

# Clinical Appropriateness Guidelines: Advanced Imaging

Appropriate Use Criteria: Pediatric Spine

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Proprietary

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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 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)

## Cervical Spine – Pediatrics



### 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 first thoracic (T1) vertebra
- Axial images are routinely obtained, with capability for coronal and sagittal reconstructions

### Technology 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
- Although cervical spine CT has high diagnostic utility for bony injuries, it is not ideal for ligamentous injuries that are more common in children than in adults.
- CT cervical spine is not appropriate for imaging of the soft tissues of the neck. See CPT codes 70490-70492 CT soft tissue neck for this service

### Common Diagnostic Indications

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

##### Basilar invagination

- Superior displacement of the odontoid

**Note:** *This diagnosis is often associated with skeletal dysplasia or metabolic bone disease*

##### Congenital spine anomaly

(any **one** of the following)

- Achondroplasia and other dwarfism
- Congenital kyphosis and scoliosis
- Klippel-Feil syndrome
- Mucopolysaccharidosis
- Neurofibromatosis
- Other vertebral segmentation and fusion defects (hemi, block and butterfly vertebrae)
- Sclerosing bone dysplasia
- Skeletal dysplasia
- Spondyloepiphyseal dysplasia
- Syndromes including Down, Turner, and Marfan
- VACTERL (Vertebral, Anorectal, Cardiac, Tracheo-Esophageal fistula, Renal and Limb anomaly) association

# Common Diagnostic Indications

## 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

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## Craniocervical instability

- Following non-diagnostic radiograph in a high risk patient (**any one of the following**)
  - Down syndrome
  - Grisel syndrome
  - Rheumatoid arthritis
  - Skeletal dysplasia
  - Trauma

**Note:** Includes atlantoaxial and occipital instability, and basilar invagination. Refers to superior displacement of the odontoid, often associated with skeletal dysplasia or metabolic bone disease

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## Fracture evaluation

- Following non-diagnostic radiograph

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## Infectious process

(**any one of the following**)

- Abscess
- Discitis
- Osteomyelitis

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## Neck pain with signs of compression

- Neck or radicular pain with neurologic findings related to the cervical spine (**any one of the following**)
  - Objective muscle weakness
  - Objective sensory abnormality in the cervical dermatome distribution
  - Reflex abnormality
  - Spasticity

**Note:** Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated <sup>4-7</sup>

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## Non-specific neck pain

- Following a non-diagnostic radiograph and 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

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## Post-myelogram CT or CT following other interventional procedure to the cervical spine

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## Post-operative or post-procedure evaluation

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

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## Pre-operative or pre-procedure evaluation

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

# Common Diagnostic Indications

## Scoliosis

- Diagnosis and management of scoliosis confirmed by radiography (**any one of the following**)
  - Patient is less than 10 years of age
  - Patient is age 10 years or older with an atypical finding<sup>1-3</sup> (**any one of the following**)
    - Neurological sign/symptom
    - Rapid curve progression (greater than 10 degrees per year)
    - Significant pain<sup>1</sup>
    - Unusual curvature (such as left thoracic kyphosis)
  - Surgical planning
  - Post-surgical evaluation

**Note:** Scoliosis defined by age of clinical presentation: congenital (at birth), infantile (<3 years), juvenile (3-10 years), and adolescent (10+ years). For pediatric patients who may require imaging of a significant portion of the spine or the entire spine, MRI should be considered to minimize radiation exposure

## Spondyloarthropathy

(**any one of the following**)

- Following non-diagnostic radiograph
- Following non-diagnostic standard laboratory work-up for spondyloarthropathy

**Note:** This includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis

## Trauma

(**any one of the following**)

- Acute trauma
- Following non-diagnostic radiograph when pain is persistent or progressively worsening
- Neurologic deficit with possible spinal cord injury

## Tumor, benign or malignant

(**any one of the following**)

- Primary or metastatic neoplasm involving the vertebrae
- Spinal cord neoplasm

**Note:** Includes both primary and secondary intramedullary, intradural/leptomeningeal and extramedullary neoplasms

# References

1. Wright N. Imaging in Scoliosis. *Arch Dis Child*. Jan 2000; 82(1): 38-40.
2. Evans SC, Edgar MA, Hall-Craggs MA, Powell MP, Taylor BA, Noordeen HH. MRI of 'idiopathic' juvenile scoliosis. A prospective study. *J Bone Joint Surg Br*. 1996 Mar;78(2):314-7.
3. Blickman JG, Parker BR, Barnes PD, eds. *Pediatric Radiology: the Requisites*. Philadelphia: Mosby Elsevier; 2009.
4. American Association of Neurological and Electrodiagnostic Medicine. *Choosing Wisely: Five Things Physicians and Patients Should Question*. ABIM Foundation; February 10, 2015. [www.choosingwisely.org](http://www.choosingwisely.org). Accessed September 10, 2014.
5. 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.
6. 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.
7. 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) Cervical Spine – Pediatrics



## 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 first thoracic (T1) vertebra
- Axial images are routinely obtained, with capability for coronal and sagittal reconstructions

## Technology 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

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

### Chiari malformation (Arnold-Chiari malformation)

#### Congenital spine anomaly

(any **one** of the following)

- Achondroplasia and other dwarfism
- Congenital kyphosis and scoliosis
- Klippel-Feil syndrome
- Mucopolysaccharidosis
- Neurofibromatosis
- Other vertebral segmentation and fusion defects (hemi, block and butterfly vertebrae)
- Sclerosing bone dysplasia
- Skeletal dysplasia
- Spondyloepiphyseal dysplasia
- Syndromes including Down, Turner, and Marfan
- VACTERL (Vertebral, Anorectal, Cardiac, Tracheo-Esophageal fistula, Renal and Limb anomaly) association

# Common Diagnostic Indications

## Craniocervical instability

- Following non-diagnostic radiograph in a high risk patient (**any one of the following**)
  - Down syndrome
  - Grisel syndrome
  - Rheumatoid arthritis
  - Skeletal dysplasia
  - Trauma

**Note:** Includes atlantoaxial and occipital instability, and basilar invagination. Refers to superior displacement of the odontoid, often associated with skeletal dysplasia or metabolic bone disease

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## Craniocervical junction abnormality

**Note:** Includes basilar invagination, platybasia, and os odontoidem

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## Fracture evaluation

- Following non-diagnostic radiograph

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## Infectious process

(**any one** of the following)

- Abscess
- Discitis
- Osteomyelitis

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

- For management of established JIA following non-diagnostic radiograph, to determine appropriate course of therapy, particularly intra-articular therapy

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## Multiple sclerosis or other white-matter disease

(**any one** of the following)

- Diagnosis
- Evaluation of changes in neurologic signs and symptoms
- For multiple sclerosis (**any one of the following**)
  - Assess asymptomatic disease progression
  - Evaluate response to treatment
  - Track disease progression to establish a prognosis

**Note:** Includes multiple sclerosis and acute disseminated encephalomyelitis (ADEM)

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## Myelopathy

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### Neck pain with signs of compression

- Neck or radicular pain with neurologic findings related to the cervical spine (**any one of the following**)
  - Objective muscle weakness
  - Objective sensory abnormality in the cervical dermatome distribution
  - Reflex abnormality
  - Spasticity

**Note:** Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated<sup>5-8</sup>

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### Non-specific neck pain

- Following non-diagnostic radiograph and 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

# Common Diagnostic Indications

## Post-operative or post-procedure evaluation

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

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## Pre-operative or pre-procedure evaluation

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

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## Scoliosis

- Diagnosis and management of scoliosis confirmed by radiography and (**any one of the following**)
  - Patient is less than 10 years of age
  - Patient is age 10 years or older with an atypical finding<sup>2-4</sup> (**any one of the following**)
    - Neurological sign/symptom
    - Rapid curve progression (greater than 10 degrees per year)
    - Significant pain<sup>2</sup>
    - Unusual curvature (such as left thoracic kyphosis)
  - Surgical planning
  - Post-surgical evaluation

**Note:** Scoliosis defined by age of clinical presentation: congenital (at birth), infantile (<3 years), juvenile (3-10 years), and adolescent (10+ years). For pediatric patients who may require imaging of a significant portion of the spine or the entire spine, MRI should be considered to minimize radiation exposure

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## Spinal cord infarct

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### Spondyloarthropathy

(**any one of the following**)

- Following non-diagnostic radiograph
- Following non-diagnostic standard laboratory work-up for spondyloarthropathy

**Note:** This includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis

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### Syringohydromyelia

(**any one of the following**)

- Diagnosis
- Periodic surveillance

**Note:** Includes syrinx, hydromelia, and hydrosyringomelia

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## Trauma

(**any one of the following**)

- Acute trauma
- Following non-diagnostic radiograph when pain is persistent or progressively worsening
- Neurologic deficit with possible spinal cord injury

**Note:** Includes spinal cord injury without radiographic abnormality (SCIWORA)

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## Tumor, benign or malignant

(**any one of the following**)

- Primary or metastatic neoplasm involving the vertebrae
- Spinal cord neoplasm

**Note:** Includes both primary and secondary intramedullary, intradural/leptomeningeal and extramedullary neoplasms

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## References

1. Magni-Manzoni S, Malattia C, Lanni S, Ravelli A. Advances and challenges in imaging in juvenile idiopathic arthritis. *Nat Rev Rheumatol*. 2012 Mar 27;8(6):329-336.
2. Wright N. Imaging in Scoliosis. *Arch Dis Child*. Jan 2000; 82(1): 38-40.
3. Evans SC, Edgar MA, Hall-Craggs MA, Powell MP, Taylor BA, Noordeen HH. MRI of 'idiopathic' juvenile scoliosis. A prospective study. *J Bone Joint Surg Br*. 1996 Mar;78(2):314-317.
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# Computed Tomography (CT)

## Thoracic Spine – Pediatrics



### 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

### Technology 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

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

##### Congenital spine anomaly

(any **one** of the following)

- Achondroplasia and other dwarfism
- Congenital kyphosis and scoliosis
- Klippel-Feil syndrome
- Mucopolysaccharidosis
- Neurofibromatosis
- Other vertebral segmentation and fusion defects (hemi, block and butterfly vertebrae)
- Sclerosing bone dysplasia
- Skeletal dysplasia
- Spondyloepiphyseal dysplasia
- Syndromes including Down, Turner, and Marfan
- VACTERL (Vertebral, Anorectal, Cardiac, Tracheo-Esophageal fistula, Renal and Limb anomaly) association

##### 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

# Common Diagnostic Indications

## Fracture evaluation

- Following non-diagnostic radiograph

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## Infectious process

(any **one** of the following)

- Abscess
- Discitis
- Osteomyelitis

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## Mid-back pain with signs of compression

- Mid-back or radicular pain with neurologic findings related to the thoracic spine (**any one of the following**)
  - Objective muscle weakness
  - Objective sensory abnormality in the thoracic dermatome distribution
  - Reflex abnormality
  - Spasticity

**Note:** *Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated*<sup>4-7</sup>

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## Non-specific mid-back pain

- Following non-diagnostic radiograph and 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*

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## Post-myelogram CT or CT following other interventional procedure to the thoracic spine

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## Post-operative or post-procedure evaluation

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

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## Pre-operative or pre-procedure evaluation

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

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## Scoliosis

- Diagnosis and management of scoliosis confirmed by radiography and (**any one of the following**)
  - Patient is less than 10 years of age
  - Patient is age 10 years or older with an atypical finding<sup>1-3</sup> (**any one** of the following)
    - Neurological sign/symptom
    - Rapid curve progression (greater than 10 degrees per year)
    - Significant pain<sup>1</sup>
    - Unusual curvature (such as left thoracic kyphosis)
  - Surgical planning
  - Post-surgical evaluation

**Note:** *Scoliosis defined by age of clinical presentation: congenital (at birth), infantile (<3 years), juvenile (3-10 years), and adolescent (10+ years). For pediatric patients who may require imaging of a significant portion of the spine or the entire spine, MRI should be considered to minimize radiation exposure*

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## Spondyloarthropathy

(any **one** of the following)

- Following non-diagnostic radiograph
- Following non-diagnostic standard laboratory work-up for spondyloarthropathy

**Note:** *This includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis*

# Common Diagnostic Indications

## Trauma

(any **one** of the following)

- Acute trauma
- Following non-diagnostic radiograph when pain is persistent or progressively worsening
- Neurologic deficit with possible spinal cord injury

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## Tumor, benign or malignant

(any **one** of the following)

- Primary or metastatic neoplasm involving the vertebrae
- Spinal cord neoplasm

**Note:** Includes both primary and secondary intramedullary, intradural/leptomeningeal, and extramedullary neoplasms

## References

1. Wright N. Imaging in scoliosis. *Arch Dis Child*. Jan 2000; 82(1): 38-40.
2. Evans SC, Edgar MA, Hall-Craggs MA, Powell MP, Taylor BA, Noordeen HH. MRI of 'idiopathic' juvenile scoliosis. A prospective study. *J Bone Joint Surg Br*. 1996 Mar;78(2):314-317.
3. Blickman JG, Parker BR, Barnes PD, eds. *Pediatric Radiology: the Requisites*. Philadelphia: Mosby Elsevier; 2009.
4. American Association of Neuromuscular and Electromyography Medicine. *Choosing Wisely: Five Things Physicians and Patients Should Question*. ABIM Foundation; February 10, 2015. [www.choosingwisely.org](http://www.choosingwisely.org). Accessed September 10, 2014.
5. 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.
6. 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.
7. 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 Electromyography and Clinical Neurophysiology, and the American Academy of Physical Medicine and Rehabilitation. *Neurology*. 2005;64(2):199-207

# Magnetic Resonance Imaging (MRI)

## Thoracic Spine – Pediatrics



### 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

### Technology 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

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

##### Congenital spine anomaly

(any **one** of the following)

- Achondroplasia and other dwarfism
- Congenital kyphosis and scoliosis
- Klippel-Feil syndrome
- Mucopolysaccharidosis
- Neurofibromatosis
- Other vertebral segmentation and fusion defects (hemi, block and butterfly vertebrae)
- Sclerosing bone dysplasia
- Skeletal dysplasia
- Spondyloepiphyseal dysplasia
- Syndromes including Down, Turner, and Marfan
- VACTERL (Vertebral, Anorectal, Cardiac, Tracheo-Esophageal fistula, Renal and Limb anomaly) association

##### Fracture evaluation

- Following non-diagnostic radiograph



# Common Diagnostic Indications

## Infectious process

(any **one** of the following)

- Abscess
- Discitis
- Osteomyelitis

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

- For management of established JIA following non-diagnostic radiograph, to determine appropriate course of therapy, particularly intra-articular therapy

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## Mid-back pain with signs of compression

- Mid-back or radicular pain with neurologic findings related to the thoracic spine (**any one of the following**)
  - Objective muscle weakness
  - Objective sensory abnormality in the cervical dermatome distribution
  - Reflex abnormality
  - Spasticity

**Note:** *Imaging in patients with polyneuropathy without additional abnormalities on neurological exam is not indicated<sup>5-8</sup>*

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## Multiple sclerosis or other white-matter disease

(any **one** of the following)

- Diagnosis
- Evaluation of changes in neurologic signs and symptoms
- For multiple sclerosis (**any one of the following**)
  - Assess asymptomatic disease progression
  - Evaluate response to treatment
  - Track disease progression to establish a prognosis

**Note:** *Includes multiple sclerosis and acute disseminated encephalomyelitis (ADEM)*

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## Myelopathy

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### Non-specific mid-back pain

- Following non-diagnostic radiograph and 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*

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## Post-operative or post-procedure evaluation

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

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## Pre-operative or pre-procedure evaluation

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

# Common Diagnostic Indications

## Scoliosis

- Diagnosis and management of scoliosis confirmed by radiography and (**any one of the following**)
  - Patient is less than 10 years of age
  - Patient is age 10 years or older with an atypical finding<sup>2-4</sup> (**any one of the following**)
    - Neurological sign/symptom
    - Rapid curve progression (greater than 10 degrees per year)
    - Significant pain<sup>2</sup>
    - Unusual curvature (such as left thoracic kyphosis)
  - Surgical planning
  - Post-surgical evaluation

**Note:** *Scoliosis defined by age of clinical presentation: congenital (at birth), infantile (<3 years), juvenile (3-10 years), and adolescent (10+ years). For pediatric patients who may require imaging of a significant portion of the spine or the entire spine, MRI should be considered to minimize radiation exposure*

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## Spinal cord infarct

### Spondyloarthropathy

(**any one of the following**)

- Following non-diagnostic radiograph
- Following non-diagnostic standard laboratory work-up for spondyloarthropathy

**Note:** *This includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis*

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### Syringohydromyelia

(**any one of the following**)

- Diagnosis
- Periodic surveillance

**Note:** *Includes syrinx, hydromelia, and hydrosyringomelia*

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### Spinal dysraphism

(**any one of the following**)

- Patients five (5) months of age or younger, following non-diagnostic ultrasound
- Patients older than five (5) months of age

**Note:** *Includes midline back mass when there is clinical concern for spinal dysraphism. This also includes closed spinal dysraphism (such as; lipomyelocele, lipomyelomeningocele, or dermal sinus) as well as open spinal dysraphism (such as meningocele, myelocele, or myelomeningocele)*

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### Tethered cord

(**any one of the following**)

- Diagnosis in patients five (5) months of age or younger, following a non-diagnostic ultrasound
- Diagnosis in patients older than five (5) months of age
- Pre-operative planning
- Post-operative evaluation when re-tethering is suspected

**Note:** *Defined as stretching of the low lying (below L2) cord due to attachment of the filum terminale*

# Common Diagnostic Indications

## Trauma

(any **one** of the following)

- Acute trauma
- Following non-diagnostic radiograph when pain is persistent or progressively worsening
- Neurologic deficit with possible spinal cord injury

**Note:** Includes spinal cord injury without radiographic abnormality (SCIWORA)

## Tumor, benign or malignant

(any **one** of the following)

- Primary or metastatic neoplasm involving the vertebrae
- Spinal cord neoplasm

**Note:** Includes both primary and secondary intramedullary, intradural/leptomeningeal and extramedullary neoplasms

# References

1. Magni-Manzoni S, Malattia C, Lanni S, Ravelli A. Advances and challenges in imaging in juvenile idiopathic arthritis. *Nat Rev Rheumatol*. 2012 Mar 27;8(6):329-336.
2. Wright N. Imaging in Scoliosis. *Arch Dis Child*. 2000;82(1):38-40.
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6. 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.
7. 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.
8. 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 – Pediatrics



## 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

## Technology 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

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

### Cauda equina syndrome

### 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

### Congenital spine anomaly

(**any one** of the following)

- Achondroplasia and other dwarfism
- Congenital kyphosis and scoliosis
- Klippel-Feil syndrome
- Mucopolysaccharidosis
- Neurofibromatosis
- Other vertebral segmentation and fusion defects (hemi, block and butterfly vertebrae)
- Sclerosing bone dysplasia
- Skeletal dysplasia
- Spondyloepiphyseal dysplasia
- Syndromes including Down, Turner, and Marfan
- VACTERL (Vertebral, Anorectal, Cardiac, Tracheo-Esophageal fistula, Renal and Limb anomaly) association

### Fracture evaluation

- Following non-diagnostic radiograph

# Common Diagnostic Indications

## Infectious process

(any **one** of the following)

- Abscess
- Arachnoiditis
- Discitis
- Osteomyelitis

## Low back pain

(any **one** of the following)

- Pain is persistent (**all** of the following)
  - Following a four (4) week trial of conservative therapy
  - Following non-diagnostic radiograph
- Patient age is less than 5 years
- Red flag signs or symptoms are present<sup>1-3</sup> (see table below)
- Trauma – see separate Trauma indication

**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: Low back pain red flag features**

Back pain characteristics	Constitutional signs	Neurologic signs and symptoms
<ul style="list-style-type: none"><li>• Constant pain</li><li>• Disrupts sleep</li><li>• Recurrent pain</li><li>• Worsening after initiation of conservative management early morning stiffness</li></ul>	<ul style="list-style-type: none"><li>• Bruising</li><li>• Lymphadenopathy</li><li>• Night sweats</li><li>• Unexplained fever</li><li>• Weight loss</li></ul>	<ul style="list-style-type: none"><li>• Altered gait</li><li>• Bowel or bladder dysfunction</li><li>• Radicular pain</li><li>• Sensory symptoms in a lumbar dermatome distribution</li><li>• Spasticity/abnormal reflexes</li><li>• Weakness</li></ul>

## Myelopathy involving the lower spinal cord

### Post-myelogram CT or CT following other interventional procedure to the lumbar spine

#### 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

## Scoliosis

- Diagnosis and management of scoliosis confirmed by radiography and (any one of the following)
  - Patient is less than 10 years of age
  - Patient is age 10 years or older with an atypical finding<sup>1-3</sup> (any one of the following)
    - Neurological sign/symptom
    - Rapid curve progression (greater than 10 degrees per year)
    - Significant pain<sup>1</sup>
    - Unusual curvature (such as left thoracic kyphosis)
  - Surgical planning
  - Post-surgical evaluation

**Note:** Scoliosis defined by age of clinical presentation: congenital (at birth), infantile (<3 years), juvenile (3-10 years), and adolescent (10+ years). For pediatric patients who may require imaging of a significant portion of the spine or the entire spine, MRI should be considered to minimize radiation exposure

## Common Diagnostic Indications

### Spondyloarthropathy

(any **one** of the following)

- Following non-diagnostic radiograph
- Following non-diagnostic standard laboratory work-up for spondyloarthropathy

**Note:** This includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis

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### Spondylolysis

(any **one** of the following)

- Following a non-diagnostic radiograph when there is strong clinical concern
- Following a radiograph that shows spondylolisthesis

**Note:** Follow-up can be performed for four (4) months to assess healing<sup>2</sup> CT is preferred to evaluate bony detail

---

### Trauma

(any **one** of the following)

- Acute trauma
  - Following non-diagnostic radiograph when pain is persistent or progressively worsening
  - Neurologic deficit with possible spinal cord injury
- 

### Tumor, benign or malignant

(any **one** of the following)

- Primary or metastatic neoplasm involving the vertebrae
- Spinal cord neoplasm

**Note:** Includes both primary and secondary intramedullary, intradural/leptomeningeal and extramedullary neoplasms

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## References

1. Feldman DS, Straight JJ, Badra MI, Mohaideen A, Madan SS. Evaluation of an algorithmic approach to pediatric back pain. *J Pediatr Orthop.* 2006;26(3):353-357.
2. Rodriguez DP, Poussaint TY. Imaging of back pain in children. *AJNR Am J Neuroradiol.* 2010 May;31(5):787-802.
3. Feldman DS, Hedden DM, Wright JG. The use of bone scan to investigate back pain in children and adolescents. *J Pediatr Orthop.* 2000;20:790-795.

# Magnetic Resonance Imaging (MRI)

## Lumbar Spine – Pediatrics



### 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

### Technology Considerations

- For most 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 Indications

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

##### Back mass

- For patients up to age five (5) months following an abnormal or non-diagnostic ultrasound

##### Cauda equina syndrome

# Common Diagnostic Indications

## Congenital spine anomaly

(any **one** of the following)

- Achondroplasia and other dwarfism
- Congenital kyphosis and scoliosis
- Klippel-Feil syndrome
- Mucopolysaccharidosis
- Neurofibromatosis
- Other vertebral segmentation and fusion defects (hemi, block and butterfly vertebrae)
- Sclerosing bone dysplasia
- Skeletal dysplasia
- Spondyloepiphyseal dysplasia
- Syndromes: Down's, Turner's, Marfan's
- VACTERL (Vertebral, Anorectal, Cardiac, Tracheo-Esophageal fistula, Renal and Limb anomaly) association

## Fracture evaluation

- Following non-diagnostic radiograph

## Infectious process

(any **one** of the following)

- Abscess
- Arachnoiditis
- Discitis
- Osteomyelitis

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

- For management of established JIA following non-diagnostic radiograph, to determine appropriate course of therapy, particularly intra-articular therapy

## Low back pain

(any **one** of the following)

- Pain is persistent (**all** of the following)
  - Following a four (4) week trial of conservative therapy
  - Following non-diagnostic radiograph
- Patient age is less than 5 years
- Red flag signs or symptoms are present<sup>2-4</sup> (see table below)
- Trauma – see separate Trauma indication

**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: Low back pain red flag features**

Back pain characteristics	Constitutional signs	Neurologic signs and symptoms
<ul style="list-style-type: none"> <li>• Constant pain</li> <li>• Disrupts sleep</li> <li>• Recurrent pain</li> <li>• Worsening after initiation of conservative management early morning stiffness</li> </ul>	<ul style="list-style-type: none"> <li>• Bruising</li> <li>• Lymphadenopathy</li> <li>• Night sweats</li> <li>• Unexplained fever</li> <li>• Weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• Altered gait</li> <li>• Bowel or bladder dysfunction</li> <li>• Radicular pain</li> <li>• Sensory symptoms in a lumbar dermatome distribution</li> <li>• Spasticity/abnormal reflexes</li> <li>• Weakness</li> </ul>

## Myelopathy involving the lower spinal cord



# Common Diagnostic Indications

## Post-operative or post-procedure evaluation

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

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## Pre-operative or pre-procedure evaluation

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

---

### Scoliosis

- Diagnosis and management of scoliosis confirmed by radiography and (**any one of the following**)
  - Patient is less than 10 years of age
  - Patient is age 10 years or older with an atypical finding<sup>2-4</sup> (**any one of the following**)
    - Neurological sign/symptom
    - Rapid curve progression (greater than 10 degrees per year)
    - Significant pain<sup>2</sup>
    - Unusual curvature (such as left thoracic kyphosis)
  - Surgical planning
  - Post-surgical evaluation

**Note:** Scoliosis defined by age of clinical presentation: congenital (at birth), infantile (<3 years), juvenile (3-10 years), and adolescent (10+ years). For pediatric patients who may require imaging of a significant portion of the spine or the entire spine, MRI should be considered to minimize radiation exposure

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### Spinal cord infarct

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### Spinal dysraphism

- Patients five (5) months of age or younger, following non-diagnostic ultrasound
- Patients older than five (5) months of age

**Note:** Includes midline back mass when there is clinical concern for spinal dysraphism. This also includes closed spinal dysraphism (such as; lipomyelocele, lipomyelomeningocele, or dermal sinus) as well as open spinal dysraphism (such as meningocele, myelocele, or myelomeningocele)

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### Spina bifida occulta

- Symptomatic patients – see **Tethered cord**

**Note:** Common incidental finding on radiography

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### Spondyloarthropathy

(**any one of the following**)

- Following non-diagnostic radiograph
- Following non-diagnostic standard laboratory work-up for spondyloarthropathy

**Note:** This includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthritis associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis

---

### Spondylolysis

(**any one of the following**)

- Following a non-diagnostic radiograph when there is strong clinical concern
- Following a radiograph that shows spondylolisthesis

**Note:** Follow-up can be performed for four (4) months to assess healing<sup>4</sup>. CT is preferred to evaluate bony detail

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# Common Diagnostic Indications

## Tethered cord

(any **one** of the following)

- Diagnosis in patients five (5) months of age or younger, following a non-diagnostic ultrasound
- Diagnosis in patients older than five (5) months of age
- Pre-operative planning
- Post-operative evaluation when retethering is suspected

**Note:** Defined as stretching of the low lying (below L2) cord due to attachment of the filum terminale

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## Trauma

(any **one** of the following)

- Acute trauma
- Following non-diagnostic radiograph when pain is persistent or progressively worsening
- Neurologic deficit with possible spinal cord injury

**Note:** Includes spinal cord injury without radiographic abnormality (SCIWORA)

---

## Tumor, benign or malignant

(any **one** of the following)

- Primary or metastatic neoplasm involving the vertebrae
- Spinal cord neoplasm

**Note:** Includes both primary and secondary intramedullary, intradural/leptomeningeal and extramedullary neoplasms

# References

1. Magni-Manzoni S, Malattia C, Lanni S, Ravelli A. Advances and challenges in imaging in juvenile idiopathic arthritis. *Nat Rev Rheumatol*. 2012 Mar 27;8(6):329-336.
2. Feldman DS, Straight JJ, Badra MI, Mohaideen A, Madan SS. Evaluation of an algorithmic approach to pediatric back pain. *J Pediatr Orthop*. 2006;26(3):353-357.
3. Rodriguez DP, Poussaint TY. Imaging of back pain in children. *AJNR Am J Neuroradiol*. 2010;31(5):787-802.
4. Feldman DS, Hedden DM, Wright JG. The use of bone scan to investigate back pain in children and adolescents. *J Pediatr Orthop*. 2000;20:790-795.

## CPT Codes

72159..... Magnetic resonance angiography of spinal canal

*Angiography includes imaging of all blood vessels, including arteries and veins. The code above includes MR Venography.*

## Standard Anatomic Coverage

- Scan coverage depends on the specific clinical indication for the spinal canal MRA
- General landmarks extend from the craniocervical junction through the lumbosacral region

## Technology 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

## MR 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

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

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**Post-operative or post-procedure evaluation**

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**Pre-operative or pre-procedure evaluation**