CLINICAL APPROPRIATENESS GUIDELINES

ADVANCED IMAGING

Appropriate Use Criteria: Imaging of the Spine

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Proprietary

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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. 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.

Administrative Guidelines

Ordering of Multiple Studies

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

Simultaneous Ordering of Multiple Studies

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

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

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

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

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

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

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

Repeated Imaging

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

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

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

Pre-Test Requirements

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

- A clinical evaluation has been performed prior to the imaging request (which should include a complete history and physical exam and review of results from relevant laboratory studies, prior imaging and supplementary testing) to identify suspected or established diseases or conditions.
- For suspected diseases or conditions:
    - Based on the clinical evaluation, there is a reasonable likelihood of disease prior to imaging; and
    - Current literature and standards of medical practice support that the requested imaging study is the most appropriate method of narrowing the differential diagnosis generated through the clinical evaluation and can be reasonably expected to lead to a change in management of the patient; and
    - The imaging requested is reasonably expected to improve patient outcomes based on current literature and standards of medical practice.
- For established diseases or conditions:
    - Advanced imaging is needed to determine whether the extent or nature of the disease or condition has changed; and
    - Current literature and standards of medical practice support that the requested imaging study is the most appropriate method of determining this and can be reasonably expected to lead to a change in management of the patient; and
    - The imaging requested is reasonably expected to improve patient outcomes based on current literature and standards of medical practice.
- If these elements are not established with respect to a given request, the determination of appropriateness will most likely require a peer-to-peer conversation to understand the individual and unique facts that would supersede the pre-test requirements set forth above. During the peer-to-peer conversation, factors such as patient acuity and setting of service may also be taken into account.

History

Status	Date	Action
Reviewed and revised	07/26/2016	Independent Multispecialty Physician Panel review and revision
Created	03/30/2005	Original effective date

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

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

Statistical terminology [1]

- **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%.

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 but not limited to the following:
  - Prescription strength anti-inflammatory medications and analgesics
  - Adjunctive medications such as nerve membrane stabilizers or muscle relaxants
  - Physician-supervised therapeutic exercise program or physical therapy
  - Manual therapy or spinal manipulation
  - Alternative therapies such as acupuncture
  - Appropriate management of underlying or associated cognitive, behavioral or addiction disorders

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

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 or 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 or MRI all spinal levels

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 or MRI all spinal levels

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 in persons with **ANY** of the following high-risk conditions:

- Down syndrome
- Grisel syndrome
- Skeletal dysplasia

IMAGING STUDY

- Radiographs required
- CT or 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

- Radiographs required for initial evaluation in pediatric patients
- CT or MRI of all spinal levels

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.[2] 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.[3]

Scoliosis is usually defined as a lateral curvature of the spine of > 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. [3]

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.[4]

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

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.[6]

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's).[3]

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 for diagnosis and management when results of imaging will impact treatment.

IMAGING STUDY

- Ultrasound required for initial evaluation in infants age 5 months or younger
- MRI cervical, thoracic, or lumbar spine
- CT thoracic or lumbar spine when MRI contraindicated

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.[7]

Ultrasound of the spine can be performed in neonates prior to ossification of the cartilaginous spine[7] and is a useful screening test in newborns and in utero,[8] 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.[9]

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 or 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%.[10] 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 3-4 months of age usually renders this modality suboptimal as a screening tool beyond this period.[7]

Infectious and Inflammatory Conditions

Juvenile idiopathic arthritis (Pediatric only)

Also see juvenile idiopathic arthritis in 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 all spinal levels
- CT when MRI is contraindicated or expected to be 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.[11]

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.[12]

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.[12]

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.[13] 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]). [13]

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

Advanced imaging of the spine is considered medically necessary when required to establish a diagnosis or guide management.

IMAGING STUDY

- MRI cervical or thoracic spine

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 or 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,[15] which carries an increased risk of mortality and morbidity in rheumatoid arthritis patients,[16] 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

- CT or MRI all spinal levels
- FDG-PET for chronic osteomyelitis

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 and/or laboratory evaluation.

IMAGING STUDY

- CT or MRI all spinal levels

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.[17] 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.[18]

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.[19]
- 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.[20]
- 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.[21]

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.[17] 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.[22]
- 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.[22]

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[23]
- In case of negative radiographs in patients with a suspicion of SpA, MRI is mandatory to look for early inflammatory lesions[24]
- Consider plain film X-rays, ultrasound and/or MRI of other peripheral and axial symptomatic sites[20]

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 SI 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.[21]

Trauma

Cervical injury

Advanced imaging is considered medically necessary in the following scenarios:

- Acute significant trauma
- Neurologic deficit suggestive of cord injury
- Progressively worsening pain following an injury
- Suspected fracture or craniocervical instability when radiographs are nondiagnostic

IMAGING STUDY

- CT or MRI cervical spine

Rationale

Multiple guidelines recommend use of CT in patients with acute significant cervical trauma.[25, 26] While the diagnostic yield in the acute trauma setting is low,[27] the morbidity and mortality of a missed fracture are high.[28]

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,[29, 30] 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.[31]

Thoracic or lumbar injury

Advanced imaging is considered medically necessary in the following scenarios:

- Acute significant trauma
- Neurologic deficit suggestive of cord injury
- Following nondiagnostic radiographs when **EITHER** of the following is present:
  - Suspected fracture
  - Progressive pain without neurologic findings

IMAGING STUDY

- CT or MRI of thoracic or lumbar spine

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.[32] 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.[26] 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.[32]

Tumor

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 or MRI all spinal levels

Miscellaneous Conditions of the Spine

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 or MRI spine for suspected compression fracture with nondiagnostic radiographs

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 all spinal levels
- CT all spinal levels when MRI is contraindicated or expected to be 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

- Radiographs required
- CT or MRI lumbar spine

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 contraindicated

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 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 or 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 all spinal levels
- CT all spinal levels may be used as an alternative in pediatric patients, or when MRI is contraindicated 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 which includes at least 2 different forms of treatment and negative or nondiagnostic radiographs
- Radicular pain – in **EITHER** of the following scenarios:
  - Documented abnormality on neurological exam in a dermatome/radicular distribution that has not previously been imaged or has progressed since a prior imaging study has been performed
  - Lack of improvement or worsening during a 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 therapy
- Pain with evidence of nerve root or cord compression

IMAGING STUDY

- CT or MRI cervical spine
- CT myelogram

Rationale

Neck pain is the fourth leading cause of global disability and has an annual prevalence rate exceeding 30%.[33-35] A majority (approximately 70%) of patients with neck pain improve with conservative/medical management alone.[36]

Agreement exists among several high-quality guidelines that patients with progressive neurological deficits should undergo MRI,[37, 38] 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.[39]

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.[40]

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.[41] 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.[42]
- Multimodal exercises and cognitive behavioral therapy result in less disability from neck pain at 1 year when compared to general physiotherapy.[42,43]
- Education and exercise are more effective at reducing 4-month disability from neck pain than manual therapy alone.[44]

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,[37,45] 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.[39]

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.[46] The majority of neck pain in children may be mechanical, although data is retrospective[47] and neck pain may be the presentation of more serious disease, including retropharyngeal abscess or neoplasm.[48]

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 4 to 6 weeks of conservative management supervised by the ordering physician

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 therapy
- Pain with evidence of nerve root or cord compression

IMAGING STUDY

- CT or MRI thoracic spine
- CT myelogram

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 supervised by the ordering physician

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 therapy of at least 4 weeks duration
- Pain in children younger than age 5
- Pain accompanied by any red flag features (see Table 1)

Table1: Red flag features of low back pain

Back pain characteristics	Constitutional signs	Neurologic signs and symptoms
• Constant pain • Disrupts sleep • Recurrent pain • Worsening after initiation of conservative management • Early morning stiffness	• Bruising • Lymphadenopathy • Night sweats • Unexplained fever • Weight loss	• Altered gait • Bowel or bladder dysfunction • Radicular pain • Sensory symptoms in a lumbar dermatome distribution • Spasticity/abnormal reflexes • Weakness

IMAGING STUDY

- CT or MRI lumbar spine
- CT myelogram

Rationale

Low back pain (LBP) is currently the second most common cause of disability in the United States and is the most common cause of disability in those under age 45.[49,50] It is the second most common reason for a physician visit and affects 80% to 85% of people over their lifetimes.[51]

ACUTE LOW BACK PAIN

The majority of individuals with an episode of acute LBP improve and return to work within the first 2 weeks.[52] The probability of recurrence within the first year ranges from 30% to 60%.[53] Most of these recurrences will recover in much the same pattern as the initial event. In as many as 1/3 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.[54] Most patients who seek attention for their back pain will improve within 2 weeks, and most experience significant improvement within 4 weeks.[50] Practitioners should emphasize that acute LBP is nearly always benign and generally resolves within 1 to 6 weeks.[55] Most patients presenting with uncomplicated acute LBP and/or radiculopathy do not require imaging.[51] Routine advanced imaging has not been shown to improve patient outcomes and may in fact identify abnormalities that are unrelated to the presenting symptoms.[51]

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.[51] Most disc herniations resolve in 8 weeks.[50] Patients typically see improvement within 4 weeks of noninvasive management and there is little evidence to support routine imaging.[56] 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).[57] 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.[58]

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, CTM, or CT."[59]

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).[56]

PEDIATRIC BACK PAIN

LBP 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.[60]

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.[61]

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Codes

The following codes may be applicable to the spine imaging and may not be all-inclusive.

CPT

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

HCPCS

None

ICD-10 Diagnosis

Refer to the ICD-10 CM manual

History

Status	Date	Action
Restructured	01/01/2019	Advanced Imaging guidelines redesigned and reorganized to a condition-based structure
Reviewed	02/14/2017	Last Independent Multispecialty Physician Panel review
Revised	07/26/2016	Independent Multispecialty Physician Panel revision
Created	03/30/2005	Original effective date