| *National Imaging Associates, Inc. | |
|---|---|
| **Clinical guidelines**<br>**THORACIC SPINE MRI** | **Original Date: September 1997** |
| **CPT Codes: 72146, 72147, 72157, +0698T** | **Last Revised Date: December~~May~~ 2023** |
| **Guideline Number: NIA_CG_042** | **Implementation Date: July~~January~~ 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.*

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**INDICATIONS FOR THORACIC 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 (the entire spinal cord and/or autonomic postganglionic chain must be assessed)**

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

**For evaluation of neurologic deficits[1-4]**

- With any of the following new neurological deficits documented on physical exam
  - Extremity muscular weakness (and not likely caused by plexopathy or peripheral neuropathy)[5, 6]
  - 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 thoracic 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, and likely localized to the thoracic spinal cord
- New onset bowel or bladder dysfunction (e.g., retention or incontinence)- not related to an inherent bowel or bladder process
- Gait abnormalities, most likely cause by a suspected or known myelopathy (see Table 1 for more details)

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

**For evaluation of back 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~~t~~ minimum of ~~least~~ six (6) weeks within the last six (6) months;
  **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 thoracic radiculopathy. (EMG is not recommended to determine the cause of axial lumbar, thoracic, or cervical spine pain)[10]
- Isolated back pain in pediatric population[11] – 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**
  - Postural changes (e.g., kyphosis or scoliosis), **OR**
  - Limp (or refusal to walk in a younger child)[12, 13]

**As part of initial pre-operative / post-operative / procedural evaluation ("CT best examination to assess for hardware complication, extent of fusion and pseudoarthrosis"[14, 15] and MRI for cord, nerve root compression, disc pathology or post-op infection)**

- For preoperative evaluation/planning
- Prior to spinal cord stimulator to exclude canal stenosis if no prior MRI imaging of the thoracic spine has been done recently[16, 17]
- 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 or dural 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[14, 18]- see neurological deficit section above
- When combo requests (see above statement[+]) are submitted (i.e., MRI and CT of the spine), the office notes should clearly document the need for both studies to be done simultaneously, i.e., the need for both soft tissue and bony anatomy is required[19]
    - Combination requests where both thoracic spine CT and MRI thoracic spine are both approvable (not an all-inclusive list):
        - OPLL (Ossification of posterior longitudinal ligament)-
            - Most common in cervical spine (rare but more severe in thoracic spine)[20]
        - Pathologic or complex fractures
        - Malignant process of spine with both bony and soft tissue involvement
        - Clearly documented indication for bony and soft tissue abnormality where assessment will change management for the patient

**For evaluation of suspected myelopathy[21-25]**

- Does **NOT** require conservative care
- Progressive symptoms including unsteadiness, broad-based gait, increased muscle tone, pins and needles sensation, weakness and wasting of the lower limbs, and diminished sensation to light touch, temperature, proprioception, and vibration; limb hyperreflexia and pathologic reflexes; bowel and bladder dysfunction in more severe cases
- Any of the neurological deficits as noted above

**For evaluation of known or suspected multiple sclerosis (MS)[25-28]**

- Suspected or known MS with new or changing symptoms suggesting underlying thoracic spinal cord disease (i.e., transverse myelitis, progressive myelopathy)
- Suspected or known pediatric demyelinating diseases (MS/ADEM)

**Combination studies for MS**

- **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[27]
    - 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[30]**

- Presents with any of the following neurological deficits as above
- With progression or worsening of symptoms during the course of a trial 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

("MRI and CT provide complementary information. When indicated it is appropriate to perform both examinations").[30]

**For evaluation of known or new compression fractures with worsening back pain[30, 34]**

- 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[35]
- With an associated new focal neurologic deficit as above
- 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)[36-38]

- **Primary tumor**
    - Initial staging primary spinal tumor[39]
    - 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 primary 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[40]
- **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[40]
    - Known malignancy with new signs or symptoms (e.g., new or increasing nontraumatic pain, radiculopathy or back 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 [33-35]

**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, or inflammatory disease[41, 42]**

- **Infection**
  - As evidenced by signs and/or symptoms, laboratory (i.e., abnormal white blood cell count, ESR and/or CRP) or prior imaging findings[43]
  - Follow-up imaging of infection
    - With worsening symptoms/laboratory values (i.e., white blood cell count, ESR/CRP) or radiographic findings[44]
- **Spondyloarthropathies**
  - 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[42]**

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

**Other Indications for a Thoracic 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[45-47]
- 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[48]
  - Known Chiari II ( Arnold-Chiari syndrome), III, or IV malformation
- Syrinx or syringomyelia (known or suspected)
  - With neurologic findings and/or predisposing conditions (e.g., Chiari malformation, prior trauma, neoplasm, arachnoiditis, severe spondylosis[49])
  - 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 Thoracic Spine
- Suspected neuroinflammatory Conditions/Diseases (e.g., sarcoidosis, Behcet's)
  - After detailed neurological exam and appropriate initial work up

**COMBINATION STUDIES WITH THORACIC SPINE MRI**

**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[49])
- 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[50, 51]: 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[52-54] (e.g., congenital scoliosis, idiopathic scoliosis, scoliosis with vertebral anomalies)
  - In the presence of neurological deficit, progressive spinal deformity, or for preoperative planning[55]
  - 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[56]
    - 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[57, 58]
  - 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[46, 52]
  - 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,[45-47] when anesthesia

required for imaging[59] (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
    - Suspected leptomeningeal carcinomatosis (LC)[60] -see Overview
    - Any combination of these for spinal survey in patient with metastases
    - Tumor evaluation and monitoring in neurocutaneous syndromes
- 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))

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**BACKGROUND**

Magnetic resonance imaging (MRI) produces high quality multiplanar images of organs and structures within the body without using ionizing radiation. It is used for evaluation, assessment of severity, and follow-up of diseases of the spine and is the preferred modality for imaging intervertebral disc degeneration. High contrast resolution (soft tissue contrast) and multiplanar imaging (sagittal as well as axial planes) are helpful in the evaluation of possible disc herniation and detecting nerve root compression. MRI is one of the most useful techniques to evaluate spine infection and is also used to evaluate tumors, cancer, and immune system suppression.

**OVERVIEW**

***Conservative Treatment~~therapy –~~ ~~(Spine)~~**

Non-operative conservative treatment should include a multimodality approach consisting of a at least one (1) ~~combination of~~ active and one (1) inactive component ~~s~~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)

~~Inactive components, such as rest, ice, heat, modified activities, medical devices, acupuncture and/or stimulators, medications, injections (epidural, facet, bursal, and/or joint, not including trigger point), and diathermy can be utilized. Active modalities may consist of physical therapy,~~

~~a physician-supervised home exercise program**, and/or osteopathic manipulative medicine (OMT) or chiropractic care when considered safe and appropriate.~~**Home Exercise Program ~~-~~ (HEP)~~/Therapy –~~

The following two elements are required to meet ~~guidelines for completion of~~ conservative therapy guidelines for HEP:[15, 61]

- Documentation of an ~~Information provided on~~ exercise prescription/plan provided by a physician, physical therapist, or chiropractor; **AND**
- Follow-up ~~with member with~~ documentation ~~provided~~ regarding ~~lack of improvement (failed) after~~ completion of HEP ~~(~~after the required ~~suitable~~ 6-week timeframe ~~period),~~ or inability to complete HEP due to a documented medical reason (e.g., ~~physical reason- i.e.,~~ increased pain~~,~~ or inability to physically perform exercises). ~~(Patient inconvenience or noncompliance without explanation does not constitute "inability to complete" HEP). Dates and duration of failed PT, physician-supervised HEP, or chiropractic treatment should be documented in the original office notes or an addendum to the notes~~

**Table 1: Gait and spine imaging[62-67]**

| 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;**<br>• **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 MRI see Brain MRI Guideline** |

**Table 2: MRI and Cutaneous StigmataRisk Stratification for Various Cutaneous Markers**

| High Risk | Intermediate Risk | Low Risk |
|---|---|---|
| • Hypertrichosis<br>• Infantile hemangioma<br>• Atretic meningocele<br>• DST<br>• Subcutaneous lipoma<br>• Caudal appendage<br>• 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<br>• Light hair<br>• Isolated café au lait spots<br>• Mongolian spots<br>• Hypo- and hypermelanotic macules or papules<br>• Deviated or forked gluteal cleft<br>• Nonmidline lesions |

‡LUMBAR, lower body hemangioma and other cutaneous defects, urogenital abnormalities, ulcerations, myelopathy, bony defects, anorectal malformations, arterial anomalies, and renal anomalies.

**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%).[68]

**Ossification Posterior Longitudinal Ligament (OPLL)[20]** – 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.[69]

**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.[70]
- 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.[71]
- In patients with Tuberous Sclerosis, Brain MRI should be obtained every 1-3 years up until age 25 for surveillance for CNS abnormalities.[72]
- In Von Hippel Lindau Syndrome, imaging of the brain and spinal cord for hemangioblastomas is recommended every 2 years.[73]
- 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.[74]

**Drop Metastases**[75] – 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**[76] – 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, and 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<br>• Updated background section<br>• Clarified pathological reflexes<br>• General Information moved to beginning of guideline with added statement on clinical indications not addressed in this guideline<br>• Added statement regarding further evaluation of indeterminate findings on prior imaging<br>• Clarified cerebellar ataxia in gait table<br>• Removed radicular pain and malaise from Isolated Back Pain in the Pediatric population: Red flags<br>• Removed Additional Resources |
| March 2022 | Added<br>• Combination request for overlapping body part statement<br>• Clarified muscle weakness not related to plexopathy or peripheral neuropathy<br>• Clarified bowel and bladder dysfunction – not related to an inherent bowel or bladder problem<br>• Clarified combination MS for cervical and/or thoracic spine combination requests<br>• Descriptions for tethered cord<br>• Background section of Drop Metastases<br>• Background section of Leptomeningeal Carcinomatosis<br>• Clarified toe walking in pediatric patient with myelopathy for thoracic spine<br>Removed<br>• Removed from combination section syrinx and syringomyelia and added subsection for cervical and thoracic spine section<br>• Removed pediatric back pain from the total spine combination section |

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