

# Clinical Appropriateness Guidelines: Advanced Imaging

Appropriate Use Criteria: Pediatric Extremities

Effective Date: November 20, 2017

Proprietary

Date of Origin: 10/29/2014

Last revised: 08/27/2015

Last reviewed: 07/26/2016



8600 W Bryn Mawr Avenue

South Tower - Suite 800

Chicago, IL 60631

P. 773.864.4600

[www.aimspecialtyhealth.com](http://www.aimspecialtyhealth.com)

<b>Description and Application of the Guidelines</b> .....	<b>3</b>
<b>Administrative Guidelines</b> .....	<b>4</b>
Ordering of Multiple Studies .....	4
Pre-test Requirements .....	5
<b>Extremity Imaging</b> .....	<b>6</b>
CT Upper Extremity – Pediatrics .....	6
MRI Upper Extremity (Any Joint) – Pediatrics .....	9
MRI Upper Extremity (Non-Joint) – Pediatrics .....	13
CTA and MRA Upper Extremity – Pediatrics .....	16
CT Lower Extremity – Pediatrics .....	18
MRI Lower Extremity (Joint & Non-Joint) – Pediatrics .....	21
CTA and MRA Lower Extremity – Pediatrics .....	28

# 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.

---

CPT® (Current Procedural Terminology) is a registered trademark of the American Medical Association (AMA). CPT® five digit codes, nomenclature and other data are copyright by the American Medical Association. All Rights Reserved. AMA does not directly or indirectly practice medicine or dispense medical services. AMA assumes no liability for the data contained herein or not contained herein.

# 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 medical 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) Upper Extremity – Pediatrics



## 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

## Technology Considerations

- Non-diagnostic radiographs should be obtained before advanced imaging
- CT is generally 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

### Abnormality detected on other imaging study which requires additional clarification to direct treatment

#### Congenital anomaly

- Following non-diagnostic radiograph when further characterization is necessary

#### Contraindication to MRI

- Patient meets criteria for MRI exam (any one of the following)
  - Patient has a contraindication to MRI (examples include metallic foreign bodies, permanent pacemaker, implantable cardioverter-defibrillators, and intracranial aneurysm surgical clips that are not compatible with MR imaging)
  - Patient is claustrophobic and unable to tolerate MRI

#### CT accompanying an arthrogram (CT arthrography)

# Common Diagnostic Indications

## Fracture evaluation

- Following non-diagnostic radiograph (**any one of the following**)
  - Assessment of fracture healing for delayed union or non-union
  - Occult/stress fracture
  - Pre-operative evaluation (**any one of the following**)
    - Define the extent of an acute fracture
    - Intra-articular fracture
    - Physeal bar
    - Salter-Harris fracture

---

## 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

(**any one of the following**)

- Abscess, to determine location and extent for surgical treatment
- Fasciitis
- Osteomyelitis, following non-diagnostic radiographs and when MRI is contraindicated
- Underlying soft tissue infection is clinically suspected and patient is unresponsive to treatment (such as antibiotics or incision/drainage)

---

## Instability. anterior glenohumeral

- For preoperative evaluation when radiograph is insufficient for planning (**any one of the following**)
  - First time dislocation for a young patient at high risk for recurrence<sup>1,2</sup>
  - Recurrent anterior shoulder dislocation

---

## Intraarticular loose body

**Note:** Includes synovial osteochondromatosis

---

## Juvenile Idiopathic Arthritis (JIA)<sup>3</sup>

- For management of established JIA when radiograph is insufficient to determine appropriate course of therapy, particularly intra-articular therapy

---

## Osteochondroma (exostosis)

(**any one of the following**)

- Patient is symptomatic
- Periodic surveillance for malignant degeneration (especially when hereditary)

**Note:** Includes hereditary multiple exostosis

---

## Osteonecrosis (avascular necrosis [AVN], aseptic necrosis)

- Following non-diagnostic radiograph

**Note:** MRI is generally 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

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

---

## Pre-operative or pre-procedure evaluation

**Note:** For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

# Common Diagnostic Indications

## Septic arthritis

- When MRI is contraindicated (**any one of the following**)
  - Diagnosis
  - Evaluate for associated osteomyelitis or cartilage involvement
  - Pre-operative evaluation

**Note:** *Septic arthritis is considered a medical emergency and typically not managed with elective outpatient imaging*

---

## Shoulder pain, acute or chronic

- Following non-diagnostic radiograph (**any one of the following**)
  - When there is suspected bursitis or long head of biceps tenosynovitis and the patient is a candidate for corticosteroid or anesthetic injection
  - When the patient fails to show substantial improvement following a six (6) week trial of conservative therapy

**Note:** *Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications*

---

## Soft tissue mass

---

### Trauma

- Following non-diagnostic radiograph

**Note:** *Includes non-accidental injury (NAI)*

---

### Tumor, malignant

- Evaluation of biopsy-proven malignancy

**Note:** *Examples of biopsy-proven malignancies include osteosarcoma, Ewing's sarcoma, chondrosarcoma, lymphoma, fibrosarcoma, liposarcoma, synovial sarcoma, and metastatic disease*

---

# References

1. Bencardino JT, Gyftopoulos S, Palmer WE. Imaging in anterior glenohumeral instability. *Radiology*. 2013;269(2):323-337.
2. Piasecki DP, Verma NN, Romeo AA, Levine WN, Bach BR Jr, Provencher MT. Glenoid bone deficiency in recurrent anterior shoulder instability: diagnosis and management. *J Am Acad Orthop Surg*. 2009;17(8):482-493.
3. Magni-Manzoni S, Malattia C, Lanni S, Ravelli A. Advances and challenges in imaging in juvenile idiopathic arthritis. *Nat Rev Rheumatol*. 2012. 27;8(6):329-336.



# Magnetic Resonance Imaging (MRI) Upper Extremity (Any Joint) – Pediatrics



## 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

## Technology Considerations

- Non-diagnostic 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 generally 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 generally recommended 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 generally 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

**Abnormality detected on other imaging study which requires additional clarification to direct treatment**

#### Congenital anomaly

- Following non-diagnostic radiograph

#### Fracture evaluation

- Following non-diagnostic radiograph (**any one of the following**)
  - Assessment of fracture healing for delayed union or non-union
  - Occult/stress fracture
  - Pre-operative evaluation (**any one of the following**)
    - Define the extent of an acute fracture
    - Intra-articular fracture
    - Physeal bar
    - Salter-Harris fracture

# 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

(any **one** of the following)

- Abscess, to determine location and extent for surgical treatment
- Fasciitis
- Osteomyelitis, following non-diagnostic radiographs
- Underlying soft tissue infection is clinically suspected and patient is unresponsive to treatment (such as antibiotics or incision/drainage)

---

## Intraarticular loose body

- Following non-diagnostic radiographs

**Note:** Includes synovial osteochondromatosis

---

## Juvenile Idiopathic Arthritis (JIA)<sup>1</sup>

- For management of established JIA when radiograph is insufficient to determine appropriate course of therapy, particularly intra-articular therapy

---

## Ligament or tendon injury

- Following a focused history and physical exam, the patient fails to show substantial improvement following a trial of conservative therapy

**Note:** Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

---

## MRI accompanying an arthrogram (MR arthrography)

---

### Osteochondral lesion

---

#### Osteochondroma (exostosis)

(any **one** of the following)

- Patient is symptomatic
- Periodic surveillance for malignant degeneration (especially when hereditary)

**Note:** Includes hereditary multiple exostosis

---

#### Osteonecrosis (avascular necrosis [AVN], aseptic necrosis)

- Following non-diagnostic radiograph

**Note:** MRI is generally 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)

---

### Pigmented villonodular synovitis (PVNS)

---

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

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

---

#### Pre-operative or pre-procedure evaluation

**Note:** For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

---

### Septic arthritis

# Common Diagnostic Indications

(any **one** of the following)

- Diagnosis
- Evaluate for associated osteomyelitis or cartilage involvement
- Pre-surgical planning

**Note:** Septic arthritis is considered a medical emergency and typically not managed with elective outpatient imaging

## Soft tissue mass

### Trauma

- Following non-diagnostic radiograph

**Note:** Includes non-accidental injury (NAI)

### Tumor, malignant

- Evaluation of biopsy-proven malignancy

**Note:** Examples of biopsy-proven malignancies include osteosarcoma, Ewing's sarcoma, chondrosarcoma, lymphoma, fibrosarcoma, liposarcoma, synovial sarcoma, and metastatic disease

## Shoulder Joint

### Instability/labral tear, anterior glenohumeral

- Diagnosis of anterior glenohumeral instability/anterior labral tear when (any **one** of the following)
  - Recurrent anterior shoulder dislocation<sup>2</sup>
  - First time dislocation for a young patient that has a high risk for recurrent dislocation<sup>3</sup>

### Shoulder pain, acute or chronic

- Following non-diagnostic radiograph (any **one** of the following)
  - When there is suspected bursitis or long head of biceps tenosynovitis and the patient is a candidate for corticosteroid or anesthetic injection
  - When the patient fails to show substantial improvement following a six (6) week trial of conservative therapy

**Note:** Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

### Superior Labrum Anterior Posterior (SLAP) tear (including labral tears)

(any **one** of the following)

- Diagnosis when there are clinical findings of a SLAP tear (as shown in **Table 1**) (any **one** of the following)
  - High-risk patient (as defined in **Table 2**)
  - Symptoms do not improve or worsen after 4 weeks of conservative therapy
- Pre-operative evaluation and (any **one** of the following)
  - Labral tear established by a modality other than MRI
  - More than 1 year between MRI and surgical evaluation
- Post-operative at least three (3) months post-surgery when there is no clinical improvement

**Note:** Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

Table 1. Clinical findings of a SLAP tear <sup>4-6</sup>	Table 2. Patients at High Risk for a SLAP tear
<p>(any <b>one</b> of the following)</p> <ul style="list-style-type: none"> <li>• Pain exacerbated by overhead activity or heavy lifting</li> <li>• Popping or locking of the shoulder</li> <li>• Signs of shoulder instability                             <ul style="list-style-type: none"> <li>○ Compression-Rotation test</li> <li>○ O'Brien's test</li> <li>○ Speed's biceps tendon test</li> <li>○ Yergason's test)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Acute trauma and evidence of suprascapular nerve entrapment (any <b>one</b> of the following)                             <ul style="list-style-type: none"> <li>○ Posterolateral shoulder pain</li> <li>○ Supraspinatus and/or infraspinatus atrophy</li> <li>○ Supraspinatus and/or infraspinatus weakness</li> </ul> </li> </ul>

## Common Diagnostic Indications

### Suspected occult shoulder fracture

- Following non-diagnostic radiograph when there is a high clinical suspicion

## Elbow

### Biceps tendon rupture

- At insertion onto radial tuberosity

### Capitellar osteochondritis

### Epicondylitis

- Following a focused history, physical exam, and non-diagnostic radiograph when patient fails to show substantial improvement following a trial of conservative therapy

**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. Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications*

### Suspected occult elbow fracture

- Following non-diagnostic radiograph when there is a high clinical suspicion

### Triceps tendon rupture

- From olecranon insertion site

### Ulnar collateral ligament tear

## Wrist and Hand

### Scaphoid fracture

### Scapholunate instability

### Triangular fibrocartilage complex (TFCC) tear

### Ulnar collateral ligament tear (gamekeeper's thumb)

## References

1. Magni-Manzoni S, Malattia C, Lanni S, Ravelli A. Advances and challenges in imaging in juvenile idiopathic arthritis. *Nat Rev Rheumatol*. 2012. 27;8(6):329-336.
2. Bencardino JT, Gyftopoulos S, Palmer WE. Imaging in anterior glenohumeral instability. *Radiology*. 2013;269(2):323-337.
3. Li X, Ma R, Nielsen NM, Gulotta LV, Dines JS, Owens BD. Management of shoulder instability in the skeletally immature patient. *J Am Acad Orthop Surg*. 2013;21(9):529-537.
4. Hanchard NC, Lenza M, Handoll HH, Takwoingi Y. Physical tests for shoulder impingements and local lesions of bursa, tendon or labrum that may accompany impingement. *Cochrane Database Syst Rev*. 2013;4:CD007427.
5. Keener JD, Brophy RH. Superior labral tears of the shoulder: pathogenesis, evaluation, and treatment. *J Am Acad Orthop Surg*. 2009;17(10):627-637.
6. Nam EK, Snyder SJ. The diagnosis and treatment of superior labrum, anterior and posterior (SLAP) lesions. *Am J Sports Med*. 2003;31(5):798-810.

# Magnetic Resonance Imaging (MRI) Upper Extremity (Non-Joint) – Pediatrics



## 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

## Technology Considerations

- Non-diagnostic radiographs should be obtained before advanced imaging
- CT is generally 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 generally 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

**Abnormality detected on other imaging study which requires additional clarification to direct treatment**

---

**Brachial plexopathy**

---

**Brachial plexus mass**

---

**Congenital anomaly**

- Following non-diagnostic radiograph

---

**Entrapment neuropathy**

**(All of the following)**

- Diagnosis confirmed by electromyogram (EMG)
- Following a trial of conservative therapy
- Results will be used to direct treatment

**Note:** Suspected entrapment neuropathy, cubital tunnel detail, and/or carpal tunnel are not considered medically necessary. Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

# Common Diagnostic Indications

## Fracture evaluation

- Following non-diagnostic radiograph (**any one of the following**)
  - Assessment of fracture healing for delayed union or non-union
  - Occult/stress fracture
  - Pre-operative evaluation (**any one of the following**)
    - Define the extent of an acute fracture
    - Intra-articular fracture
    - Physeal bar
    - Salter-Harris fracture

---

## Infectious process

(**any one of the following**)

- Abscess, to determine location and extent for surgical treatment
- Fasciitis
- Osteomyelitis, following non-diagnostic radiographs
- Underlying soft tissue infection is clinically suspected and patient is unresponsive to treatment (such as antibiotics or incision/drainage)

---

## Myositis

(**any one of the following**)

- Determine optimal location for biopsy
- Monitor treatment response

---

## Osteochondroma (exostosis)

(**any one of the following**)

- Patient is symptomatic
- Periodic surveillance for malignant degeneration (especially when hereditary)

**Note:** Includes hereditary multiple exostosis

---

## Persistent upper extremity pain

(**All of the following**)

- Focused history and physical exam suggest non-specific upper extremity pain
- Following non-diagnostic radiographs
- Patient fails to show substantial improvement following a six (6) week trial of conservative therapy

**Note:** For suspicion of specific etiology, please refer to corresponding indication. Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

---

## Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

---

## Pre-operative or pre-procedure evaluation

**Note:** For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

---

## Septic arthritis

(**any one of the following**)

- Diagnosis
- Evaluate for associated osteomyelitis or cartilage involvement
- Pre-surgical planning

**Note:** Septic arthritis is considered a medical emergency and typically not managed with elective outpatient imaging

# Common Diagnostic Indications

## Soft tissue mass

---

### Trauma

- Following non-diagnostic radiograph

**Note:** *Includes non-accidental injury (NAI)*

---

### Tumor, malignant

- Evaluation of biopsy-proven malignancy

**Note:** *Examples of biopsy-proven malignancies include osteosarcoma, Ewing's sarcoma, chondrosarcoma, lymphoma, fibrosarcoma, liposarcoma, synovial sarcoma, and metastatic disease*

---

## Ulnar collateral ligament tear (gamekeeper's thumb)

## 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 (Note: upper extremity MRA is not currently a covered benefit by the Centers for Medicare and Medicaid Services, through a National Coverage Determination)

*Angiography includes imaging of all blood vessels, including arteries and veins. The codes above include CT and MR Venography respectively.*

## Standard Anatomic Coverage

- Depends on the specific anatomic area of interest, from the axillary region through the hand and digits

## Technology 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

---

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

---

### Dialysis graft evaluation

- Following duplex Doppler assessment
- 

### Dissection

---

### Intramural hematoma

---

### Post-operative or post-procedure evaluation

*Note: For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline*

---

### Pre-operative or pre-procedure evaluation

*Note: For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline*

---

### Thromboembolic disease, arterial or venous



## Common Diagnostic Indications

Vascular invasion or compression by a musculoskeletal neoplasm

---

Vasculitis

## 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

## Technology Considerations

- Non-diagnostic radiographs should be obtained before advanced imaging
- CT is generally 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

### Abnormality detected on other imaging study which requires additional clarification to direct treatment

#### Congenital anomaly of the lower extremity

- Diagnosis and management (primarily pre-operative evaluation) following non-diagnostic radiographs for (**any one of the following**)
  - Acetabular dysplasia
  - Congenital short femur (**any one of the following**)
    - Achondroplasia
    - Mucopolysaccharidosis
    - Neurofibromatosis
    - Skeletal dysplasias
    - Spondyloepiphyseal dysplasia
  - Proximal focal femoral deficiency (PFFD)

**Note:** For evaluation of congenital anomalies not specifically referenced elsewhere in this guideline

#### Contraindication to MRI

- Patient meets criteria for MRI exam (**any one of the following**)
  - Patient has a contraindication to MRI (examples include metallic foreign bodies, permanent pacemaker, implantable cardioverter-defibrillators, and intracranial aneurysm surgical clips that are not compatible with MR imaging)
  - Patient is claustrophobic and unable to tolerate MRI

#### CT accompanying an arthrogram (CT arthrography)

# Common Diagnostic Indications

## Fracture evaluation

- Following non-diagnostic radiograph (**any one of the following**)
  - Assessment of fracture healing for delayed union or non-union
  - Occult/stress fracture
  - Pre-operative evaluation (**any one of the following**)
    - Define the extent of an acute fracture
    - Intra-articular fracture
    - Physeal bar
    - Salter-Harris fracture

---

## 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

(**any one of the following**)

- Abscess, to determine location and extent for surgical treatment
- Fasciitis
- Osteomyelitis, following non-diagnostic radiographs and when MRI is contraindicated
- Underlying soft tissue infection is clinically suspected and patient is unresponsive to treatment (such as antibiotics or incision/drainage)

---

## Juvenile Idiopathic Arthritis (JIA)

- For management of established JIA when radiograph is insufficient to determine appropriate course of therapy, particularly intra-articular therapy

---

## Osteochondroma (exostosis)

(**any one of the following**)

- Patient is symptomatic
- Periodic surveillance for malignant degeneration (especially when hereditary)

**Note:** *Includes hereditary multiple exostosis*

---

## Osteoid osteoma

(**any one of the following**)

- Following suggestive radiographs for further characterization of the nidus
- Following non-diagnostic radiographs with high clinical suspicion

---

## Osteonecrosis (avascular necrosis [AVN], aseptic necrosis)

- Following non-diagnostic radiograph

**Note:** *MRI is generally the preferred imaging modality, particularly for evaluation in the early stages of osteonecrosis.*

---

## Persistent lower extremity pain (excluding knee joint)

(**All of the following**)

- Focused history and physical exam suggest non-specific lower extremity pain
- Following non-diagnostic radiographs
- Patient fails to show substantial improvement following a trial of conservative therapy

**Note:** *For suspicion of specific etiology, please refer to corresponding indication. Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications*

# Common Diagnostic Indications

## Post-traumatic complications

(any **one** of the following)

- Chondrolysis
- Intra-articular bodies
- Premature growth plate closure

## Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

## Pre-operative or pre-procedure evaluation

**Note:** For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

## Septic arthritis

- When MRI is contraindicated (any **one** of the following)
  - Diagnosis
  - Evaluate for associated osteomyelitis or cartilage involvement<sup>4,5</sup>
  - Pre-operative evaluation

**Note:** Septic arthritis is considered a medical emergency and typically not managed with elective outpatient imaging

## Soft tissue mass

### Trauma

- Following non-diagnostic radiograph

**Note:** Includes non-accidental injury (NAI)

### Tarsal coalition

- Following non-diagnostic radiograph

## Transient dislocation of the patella

### Tumor, malignant

- Evaluation of biopsy-proven malignancy

**Note:** Examples of biopsy-proven malignancies include osteosarcoma, Ewing's sarcoma, chondrosarcoma, lymphoma, fibromasarcoma, liposarcoma, synovial sarcoma, and metastatic disease

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

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

### Limb malalignment, preoperative

**Note:** Radiographs or CT scanogram are usually sufficient. CT scanogram (without cross-sectional imaging) is not part of AIM review

# Magnetic Resonance Imaging (MRI) Lower Extremity (Joint & Non-Joint) - Pediatrics



## 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

## Technology Considerations

- Non-diagnostic 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 generally 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 generally 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

#### Abnormality detected on other imaging study which requires additional clarification to direct treatment

#### Congenital anomaly of the lower extremity<sup>1</sup>

- Diagnosis and management (primarily pre-operative evaluation) following non-diagnostic radiographs for (**any one of the following**)
  - Acetabular dysplasia
  - Congenital short femur (**any one of the following**)
    - Achondroplasia
    - Mucopolysaccharidosis
    - Neurofibromatosis
    - Skeletal dysplasias
    - Spondyloepiphyseal dysplasia
  - Proximal focal femoral deficiency (PFFD)

**Note:** For evaluation of congenital anomalies not specifically referenced elsewhere in this guideline

# Common Diagnostic Indications

## Fracture evaluation

- Following non-diagnostic radiograph (**any one of the following**)
  - Assessment of fracture healing for delayed union or non-union
  - Occult/stress fracture
  - Pre-operative evaluation (**any one of the following**)
    - Define the extent of an acute fracture
    - Intra-articular fracture
    - Physeal bar
    - Salter-Harris fracture

---

## 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

(**any one of the following**)

- Abscess, to determine location and extent for surgical treatment
- Fasciitis
- Osteomyelitis, following non-diagnostic radiographs
- Underlying soft tissue infection is clinically suspected and patient is unresponsive to treatment (such as antibiotics or incision/drainage)

---

## Intraarticular loose body

- Following non-diagnostic radiographs

**Note:** Includes synovial osteochondromatosis

---

## Juvenile Idiopathic Arthritis (JIA)<sup>2</sup>

- For management of established JIA when radiograph is insufficient to determine appropriate course of therapy, particularly intra-articular therapy

---

## MRI accompanying an arthrogram (MR arthrography)

---

## Myositis

(**any one of the following**)

- Determine optimal location for biopsy
- Monitor treatment response

**Note:** Includes dermatomyositis<sup>3</sup>

---

## Osteochondral lesion<sup>4</sup>

---

## Osteochondroma (exostosis)

(**any one of the following**)

- Patient is symptomatic
- Periodic surveillance for malignant degeneration (especially when hereditary)

**Note:** Includes hereditary multiple exostosis

---

## Osteoid osteoma

(**any one of the following**)

- Following suggestive radiographs for further characterization of the nidus
- Following non-diagnostic radiographs with high clinical suspicion

# Common Diagnostic Indications

## Osteonecrosis (avascular necrosis [AVN], aseptic necrosis)

- Following non-diagnostic radiograph

**Note:** MRI is generally the preferred imaging modality, particularly for evaluation in the early stages of osteonecrosis.

## Persistent lower extremity pain (excluding knee and hip joint)

(All of the following)

- Focused history and physical exam suggest non-specific lower extremity pain
- Following non-diagnostic radiographs
- Patient fails to show substantial improvement following a trial of conservative therapy

**Note:** For suspicion of specific etiology, please refer to corresponding indication. Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

## Pigmented villonodular synovitis (PVNS)

### Post-traumatic complications<sup>3</sup>

(any one of the following)

- Chondrolysis
- Intra-articular bodies
- Premature growth plate closure

## Post-operative or post-procedure evaluation

**Note:** For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline

## Pre-operative or pre-procedure evaluation

**Note:** For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline

## Septic arthritis

(any one of the following)

- Diagnosis
- Evaluate for associated osteomyelitis or cartilage involvement<sup>5,6</sup>
- Pre-surgical planning

**Note:** Septic arthritis is considered a medical emergency and typically not managed with elective outpatient imaging

## Soft tissue mass

### Trauma

- Following non-diagnostic radiograph

**Note:** Includes non-accidental injury (NAI)

### Tumor, malignant

- Evaluation of biopsy-proven malignancy

**Note:** Examples of biopsy-proven malignancies include osteosarcoma, Ewing's sarcoma, chondrosarcoma, lymphoma, fibromasarcoma, liposarcoma, synovial sarcoma, and metastatic disease

## Hip Joint

### Coxa vara<sup>1</sup>

(any one of the following)

- Diagnosis following non-diagnostic radiograph
- Hip pain
- Pre-operative evaluation

# Common Diagnostic Indications

## Developmental hip dysplasia<sup>1</sup>

(any **one** of the following)

- Diagnosis following non-diagnostic radiograph
- Pre-operative evaluation (**any one** of the following)
  - Complex dislocations (i.e., teratologic)
  - Failure to respond to bracing
  - Late diagnosis
- Post-operative evaluation (**any one** of the following)
  - Adequacy of surgical reduction
  - Complications including growth disturbance or avascular necrosis

---

## Labral tear of the hip

---

## Legg-Calvé-Perthes disease

- Requires initial radiographic evaluation

**Note:** *Eponym for osteonecrosis (avascular necrosis) of bony epiphysis in femoral heads, usually in 4-10 year old age range*

---

## Non-specific hip pain

- Following non-diagnostic radiograph (**any one** of the following)
  - Patient younger than age 5 years and has a limp<sup>6</sup> following non-diagnostic ultrasound
  - Patient age 5 years or older<sup>7</sup> and has failed to show substantial improvement following a trial of conservative therapy

**Note:** *When a specific etiology is suspected, please refer to corresponding indication such as Infectious process, Legg-Calvé-Perthes, Slipped capital femoral epiphysis (SCFE), and Trauma. Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications*

---

## Occult hip fracture

- Following non-diagnostic radiograph when there is a high clinical suspicion

---

## Slipped capital femoral epiphysis<sup>7</sup>

- Following non-diagnostic radiograph

**Note:** *Defined as an atraumatic fracture through the physeal plate. The affected population is typically overweight teenagers*

## Knee Joint

### Blount's disease

- Pre-operative evaluation when there is clinical concern for physeal bony bars and radiograph is insufficient for planning

**Note:** *Radiographs are usually sufficient*

---

### Discoid meniscus<sup>8-11</sup>

**Note:** *See indication for meniscal tear/injury*

---

### Hemarthrosis/Lipohemarthrosis



# Common Diagnostic Indications

## Ligament tear of the knee

(any **one** of the following)

- Focused history and physical exam suggests a ligament tear when
  - Patient fails to show substantial improvement following a four (4) week trial of conservative therapy
- Post-operative evaluation following a ligament or tendon repair when there are new symptoms
- Pre-operative evaluation, based on physical exam findings (**any one** of the following)
  - Positive anterior or posterior drawer test
  - Positive Lachman test
  - Positive medial or lateral stress test
  - Positive pivot shift test

**Note:** Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

---

## Meniscal tear/injury

(any **one** of the following)

- Focused history and physical exam suggests a meniscal tear when
  - Patient fails to show substantial improvement following a four (4) week trial of conservative therapy
- Pre-operative evaluation, based on physical exam findings (**any one** of the following)
  - Anterior cruciate ligament tear is present
  - Inability to bear weight
  - Inability to fully extend knee
  - Locking
  - Positive McMurray test with minimal knee flexion
  - Severe twisting injury after which activity could not be resumed
  - Swelling and symptoms develop immediately after an acute injury

**Note:** Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

---

## Osteochondritis dissecans<sup>4</sup>

---

## Patellar sleeve avulsion<sup>12</sup>

---

## Transient dislocation of the patella<sup>13,14</sup>

## Ankle and Foot

### Tendon injury of the ankle or foot, acute or chronic

- Patient fails to show substantial improvement following a trial of conservative therapy

**Note:** Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications

---

### Tendon rupture, acute

- For pre-operative evaluation (**any one** of the following)
  - Following non-diagnostic radiograph for bone avulsion
  - Following non-diagnostic ultrasound
  - Severe muscle weakness from the involved tendon

---

### Morton's neuroma

- When the diagnosis is not clear on physical examination or ultrasound

# Common Diagnostic Indications

## Neuropathic osteodystrophy (Charcot joint)

- Following non-diagnostic radiograph when additional diagnostic information needed to direct treatment

## Plantar fasciitis

- Pre-operative evaluation of a patient who fails to show substantial improvement following six (6) months of physician supervised conservative therapy

**Note:** *Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications*

## Tarsal coalition

- Following non-diagnostic radiograph

**Note:** *CT may be preferred for bony coalition*

## Tarsal tunnel

(any **one** of the following)

- Following EMG nerve conduction study when patient fails to show substantial improvement following four (4) weeks of physician supervised conservative therapy
- Neuropathy secondary to entrapment or compression of the posterior tibial nerve or its branches in the fibro-osseous tunnel, deep to the flexor retinaculum

**Note:** *Conservative therapy may include physician supervised physical therapy, a completed home physical therapy program, anti-inflammatory, antispasmodics, and/or other pain management medications*

## 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.

### Transient (toxic) synovitis<sup>6</sup>

**Note:** *Patient is 2 to 9 years of age. Transient synovitis is self-limiting. Ultrasound may help to confirm the presence of a joint effusion*

### Osgood-Schlatter<sup>12</sup>

**Note:** *Advanced imaging is not generally indicated. Clinical diagnosis sometimes suggested by radiography*

### Patellar tendinitis

**Note:** *Advanced imaging is not generally indicated. This is a clinical diagnosis*

### Sinding-Larsen-Johnassen<sup>12</sup>

**Note:** *Advanced imaging is not generally indicated. Clinical diagnosis sometimes suggested by radiography*

# References

1. Dillon JE, Connolly SA, Connolly LP, Kim YJ, Jaramillo D. MR imaging of congenital/developmental and acquired disorders of the pediatric hip and pelvis. *MagnReson Imaging Clin N Am*. 2005;13(4):783-797.
2. Magni-Manzoni S, Malattia C, Lanni S, Ravelli A. Advances and challenges in imaging in juvenile idiopathic arthritis. *Nat Rev Rheumatol*. 2012 27;8(6):329-336.
3. American College of Radiology.ACR–SPR Practice Parameter for the Performance and Interpretation of Pediatric Magnetic Resonance Imaging (MRI). Reston, VA: ACR; amended 2014.
4. American Academy of Orthopaedic Surgeons.Diagnosis and Treatment of OsteochondritisDissecans: Guideline and Evidence Report. Rosemont, IL: AAOS; December 4, 2010. <http://www.aaos.org/Research/guidelines/OCDGuideline.asp>. Accessed August 20, 2014.
5. Gill KG. Pediatric hip: pearls and pitfalls. *SeminMusculoskeletRadiol*. 2013;17(3):328-338.
6. Jain N, Sah M, Chakraverty J, Evans A, Kamath S. Radiological approach to a child with hip pain. *Clin Radiol*. 2013;68(11):1167-1178.

## References

7. Jarrett DY, Matheney T, Kleinman PK. Imaging SCFE: diagnosis, treatment and complications. *Pediatr Radiol*. 2013;43 Suppl 1:S71-S82.
8. Pai DR, Strouse PJ. MRI of the pediatric knee. *AJR Am J Roentgenol*. 2011;196(5):1019-1027.
9. Luhmann SJ, Schootman M, Gordon JE, Wright RW. Magnetic resonance imaging of the knee in children and adolescents. Its role in clinical decision-making. *J Bone Joint Surg Am*. 2005;87(3):497-502.
10. Kelly BT, Green DW. Discoid lateral meniscus in children. *Curr Opin Pediatr*. 2002;14(1):54-61.
11. Kramer DE, Micheli LJ. Meniscal tears and discoid meniscus in children: diagnosis and treatment. *J Am Acad Orthop Surg*. 2009;17(11):698-707.
12. Sanchez R, Strouse PJ. The knee: MR imaging of uniquely pediatric disorders. *Magn Reson Imaging Clin N Am*. 2009;17(3):521-537.
13. Thapa MM, Chaturvedi A, Iyer RS, et al. MRI of pediatric patients: Part 2, normal variants and abnormalities of the knee. *AJR Am J Roentgenol*. 2012;198(5):W456-W465.
14. Strouse PJ. MRI of the knee: key points in the pediatric population. *Pediatr Radiol*. 2010;40(4):447-452.

## 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

*Angiography includes imaging of all blood vessels, including arteries and veins. The codes above include CT and MR Venography respectively.*

## Standard Anatomic Coverage

- Depends on the area of interest and may extend from the iliofemoral regions through the feet

## Technology 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 limb ischemia

*Note: Examples include ischemic ulcers and gangrene in patients with diabetic vascular disease*

---

### Dissection

---

### Intramural hematoma

---

### Post-operative or post-procedure evaluation

*Note: For post-operative evaluation of conditions not specifically referenced elsewhere in this guideline*

---

### Pre-operative or pre-procedure evaluation

*Note: For pre-operative evaluation of conditions not specifically referenced elsewhere in this guideline*

---

### Thromboembolic disease, arterial or venous

---

### Vascular invasion or compression by a musculoskeletal neoplasm

---

## Common Diagnostic Indications

Vasculitis

Venous compression, due to surrounding mass effect

Venous thrombosis