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Clinical Appropriateness Guidelines

Advanced Imaging

Appropriate Use Criteria: Imaging of the Spine

Proprietary

Table of Contents

Description and Application of the Guidelines

The Carelon Clinical Appropriateness Guidelines (hereinafter “the Carelon 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. The Guidelines establish objective and evidence-based criteria for medical necessity determinations, where possible, that can be used in support of the following:

- 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 address patient safety concerns
- To enhance the quality of health care
- To promote the most efficient and cost-effective use of services

The Carelon guideline development process complies with applicable accreditation and legal 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. Resources reviewed include widely-used treatment guidelines, randomized controlled trials or prospective cohort studies, and large systematic reviews or meta-analyses. Carelon reviews all of its Guidelines at least annually.

Carelon makes its Guidelines publicly available on its website. Copies of the Guidelines are also available upon oral or written request. Additional details, such as summaries of evidence, a list of the sources of evidence, and an explanation of the rationale that supports the adoption of the Guidelines, are included in each guideline document.

Although the Guidelines are publicly-available, Carelon considers the Guidelines to be important, proprietary information of Carelon, which cannot be sold, assigned, leased, licensed, reproduced or distributed without the written consent of Carelon.

Carelon 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 Carelon 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, and in the case of reviews for Medicare Advantage Plans, the Guidelines are only applied where there is not fully established CMS criteria. If requested by a health plan, Carelon will review requests based on health plan medical policy/guidelines in lieu of the Carelon Guidelines. Pharmaceuticals, radiotracers, or medical devices used in any of the diagnostic or therapeutic interventions listed in the Guidelines must be FDA approved or conditionally approved for the intended use. However, use of an FDA approved or conditionally approved product does not constitute medical necessity or guarantee reimbursement by the respective health plan.

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

General Clinical Guideline

Clinical Appropriateness Framework

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

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

Providers may be required to submit clinical documentation in support of a request for services. Such documentation must a) accurately reflect the clinical situation at the time of the requested service, and b) sufficiently document the ordering provider's clinical intent.

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 justify a finding of clinical appropriateness. During the peer-to-peer conversation, factors such as patient acuity and setting of service may also be taken into account to the extent permitted by law.

Simultaneous Ordering of Multiple Diagnostic or Therapeutic Interventions

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

Additionally, either of the following may apply:

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

Repeat Diagnostic Intervention

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

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

- Repeated diagnostic testing at the same facility due to technical issues
- Repeated diagnostic testing requested at a different facility due to provider preference or quality concerns

- Repeated diagnostic testing of the same anatomic area based on persistent symptoms with no clinical change, treatment, or intervention since the previous study
- Repeated diagnostic testing of the same anatomic area by different providers for the same member over a short period of time

Repeat Therapeutic Intervention

In general, repeated therapeutic intervention in the same anatomic area is considered appropriate when the prior intervention proved effective or beneficial and the expected duration of relief has lapsed. A repeat intervention requested prior to the expected duration of relief is not appropriate unless it can be confirmed that the prior intervention was never administered. Requests for on-going services may depend on completion of previously authorized services in situations where a patient's response to authorized services is relevant to a determination of clinical appropriateness.

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** is testing in the absence of signs or symptoms of disease

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

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

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

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

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**[1] – a combination of strategies to reduce inflammation, alleviate pain, and correct underlying dysfunction, including physical therapy **AND** at least **ONE** complementary conservative treatment strategy.
    - **Physical therapy requirement** includes **ANY** of the following:
        - Physical therapy rendered by a qualified provider of physical therapy services
        - Supervised home treatment program that includes **ALL** of the following:
            - Participation in a patient specific or tailored program
            - Initial active instruction by physician or allied health provider with redemonstration of patient ability to perform exercises
            - Compliance (documented or by clinician attestation on follow-up evaluation)
        - **Exception to the physical therapy requirement** in unusual circumstances (for instance, intractable pain so severe that physical therapy is not possible) when clearly documented in the medical record
    - **Complementary conservative treatment requirement** includes **ANY** of the following:
        - Prescription strength anti-inflammatory medications and analgesics[2]
        - Adjunctive medications such as nerve membrane stabilizers or muscle relaxants[2]
        - Epidural steroid injection[2]

        - Alternative therapies such as acupuncture, chiropractic care, massage therapy, activity modification, and/or a trial period of rest (e.g. from the aggravating/contributing factors) where applicable
    - **Exception to specified duration of conservative management** may be made in unusual circumstances (for example, worsening of symptoms during a course of conservative management) when clearly documented in the medical record, or when the duration period is substantiated by documentation of serial evaluation

[1] Additional condition or procedure specific requirements may apply and can be found in the respective sections of the guideline.

[2] In the absence of contraindications

- **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.

Statistical terminology

- **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

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 (preferred)

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 following nondiagnostic radiographs when results of imaging will impact treatment.

IMAGING STUDY

- CT cervical, thoracic, or lumbar spine (preferred)
- MRI cervical, thoracic, or lumbar spine

Craniocervical 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
- 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,[1] which carries an increased risk of mortality and morbidity in rheumatoid arthritis patients,[2] and lifetime radiological follow up may be required.

Scoliosis

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

- Congenital, juvenile or neuromuscular scoliosis
- Adolescent idiopathic scoliosis in **ANY** of the following scenarios:
    - High-risk features (any **ONE**):
        - Early onset (prior to 10 years of age)
        - Atypical curves (left thoracic or right lumbar)
        - Neurological signs or symptoms
    - Presurgical planning for adolescent idiopathic scoliosis with a Cobb angle of at least 40 degrees
    - Persistent and significant neurogenic symptoms (claudication or radicular pain) with functional impairment, unresponsive to at least 3 months of conservative management
- Severe degenerative scoliosis with a minimum Cobb angle of 30 degrees, or sagittal vertical axis greater than 5 cm, for presurgical planning with **ANY** of the following:
    - Documented progression of deformity with persistent axial (non-radiating) pain and functional impairment, unresponsive to at least 3 months of conservative management
    - Persistent and significant neurogenic symptoms (claudication or radicular pain) with functional impairment, unresponsive to at least 3 months of conservative management
- Post-surgical evaluation in patients with new or progressive symptoms when radiographs are nondiagnostic

** Lower thresholds for Cobb angle and/or non surgical management may be appropriate in patients with high-risk features*

** Post-surgical evaluation may be covered by other guidelines (infection, trauma, etc.)*

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.[3] 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.[4]

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.[4]

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.[5]

Adolescent scoliosis is common (2%-4% prevalence) and usually idiopathic.[6] The typical patient has a right thoracic or thoracolumbar curve (S-shaped) and no neurological findings, and imaging is not generally indicated.[5] 96-98% of adolescents with idiopathic scoliosis do not have an underlying abnormality; therefore, in the absence of risk factors, MRI screening is not efficacious.[7]

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.[8]

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).[4]

A clinical practice guideline states, “Other diagnostic imaging procedures are in use in idiopathic scoliosis, like various radiographic technique beyond classical projections, MRI, and neurophysiological exams. Nevertheless, beyond their importance in the surgical setting, in the everyday use for conservative purposes, these techniques are not supported by the actual evidence, unless there are symptoms and signs of neurological compromise. Magnetic resonance imaging does not serve for deformity evaluation; however, it should be ordered to rule out the diagnosis of non-idiopathic scoliosis (Chiari malformation, syringomyelia, diastematomyelia, tethered spinal cord). Computed tomography is not used in non-surgical management of idiopathic scoliosis because of high radiation dose.”[9]

Spinal dysraphism and tethered cord

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

Note: Only lumbar spine imaging is required when evaluating a tethered cord.

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.[10]

Ultrasound of the spine can be performed in neonates prior to ossification of the cartilaginous spine[10] and is a useful screening test in newborns and in utero,[11] 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.[12]

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%.[13] 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.[10]

Infectious and Inflammatory Conditions

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 enthesis-related arthritis. JIA is the most common childhood rheumatic entity, with a prevalence of 0.6 to 1.9 in 1000 children.[14]

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.[15]

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.[15]

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.[16] 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.[14]

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]).[16]

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.[14]

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
    - New or progressive signs or symptoms of myelopathy
    - Initial evaluation of clinically isolated syndrome (CIS) or a new clinical attack (as defined by the 2017 McDonald criteria) in patients without an established MS diagnosis
    - When MS is suspected, and a recent MRI brain has not established another cause and is not sufficient to fulfill the 2017 McDonald criteria
- Management
    - Evaluation of new or recurrent signs or symptoms of myelopathy
    - 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[17] 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.[18] 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.[18]

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.**[19]** Spine MRI may also inform the management of MS by confirming a disease flare when clinically suspected or by excuding 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,[19,20] 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.[21] Future research is likely to change recommendations for the diagnosis and management of RIS and additional studies have been identified as a high priority.[19]

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).[22] 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.[23,24,25,26]

CT is not recommended in the evaluation of demyelinating disease due to low sensitivity relative to MRI and other clinical and laboratory tests.[27] 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[26] or incorporated into the McDonald criteria or other standardized MS imaging protocols and require further research before incorporation into routine clinical practice.[28]

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[29]; NMO typically presents with longitudinally extensive transverse myelitis (LETM) and a positive serum NMO-IgG/Aquaporin 4 (AQP4) antibody test.[21,30]

The McDonald criteria apply in pediatrics, although MS is rare in this population, and hence data is limited.[25]

Spinal infection

Includes epidural abscess, arachnoiditis, discitis, and vertebral osteomyelitis.

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

- Diagnosis in patients with new or worsening spinal pain or neurological abnormalities, and **ANY** of the following:
    - Documented fever
    - Elevated ESR or CRP
    - Known bloodstream infection
    - **ANY** of the following risk factors:
        - Diabetes mellitus
        - Intravenous drug use
        - Malignancy
        - HIV
        - Dialysis
        - Recent spinal intervention (examples include: surgery with or without hardware placement, stimulator implantation, or pain injection)
        - Decubitus ulcer or wound overlying the spine
- Management in patients with a poor response to therapy based on clinical and laboratory (ESR or CRP) assessment.

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, or when MRI cannot be performed and CT is nondiagnostic

Rationale

MRI has high diagnostic accuracy for spondylodiscitis, is widely available, nonionizing, and is recommended as the initial modality by multiple clinical guidelines.[31 32 33]

Axial 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 in **ANY** of the following scenarios:

- Diagnosis of nonradiographic spondyloarthritis (nrSpA) when **ALL** of the following are present:
    - Lumbar and sacral radiographs are negative or equivocal
    - Sacroiliac joint/pelvis MRI are equivocal for sacroiliitis
    - Inflammatory back pain which has been present for at least 3 months. Inflammatory back pain is defined as back pain with at least **FOUR (4)** of the following features:
        - Patient is younger than age 40
        - Insidious (gradual) onset
        - Improvement with exercise
        - No improvement with rest
        - Pain at night that improves on getting up
- Management when **ALL** of the following are present:
    - On biologic therapy for treatment of nonradiographic spondyloarthritis (nrSpA) involving the lumbar spine
    - Unclear disease activity after full clinical and laboratory evaluation
    - Lumbar spine is the only known site of disease
    - Progression on MRI will lead to a change of biologic drug or cessation of biologic therapy

IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine (preferred)

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 enthesis. 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.[34] While sacroiliitis is the most common MRI manifestation of axial spondyloarthropathy, bone marrow edema can be seen in the vertebra as well and characteristic patterns have been described.[35]

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.[36]
- 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.[37]
- 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.[38]

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.[34] Patients that do not meet the ASAS criteria are a low pretest probability group unlikely to have axial spondyloarthropathy. 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 spondyloarthropathy (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.[39]
- 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.[39]

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.[40]
- In case of negative radiographs in patients with a suspicion of SpA, MRI is mandatory to look for early inflammatory lesions.[41]
- Consider plain film X-rays, ultrasound and/or MRI of other peripheral and axial symptomatic sites[37]

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.[38]

Trauma

Cervical injury

Advanced imaging is considered medically necessary in the following scenarios:

ADULT

- Initial diagnosis of 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
- Management of trauma in **ANY** of the following scenarios:
    - Post-traumatic neurologic deficit on exam
    - 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 for initial diagnosis or management
- MRI cervical spine for management of trauma, except follow up of known fracture

PEDIATRIC

- Initial diagnosis of acute significant trauma following nondiagnostic radiographs in children age 3 or older who meet PECARN or NEXUS criteria or in children under 3 with a Pieretti-Vanmarcke weight score of 1 or greater
- Diagnosis or management of trauma in **ANY** of the following scenarios:
    - Post-traumatic neurologic deficit on exam
    - 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 for initial diagnosis, or for diagnosis or management of trauma
- MRI cervical spine for diagnosis or management of trauma

Rationale

Multiple guidelines recommend use of CT in patients with acute significant cervical trauma.[42, 43] While the diagnostic yield in the acute trauma setting is low,[44] the morbidity and mortality of a missed fracture are high.[45]

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.[46] 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,[47] and the Canadian C-spine rule excluded several high risk populations including inflammatory arthritis and prior surgery.[48] 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%).[49]

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,[50, 51] 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.[52]

Thoracic or lumbar injury

Advanced imaging is considered medically necessary in the following scenarios:

- Initial diagnosis of trauma in **EITHER** of the following scenarios:
    - High-risk patients (**ANY** of the following):
        - Midline thoracolumbar tenderness
        - High-energy mechanism of injury
        - Greater than 60 years of age
        - Unexaminable patient (intoxicated, GCS < 15, distracting injury)
        - Underlying ankylosing spondylitis or diffuse idiopathic skeletal hyperostosis (DISH)
    - Following nondiagnostic spine radiographs
- Management of trauma in **ANY** of the following scenarios:
    - Post-traumatic neurologic deficit on exam
    - Ligamentous injury suggested by CT or radiography
    - Progressively worsening pain unexplained by CT, in a high-risk patient (as defined above)
    - Follow up of symptomatic fracture with new or worsening symptoms
    - Presurgical planning

IMAGING STUDY

- CT thoracic or lumbar spine for initial diagnosis or for management
- MRI thoracic or lumbar spine for management of trauma, except follow up of symptomatic fracture

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.[53] 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.[43] 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.[53]

Tumor

Tumor

For management of documented malignancy, please refer to the Oncologic Imaging guidelines. For isolated neck or back pain, see Pain Indications.

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

Nontraumatic spinal fractures

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

- Diagnosis of compression fracture when **BOTH** of the following apply:
    - Radiographs are nondiagnostic
    - Pain is persistent after a two-week course of conservative management OR worsens during conservative management
- Management of fragility fracture when needed to direct intervention

IMAGING STUDY

- CT cervical, thoracic, or lumbar spine
- MRI cervical, thoracic, or lumbar spine (preferred)

Osteoporosis and osteopenia

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

Screening and Diagnostic indications

- Women over 64 years of age
- Post-menopausal women younger than 65 years of age who are at increased risk of osteoporosis with clinical risk factors
- Men aged 70 and older, or between 50 and 69 with clinical risk factors
- Persons being treated with medications associated with development of osteoporosis
- Persons with new onset fracture after age 50
- 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 interval development of risk factors for accelerated bone loss

Note: For patients with interval development of a risk factor for accelerated bone loss, please refer to Screening and Diagnostic Indications.

IMAGING STUDY

- CT bone density

Paget 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 disease of the bone is a metabolic bone disease characterized by noninflammatory osteoclastic activity followed by osteoblastic activity.[54] 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 (pars defect)

Advanced imaging of the spine is considered medically necessary for suspected spondylolysis following nondiagnostic lumbar spine radiographs.

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.[55] The condition is relatively rare with an estimated incidence of 2 to 5 per 100,000[56] and typically presents with an orthostatic headache in the setting of a low (< 6 cm H_2O) CSF pressure and only very rarely without headache.[55] 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.[55] 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, management, and a single surveillance study to confirm stability .

IMAGING STUDY

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

Note: Repeat MRI spine with contrast may be appropriate when a syrinx was discovered on a noncontrast examination. Surveillance imaging indicates that there are no new or worsening signs or symptoms and the syrinx has been stable on prior imaging studies.

Perioperative and Periprocedural Imaging

Postoperative and postprocedural imaging, including delayed hardware failure or healing related to prior surgery, not otherwise specified

Includes conditions not otherwise referenced in the Spine guidelines. For pain after spine surgery beyond the perioperative time frame, please refer to the Pain indications.

Advanced imaging is considered medically necessary for diagnosis and management following nondiagnostic radiographs.

IMAGING STUDY

- CT cervical, thoracic, or lumbar spine (excluding CT discography)
- MRI cervical, thoracic, or lumbar spine

Signs and Symptoms

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 new or worsening 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 of myelopathic signs or symptoms.

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 in adults

Radiculopathy

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

- Radiculopathy with neurologic findings suggesting nerve root or cord compression that has not previously been imaged or has progressed since imaging was performed
- Radiculopathy that has not responded to at least 6 weeks of conservative management

IMAGING STUDY

- CT cervical, thoracic, or lumbar spine when MRI cannot be performed or is nondiagnostic; or when being done as CT myelography
- MRI cervical, thoracic, or lumbar spine

Spinal stenosis

ADULT

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

- Pain with neurologic findings (other than neurogenic claudication) suggesting lumbar nerve root or cord compression that has not previously been imaged or has progressed since imaging was performed
- Acute onset of neurogenic claudication in patients who are not candidates for conservative management due to intractable pain
- Chronic neurogenic claudication that has not responded to at least 6 weeks of conservative management
- Spondylolisthesis, with evidence of instability on lumbar spine radiographs

IMAGING STUDY

- CT lumbar spine (excluding CT discography) when MRI cannot be performed or is nondiagnostic
- MRI lumbar spine

Rationale

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.[57]

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).[58]

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.

Non-specific 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:

- For persistent localized or non-radicular pain following at least 6 weeks of conservative management and negative or nondiagnostic radiographs
- 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

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 (excluding CT discography) when MRI cannot be performed or is nondiagnostic
- MRI cervical spine

Rationale

Neck pain is the fourth leading cause of global disability and has an annual prevalence rate exceeding 30%.[59-61] A majority (approximately 70%) of patients with neck pain improve with conservative/medical management alone.[62]

Agreement exists among several high-quality guidelines that patients with progressive neurological deficits should undergo MRI,[63, 64] 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.[65]

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.[66]

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.[67] 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.[68]
- Multimodal exercises and cognitive behavioral therapy result in less disability from neck pain at 1 year when compared to general physiotherapy.[68,69]
- Education and exercise are more effective at reducing 4-month disability from neck pain than manual therapy alone.[70]

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,[63,71] 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, which are recommended by the American College of Radiology[72] for initial imaging of new or increasing nontraumatic neck pain in the absence of "red flags." 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.[65]

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.[73] The majority of neck pain in children may be mechanical, although data is retrospective[74] and neck pain may be the presentation of more serious disease, including retropharyngeal abscess or neoplasm.[75]

Non-specific 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 (excluding CT discography) when MRI cannot be performed or is nondiagnostic
- MRI thoracic spine

Rationale

Evidence regarding the assessment of pain in the thoracic region is limited, as non-specific pain in this region is less common than either cervical or lumbar region pain. However, specialty society guidance regarding the management of thoracic region pain generally aligns with that regarding lumbar region pain.[76]

Non-specific 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:

- Pain with nondiagnostic radiographs and **ANY** of the following characteristics:
    - Constant
    - Occurs at night
    - Radicular
    - Duration greater than 4 weeks and not responsive to conservative management
- Pain with neurologic findings suggesting lumbar nerve root or cord compression that has not previously been imaged or has progressed since imaging was performed

IMAGING STUDY

- CT lumbar spine (excluding CT discography) when MRI cannot be performed or is nondiagnostic
- 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.[77,78] It is the second most common reason for a physician visit and affects 80% to 85% of people over their lifetimes.[79]

ACUTE LOW BACK PAIN

The majority of individuals with an episode of acute LBP improve and return to work within the first 2 weeks.[80] The probability of recurrence within the first year ranges from 30% to 60%.[81] 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.[82] Most patients who seek attention for their back pain will improve within 2 weeks, and most experience significant improvement within 4 weeks.[78] Practitioners should emphasize that acute LBP is nearly always benign and generally resolves within 1 to 6 weeks.[83] Most patients presenting with uncomplicated acute LBP and/or radiculopathy do not require imaging.[79] Routine advanced imaging has not been shown to improve patient outcomes and may in fact identify abnormalities that are unrelated to the presenting symptoms.[79]

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.[79] Most disc herniations resolve in 8 weeks.[78] Patients typically see improvement within 4 weeks of noninvasive management and there is little evidence to support routine imaging.[58] 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).[84] 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.[85]

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.[57]

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).[58]

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.[86]

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.[87]

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Codes

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

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

CPT/HCPCS

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	01/23/2024	10/20/2024	Independent Multispecialty Physician Panel (IMPP) review. Revised definitions and these indications: Postoperative and postprocedural imaging and Non-specific low back pain.
Updated	01/23/2024	Unchanged	Expanded guideline rationale. Added required language per new Medicare regulations.
Revised	01/24/2023	09/10/2023	IMPP review. Revised indications: Spinal infection, Cervical injury, Thoracic or lumbar injury, and Radiculopathy.
Revised	11/11/2021	09/11/2022	IMPP review. Revised general prerequisites for spine imaging and these indications: Cervical injury, Thoracic or lumbar injury, Osteoporosis and osteopenia, Perioperative and periprocedural Imaging, including delayed hardware failure or healing related to prior surgery, not otherwise specified.
Revised	12/03/2020	09/12/2021	IMPP review. Revised definitions, general prerequisites for spine imaging and these indications: Chiari malformation, Congenital vertebral defects, Craniocervical junction abnormalities, Scoliosis, Spinal dysraphism and tethered cord, Multiple sclerosis or other white matter disease, Rheumatoid arthritis, Spinal infection, Axial spondyloarthropathy, Cervical

Status	Review Date	Effective Date	Action
			injury, Thoracic or lumbar injury, Nontraumatic spinal fractures, Osteoporosis and osteopenia, Spondylolysis (pars defect), Syringomyelia, Perioperative and periprocedural imaging, including delayed hardware failure or healing related to prior surgery, not otherwise specified, Radiculopathy, Spinal stenosis, Non-specific neck pain (cervical), Non-specific mid-back pain (thoracic), Non-specific low back pain (lumbar).
Revised	-	03/14/2021	Added HCPCS codes G0235 and S8085.
Reaffirmed	07/08/2020	Unchanged	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.