

## CLINICAL APPROPRIATENESS GUIDELINES

# ADVANCED IMAGING

### Appropriate Use Criteria: Imaging of the Spine

**EFFECTIVE MARCH 14, 2021**

**Proprietary**

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

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## Description and Application of the Guidelines

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

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

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

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

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

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

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

## General Clinical Guideline

### Clinical Appropriateness Framework

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

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

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

### Simultaneous Ordering of Multiple Diagnostic or Therapeutic Interventions

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

Additionally, either of the following may apply:

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

### Repeat Diagnostic Intervention

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

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

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

## Repeat Therapeutic Intervention

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

# Imaging of the Spine

## General Information/Overview

### Scope

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

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

### Technology Considerations

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

**Computed tomography (CT)** is the preferred imaging modality for bony abnormalities of the spine when radiographs do not provide sufficient detail for management. Common indications include fracture, vertebral anomalies, and osseous tumors.

Spine CT is also utilized for **CT myelography**, in which radiographically opaque dye is injected into the thecal sac to image nerve detail. CT myelography is invasive, but is comparable to MRI in detection of neural impingement and stenosis, and can also be used in diagnosis of cerebrospinal fluid leak and nerve root avulsion. Conventional myelography, in which radiographs are obtained rather than using CT imaging, is less commonly performed.

Disadvantages of CT include exposure to ionizing radiation and risks associated with iodinated contrast, including allergy and impaired renal function.

**Magnetic resonance imaging (MRI)** is the preferred modality for the majority of soft tissue indications in the spine due to its superior resolution and lack of ionizing radiation. MRI can be performed with or without contrast; contrast may be necessary for infection, tumor, and post-surgical evaluation. Contrast MRI may also be useful for imaging herniated discs—particularly if herniation needs to be distinguished from post-surgical epidural scarring—and diagnosing tumors in the intramedullary, extramedullary, and extradural spaces.

Contraindications to MRI may include implanted devices unsafe for use in an MRI scanner—such as pacemakers or implantable cardioverter-defibrillators—and claustrophobia.

**CT discography** determines the available volume of discs and can be used to localize annulus fibrosis fissures or herniated discs. Discography can also confirm the source of back pain by reproducing the symptoms associated with disc herniation. **MR discography** may be performed in the event that CT is contraindicated. False positives, infection, and neural injury are possible with discography, and it should be used primarily to confirm an initial diagnosis.

### Definitions

Phases of the care continuum are broadly defined as follows:

- **Screening** – testing in the absence of signs or symptoms of disease

- **Diagnosis** – testing based on a reasonable suspicion of a particular condition or disorder, usually due to the presence of signs or symptoms
- **Management** – testing to direct therapy of an established condition, which may include preoperative or postoperative imaging, or imaging performed to evaluate the response to nonsurgical intervention
- **Surveillance** – periodic assessment following completion of therapy, or for monitoring known disease that is stable or asymptomatic

#### General prerequisites for spine imaging:

- **Evidence of nerve root or cord compression** – objective muscle weakness or sensory abnormality corresponding to a specific dermatome/myotome, reflex changes or spasticity
- **Conservative management** – a combination of strategies to reduce inflammation, alleviate pain, and improve function, including physical therapy or a physician-supervised therapeutic exercise program (unless contraindicated) and at least **ONE** of the following:
  - Prescription strength anti-inflammatory medications and analgesics
  - Adjunctive medications such as nerve membrane stabilizers or muscle relaxants
  - Manual therapy or spinal manipulation
  - Alternative therapies such as acupuncture
  - Appropriate management of underlying or associated cognitive, behavioral or addiction disorders
- **Clinical reevaluation** – In most cases, reevaluation should include a physical examination. Direct contact by other methods, such as telephone communication or electronic messaging, may substitute for in-person evaluation when circumstances preclude an office visit.
- **Failure of conservative management** – Patient has completed a full course of conservative management, as defined above, and has not shown significant improvement, or has worsened during a course of conservative management, and more invasive forms of therapy are being considered.
- **Physician-supervised therapeutic exercise program** – A form of conservative management that includes **ALL** of the following:
  - Participation in a patient specific or tailored program
  - Initial active instruction by MD/DO/PT with demonstration of patient ability to perform exercises
  - Compliance (documented or by clinician attestation on follow-up evaluation)

#### Statistical terminology <sup>1</sup>

- **Confidence interval (CI)** – range of values which is likely to contain the cited statistic. For example, 92% sensitivity (95% CI, 89%-95%) means that, while the sensitivity was calculated at 92% on the current study, there is a 95% chance that, if a study were to be repeated, the sensitivity on the repeat study would be in the range of 89%-95%.
- **Diagnostic accuracy** – ability of a test to discriminate between the target condition and health. Diagnostic accuracy is quantified using sensitivity and specificity, predictive values, and likelihood ratios.
- **Hazard ratio** – odds that an individual in the group with the higher hazard reaches the outcome first. Hazard ratio is analogous to odds ratio and is reported most commonly in time-to-event analysis or survival analysis. A hazard ratio of 1 means that the hazard rates of the 2 groups are equivalent. A hazard ratio of greater than 1 or less than 1 means that there are differences in the hazard rates between the 2 groups.
- **Likelihood ratio** – ratio of an expected test result (positive or negative) in patients *with* the disease to an expected test result (positive or negative) in patients *without* the disease. Positive

likelihood ratios, especially those greater than 10, help rule in a disease (i.e., they substantially raise the post-test probability of the disease, and hence make it very likely and the test very useful in identifying the disease). Negative likelihood ratios, especially those less than 0.1, help rule out a disease (i.e., they substantially decrease the post-test probability of disease, and hence make it very unlikely and the test very useful in excluding the disease).

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

## Clinical Indications

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

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

**General prerequisites for spine imaging include evidence of nerve root or cord compression and conservative management, as defined above.** Documentation of compliance with a plan of therapy that includes elements of conservative management may be required. Exceptions may be considered on a case-by-case basis.

## Congenital and Developmental Conditions

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### Chiari malformation

Advanced imaging of the spine is considered medically necessary for diagnosis and management when the results of imaging will impact treatment decisions.

#### IMAGING STUDY

- CT cervical spine
- MRI cervical spine

### Congenital spinal cord anomalies not listed

Advanced imaging of the spine is considered medically necessary for diagnosis and management when the results of imaging will impact treatment decisions.

#### IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine

*Note: Spina bifida occulta is a common incidental finding in pediatric patients. Imaging should not be performed unless the patient is symptomatic and there is a concern for tethered cord.*

### Congenital vertebral defects

*Includes skeletal dysplasia as well as segmentation and fusion anomalies*

Advanced imaging of the spine is considered medically necessary for diagnosis and management when results of imaging will impact treatment.

#### IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine

### Cranio cervical junction abnormalities

*Includes atlantoaxial and occipital instability as well as basilar invagination*

Advanced imaging of the spine is considered medically necessary for diagnosis and management following nondiagnostic radiographs in persons with **ANY** of the following high-risk conditions:

- Down syndrome
- Grisel syndrome
- Skeletal dysplasia

#### IMAGING STUDY

- CT cervical spine when radiographs are not sufficient to guide treatment
- MRI cervical spine when radiographs are not sufficient to guide treatment

### Scoliosis

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

- Evaluation of scoliosis following initial radiographs in the following groups:
  - Congenital scoliosis

- Idiopathic scoliosis with **ANY** of the following atypical features:
  - Early onset (prior to 10 years of age)
  - Unusual curvature (left thoracic or right lumbar)
  - Neurological signs or symptoms
  - Rapidly progressive scoliosis
  - Significant pain
- Scoliosis related to other pathologic processes such as neurofibromatosis
- Surgical planning
- Post-surgical evaluation

### IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine

*Note: 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.*

### Rationale

Idiopathic scoliosis is a lateral curvature of the spine of unknown etiology, occurring at any time before the end of growth in otherwise healthy children.<sup>2</sup> Idiopathic scoliosis is classified by age of onset as infantile before three years of age, juvenile between 3 and 10 years of age or before puberty (both early onset), and adolescent when detected after 10 years of age or post puberty.<sup>3</sup>

Scoliosis is usually defined as a lateral curvature of the spine of greater than 10 degrees, and it is estimated that 2% of children are affected at some stage of their life. The etiology of the spinal deformity may be idiopathic (80% of cases), particularly in adolescents. However, it may be associated with underlying systemic syndromes, secondary to a neuromuscular condition (10% of cases), skeletal dysplasia, or secondary to congenital spinal deformity (10% of cases). Scoliosis is classified as early onset when clinical and radiological symptoms occur before 10 years of age.<sup>3</sup>

Radiography is the first and primary modality to evaluate scoliosis in pediatric patients. It can be used to make the diagnosis of scoliosis, evaluate progression, and perform follow-up treatment. Radiography can evaluate for changes in the Cobb angle, which is the primary metric for evaluating scoliosis.<sup>4</sup>

Adolescent scoliosis is common (2%-4% prevalence) and usually idiopathic.<sup>5</sup> The typical patient has a right thoracic or thoracolumbar curve (S-shaped) and no neurological findings, and imaging is not generally indicated.<sup>4</sup>

Imaging is indicated in patients with scoliosis and atypical findings, as atypical patients are more likely to have congenital anomalies of the vertebrae or spinal cord. The degree of scoliosis is not associated with an increase in imaging abnormalities and is therefore not an atypical feature.<sup>6</sup>

Congenital scoliosis is often associated with additional development anomalies including Chiari malformation (30%), diastematomyelia (20%), spinal segmentation anomalies and systemic developmental anomalies (VACTERL), and connective tissue disease (Marfan syndrome).<sup>3</sup>

## Spinal dysraphism

*Includes closed spinal dysraphism (lipomyelocele, lipomyelomeningocele, or dermal sinus) as well as open spinal dysraphism (meningocele, myelocele, or myelomeningocele)*

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

- For diagnosis and management in patients older than 5 months of age
- For diagnosis and management following nondiagnostic ultrasound in patients 5 months of age or younger

### IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine
- CT cervical, thoracic, or lumbar spine when MRI cannot be performed or is nondiagnostic

## Rationale

Spinal dysraphism is a term used to describe a broad spectrum of disorders characterized by incomplete or absent midline fusion of the dorsal spinal elements (spina bifida), neural structures, or both. Examples include open (communicating with the nerve roots) and closed dysraphisms including myelocele, myelomeningocele, spina bifida, and dorsal dermal sinus.<sup>7</sup>

Ultrasound of the spine can be performed in neonates prior to ossification of the cartilaginous spine<sup>7</sup> and is a useful screening test in newborns and in utero,<sup>8</sup> helping to select patients who require further evaluation with MRI, which has higher diagnostic accuracy but is more time intensive and which may require sedation.<sup>9</sup>

## Tethered cord

Advanced imaging of the spine is considered medically necessary for diagnosis and management when results of imaging will impact treatment.

### IMAGING STUDY

- CT lumbar spine
- MRI lumbar spine

### Rationale

Ultrasound is preferred as the initial imaging modality to screen for tethered cord in infants under 5 months, with a sensitivity of 80% and specificity of 89%.<sup>10</sup> Ultrasound is limited in older neonates. As the cartilaginous posterior elements of the spine ossify from caudally to cranially, reduced sound penetration in the lumbar spine by approximately 3 to 4 months of age usually renders this modality suboptimal as a screening tool beyond this period.<sup>7</sup>

## Infectious and Inflammatory Conditions

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### Juvenile idiopathic arthritis (Pediatric only)

*Also see Extremity Imaging guidelines.*

Advanced imaging of the spine is considered medically necessary for management of established juvenile idiopathic arthritis when radiographs are insufficient to determine appropriate course of therapy.

### IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine
- CT cervical, thoracic, or lumbar spine when MRI cannot be performed or is nondiagnostic

### Rationale

Juvenile idiopathic arthritis (JIA), the most common rheumatic disease of children and adolescents, is an umbrella term that encompasses all forms of arthritis that begin before age 16, persist for more than 6 weeks, and are of unknown etiology. Specific examples of JIA include oligoarthritis, polyarthritis, systemic arthritis, psoriatic arthritis, and enthesitis-related arthritis. JIA is the most common childhood rheumatic entity, with a prevalence of 0.6 to 1.9 in 1000 children.<sup>11</sup>

JIA is primarily a clinical diagnosis. General practitioners should base diagnosis of JIA (and differential diagnosis) on history and clinical examination, with strong suspicion of JIA indicated by pain and swelling of single or multiple joints, persistent or worsening loss of function, fever of at least 10 days with unknown cause (often associated with transient erythematous rash), decreased range of motion, and joint warmth or effusion.<sup>12</sup>

Laboratory assessment with appropriate tests can assist in increasing diagnostic certainty, excluding differential diagnoses, and predicting patients likely to progress to erosive disease. Base investigations usually include erythrocyte sedimentation rate or C-reactive protein and full blood count, with consideration given to rheumatoid factor, antinuclear antibody, and human leukocyte antigen B27.<sup>12</sup>

When there is clinical diagnostic doubt, conventional radiographs (CR), ultrasound, or MRI can be used to improve the certainty of a diagnosis of JIA above clinical features alone.<sup>1</sup> MRI is the most sensitive noninvasive imaging modality to evaluate for inflammation of the joints, tendons, and entheses, and is the only modality that can depict bone marrow edema. Currently, MRI with contrast is the most sensitive tool for determining active synovitis.<sup>11</sup>

When the imaging modalities were directly compared, MRI and US detected more joint damage than CR, but primarily at the hip (MRI vs CR detection rate, mean [range] 1.54-fold [1.08–2.0-fold]; ultrasound vs CR detection rate, mean 2.29-fold), and at the wrist (MRI vs CR detection rate, 1.36-fold [1.0–2.0-fold]).<sup>1</sup>

Imaging studies help identify children with a high likelihood of early erosive joint damage, providing an opportunity to implement aggressive therapy at an early stage in an attempt to reduce morbidity.<sup>11</sup>

## Multiple sclerosis or other white matter disease

Also see *Brain Imaging guidelines*.

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

- Diagnosis
- Management
  - Evaluation of known cervical or thoracic cord lesions with new or recurrent signs or symptoms of myelopathy
  - Evaluation of new signs or symptoms of myelopathy in patients without known cervical or thoracic cord lesions
  - Recent or current use of natalizumab
  - New baseline prior to starting or changing therapy
  - Following a change in disease-modifying therapy: Initial imaging at 3-6 months and follow up at 6-12 months
  - Other white matter diseases
- Surveillance
  - Clinically isolated syndrome (CIS) or radiologically isolated syndrome (RIS): Imaging 3-6 months after presentation, 6-12 months after presentation, and annually thereafter
  - Annual evaluation in stable patients with known cervical or thoracic cord lesions who have had no change in therapy

### IMAGING STUDY

- MRI cervical or thoracic spine

### Rationale

Multiple sclerosis (MS) is a chronic, disabling autoimmune disease of the central nervous system<sup>13</sup> and among the most common causes of neurological disability in young people, with an annual incidence ranging from 2 to 10 cases per 100,000 persons per year.<sup>14</sup> Its clinical manifestations typically occur between 20 and 40 years of age, with symptoms and signs involving different regions of the central nervous system: optic nerve, brainstem, cerebellum, cerebral hemispheres, and spinal cord. MS has a chronic course—relapses and disability progression evolving over 30 to 40 years are typical.<sup>14</sup>

The revised 2017 McDonald criteria are commonly accepted criteria establishing the diagnosis of MS and are used in both clinical and research contexts. The McDonald criteria incorporate clinical presentation as well as laboratory and imaging biomarkers. Unlike brain MRI, spine MRI may not be needed in all patients with suspected MS and consensus recommendations suggest it is best used in patients with signs or symptoms of myelopathy for spinal cord localization, insufficient brain MRI evidence to establish the diagnosis, a presentation other than clinically isolated syndrome, or with atypical features including older age of onset.<sup>15</sup> Spine MRI may also inform the management of MS by confirming a disease flare when clinically suspected or by excluding other causes for the new neurological signs or symptoms.

Patients with clinically isolated syndrome (CIS) present with a clinical attack typical for demyelinating disease (for example optic neuritis) but do not meet the McDonald criteria. They are at increased risk for MS and MRI is indicated to determine whether these patients develop the disease.

While MS should not be diagnosed on the basis of MRI findings alone,<sup>15,16</sup> patients rarely present with white matter disease typical of multiple sclerosis (not nonspecific) without clinical symptoms. These patients are classified as having a radiologically isolated syndrome (RIS). Follow up imaging in RIS is controversial, but RIS patients appear to be at increased risk for conversion to MS.<sup>17</sup> Future research is likely to change recommendations for the diagnosis and management of RIS and additional studies have been identified as a high priority.<sup>15</sup>

There are over a dozen FDA-approved disease-modifying therapies (DMTs) for multiple sclerosis including interferon beta-1a, glatiramer acetate, fingolimod and natalizumab and they are recommended in patients with relapsing forms of MS with recent clinical relapses or MRI activity (strong recommendation based on moderate quality evidence).<sup>18</sup> For patients without new clinical findings, MRI may therefore be used in the management (immediately prior to or after changing DMTs) or in surveillance for subclinical disease in patients without clinical or recent therapy changes). More

frequent MRI evaluation is recommended in patients with a recent therapy change as recurrences are more likely within the first year. Patients on natalizumab (Tysabri) have a higher relative risk for progressive multifocal leukoencephalopathy (PML) and may require more frequent imaging.

Management and surveillance intervals for MS, CIS and RIS are primarily consensus based but addressed in several evidence and practice based guidelines.<sup>19,20,21,22</sup>

CT is not recommended in the evaluation of demyelinating disease due to low sensitivity relative to MRI and other clinical and laboratory tests.<sup>23</sup> Likewise, several nonconventional technique variants of MRI (magnetization transfer, diffusion tensor, functional MRI) have been proposed as add-on diagnostic tests for MS but they have not been validated at the individual level<sup>22</sup> or incorporated into the McDonald criteria or other standardized MS imaging protocols and require further research before incorporation into routine clinical practice.<sup>24</sup>

Other demyelinating diseases of the central nervous system are rare and include autoimmune disseminated encephalomyelitis (ADEM) and neuromyelitis optica (NMO). Their clinical presentation can overlap with MS, but clinical, laboratory and MRI findings help to distinguish the etiologies. For instance, ADEM usually has an viral or vaccine prodrome and is more common in pediatric patients<sup>25</sup>; NMO typically presents with longitudinally extensive transverse myelitis (LETM) and a positive serum NMO-IgG/Aquaporin 4 (AQP4) antibody test.<sup>17,26</sup>

The McDonald criteria apply in pediatrics, although MS is rare in this population, and hence data is limited.<sup>21</sup>

## Rheumatoid arthritis (Adult only)

Advanced imaging of the spine is considered medically necessary for evaluation of suspected cervical subluxation in persons with confirmed rheumatoid arthritis.

### IMAGING STUDY

- CT cervical spine
- MRI cervical spine

### Rationale

Rheumatoid arthritis is a systemic inflammatory disease that affects the cervical spine in up to 80% of cases resulting in craniocervical instability, most commonly from atlantoaxial subluxation. MRI is the most sensitive exam to establish the diagnosis,<sup>27</sup> which carries an increased risk of mortality and morbidity in rheumatoid arthritis patients,<sup>28</sup> and lifetime radiological follow up may be required.

## Spinal infection

Advanced imaging of the spine is considered medically necessary for diagnosis and management of spinal infection, including but not limited to epidural abscess, arachnoiditis, discitis, and osteomyelitis.

### IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine
- CT cervical, thoracic, or lumbar spine when MRI cannot be performed or is nondiagnostic
- FDG-PET/CT for chronic osteomyelitis

### Rationale

MRI has high diagnostic accuracy for spondylodiscitis, is widely available, nonionizing, and is recommended as the initial modality by multiple clinical guidelines.<sup>29 30 31</sup>

## Spondyloarthropathy

*Includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, spondyloarthropathy associated with inflammatory bowel disease, and juvenile-onset spondyloarthritis*

Advanced imaging of the spine is considered medically necessary for diagnosis following standard evaluation with radiographs or laboratory evaluation.

### IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine

## Rationale

Axial spondyloarthritis (SpA) includes a group of rare (estimated 0.25% to 1% prevalence) disorders that may be human leukocyte antigen B27 (HLA-B27) positive and that manifest with inflammatory changes around the entheses. SpA includes ankylosing spondylitis (AS), reactive arthritis, psoriatic arthritis, arthropathy associated with inflammatory bowel disease, and undifferentiated SpA.

The Assessment of Spondyloarthritis International Society (ASAS) has developed and validated criteria (ASAS cohort) for spondyloarthritis, as well as for their subsets, axial SpA and peripheral SpA.<sup>32</sup> While sacroiliitis is the most common MRI manifestation of axial spondyloarthritis, bone marrow edema can be seen in the vertebra as well and characteristic patterns have been described.<sup>33</sup>

Consensus among guidelines that radiography of the pelvis and/or spine is the preferred imaging modality for initial evaluation of SpA:

- The first-line imaging modality is radiography. We recommend imaging the whole spine.<sup>34</sup>
- Offer plain film X-ray of the sacroiliac joints for people with suspected axial spondyloarthritis, unless the person is likely to have an immature skeleton.<sup>35</sup>
- In patients with ankylosing spondylitis (not non-radiographic axial SpA), initial conventional radiography of the lumbar and cervical spine is recommended to detect syndesmophytes, which are predictive of development of new syndesmophytes.<sup>36</sup>

ASAS criteria for axial spondyloarthritis have a high diagnostic accuracy (sensitivity 82%, specificity 88%) based on a systematic review of 9 papers and 5739 patients.<sup>32</sup> Patients that do not meet the ASAS criteria are a low pretest probability group unlikely to have axial spondyloarthritis. ASAS criteria for axial spondyloarthritis include:

- Age less than 45 years
- Back pain of at least 3 months duration
- Sacroiliitis on imaging (either definitive changes on radiography or evidence from MRI) and one characteristic feature
- HLA-B27 positive and at least two characteristic clinical features, which include arthritis, uveitis, dactylitis, psoriasis, Crohn's disease, positive NSAID response, and family history.

Diagnostic criteria for axial spondyloarthritis (ASAS) are based on MRI of the sacroiliac joints, not the spine. MRI of the spine has a low yield in patients with a negative sacroiliac joint MRI and should not be routinely performed.

- Retrospective study of 1191 patients under age 45 with chronic lower back pain (approximately 7%) were found to have sacroiliitis. Less than 2% of patients with a negative sacroiliac joint MRI had a positive spine MRI. Spine MRI changed management (reclassified patients from negative to positive axial SpA) in only 0.16% of cases.<sup>37</sup>
- MRI can demonstrate edema of the vertebral body corners (also known as corner inflammatory lesions) and bone marrow edema. A positive MRI spine is defined as 3 or more lesions present on 2 or more slices, but this definition is used primarily for research purposes.<sup>37</sup>

There is consensus among guidelines that MRI should be obtained in patients with persistent clinical suspicion when radiography is negative or indeterminate:

- If a diagnosis of axial spondyloarthritis cannot be confirmed and clinical suspicion remains high, consider a follow-up MRI.<sup>38</sup>
- In case of negative radiographs in patients with a suspicion of SpA, MRI is mandatory to look for early inflammatory lesions.<sup>39</sup>
- Consider plain film X-rays, ultrasound and/or MRI of other peripheral and axial symptomatic sites<sup>35</sup>

A negative/indeterminate radiograph meets **BOTH** of the following criteria:

- Does not satisfy the New York Criteria for Ankylosing Spondylitis bilateral grade 2–4 or unilateral grade 3–4 sacroiliitis (evidence of erosions, sclerosis, joint space widening, narrowing or ankyloses)
- Does not otherwise explain the back pain

MRI of the sacroiliac joints and/or the spine may be used to assess and monitor disease activity in axial SpA, providing additional information on top of clinical and biochemical assessments. The decision on when to repeat MRI depends on the clinical circumstances. In general, STIR sequences are sufficient to detect inflammation and the use of contrast medium is not needed.<sup>36</sup>

## Trauma

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### Cervical injury

Advanced imaging is considered medically necessary in the following scenarios:

**ADULT**

- Initial diagnosis of acute trauma with **ANY** of the following:
  - Abnormal radiographs suggestive of fracture
  - Posterior midline cervical spine tenderness following initial radiographs
  - Altered level of consciousness or intoxication
  - Focal neurological deficit
  - High-risk mechanism including penetrating neck trauma
  - Secondary distracting injuries including other fractures
  - Trauma within 48 hours with limited range of neck motion or unstable vital signs
  - Age over 65 years
  - Known cervical spine disease that may predispose to fracture (**ANY** of the following):
    - Inflammatory arthritis
    - Osteoporosis
    - Prior cervical spine surgery
    - Malignancy or primary bone neoplasm
- Diagnosis or management of trauma in **ANY** of the following scenarios:
  - Post-traumatic neurologic deficit (radiculopathy or myelopathy)
  - Soft tissue injury suggested by CT or radiography
  - Progressively worsening pain unexplained by CT
  - Follow up of known fracture
  - Presurgical planning

**PEDIATRIC**

- Initial diagnosis of acute significant trauma
- Diagnosis or management of trauma in **ANY** of the following scenarios:
  - Post-traumatic neurologic deficit (radiculopathy or myelopathy)
  - Soft tissue injury suggested by CT or radiography
  - Progressively worsening pain unexplained by CT
  - Follow up of known fracture
  - Presurgical planning

**IMAGING STUDY**

- CT cervical spine
- MRI cervical spine for diagnosis or management of trauma

**Rationale**

Multiple guidelines recommend use of CT in patients with acute significant cervical trauma.<sup>40, 41</sup> While the diagnostic yield in the acute trauma setting is low,<sup>42</sup> the morbidity and mortality of a missed fracture are high.<sup>43</sup>

Both the Canadian C-spine rule and the NEXUS criteria are validated clinical prediction rules with high negative predictive value for clinical significant cervical spine trauma. A 2012 systematic review of 15 studies with over 10,000 patients and 500 true positive cases found high median negative likelihood ratios of 0.18 (Interquartile range 0.03-0.24) for the Canadian C-spine Rule and 0.3 (Interquartile range 0.19-0.41) for the Nexus criteria, implying a very low (less than 1%) post test probability for clinically significant injury when either rule is negative.<sup>44</sup> Of note, these criteria primarily validated the use of radiography not CT in the acute trauma setting and specificity for certain criteria is likely to be lower in the outpatient setting and for trauma beyond 48 hours.

Sensitivity of the NEXUS criteria is reduced in the elderly,<sup>45</sup> and the Canadian C-spine rule excluded several high risk populations including inflammatory arthritis and prior surgery.<sup>46</sup> In addition, these clinical prediction rules have not been sufficiently validated in the pediatric population with fewer than 100 clinical significant trauma events reported in the literature and with wide ranging confidence intervals for sensitivity—NEXUS 57% (95% CI, 18%-90%), Canadian C spine Rule 86% (95% CI, 42%-100%).<sup>47</sup>

After initial evaluation with CT, MRI may be a helpful add-on test in select patient populations such as those with spinal cord injury without radiographic abnormality,<sup>48, 49</sup> neurological signs and symptoms, or progressive symptoms unexplained by radiography or CT. MRI is more sensitive than CT for the detection of cord edema and hemorrhage or epidural hematomas that may require surgical decompression. However, there is a very low likelihood that MRI will change management or identify clinically significant injuries in unselected acute trauma patients with a normal cervical spine CT.<sup>50</sup>

## Thoracic or lumbar injury

Advanced imaging is considered medically necessary in the following scenarios:

- Initial diagnosis of acute significant trauma
- Diagnosis or management of trauma in **ANY** of the following scenarios:
  - Post-traumatic neurologic deficit (radiculopathy or myelopathy)
  - Soft tissue injury suggested by CT or radiography
  - Progressively worsening pain unexplained by CT
  - Follow up of known fracture
  - Presurgical planning

### IMAGING STUDY

- CT thoracic or lumbar spine
- MRI thoracic or lumbar spine for diagnosis or management of trauma

### Rationale

Guidelines recommend selective use of CT in high-risk trauma patients. Patients without complaints of thoracolumbar spine (TLS) pain that have normal mental status as well as normal neurological and physical examinations may be excluded from TLS injury by clinical examination alone (without radiographic imaging) provided that there is no suspicion of high-energy mechanism or intoxication with alcohol or drugs.<sup>51</sup> X-ray should be performed as the first-line investigation for people with suspected spinal column injury without abnormal neurological signs or symptoms in the thoracic or lumbosacral regions.<sup>41</sup> Patients with back pain, TLS tenderness on examination, neurologic deficits referable to the TLS, altered mental status, intoxication, distracting injuries, or known or suspected high-energy mechanisms should be screened for TLS injury with CT scan.<sup>51</sup>

## Tumor

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### Tumor

*For management of documented malignancy, please refer to the Oncologic Imaging guidelines.*

Advanced imaging of the spine is considered medically necessary for diagnosis or management of a mass in the spinal cord, vertebrae, or adjacent soft tissue.

### IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine

## Miscellaneous Conditions of the Spine

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### Osteoporosis and osteopenia

Advanced imaging of the spine is considered medically necessary for diagnosis or management in the following scenarios:

#### Screening and Diagnostic indications

- Screening in menopausal or post-menopausal women and men age 70 or older
- Persons being treated with medications associated with development of osteoporosis
- Anyone presenting with a fragility or pathologic fracture
- Persons with a disease or condition associated with development of osteoporosis including the following:
  - Anorexia nervosa
  - Chronic liver disease
  - Chronic renal failure
  - Cushing syndrome
  - Delayed menarche or untreated premature menopause
  - Heavy alcohol consumption
  - Hypercalciuria
  - Hypogonadism
  - Inflammatory bowel disease
  - Low trauma fractures or vertebral fractures
  - Malabsorption syndromes
  - Primary hyperparathyroidism
  - Prolonged immobilization
  - Radiographic evidence of osteopenia
  - Rheumatoid arthritis
  - Thyroid disease
- Anyone considering therapy for osteoporosis, if bone mineral densitometry will facilitate decision making

#### Management indications

- Testing at 2- to 3-year intervals in persons being treated for osteoporosis or osteopenia
- Testing at 3- to 5-year intervals in untreated individuals who met the criteria for initial evaluation, without significant osteopenia on the prior study or interval development of risk factors for accelerated bone loss

#### IMAGING STUDY

- CT bone density for all indications listed
- CT cervical, thoracic, or lumbar spine for suspected compression fracture following nondiagnostic radiographs
- MRI cervical, thoracic, or lumbar spine for suspected compression fracture following nondiagnostic radiographs

## Paget's disease

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

- Determine extent of disease in patients with suggestive findings on radiography
- Monitor response to therapy in patients with normal baseline bone turnover markers
- Evaluate for malignant transformation of pagetoid lesions

### IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine to evaluate for malignant transformation
- CT cervical, thoracic, or lumbar spine to evaluate for malignant transformation

### Rationale

Paget's disease of the bone is a metabolic bone disease characterized by noninflammatory osteoclastic activity followed by osteoblastic activity.<sup>52</sup> The disease can be monostotic or polyostotic. CT or MRI may be indicated when malignant transformation of a Pagetoid lesion is suspected based on suspicious imaging or clinical findings.

## Spinal cord infarction

Advanced imaging of the spine is considered medically necessary for diagnosis and management when the results of imaging will impact treatment.

### IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine
- CT cervical, thoracic, or lumbar spine when MRI cannot be performed or is nondiagnostic

## Spondylolysis and spondylolisthesis

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

- Suspected spondylolysis with nondiagnostic lumbar spine radiographs
- Following radiographs documenting spondylolisthesis
- Preoperative planning when lumbar spine radiographs are not sufficient to guide treatment

### IMAGING STUDY

- CT lumbar spine
- MRI lumbar spine

## Spontaneous (idiopathic) intracranial hypotension (SIH)

*Also see Brain Imaging guidelines.*

Imaging is considered medically necessary in **EITHER** of the following scenarios:

- To localize a cerebrospinal fluid (CSF) leak in confirmed or suspected SIH prior to placement of an epidural blood patch
- To direct placement of a repeat epidural blood patch or for presurgical planning in patients with refractory symptoms

### IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine
- CT cervical, thoracic, or lumbar spine when MRI cannot be performed or is nondiagnostic

## Rationale

Spontaneous (idiopathic) intracranial hypotension (SIH) refers to a state of decreased cerebrospinal fluid (CSF) due to a spontaneous or idiopathic source of leakage, typically of spinal origin.<sup>53</sup> The condition is relatively rare with an estimated incidence of 2 to 5 per 100,000<sup>54</sup> and typically presents with an orthostatic headache in the setting of a low (<6 cm H<sub>2</sub>O) CSF pressure and only very rarely without headache.<sup>53</sup> Spinal sources of CSF leak are common in SIH. In patients who fail conservative measures, epidural blood patches are used to manage SIH. In patients with intracranial hypotension of unknown localization, spinal MRI changes management by confirming the diagnosis in atypical cases prior to the initial placement of an epidural blood patch or by directing placement of subsequent epidural blood patches or surgical interventions. Spinal MRI has high diagnostic accuracy for the detection of spinal CSF leaks and is the initial recommended advanced imaging modality.<sup>53</sup> CT myelography is a minimally invasive, ionizing alternative to MRI with good diagnostic accuracy.

## Syringomyelia

*Includes syrinx, hydromyelia, and hydrosyringomyelia*

Advanced imaging of the spine is considered medically necessary for diagnosis and periodic surveillance when results of imaging will impact treatment.

### IMAGING STUDY

- MRI cervical or thoracic spine
- CT cervical or thoracic spine when MRI cannot be performed or is nondiagnostic

## Perioperative and Periprocedural Imaging

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### Perioperative Imaging, including delayed hardware failure, not otherwise specified

*Includes conditions not otherwise referenced in the Spine guidelines.*

Advanced imaging is considered medically necessary when imaging is required to guide management.

### IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine

## Signs and Symptoms

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### Cauda equina syndrome

Advanced imaging of the spine is considered medically necessary for diagnosis and management when the results of imaging will impact treatment.

*Note: Low back pain or radicular pain in conjunction with any of the following signs and symptoms may suggest a diagnosis of cauda equina syndrome: severe bilateral sciatica; saddle or genital sensory disturbance; bladder, bowel, or sexual dysfunction.*

### IMAGING STUDY

- CT lumbar spine
- MRI lumbar spine

### Myelopathy

Advanced imaging of the spine is considered medically necessary for evaluation when the results of imaging will impact treatment.

## IMAGING STUDY

- MRI cervical, thoracic, or lumbar spine
- CT cervical, thoracic, or lumbar spine may be used as an alternative in pediatric patients, or when MRI cannot be performed or is nondiagnostic in adults

## Pain indications

The following pain indications should not be utilized when there are underlying conditions or clinical evidence of infection, malignancy, or other systemic pathology. Please refer to the indication/section for imaging related to these conditions. For pain related to acute trauma, see Trauma indications.

### Neck pain (cervical)

#### ADULT

Advanced imaging is considered medically necessary when the patient is a potential candidate for spine intervention in **EITHER** of the following scenarios:

- Localized or non-radicular pain when persistent following at least 6 weeks of conservative management and negative or nondiagnostic radiographs
- Radicular pain in **EITHER** of the following scenarios:
  - Documented abnormality on neurological exam in a dermatomal/radicular distribution that has not previously been imaged or has progressed since a prior imaging study has been performed
  - Lack of improvement or worsening during a 6-week course of therapy with at least 2 different forms of treatment

#### PEDIATRIC

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

- Localized or radicular pain not explained by radiograph and not responsive to a course of conservative management
- Pain with evidence of nerve root or cord compression

## IMAGING STUDY

- CT cervical spine
- MRI cervical spine

### Rationale

Neck pain is the fourth leading cause of global disability and has an annual prevalence rate exceeding 30%.<sup>55-57</sup> A majority (approximately 70%) of patients with neck pain improve with conservative/medical management alone.<sup>58</sup>

Agreement exists among several high-quality guidelines that patients with progressive neurological deficits should undergo MRI,<sup>59,60</sup> and that patients with major neurologic deficits at onset should also undergo MRI. In the absence of neurologic findings, the role of imaging becomes less clear. Although plain radiographs of the cervical spine are useful for ruling out instability, they are relatively nonspecific for diagnosing cervical radiculopathy. About 65% of asymptomatic patients age 50 to 59 will have radiographic evidence of significant cervical spine degeneration, regardless of radiculopathy symptoms.<sup>61</sup>

Routine use of CT and MRI in patients without neurologic insult or other disease has not been justified in view of the infrequency of abnormalities detected, the lack of prognostic value, inaccessibility, and the high cost of the procedures. A major limitation is the lack of definite correlation between the patient's subjective symptoms and abnormal findings seen on imaging studies. As a result, debate continues as to whether persistent pain is attributable to structural pathology or to other underlying causes.<sup>62</sup>

A recent Cochrane review found moderate evidence that neck/upper extremity strengthening exercises reduce neck pain in the near term; the average duration of the exercise programs in this review was approximately 12 weeks.<sup>63</sup> Several randomized controlled trials have shown that a multimodal approach to conservative management is better than a unimodal one:

- Exercise and education are better than education alone.<sup>64</sup>
- Multimodal exercises and cognitive behavioral therapy result in less disability from neck pain at 1 year when compared to general physiotherapy.<sup>64,65</sup>
- Education and exercise are more effective at reducing 4-month disability from neck pain than manual therapy alone.<sup>66</sup>

There is agreement among multiple high-quality guidelines that further investigation is required in patients with nonspecific neck pain who have failed a course of conservative therapy,<sup>59,67</sup> and that imaging is indicated in this group. In terms of the imaging modality, there is no consensus for routine investigation of patients with chronic neck pain beyond plain radiographs. Current evidence supports referral at 4 to 8 weeks for non-progressive radiculopathy. Advanced imaging can be considered if there is no improvement after 4 to 6 weeks.<sup>61</sup>

Guidance on appropriate neck imaging in pediatrics is more limited. Degenerative changes on MRI do not correlate with either the frequency or intensity of headaches in adolescents.<sup>68</sup> The majority of neck pain in children may be mechanical, although data is retrospective<sup>69</sup> and neck pain may be the presentation of more serious disease, including retropharyngeal abscess or neoplasm.<sup>70</sup>

## Mid-back pain (thoracic)

### ADULT

Advanced imaging is considered medically necessary when the patient is a potential candidate for spine intervention, in **EITHER** of the following scenarios:

- Pain with neurologic findings suggesting thoracic or lumbar nerve root or cord compression that has not previously been imaged or has progressed since imaging was performed
- Pain without a neurologic component that has not responded to at least 6 weeks of conservative management

### PEDIATRIC

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

- Localized or radicular pain not explained by radiograph and not responsive to a course of conservative management
- Pain with evidence of nerve root or cord compression

### IMAGING STUDY

- CT thoracic spine
- MRI thoracic spine

## Low back pain (lumbar)

### ADULT

Advanced imaging is considered medically necessary when the patient is a potential candidate for spine intervention, in **EITHER** of the following scenarios:

- Pain with neurologic findings suggesting thoracic or lumbar nerve root or cord compression that has not previously been imaged or has progressed since imaging was performed
- Pain without a neurologic component that has not responded to at least 6 weeks of conservative management

### PEDIATRIC

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

- Persistent pain not explained by radiograph and not responsive to a course of conservative management of at least 4 weeks duration
- Pain in children younger than age 5
- Pain accompanied by any red flag features (see Table 1)

**Table 1: Red flag features of low back pain**

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</li> <li>• 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>

**IMAGING STUDY**

- CT lumbar spine
- MRI lumbar spine

**Rationale**

Low back pain (LBP) is currently the second most common cause of disability in the U.S. and is the most common cause of disability in those under age 45.<sup>71,72</sup> It is the second most common reason for a physician visit and affects 80% to 85% of people over their lifetimes.<sup>73</sup>

**ACUTE LOW BACK PAIN**

The majority of individuals with an episode of acute LBP improve and return to work within the first 2 weeks.<sup>74</sup> The probability of recurrence within the first year ranges from 30% to 60%.<sup>75</sup> Most of these recurrences will recover in much the same pattern as the initial event. In as many as one-third of the cases, the initial episode of LBP persists for the next year. There is a good prognosis for LBP. The majority of patients experience significant improvements in 2 to 4 weeks.<sup>76</sup> Most patients who seek attention for their back pain will improve within 2 weeks, and most experience significant improvement within 4 weeks.<sup>72</sup> Practitioners should emphasize that acute LBP is nearly always benign and generally resolves within 1 to 6 weeks.<sup>77</sup> Most patients presenting with uncomplicated acute LBP and/or radiculopathy do not require imaging.<sup>73</sup> Routine advanced imaging has not been shown to improve patient outcomes and may in fact identify abnormalities that are unrelated to the presenting symptoms.<sup>73</sup>

**DISC HERNIATION**

A prospective study by Carragee et al. found that 84% of patients with lumbar imaging abnormalities before the onset of LBP had unchanged or improved findings after symptoms developed. In addition, nonspecific lumbar disc abnormalities are common in asymptomatic patients.<sup>73</sup> Most disc herniations resolve in 8 weeks.<sup>72</sup> Patients typically see improvement within 4 weeks of noninvasive management and there is little evidence to support routine imaging.<sup>78</sup> In fact, a randomized controlled trial comparing MRI and standard lumbar radiography found that patients who received MRI were more than twice as likely to undergo surgical interventions than patients in the lumbar radiography arm (risk difference, 0.34; 95%CI, -0.06 to 0.73).<sup>79</sup> Several randomized controlled trials suggest that early imaging for LBP incurs costs in terms of increased health care resource utilization but does not improve treatment or patient outcomes. In addition, early imaging may result in unnecessary treatment and the associated negative impact on the patient's emotional and psychological well-being.<sup>80</sup>

**SPINAL STENOSIS**

Rapid decline in patients with mild or moderately symptomatic degenerative lumbar stenosis is rare, and there is insufficient evidence to make a recommendation for or against a correlation between clinical symptoms or function with the presence of anatomic narrowing of the spinal canal on MRI, CT myelogram, or CT.<sup>81</sup>

Clinicians should evaluate patients with persistent LBP and signs or symptoms of radiculopathy or spinal stenosis with MRI (preferred) or CT only if they are potential candidates for surgery or epidural steroid injection (for suspected radiculopathy).<sup>78</sup>

**PEDIATRIC BACK PAIN**

Low back pain in children and adolescents is a common problem. The prevalence of LBP rises with age: 1% at age 7, 6% at age 10, and 18% at ages 14 to 16. By age 18, the lifetime prevalence of LBP approaches that documented in adults, with an estimated yearly prevalence of 20% and a lifetime prevalence of 75%. More than 7% of adolescents experiencing LBP will seek medical attention.<sup>82</sup>

The American College of Radiology states that for a child with back pain and no clinical red flags (constant pain, night pain, radicular pain, pain lasting over 4 weeks, and/or abnormal neurologic examination), imaging is not recommended. For a child with back pain and red flags, spine radiographs are recommended as the initial evaluation. For a child with back pain, red flags and normal radiographs, MRI spine without contrast is recommended. MRI with contrast is useful if

there is concern for inflammation, infection, or neoplasm. For a child with back pain and positive radiographs, MRI spine without contrast is recommended.

For a child with chronic back pain from overuse (mechanical), spine radiographs are recommended. MRI spine without contrast is recommended to evaluate for additional site involvement or when radiographs do not demonstrate an abnormality, or to evaluate for additional sites of involvement when radiographs are abnormal.<sup>83</sup>

## References

1. Colebatch-Bourn AN, Edwards CJ, Collado P, et al. EULAR-PreS points to consider for the use of imaging in the diagnosis and management of juvenile idiopathic arthritis in clinical practice. *Ann Rheum Dis*. 2015;74(11):1946-57.
2. Pereira EAC, Oxenham M, Lam KS. Intraspinous anomalies in early-onset idiopathic scoliosis. *Bone Joint J*. 2017;99-B(6):829-33.
3. Calloni SF, Huisman TA, Poretti A, et al. Back pain and scoliosis in children: When to image, what to consider. *The neuroradiology journal*. 2017;30(5):393-404.
4. Wright N. Imaging in scoliosis. *Arch Dis Child*. 2000;82(1):38-40.
5. Horne JP, Flannery R, Usman S. Adolescent idiopathic scoliosis: diagnosis and management. *Am Fam Physician*. 2014;89(3):193-8.
6. Ameri E, Andalib A, Tari HV, et al. The role of routine preoperative magnetic resonance imaging in idiopathic scoliosis: a ten years review. *Asian Spine J*. 2015;9(4):511-6.
7. Alvarado E, Leach J, Care M, et al. Pediatric spinal ultrasound: neonatal and intraoperative applications. *Semin Ultrasound CT MR*. 2017;38(2):126-42.
8. Ausili E, Maresca G, Massimi L, et al. Occult spinal dysraphisms in newborns with skin markers: role of ultrasonography and magnetic resonance imaging. *Childs Nerv Syst*. 2018;34(2):285-91.
9. O'Neill BR, Gallegos D, Herron A, et al. Use of magnetic resonance imaging to detect occult spinal dysraphism in infants. *J Neurosurg Pediatrics*. 2017;19(2):217-26.
10. van den Hondel D, Sloots C, de Jong TH, et al. Screening and Treatment of Tethered Spinal Cord in Anorectal Malformation Patients. *European journal of pediatric surgery : official journal of Austrian Association of Pediatric Surgery [et al] = Zeitschrift fur Kinderchirurgie*. 2016;26(1):22-8.
11. Chauvin NA, Khwaja A. Imaging of inflammatory arthritis in children: status and perspectives on the use of ultrasound, radiographs, and magnetic resonance imaging. *Rheum Dis Clin North Am*. 2016;42(4):587-606.
12. The Royal Australian College of General Practitioners. Clinical guideline for the diagnosis and management of juvenile idiopathic arthritis. East Melbourne, AU: The Royal Australian College of General Practitioners; 2009. 43 pgs.
13. Fogarty E, Schmitz S, Tubridy N, et al. Comparative efficacy of disease-modifying therapies for patients with relapsing remitting multiple sclerosis: Systematic review and network meta-analysis. *Mult Scler Relat Disord*. 2016;9:23-30.
14. Tramacere I, Del Giovane C, Salanti G, et al. Immunomodulators and immunosuppressants for relapsing-remitting multiple sclerosis: a network meta-analysis. *Cochrane Database Syst Rev*. 2015(9):CD011381.
15. Thompson AJ, Banwell BL, Barkhof F, et al. Diagnosis of multiple sclerosis: 2017 revisions of the McDonald criteria. *Lancet Neurol*. 2018;17(2):162-73.
16. National Clinical Guideline Centre. Multiple sclerosis: management of multiple sclerosis in primary and secondary care. London, UK: National Institute for Health and Care Excellence; 2014. 611 pgs.
17. Scott TF, Frohman EM, De Seze J, et al. Evidence-based guideline: clinical evaluation and treatment of transverse myelitis: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology*. 2011;77(24):2128-34.
18. Rae-Grant A, Day GS, Marrie RA, et al. Practice guideline recommendations summary: Disease-modifying therapies for adults with multiple sclerosis: Report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. *Neurology*. 2018;90(17):777-88.

19. Traboulsee A, Simon JH, Stone L, et al. Revised recommendations of the Consortium of MS Centers Task Force for a Standardized MRI Protocol and clinical guidelines for the diagnosis and follow-up of multiple sclerosis. *AJNR Am J Neuroradiol.* 2016;37(3):394-401.
20. Vagberg M, Axelsson M, Birgander R, et al. Guidelines for the use of magnetic resonance imaging in diagnosing and monitoring the treatment of multiple sclerosis: recommendations of the Swedish Multiple Sclerosis Association and the Swedish Neuroradiological Society. *Acta Neurol Scand.* 2017;135(1):17-24.
21. Rovira A, Wattjes MP, Tintore M, et al. Evidence-based guidelines: MAGNIMS consensus guidelines on the use of MRI in multiple sclerosis-clinical implementation in the diagnostic process. *Nat Rev Neurol.* 2015;11(8):471-82.
22. Filippi M, Rocca MA, Arnold DL, et al. Use of imaging in multiple sclerosis. In: Gilhus NE, Barnes MP, Brainin M, editors. *European Handbook of Neurological Management.* 1. 2nd ed. Oxford: Blackwell Publishing; 2011.
23. Kennedy TA, Corey AS, Policeni B, et al. ACR Appropriateness Criteria orbits vision and visual loss. *J Am Coll Radiol.* 2018;15(5s):S116-s31.
24. Wattjes MP, Rovira A, Miller D, et al. Evidence-based guidelines: MAGNIMS consensus guidelines on the use of MRI in multiple sclerosis--establishing disease prognosis and monitoring patients. *Nat Rev Neurol.* 2015;11(10):597-606.
25. Tenenbaum S, Chitnis T, Ness J, et al. Acute disseminated encephalomyelitis. *Neurology.* 2007;68(16 Suppl 2):S23-36.
26. Sellner J, Boggild M, Clanet M, et al. EFNS guidelines on diagnosis and management of neuromyelitis optica. *Eur J Neurol.* 2010;17(8):1019-32.
27. Joaquim AF, Appenzeller S. Cervical spine involvement in rheumatoid arthritis--a systematic review. *Autoimmun Rev.* 2014;13(12):1195-202.
28. Paus AC, Steen H, Roislien J, et al. High mortality rate in rheumatoid arthritis with subluxation of the cervical spine: a cohort study of operated and nonoperated patients. *Spine.* 2008;33(21):2278-83.
29. Berbari EF, Kanj SS, Kowalski TJ, et al. 2015 Infectious Diseases Society of America (IDSA) Clinical Practice Guidelines for the Diagnosis and Treatment of Native Vertebral Osteomyelitis in Adults. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America.* 2015;61(6):e26-46.
30. Chou R, Qaseem A, Owens DK, et al. Diagnostic imaging for low back pain: advice for high-value health care from the American College of Physicians. *Ann Intern Med.* 2011;154(3):181-9.
31. Airaksinen O, Brox JI, Cedraschi C, et al. Chapter 4. European guidelines for the management of chronic nonspecific low back pain. *European spine journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society.* 2006;15 Suppl 2:S192-300.
32. Sepriano A, Rubio R, Ramiro S, et al. Performance of the ASAS classification criteria for axial and peripheral spondyloarthritis: a systematic literature review and meta-analysis. *Ann Rheum Dis.* 2017;76(5):886-90.
33. Baraliakos X, Braun J. Imaging scoring methods in axial spondyloarthritis. *Rheum Dis Clin North Am.* 2016;42(4):663-78.
34. Schueller-Weidekamm C, Mascarenhas VV, Sudol-Szopinska I, et al. Imaging and interpretation of axial spondylarthritis: the radiologist's perspective--consensus of the Arthritis Subcommittee of the ESSR. *Semin Musculoskelet Radiol.* 2014;18(3):265-79.
35. National Institute for Health and Care Excellence. *Spondyloarthritis in over 16s: diagnosis and management.* London, UK: National Institute for Health and Care Excellence; 2017. 205 pgs.
36. Mandl P, Navarro-Compán V, Terslev L, et al. EULAR recommendations for the use of imaging in the diagnosis and management of spondyloarthritis in clinical practice. *Ann Rheum Dis.* 2015;74(7):1327.
37. Ez-Zaitouni Z, Bakker PA, van Lunteren M, et al. The yield of a positive MRI of the spine as imaging criterion in the ASAS classification criteria for axial spondyloarthritis: results from the SPACE and DESIR cohorts. *Ann Rheum Dis.* 2017;76(10):1731-6.
38. van der Heijde D, Ramiro S, Landewe R, et al. 2016 update of the ASAS-EULAR management recommendations for axial spondyloarthritis. *Ann Rheum Dis.* 2017;76(6):978-91.
39. Schueller G, Schueller-Weidekamm C. The traumatized vertebral spine reloaded: injury mechanisms and their radiologic patterns. *Semin Musculoskelet Radiol.* 2014;18(3):240-5.

40. Como JJ, Diaz JJ, Dunham CM, et al. Practice management guidelines for identification of cervical spine injuries following trauma: update from the Eastern Association for the Surgery of Trauma Practice Management Guidelines Committee. *J Trauma Acute Care Surg.* 2009;67(3).
41. National Clinical Guideline Centre. *Spinal injury: assessment and initial management.* London, UK: National Institute for Health and Care Excellence; 2016. 247 pgs.
42. Sheikh K, Belfi LM, Sharma R, et al. Evaluation of acute cervical spine imaging based on ACR Appropriateness Criteria(R). *Emerg Radiol.* 2012;19(1):11-7.
43. Moser N, Lemeunier N, Southerst D, et al. Validity and reliability of clinical prediction rules used to screen for cervical spine injury in alert low-risk patients with blunt trauma to the neck: part 2. A systematic review from the Cervical Assessment and Diagnosis Research Evaluation (CADRE) Collaboration. *Eur Spine J.* 2017.
44. Michaleff ZA, Maher CG, Verhagen AP, et al. Accuracy of the Canadian C-spine rule and NEXUS to screen for clinically important cervical spine injury in patients following blunt trauma: a systematic review. *CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne.* 2012;184(16):E867-76.
45. Paykin G, O'Reilly G, Ackland H, et al. Review article: NEXUS criteria to rule out cervical spine injury among older patients: A systematic review. *Emergency medicine Australasia : EMA.* 2018;30(4):450-5.
46. Stiell IG, Wells GA, Vandemheen KL, et al. The Canadian C-spine rule for radiography in alert and stable trauma patients. *Jama.* 2001;286(15):1841-8.
47. Slaar A, Fockens MM, Wang J, et al. Triage tools for detecting cervical spine injury in pediatric trauma patients. *The Cochrane database of systematic reviews.* 2017;12:Cd011686.
48. Boese CK, Lechler P. Spinal cord injury without radiologic abnormalities in adults: a systematic review. *J Trauma Acute Care Surg.* 2013;75(2):320-30.
49. Boese CK, Oppermann J, Siewe J, et al. Spinal cord injury without radiologic abnormality in children: a systematic review and meta-analysis. *J Trauma Acute Care Surg.* 2015;78(4):874-82.
50. Badhiwala JH, Lai CK, Alhazzani W, et al. Cervical spine clearance in obtunded patients after blunt traumatic injury: a systematic review. *Ann Intern Med.* 2015;162(6):429-37.
51. Sixta S, Moore FO, Ditillo MF, et al. Screening for thoracolumbar spinal injuries in blunt trauma: An Eastern Association for the Surgery of Trauma practice management guideline. *J Trauma Acute Care Surg.* 2012;73(5).
52. Nebot Valenzuela E, Pietschmann P. Epidemiology and pathology of Paget's disease of bone - a review. *Wien Med Wochenschr.* 2017;167(1-2):2-8.
53. Amoozegar F, Guglielmin D, Hu W, et al. Spontaneous intracranial hypotension: recommendations for management. *Can J Neurol Sci.* 2013;40(2):144-57.
54. Lin JP, Zhang SD, He FF, et al. The status of diagnosis and treatment to intracranial hypotension, including SIH. *J Headache Pain.* 2017;18(1):4.
55. Kelly J, Ritchie C, Sterling M. Clinical prediction rules for prognosis and treatment prescription in neck pain: a systematic review. *Musculoskelet Sci Pract.* 2017;27:155-64.
56. Murray CJ, Atkinson C, Bhalla K, et al. The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. *Jama.* 2013;310(6):591-608.
57. Fejer R, Kyvik KO, Hartvigsen J. The prevalence of neck pain in the world population: a systematic critical review of the literature. *Eur Spine J.* 2006;15(6):834-48.
58. Radhakrishnan K, Litchy WJ, O'Fallon WM, et al. Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990. *Brain : a journal of neurology.* 1994;117 ( Pt 2):325-35.
59. Bussieres AE, Taylor JA, Peterson C. Diagnostic imaging practice guidelines for musculoskeletal complaints in adults-an evidence-based approach-part 3: spinal disorders. *J Manipulative Physiol Ther.* 2008;31(1):33-88.
60. Guzman J, Haldeman S, Carroll LJ, et al. Clinical practice implications of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders: from concepts and findings to recommendations. *J Manipulative Physiol Ther.* 2009;32(2 Suppl):S227-43.
61. Childress MA, Becker BA. Nonoperative management of cervical radiculopathy. *Am Fam Physician.* 2016;93(9):746-54.

62. Childs JD, Cleland JA, Elliott JM, et al. Neck pain: Clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association. *J Orthop Sports Phys Ther.* 2008;38(9):A1-a34.
63. Gross A, Kay TM, Paquin JP, et al. Exercises for mechanical neck disorders. *Cochrane Database Syst Rev.* 2015;1:Cd004250.
64. Ris I, Sogaard K, Gram B, et al. Does a combination of physical training, specific exercises and pain education improve health-related quality of life in patients with chronic neck pain? A randomised control trial with a 4-month follow up. *Manual therapy.* 2016;26:132-40.
65. Monticone M, Ambrosini E, Rocca B, et al. Group-based multimodal exercises integrated with cognitive-behavioural therapy improve disability, pain and quality of life of subjects with chronic neck pain: a randomized controlled trial with one-year follow-up. *Clinical rehabilitation.* 2017;31(6):742-52.
66. Beltran-Alacreu H, Lopez-de-Uralde-Villanueva I, Fernandez-Carnero J, et al. Manual Therapy, Therapeutic Patient Education, and Therapeutic Exercise, an Effective Multimodal Treatment of Nonspecific Chronic Neck Pain: A Randomized Controlled Trial. *American journal of physical medicine & rehabilitation.* 2015;94(10 Suppl 1):887-97.
67. North American Spine Society. *Diagnosis and treatment of cervical radiculopathy from degenerative disorders.* Burr Ridge, IL: North American Spine Society; 2010. 181 pgs.
68. Laimi K, Pitkanen J, Metsahonkala L, et al. Adolescent cervical disc degeneration in MRI does not predict adult headache or neck pain: a 5-year follow-up of adolescents with and without headache. *Cephalalgia.* 2014;34(9):679-85.
69. Cox J, Davidian C, Mior S. Neck pain in children: a retrospective case series. *J Can Chiropr Assoc.* 2016;60(3):212-9.
70. Antunes NL. Back and neck pain in children with cancer. *Pediatr Neurol.* 2002;27(1):46-8.
71. Centers for Disease Control and Prevention. Prevalence and most common causes of disability among adults--United States, 2005. *MMWR Morb Mortal Wkly Rep.* 2009;58(16):421-6.
72. Institute for Clinical Systems Improvement. *Adult acute and subacute low back pain.* Bloomington, MN: Institute for Clinical Systems Improvement; 2012. 92 pgs.
73. Patel ND, Broderick DF, Burns J, et al. ACR Appropriateness Criteria Low Back Pain. *Journal of the American College of Radiology : JACR.* 2016;13(9):1069-78.
74. Pengel LH, Herbert RD, Maher CG, et al. Acute low back pain: systematic review of its prognosis. *Bmj.* 2003;327(7410):323.
75. Hayden JA, van Tulder MW, Tomlinson G. Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. *Ann Intern Med.* 2005;142(9):776-85.
76. Atlas SJ, Deyo RA. Evaluating and Managing Acute Low Back Pain in the Primary Care Setting. *Journal of General Internal Medicine.* 2001;16(2):120-31.
77. Institute of Health Economics. *Toward Optimized Practice. Guideline for the evidence-informed primary care management of low back pain.* Edmonton, CA2011. 37 pgs.
78. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med.* 2007;147(7):478-91.
79. Srinivas SV, Deyo RA, Berger ZD. Application of "less is more" to low back pain. *Arch Intern Med.* 2012;172(13):1016-20.
80. Graves JM, Fulton-Kehoe D, Jarvik JG, et al. Early imaging for acute low back pain: one-year health and disability outcomes among Washington State workers. *Spine.* 2012;37(18):1617-27.
81. Kreiner DS, Shaffer WO, Baisden JL, et al. An evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis (update). *Spine J.* 2013;13(7):734-43.
82. MacDonald J, Stuart E, Rodenberg R. Musculoskeletal Low Back Pain in School-aged Children: A Review. *JAMA pediatrics.* 2017;171(3):280-7.
83. Booth TN, Iyer RS, Falcone RA, Jr., et al. ACR Appropriateness Criteria back pain-child. *J Am Coll Radiol.* 2017;14(5s):S13-s24.

## Codes

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

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

### CPT/HCPCS

72125	CT cervical spine, without contrast
72126	CT cervical spine, with contrast
72127	CT cervical spine, without contrast, followed by reimaging with contrast
72128	CT thoracic spine, without contrast
72129	CT thoracic spine, with contrast
72130	CT thoracic spine, without contrast, followed by reimaging with contrast
72131	CT lumbar spine, without contrast
72132	CT lumbar spine, with contrast
72133	CT lumbar spine, without contrast, followed by reimaging with contrast
72141	MRI cervical spine, without contrast
72142	MRI cervical spine, with contrast
72146	MRI thoracic spine, without contrast
72147	MRI thoracic spine, with contrast
72148	MRI lumbar spine, without contrast
72149	MRI lumbar spine, with contrast
72156	MRI cervical spine, without contrast, followed by reimaging with contrast
72157	MRI thoracic spine, without contrast, followed by reimaging with contrast
72158	MRI lumbar spine, without contrast, followed by reimaging with contrast
77078	CT bone mineral density study, 1 or more sites, axial skeleton
78811	PET imaging, limited area
78812	PET imaging, skull to mid-thigh
78813	PET imaging, whole body
78814	PET imaging, with concurrently acquired CT for attenuation correction and anatomic localization; limited area
78815	PET imaging, with concurrently acquired CT for attenuation correction and anatomic localization; skull base to mid-thigh
78816	PET imaging, with concurrently acquired CT for attenuation correction and anatomic localization; whole body
G0235	PET imaging, any site, not otherwise specified
S8085	Fluorine-18 fluorodeoxyglucose (f-18 fdg) imaging using dual-head coincidence detection system (non-dedicated PET scan)

### ICD-10 Diagnosis

Refer to the ICD-10 CM manual

## History

Status	Review Date	Effective Date	Action
Revised	-	03/14/2021	Added HCPCS codes G0235 and S8085.
Reaffirmed	07/08/2020	Unchanged	Last Independent Multispecialty Physician Panel (IMPP) review. Guideline reaffirmed.
Revised	01/28/2019	09/28/2019	IMPP review. Revised general prerequisites for spine imaging and these indications: Multiple sclerosis, Spinal infection, Cervical injury, Thoracic or lumbar injury, Paget's disease, Spontaneous intracranial hypotension, Perioperative imaging, Neck pain, Mid-back pain.
Restructured	09/12/2018	01/01/2019	IMPP review. Advanced Imaging guidelines redesigned and reorganized to a condition-based structure. Incorporated AIM guidelines for pediatric imaging.
Revised	07/11/2018	03/09/2019	IMPP review. Renamed the Administrative Guidelines to "General Clinical Guideline." Retitled Pretest Requirements to "Clinical Appropriateness Framework" to summarize the components of a decision to pursue diagnostic testing. Revised to expand applicability beyond diagnostic imaging, retitled Ordering of Multiple Studies to "Ordering of Multiple Diagnostic or Therapeutic Interventions" and replaced imaging-specific terms with "diagnostic or therapeutic intervention." Repeated Imaging split into two subsections, "repeat diagnostic testing" and "repeat therapeutic intervention."
Reaffirmed	02/14/2017	03/12/2018	Annual review.
Revised	07/26/2016	11/20/2017	IMPP review.
Created	-	03/30/2005	Original effective date.