CT is not recommended for routine use for prostate cancer management because data remain insufficient. Furthermore, further study is needed to determine the best use of choline PET/CT in men with prostate cancer.

## Skin, including:

### Melanoma

- Initial treatment strategy—Evaluation for metastatic disease when **any of the following** are true:
  - Regional lymph node involvement has been demonstrated and standard imaging studies do not clearly demonstrate metastatic disease.
  - Metastatic disease is suspected based on signs or symptoms, and standard imaging demonstrates an abnormal finding that is suspicious for metastatic disease.
  - Standard imaging studies are equivocal or non-diagnostic for the extent of known metastatic disease
- Subsequent treatment strategy
  - Evaluation of objective signs or symptoms of metastatic disease when CT or MRI has not clearly demonstrated recurrence or progression

**Note:** An isolated finding of a new skin lesion is not sufficient evidence of systemic recurrence.

# Common Diagnostic Indications

## Mucosal Melanoma

- Initial treatment strategy
  - Detection of metastatic disease
- Radiation planning
  - Prior to initiation of radiation therapy
- Subsequent treatment strategy
  - Evaluation of disease following clinical response to treatment, no sooner than 12 weeks after completion of therapy
  - Evaluation of signs or symptoms of metastatic disease when CT or MRI has not clearly demonstrated recurrence or progression

**Note:** An isolated finding of a new mucosal lesion is not sufficient evidence of systemic recurrence.

## Non-melanoma skin (includes basal cell, squamous cell, and Merkel cell)

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

## Kaposi's sarcoma

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

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## Thorax, other than lung cancer, including pleural malignancies, cancers of the thymus, heart, and mediastinum

- Initial treatment strategy
  - For initial staging of diagnosed or suspected cancer
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

# Common Diagnostic Indications

## Thyroid

- Initial treatment strategy
  - Poorly differentiated papillary
  - Anaplastic
  - Medullary
  - Hurthle Cell
- Subsequent treatment strategy
  - Poorly differentiated papillary
  - Anaplastic
  - Medullary
  - Hurthle Cell
  - Well-differentiated papillary or follicular thyroid cancer
    - For evaluation of suspected recurrence when **both of the following** are met:
      - With negative I131 scan, or a history of a negative I131 scan
      - Stimulated thyroglobulin level greater than two (2) ng/dL in the absence of antibodies.
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms, or other imaging findings.

**Note:** PET is most useful for non-iodine avid thyroid cancer. Furthermore, alternative imaging modalities should be considered in those tumor types for which falsely negative PET or PET/CT results are commonly reported, including medullary thyroid carcinoma. PET should be used with caution unless disease is known to be FDG-avid.

## Urogenital organs, other, including uterus, placenta, other female genitalia, testis, penis, and other male genitalia—excludes ovarian (epithelial), bladder and kidney cancers

- Initial treatment strategy
- Subsequent treatment strategy
- Surveillance
  - After one post-treatment study (documenting no evidence of disease) in the setting of curative disease (considered subsequent treatment strategy), PET can only be used to evaluate suspicion of recurrence based on signs, symptoms or other imaging findings.

**Note:** Alternative imaging modalities should be considered in those tumor types for which falsely negative PET or PET/CT results are commonly reported, including many renal cell (kidney) carcinomas. PET should be used with caution.

## Screening: PET or PET/CT is considered not medically necessary as a screening test (i.e., for evaluation of patients without specific signs and symptoms of disease).

## PET for screening or diagnosis of breast cancer is not a covered benefit by the Centers for Medicare & Medicaid Services and multiple health plans.

## Other Considerations

**PET mammography is an evolving technology under clinical development. This technology and its impact on health outcomes will continue to undergo review as new evidence-based studies are published. Interval routine coverage for PET mammography is not generally available and is not considered medically appropriate at this time.**

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**PET bone scanning is currently only a covered benefit by the Centers for Medicare & Medicaid Services with CED. PET bone scanning is an evolving technology under clinical development. This technology and its impact on health outcomes will continue to undergo review as new evidence-based studies are published.**

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**PET bone scan is considered not medically necessary.**

## PET Imaging of Infectious Processes

**For diagnosis of chronic osteomyelitis involving the axial skeleton**

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# Quantitative CT (QCT) Bone Mineral Densitometry



## CPT Codes

77078..... Computed tomography, bone mineral density study, 1 or more sites; axial skeleton (e.g., hips, pelvis, spine)

## Standard Anatomic Coverage

- For central QCT, spine and hip measurements are obtained

## Imaging Considerations

- Bone mineral densitometry may be performed on the central axial skeleton (i.e., spine, femoral head, proximal femur)
- Central dual x-ray absorptiometry (DXA), also referred to as dual-energy x-ray absorptiometry (DEXA), is the most commonly used test to evaluate bone mineral density and is considered the technology of choice, when available.
- QCT has a high sensitivity for detection of bone loss. However, when compared with DXA, QCT is often less readily available, more expensive and incurs higher radiation exposure.
- QCT may not be covered as a screening exam in patients at low risk for osteoporosis.

# Common Diagnostic Indications

## Initial examination – when any one of the following criteria are met

- Menopausal or post-menopausal women – as an initial examination to screen for osteoporosis
- Men of 70 years age or older, regardless of risk factors
- Anyone presenting with a fragility or pathologic fracture
- Anyone with a disease or condition associated with development of osteoporosis, including any of the following abnormalities:
  - Anorexia nervosa
  - Chronic liver disease
  - Chronic renal failure
  - Cushing's syndrome
  - Delayed menarche or untreated premature menopause
  - Heavy alcohol consumption
  - Hypercalciuria
  - Hypogonadism
  - Inflammatory bowel disease
  - Low trauma fractures or vertebral fractures
  - Malabsorption syndromes
  - Primary hyperparathyroidism
  - Prolonged immobilization
  - Radiographic evidence of osteopenia
  - Rheumatoid arthritis
  - Thyroid disease
- Anyone on a medication associated with development of osteoporosis, including but not limited to the following medications:
  - Glucocorticoids (e.g., prednisone, prednisolone, decadron, dexamethasone) – treatment for longer than 3 months
  - Phenytoin (Dilantin) – treatment for longer than 3 months
  - Heparin – treatment for longer than 1 month
  - Depo-Provera injectable contraceptive – long-standing use (longer than 2 years)
  - Lithium treatment
  - Lupron therapy
  - Cytotoxic agents which affect bone density (e.g., adjuvant chemotherapy in many premenopausal females with breast cancer)
  - Proton pump inhibitors (PPI) and histamine-2 (H2) receptor blockers for gastroesophageal reflux disease in patients over 50 years of age, under treatment for longer than 3 months
- Anyone who is considering therapy for osteoporosis, if bone mineral densitometry would facilitate the decision

## Repeat examination – when any one of the following criteria are met:

- Anyone under treatment for osteoporosis, to monitor the response to therapy for bone loss – at intervals of every 2 to 3 years
- Untreated individuals who met the criteria for initial evaluation, without significant osteopenia on prior bone densitometry and without interval increased risk for accelerated bone loss – at intervals of every 3 to 5 years

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# Magnetic Resonance Imaging (MRI) Bone Marrow Blood Supply



## CPT Codes

77084..... MRI of bone marrow blood supply

## Standard Anatomic Coverage

- MRI of the bone marrow blood supply is used to image multiple anatomic areas in the axial and appendicular skeleton

## Imaging Considerations<sup>1</sup>

- In addition to MRI, several other imaging procedures are available to assess the bone marrow, including skeletal radiographic survey and nuclear scintigraphy.
- To undertake extensive coverage of the skeleton with MRI of the bone marrow blood supply, phased array MR coils are often used.
- Performed most often to study a specific lesion(s), based on the results of other imaging or laboratory studies, or to evaluate focal pain or neurologic symptoms.
- On some occasions used to survey the whole body for marrow replacement or infiltration by neoplastic cells [5–12]. In these instances, the entire body is imaged from the vertex to the heels, usually in a single plane (coronal or sagittal) acquired with overlapping stations.

## Common Diagnostic Indications

### Myeloma<sup>2,3</sup>

- Diagnosis when all of the following are met:
  - No lytic bone lesions seen on whole body radiography
    - Note: for further characterization of an equivocal bone lesion seen on whole body radiography. A dedicated MRI of the region (i.e. cervical, thoracic, lumbar spine, pelvis or extremity) should be obtained
  - To establish the diagnosis of myeloma at least one of the following is required:
    - Biopsy proven plasmacytoma
    - Clonal bone marrow plasma cells greater than 10%
    - M-protein greater than or equal to 3 g/dL and/or 10 to 60 percent bone marrow plasma cells

**Note:** The evidence for use of MRI in myeloma is insufficient for the evaluation of the following: Response to therapy, prognosis, and monoclonal gammopathy of uncertain significance (MGUS). For myeloma with back pain, see tumor evaluation (cervical, thoracic, lumbar spine).

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# MRI Bone Marrow Blood Supply Bibliography



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# Magnetic Resonance Spectroscopy (MRS)



## CPT Codes

76390..... Magnetic Resonance Spectroscopy (MRS)

## Standard Anatomic Coverage

- Application of MRS has been described in multiple anatomic areas to further evaluate the biochemical properties of specific tissues.

## Background

- MR Spectroscopy is not currently a covered benefit by the Centers for Medicare and Medicaid Services, through a National Coverage Determination.
- MR spectroscopy provides a biochemical profile of different metabolic constituents in tissues. When MRS is performed, metabolites which may be measured include Choline (Cho), N-Acetyl Aspartate (NAA), Creatine (Cr), lactate and lipid.
- Certain ratios of metabolites have been described as suggestive of high grade malignancy. An example is a Choline/Creatine ratio greater than the 2:1, compared with the normal ratio from spectroscopic data of approximately 1.
- When performed, MRS usually accompanies an MRI exam.
- Potential uses of MRS that have been described include neuroimaging of brain tissue (for brain tumor differentiation from non-tumor conditions such as necrosis and abscess; cerebrovascular accident; dementia; epilepsy; Parkinson's disease; mitochondrial disorders), breast lesion assessment and evaluation of lower extremity ischemia.

## Magnetic Resonance Spectroscopy

- MR Spectroscopy is an evolving technology under clinical development. This technology and its impact on health outcomes will continue to undergo review, as new evidence-based studies are published. At this point, medically necessary applications are limited (see below). Interval routine coverage for MR spectroscopy is not generally available and is not considered medically appropriate at this time.

## Diagnostic Indications

**Differentiate recurrent or residual brain tumor from post-therapy changes, (e.g., delayed radiation necrosis)**

**Differentiate brain tumor from other non-tumor diagnoses, (e.g., abscesses or other infectious or inflammatory processes)**

## References

1. Centers for Medicare & Medicaid Services. *National Coverage Determination (NCD) for Magnetic Resonance Spectroscopy (220.2.1)*. Available at <http://www.cms.gov/medicare-coverage-database/>. Accessibility verified August 8, 2016.