*National Imaging Associates, Inc.	
Clinical guideline **CERVICAL SPINE MRI**	**Original Date: September 1997**
CPT Codes: 72141, 72142, 72156, +0698T	**Last Revised Date: December 2023**
Guideline Number: NIA_CG_040	**Implementation Date: July 2024**

GENERAL INFORMATION

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- *Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*

INDICATIONS FOR CERVICAL SPINE MRI

+ If there is a combination request* for an overlapping body part, either requested at the same time or sequentially (within the past 3 months) the results of the prior study should be:

- **Inconclusive or show a need for additional or follow up imaging evaluation OR**
- **The office notes should clearly document an indication why overlapping imaging is needed and how it will change management for the patient.**

(*Unless approvable in the combination section as noted in the guidelines)

For evaluation of neurologic deficits[1-6]

- With any of the following new neurological deficits documented on physical exam
  - Extremity muscular weakness (and not likely caused by plexopathy, or peripheral neuropathy)
  - Pathologic (e.g., Babinski, Lhermitte's sign, Chaddock Sign, Hoffman's and other upper motor neuron signs); **OR** abnormal deep tendon reflexes (and not likely caused by plexopathy, or peripheral neuropathy)
  - Absent/decreased sensory changes along a particular cervical dermatome (nerve distribution): pin prick, touch, vibration, proprioception, or temperature (and not likely caused by plexopathy, or peripheral neuropathy)

- Upper or lower extremity increase muscle tone/spasticity
- New onset bowel or bladder dysfunction (e.g., retention or incontinence)- not related to an inherent bowel or bladder process
- Gait abnormalities (see Table 1 for more details)

- Suspected cervical cord compression with any neurological deficits as listed above

For evaluation of neck pain with any of the following[7-9]

- With new or worsening objective neurologic deficits (as listed above) on exam
- Failure of conservative treatment* for a minimum of six (6) weeks within the last six (6) months;[10]

  NOTE - Failure of conservative treatment is defined as one of the following:
  - Lack of meaningful improvement after a full course of treatment; **OR**
  - Progression or worsening of symptoms during treatment; **OR**
  - Documentation of a medical reason the member is unable to participate in treatment

  Closure of medical or therapy offices, patient inconvenience, or noncompliance without explanation does not constitute "inability to complete" treatment.
- With progression or worsening of symptoms during the course of conservative treatment*
- With an abnormal electromyography (EMG) or nerve conduction study (if performed) indicating a cervical radiculopathy. (EMG is not recommended to determine the cause of axial lumbar, thoracic, or cervical spine pain.)[11]
- Isolated back pain in pediatric population[12, 13] – conservative care not required if red flags present.

  Red flags that prompt imaging include any of the following:
  - Age 5 or younger **OR**
  - Constant pain, **OR**
  - Pain lasting > 4 weeks, **OR**
  - Abnormal neurologic examination, **OR**
  - Early morning stiffness and/or gelling; **OR**
  - Night pain that prevents or disrupts sleep; **OR**
  - Radicular pain; **OR**
  - Fever or weight loss or malaise **OR**[14, 15]
  - Postural changes (e.g., kyphosis or scoliosis) **OR**
  - Limp (or refusal to walk in a younger child)

As part of initial pre-operative / post-operative / procedural evaluation ("CT best examination to assess for hardware complication, extent of fusion and pseudoarthrosis"[12, 16] and MRI for cord, nerve root compression, disc pathology or post-op infection)

- For preoperative evaluation/planning
- CSF leak highly suspected and supported by patient history and/or physical exam findings (leak (known or suspected spontaneous (idiopathic) intracranial hypotension (SIH), post lumbar

puncture headache, post spinal surgery headache, orthostatic headache, rhinorrhea or otorrhea, or cerebrospinal-venous fistula))

- A follow-up study may be needed to help evaluate a patient's progress after treatment, procedure, intervention, or surgery in the last 6 months. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) requested (routine surveillance post-op not indicated without symptoms)
- Surgical infection as evidenced by signs/symptoms, laboratory, or prior imaging findings
- New or changing neurological deficits or symptoms post-operatively[16, 17] - see neurological deficit section above
- When combo requests (see above statement[+]) are submitted (e.g., MRI and CT of the spine), the office notes should clearly document the need for both studies to be done simultaneously (e.g., the need for both soft tissue and bony anatomy is required)[18]
    - Combination requests where both cervical spine CT and MRI cervical spine are both approvable (not an all-inclusive list):
        - OPLL (Ossification of posterior longitudinal ligament)[19]
        - Pathologic or complex fractures
        - Malignant process of spine with both bony and soft tissue involvement
        - Unstable craniocervical junction
        - Clearly documented indication for bony and soft tissue abnormality where assessment will change management (i.e., surgical approach) for the patient

For evaluation of suspected myelopathy[20-24]

- Does **NOT** require conservative care
- Progressive symptoms including hand clumsiness, worsening handwriting, difficulty with grasping and holding objects, diffuse numbness in the hands, pins and needles sensation, increasing difficulty with balance and ambulation
- Any of the neurological deficits as noted above

For evaluation of known or suspected multiple sclerosis (MS)[20, 25-27]

- Evidence of MS on recent baseline Brain MRI
- Suspected or known MS with new or changing symptoms consistent with cervical spinal cord disease (focal neurologic deficit or clinical sign, e.g., Lhermitte sign)
- Suspected or known pediatric demyelinating diseases (MS/ADEM)

Combination studies MS[28]

- **These body regions might be evaluated separately or in combination as guided by physical examination findings (e.g., localization to a particular segment of the spinal cord), patient history (e.g., symptom(s), time course, and where in the CNS the likely localization(s) is/are), and other available information, including prior imaging.**

- Cervical **and/or** Thoracic MRI for evaluation of highly suspected multiple sclerosis (MS) when Brain MRI has indeterminate findings and/or does not fulfill the McDonald criteria for the diagnosis of MS[26]
- Cervical **and/or** Thoracic MRI with suspected transverse myelitis - with appropriate clinical symptoms (e.g., bilateral weakness, sensory disturbance, and autonomic dysfunction which typically evolve over hours or days)
- Brain MRI with Cervical **and/or** Thoracic MRI for evaluation of neuromyelitis optica spectrum disorders (recurrent or bilateral optic neuritis; recurrent transverse myelitis)[29]
- Known MS, entire CNS axis (Brain, **and/or** Cervical **and/or** Thoracic spine) is approvable prior to the initiation or change of disease modification treatments and assess disease burden (to establish a new baseline)
- Known MS- Follow-up scans, including brain and spine imaging, if patients have known spine disease:
  - 6-12 months after starting/changing treatment
  - Every 1-2 years while on disease-modifying therapy to assess for subclinical disease activity, less frequently when stable for 2-3 years

For evaluation of trauma or acute injury[12, 30]

- Presents with any of the following neurological deficits noted above
- With progression or worsening of symptoms during the course of conservative treatment*
- History of underlying spinal abnormalities (i.e., ankylosing spondylitis, diffuse idiopathic skeletal hyperostosis) (Both MRI and CT would be approvable)[31-33]
- When the patient is clinically unevaluable or there are preliminary imaging findings (x-ray or CT) needing further evaluation
- When office notes specify the patient meets NEXUS (National Emergency X-Radiography Utilization Study) or CCR (Canadian Cervical Rules) criteria for imaging:
  - CT for initial imaging
  - MRI when suspect spinal cord or nerve root injury or when patient is obtunded, and CT is negative
  - CT or MRI for treatment planning of unstable spine

("MRI and CT provide complementary information. When indicated it is appropriate to perform both examinations")[31]

For evaluation of known or new compression fractures with worsening neck pain[12]

- With history of malignancy
  - To aid in differentiation of benign osteoporotic fractures from metastatic disease
    - A follow-up MRI in 6-8 weeks after initial MRI when initial imaging cannot decipher (indeterminate) benign osteoporotic fracture from metastatic disease (Kumar, 2016)
- With an associated new focal neurologic deficit as above[34]
- Prior to a planned surgery/intervention or if the results of the MRI will change management

For evaluation of tumor, cancer, or metastasis with any of the following:

(MRI is usually the preferred study, but CT may be needed to further characterize solitary indeterminate lesions seen on MRI)[12, 35-37]

- **Primary tumor**
  - Initial staging primary spinal tumor[38]
  - Follow-up of known primary cancer of patient undergoing active treatment within the past year or as per surveillance imaging guidance for that cancer
  - Known spinal tumor with new signs or symptoms (e.g., new or increasing nontraumatic pain, physical, laboratory, and/or imaging findings)
  - With an associated new focal neurologic deficit as above[34]
- **Metastatic tumor**
  - With evidence of metastasis on bone scan needing further clarification OR inconclusive findings on a prior imaging exam
  - With an associated new focal neurologic deficit[34]
  - Known malignancy with new signs or symptoms (e.g., new or increasing nontraumatic pain, radiculopathy or neck pain that occurs at night and wakes the patient from sleep with known active cancer, physical, laboratory, and/or imaging findings) in a tumor that tends to metastasize to the spine[12, 39]

Further evaluation of indeterminate findings on prior imaging (unless follow up is otherwise specified within the guideline):

- For initial evaluation of an inconclusive finding on a prior imaging report that requires further clarification
- One follow-up exam of a prior indeterminate MR/CT finding to ensure no suspicious interval change has occurred. (No further surveillance unless specified as highly suspicious or change was found on last follow-up exam.)

Indication for combination studies for the initial pre-therapy staging of cancer, OR active monitoring for recurrence as clinically indicated, OR evaluation of suspected metastases

- ≤ 5 concurrent studies to include CT or MRI of any of the following areas as appropriate depending on the cancer: Neck, Abdomen, Pelvis, Chest, Brain, Cervical Spine, Thoracic Spine or Lumbar Spine

For evaluation of known or suspected infection (osteomyelitis)/abscess[12,40]

- Infection
  - As evidenced by signs and/or symptoms, laboratory (i.e., abnormal white blood cell count, ESR and/or CRP) or prior imaging findings[41]
  - Follow-up imaging of infection
    - With worsening symptoms/laboratory values (i.e., white blood cell count, ESR/CRP) or radiographic findings[42]

For evaluation of known or suspected inflammatory disease or atlantoaxial instability

- In rheumatoid arthritis with neurologic signs/symptoms, or evidence of subluxation on radiographs (lateral radiograph in flexion and neutral should be the initial study)[43, 44]
    - Patients with negative radiographs but symptoms suggestive of cervical instability or in patients with neurologic deficits MRI is indicated[45]
- High-risk disorders affecting the atlantoaxial articulation, such as Down syndrome, Marfan syndrome with neurological signs/symptoms, abnormal neurological exam, or evidence of abnormal or inconclusive radiographs of the cervical spine[46]
- Spondyloarthropathies, known or suspected
    - Ankylosing Spondylitis/Spondyloarthropathies with non-diagnostic or indeterminate x-ray and appropriate rheumatology workup

For evaluation of spine abnormalities related to immune system suppression, e.g., HIV, chemotherapy, leukemia, or lymphoma[47, 48]

- As evidenced by signs/symptoms, laboratory, or prior imaging findings

Other Indications for a Cervical Spine MRI

(Note- See combination requests, below, for initial advanced imaging assessment and pre-operatively)

- Tethered cord or spinal dysraphism (known or suspected), based on preliminary imaging, neurological exam, and/or high-risk cutaneous stigmata[49-51]
    - Known Arnold-Chiari syndrome (For initial imaging (one-time initial MRI-modality assessment) see combination below)
    - Known Chiari I malformation without syrinx or hydrocephalus, follow-up imaging after initial diagnosis with new or changing signs/symptoms or exam findings consistent with spinal cord pathology[52]
    - Known Chiari II (Arnold-Chiari syndrome), III, or IV malformation
- Achondroplasia (one Cervical Spine MRI to assess the craniocervical junction, as early as possible, even in asymptomatic cases)[53, 54]
- Syrinx or syringomyelia (known or suspected)
    - With neurologic findings and/or predisposing conditions (e.g., Chiari malformation, prior trauma, neoplasm, arachnoiditis, severe spondylosis[55])
    - To further characterize a suspicious abnormality seen on prior imaging
    - Known syrinx with new/worsening symptoms
- Toe walking in a child with signs/symptoms of myelopathy localized to the Cervical Spine
- Suspected neuroinflammatory Conditions/Diseases (e.g., sarcoidosis, Behcet's)
    - After detailed neurological exam and appropriate initial work up
- Initial evaluation of trigeminal neuralgia[56] not explained on recent Brain imaging

COMBINATION OF STUDIES WITH CERVICAL SPINE MR

Brain MRI/Cervical MRI

- For evaluation of known Arnold-Chiari Malformation

Cervical and Thoracic MRI

- Initial evaluation of known or suspected syrinx or syringomyelia
    - With neurologic findings and/or predisposing conditions (e.g., Chiari malformation, prior trauma, neoplasm, arachnoiditis, severe spondylosis[55])
    - To further characterize a suspicious abnormality seen on prior imaging
    - Known syrinx with new/worsening symptom

Any combination of Cervical and/or Thoracic and/or Lumbar MRIs

Note: These body regions might be evaluated separately or in combination as documented in the clinical notes by physical examination findings (e.g., localization to a particular segment of the spinal cord), patient history, and other available information, including prior imaging.

Exception- Indications for combination studies[57, 58]: Are approved indications as noted below and being performed in children who will need anesthesia for the procedure

- Any combination of these studies for:
    - Survey/complete initial assessment of infant/child with congenital scoliosis or juvenile idiopathic scoliosis under the age of 10[59-61] (e.g., congenital scoliosis, idiopathic scoliosis, scoliosis with vertebral anomalies)
    - In the presence of neurological deficit, progressive spinal deformity, or for preoperative planning[62]
    - Back pain with known vertebral anomalies (hemivertebrae, hypoplasia, agenesis, butterfly, segmentation defect, bars, or congenital wedging) in a child on preliminary imaging
    - Scoliosis with any of the following[63]:
        - Progressive spinal deformity
        - Neurologic deficit (new or unexplained)
        - Early onset
        - Atypical curve (e.g., short segment, > 30’ kyphosis, left thoracic curve, associated organ anomalies)
        - Pre-operative planning; OR
        - When office notes clearly document how imaging will change management
- Arnold-Chiari malformations[64, 65]
    - Arnold-Chiari I
        - For evaluation of spinal abnormalities associated with initial diagnosis of Arnold-Chiari Malformation. (C/T/L spine due to association with tethered cord and syringomyelia), and initial imaging has not been completed[51, 59]
    - Arnold-Chiari II-IV - For initial evaluation and follow-up as appropriate

        - Usually associated with open and closed spinal dysraphism, particularly meningomyelocele
- Tethered cord, or spinal dysraphism (known or suspected) based on preliminary imaging, neurological exam, and/or high-risk cutaneous stigmata,[49-51] when anesthesia required for imaging[66] (e.g., meningomyelocele, lipomeningomyelocele, diastematomyelia, fatty/thickened filum terminale, and other spinal cord malformations)
- Oncological applications (e.g., primary nervous system, metastatic)
    - Drop metastasis from brain or spine (imaging also includes brain)- see Overview section
    - Suspected leptomeningeal carcinomatosis (LC)[67] -see Overview section
    - Any combination of these for spinal survey in patient with metastases
    - Tumor evaluation and monitoring in neurocutaneous syndromes - See Overview section
- CSF leak highly suspected and supported by patient history and/or physical exam findings (leak (known or suspected spontaneous (idiopathic) intracranial hypotension (SIH), post lumbar puncture headache, post spinal surgery headache, orthostatic headache, rhinorrhea or otorrhea, or cerebrospinal-venous fistula))

BACKGROUND

Magnetic resonance imaging (MRI) produces high quality multiplanar images of organs and structures within the body without radiation. It is the preferred modality for evaluating the internal structure of the spinal cord, providing assessment of conditions such as degenerative disc pathology, osteomyelitis, and discitis.

OVERVIEW

***Conservative Treatment**

Non-operative conservative treatment should include a multimodality approach consisting of at least one (1) active and one (1) inactive component targeting the affected region.

Active Modalities

- Physical therapy
- Physician-supervised home exercise program**
- Chiropractic care

Inactive Modalities

- Medications (e.g., NSAIDs, steroids, analgesics)
- Injections (e.g., epidural injection, selective nerve root block)
- Medical Devices (e.g., TENS unit, bracing)

****Home Exercise Program (HEP)**

The following two elements are required to meet conservative therapy guidelines for HEP:[68, 69]

- Documentation of an exercise prescription/plan provided by a physician, physical therapist, or chiropractor; **AND**

- Follow-up documentation regarding completion of HEP after the required 6-week timeframe or inability to complete HEP due to a documented medical reason (e.g., increased pain or inability to physically perform exercises).

Cervical myelopathy – Symptom severity varies, and a high index of suspicion is essential for making the proper diagnosis in early cases. Symptoms of pain and radiculopathy may not be present. The natural history of myelopathy is characterized by neurological deterioration. The most frequently encountered symptom is gait abnormality (86%) followed by increased muscular reflexes (79.1%), pathological reflexes (65.1%), paresthesia of upper limb (69.8%), and pain (67.4%).[24]

Table 1: Gait and spine imaging[70-75]

Gait	Characteristic	Work up/Imaging
Hemiparetic	**Spastic unilateral, circumduction**	**Brain and/or, Cervical spine imaging based on associated symptoms**
Diplegic	**Spastic bilateral, circumduction**	**Brain, Cervical and Thoracic Spine imaging**
Myelopathic	**Wide based, stiff, unsteady**	**Cervical and/or Thoracic spine MRI based on associated symptoms**
Cerebellar Ataxic	**Broad based, clumsy, staggering, lack of coordination, usually also with limb ataxia**	**Brain imaging - see Brain MRI Guideline**
Apraxic	**Magnetic, shuffling, difficulty initiating**	**Brain imaging - see Brain MRI Guideline**
Parkinsonian	**Stooped, small steps, rigid, turning en bloc, decreased arm swing**	**Brain Imaging - see Brain MRI Guideline**
Choreiform	**Irregular, jerky, involuntary movements**	**Medication review, consider brain imaging as per movement disorder Brain MR guidelines**
Sensory ataxic	**Cautious, stomping, worsening without visual input (ie + Romberg)**	**EMG, blood work, consider spinal (cervical or thoracic cord imaging) imaging based on EMG**
Neurogenic	**Steppage, dragging of toes**	• **EMG initial testing;** • **BUT if there is a foot drop, lumbar spine MRI is appropriate without EMG** • **Pelvis MR if there is evidence of plexopathy**
Vestibular	**Insecure, veer to one side, worse when eyes closed, vertigo**	**Consider Brain/IAC MR- see Brain MRI Guideline**

Table 2: MRI and Cutaneous Stigmata[OBJ]

Risk Stratification for Various Cutaneous Markers		
High Risk	Intermediate Risk	Low Risk
• Hypertrichosis • Infantile hemangioma • Atretic meningocele • DST • Subcutaneous lipoma • Caudal appendage • Segmental hemangiomas in association with LUMBAR‡ syndrome	• Capillary malformations (also referred to as NFS or salmon patch when pink and poorly defined or PWS when darker red and well-defined)	• Coccygeal dimple • Light hair • Isolated café au lait spots • Mongolian spots • Hypo- and hypermelanotic macules or papules • Deviated or forked gluteal cleft • Nonmidline lesions
‡LUMBAR, lower body hemangioma and other cutaneous defects, urogenital abnormalities, ulcerations, myelopathy, bony defects, anorectal malformations, arterial anomalies, and renal anomalies.		

Ossification Posterior Longitudinal Ligament (OPLL)[19] – Most common in cervical spine (rare but more severe in thoracic spine)

Neck and Back Pain with Cancer History – Bone is the third most common site of metastases after the liver and the lungs, and approximately two-thirds of all osseous metastases occur in the spine. Approximately 60–70% of patients with systemic cancer will have spinal metastasis. Radiographic (x-ray) examination should be performed in cases of back pain when a patient has a cancer history, but without known active cancer or a tumor that tends to metastasize to the spine. This can make a diagnosis in many cases. This may occasionally allow for selection of bone scan in lieu of MRI in some cases. When radiographs do not answer the clinical question, then MRI may be appropriate after a consideration of conservative care.

Most common spine metastasis involving primary metastasis originate from the following tumors in descending order: breast (21%), lung (19%), prostate (7.5%), renal (5%), gastrointestinal (4.5%), and thyroid (2.5%). While all tumors can seed to the spine, the cancers mentioned above metastasize to the spinal column early in the disease process. Spinal metastasis is more commonly found in the thoracic region, followed by the lumbar region, while the cervical region is the least likely site of metastasis.[39]

MRI and Neurocutaneous Syndromes

- In NF-1, clinical evaluation appears to be more useful to detect complications than is screening imaging in asymptomatic patients. Imaging is indicated in evaluation of suspected tumors based on clinical evaluation and for follow-up of known intracranial and intraspinal tumors.[76]

- Conversely in NF-2, routine MR imaging screening is always indicated, given the high prevalence of CNS tumors, especially vestibular schwannomas. In patients with NF-2, routine screening brain/IAC imaging is indicated annually starting from age 10, if asymptomatic, or earlier with clinical signs/symptoms. Most individuals with NF2 eventually develop a spinal tumor, mostly commonly schwannomas, but meningioma and ependymomas are also seen. Spinal imaging at baseline and every 2 to 3 years is also advised with more frequent imaging, if warranted, based on sites of tumor involvement.[77]
- In patients with Tuberous Sclerosis, Brain MRI should be obtained every 1-3 years up until age 25 for surveillance for CNS abnormalities.[78]
- In Von Hippel Lindau Syndrome, imaging of the brain and spinal cord for hemangioblastomas is recommended every 2 years.[79]
- In Sturge Weber Syndrome, Brain MRI can rule out intracranial involvement after only age 1 and is recommended in patients <1 year old only if symptomatic.[80]

Drop Metastases[81] – Drop metastases are intradural extramedullary spinal metastases that arise from intracranial lesions. Common examples of intracranial neoplasms that result in drop metastases include pineal tumors, ependymomas, medulloblastomas, germinomas, primitive neuroectodermal tumors (PNET), glioblastomas multiform, anaplastic astrocytomas, oligodendrogliomas, and less commonly choroid plexus neoplasms and teratomas.

Leptomeningeal Carcinomatosis[82] – Leptomeningeal carcinomatosis is complication of cancer in which cancerous cells spread to the membranes (meninges) that covers the brain and spinal cord. The most common solid tumors that involve the leptomeninges are breast, lung, melanoma, gastrointestinal, and primary central nervous system tumors.

POLICY HISTORY

Date	Summary
Dec 2023	Conservative treatment language updated in body and background
May 2023	• Updated references • Updated background section • Clarified pathological reflexes • Added trigeminal neuralgia • Added "Further evaluation of indeterminate or questionable findings on prior imaging": • Clarified cerebellar ataxia in gait table • Removed Additional Resources • General Information moved to beginning of guideline with added statement on clinical indications not addressed in this guideline • Added statement regarding clinical indications not addressed in the guideline.
March 2022	Added • Combination request for overlapping body part statement • Clarified muscle weakness no related to plexopathy or peripheral neuropathy • Clarified bowel and bladder dysfunction – not related to an inherent bowel or bladder problem • Clarified isolated neck pain in pediatric patient • Clarified combination MS for cervical and/or thoracic spine combination requests • Added subsection for cervical and thoracic spine section for syrinx and syringomyelia • Descriptions for tethered cord • Background section of Drop Metastases • Background section of Leptomeningeal Carcinomatosis • Clarified toe walking in pediatric patient with myelopathy for cervical spine Removed • Removed from combination section syrinx and syringomyelia and added subsection for cervical and thoracic spine section • Removed pediatric back pain from the total spine combination section

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