

# APPROPRIATE USE GUIDELINES

## Appropriateness of Advanced Imaging Procedures (MRI, CT, Bone Scan/PET) in Patients with Neck Pain

CDI QUALITY INSTITUTE: PROVIDER LED ENTITY (PLE)

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### Contents

Summary .....	2
Neck pain and/or radiculopathy with suspicion of cancer .....	3
Neck pain and/or radiculopathy with suspicion of infection .....	5
Neck pain/myelopathy and/or major or progressive neurological deficit .....	6
Neck pain with or without uncomplicated radiculopathy and no prior management .....	7
Neck pain/radiculopathy with moderate to severe pain, dysfunction, and/or weakness .....	8
Nonspecific neck pain (moderate or severe) without neurologic symptoms or red flags .....	9

The material for this guideline was developed by the CDI Quality Institute's Provider Led Entity (PLE) and its Spine Subject Expert Panel. The PLE is federally qualified to develop Appropriate Use Criteria (AUC) for advanced imaging studies. The AUC was finalized in March, 2017 and is available on the CDI Quality Institute's PLE site at: [https://www.mycdi.com/about\\_us/cdi\\_quality\\_institute/provider\\_led\\_entity/](https://www.mycdi.com/about_us/cdi_quality_institute/provider_led_entity/)

This is a guideline, not a policy. It is a summary and distillation of relevant subspecialty guidelines. The purpose of the CDI Quality Institute guidelines is to facilitate and accelerate the integration of medical evidence and best practices into daily clinical practices. Guidelines provide relevant medical evidence to support the development of policies within each individual practice. Guidelines should be adjusted for local standards of care, associated hospital or network policies, hospital versus outpatient settings, different patient populations, availability of resources, different experience levels, individual patient circumstances and different risk-tolerance profiles. Local practice policies should also be modified to account for new information or publications that become available between guideline revisions.

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## Summary:

At the initial visit, patients with neck pain undergo a focused history and physical examination. The examiner should screen for emergent or urgent conditions such as cancer or suspected infection. Patients without “red flags” are classified as having radiculopathy, spinal stenosis and nonspecific neck pain. The patient’s pain level and level of function should be assessed using a validated instrument if appropriate. The pain history, distribution of symptoms, associated symptoms and level of neurologic dysfunction should be assessed and recorded.

The initial treatment for acute neck pain and radiculopathy is nonspecific and, depending on comorbidities and the severity of the patient’s symptoms, may consist of patient education, medication, spinal manipulation, and/or exercise therapy. Plain radiographs may be obtained in certain instances at the time of initial evaluation or at follow-up. Early advanced imaging has not been shown to alter patient management or to improve outcome. Cross-sectional imaging is generally reserved for patient with red flags, for patients with uncontrolled or increasing pain, for patients who fail conservative therapy, in anticipation of injection therapy or for surgical planning.

MRI is generally the advanced imaging procedure of choice as it allows direct visualization of neurologic structures, has high sensitivity for infection and neoplasm, and does not utilize ionizing radiation. CT and CT myelography are generally reserved for patients who have contraindication to MRI, who have indeterminate findings on MRI, who cannot cooperate for MRI, who have a history of fusion, or who have other specific indications.

## Neck pain and/or radiculopathy with clinical, radiologic, and/or laboratory suspicion of cancer:

### **Strong recommendation for imaging:**

- MRI

### **Conditional recommendation for imaging:**

- CT or CT myelography in a patient unable to undergo MRI
- CT to evaluate indeterminate MRI findings (to evaluate for osteolysis)
- CT as the initial study (particularly if plain radiographs show an area of osteolysis or to evaluate an area of increase uptake on bone scan)
- Bone scan (to evaluate equivocal or worrisome findings on MRI or CT, and to evaluate for multiple bone lesions with metastatic disease)

### **Conditional recommendation against imaging:**

- Bone scan as a primary diagnostic test to evaluate for lesions in patients with known or suspected multiple myeloma
- PET (to evaluate indeterminate lesions on CT or MRI in patients with specific pathologic diagnoses)

Level of Evidence: Moderate

### Clinical notes:

- There is no consensus on the most predictive clinical signs of vertebral malignancy in the cervical spine. Many of the recommendations are based on the lumbar spine literature. The incidence of malignancy in the cervical spine may not be as high as it is in the lumbar spine.
- In the lumbar spine literature, a history of cancer was found to be the only factor with a significant likelihood ratio (15) for malignancy (Chou et al., 2011). Unexplained weight loss, lack of improvement after 1 month, and age older than 50 years were weaker predictors (positive likelihood ratios 2.7-3.0). Cervical lymphadenopathy and an elevated ESR (> 20mm) might also prompt additional evaluation.
- In patients with new-onset neck pain and secondary flags for malignancy, imaging might reasonably be deferred unless symptoms do not improve over several weeks, as is recommended for the lumbar spine (Chou et al., 2011). Another strategy would be to obtain plain radiographs and an erythrocyte sedimentation rate (ESR) in these patients and reserve immediate MRI or CT to patients with abnormalities on one of these tests (Chou et al., 2007).
- MRI is indicated for the evaluation of patients with neck pain, neurologic signs or symptoms, and a history of cancer.
- MRI is indicated for the evaluation of patients with evidence of neoplasm on x-rays of the cervical spine, with or without a history of cancer.
- STIR, T2 fat saturation, and/or diffusion-weight images may increase the conspicuity and sensitivity for vertebral neoplasm.

- CT myelography is indicated to evaluate intradural neoplasm or intradural metastases in patients who cannot undergo MRI.

Exclusions: none

## Neck pain and/or radiculopathy with clinical, radiologic, and/or laboratory suspicion of infection:

### **Strong recommendation for imaging:**

- MRI

### **Conditional recommendation for imaging:**

- CT in patients unable to undergo MRI
- CT in patients with indeterminate findings on MRI (to evaluate for endplate destruction or poorly demarcated endplate erosions)
- CT as the initial study (particularly with evidence of endplate erosions on plain radiographs)

### **Conditional recommendation against imaging:**

- Bone scan

### **Recommendation against imaging:**

- PET

Level of Evidence: Moderate

### Clinical notes:

- Immediate imaging is indicated in patients with new-onset neck pain, a clinical suspicion of infection, and findings on x-ray consistent with or indeterminate for infection and/or neurologic findings.
- Clinical flags for infection include new moderate to severe and/or progressive pain following an invasive spine procedure or injection, erosive or osteolytic changes on x-ray, new-onset neck pain with fever, or new-onset neck pain with elevated WBC or ESR. Disproportionate pain may also be associated with infection. Immediate imaging is indicated in these patients.
- Risk factors for infection include recent infection (e.g., bladder), IV drug abuse, and immunosuppression.
- In patients with new-onset neck pain and no fever, plain radiographs and an ESR can be obtained. Immediate imaging can be obtained if either of these tests are abnormal. Consider deferring advanced imaging until a 2-4 week follow-up in patients with negative x-rays and a negative ESR.
- STIR or T2 fat saturation images are useful to identify marrow edema and paraspinous/epidural edema, phlegmon, or abscess.
- Diffusion-weight imaging (the “claw sign”) may help differentiate inflammatory disc degeneration from vertebral spondylodiscitis (Patel et al., 2014).
- MRI with IV contrast is useful to differentiate between phlegmon and abscess (*ACR* (Newman et al., 2013)).

Exclusions: WBC and Gallium scanning.

## Neck pain/myelopathy and/or major or progressive neurological deficit:

### **Strong recommendation for imaging:**

- MRI

### **Conditional recommendation for imaging:**

- CT/CT myelography in a patient unable to undergo MRI
- CT/CT myelography in a patient with indeterminate or nondiagnostic findings on MRI
- CT/CT myelography to for surgical planning with or without prior MRI
- CT for stenosis associated with known or suspected OPLL or crystal deposition disease with prior MRI

### **Recommendation against imaging:**

- Bone scan, PET

Level of Evidence: Moderate

### Clinical notes:

- Symptoms of myelopathy include loss of coordination, sensory disturbance at multiple levels, stiffness of the upper and lower extremities, an acute change in bowel or bladder function, and frequent falling.
- Signs of myelopathy include hyperreflexia, weakness, Lhermitte sign, clonus, Hoffmann sign, and a positive Babinski sign.
- Because of the risks of cervical myelography, consider plain CT and/or neurological or spine subspecialist evaluation prior to myelography.
- Consider thoracic spine MRI and/or neurologic subspecialist evaluation in patients with myelopathic symptoms and negative MRI of the cervical spine.
- On preoperative MR, T1 hypointensity combined with T2 hyperintensity at the same level in the cervical cord may predict a poor surgical outcome (quality of evidence, Class III; strength of recommendation, D) (Mummaneni et al., 2009).
- There is conflicting Class III evidence of whether T2 hyperintensity alone, at a single level, predicts poor outcome.
- MRI examinations should include the cervico-occipital junction and the upper thoracic spine.
- MRI with IV contrast may be useful to characterize patients with intradural, intramedullary abnormalities.

Exclusions: Patients with prior fusion surgery; major trauma to detect or exclude fracture

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**Neck pain with or without uncomplicated radiculopathy\* and no prior management:**

**Conditional recommendation against imaging:**

- MRI
- CT
- Bone scan

**Low-Level of Appropriateness:**

- PET

\*Uncomplicated radiculopathy refers to patients without major trauma, no red flags and no major or progressive neurological deficits. These patients may have sensory or minor/single group motor symptoms.

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Level of Evidence: Low

Clinical notes: none

Exclusions: Major trauma

**Neck pain/radiculopathy with moderate to severe pain, significant dysfunction, profound weakness and/or:**

- **Failure of conservative therapy (including uncontrolled pain and/or marked disability, pain increasing during conservative therapy and moderate to severe pain and/or dysfunction persisting after an appropriate trial of conservative therapy for a period of 4-6 weeks);**
- **Persistent or recurrent symptoms following surgery; or**
- **Evaluation for injection therapy or surgery**

**Strong recommendation for imaging:**

- MRI

**Conditional recommendation for imaging:**

- CT or CT myelography in a patient unable to undergo MRI
- CT or CT myelography in a patient with discordant MRI findings and symptoms
- CT or CT myelography in a patient undergoing surgical planning following MRI
- CT as the initial study without prior MRI and without contraindications to MRI

**Recommendation against imaging:**

- CT myelography as the initial study without prior MRI and without contraindications to MRI
- Bone scan, PET

Level of Evidence: Moderate

Clinical notes:

- Clinicians should consider using validated tools to assess and follow pain and disability.
- The natural history of cervical disc herniation with radiculopathy for most patients is for improvement in the first 4 weeks with noninvasive therapy.
- Early treatment of radiculopathy is noninvasive and may consist of manipulation, exercise therapy, physical therapy, or pharmacologic therapy.
- Failure of conservative care can be defined as moderate to severe persistent symptoms following an appropriate period of conservative care (typically 4-6 weeks), uncontrolled pain, marked limitation of function, increased pain during conservative care, or inability to participate in noninvasive care for an appropriate period of time.
- Findings on MRI and CT are nonspecific and require strict correlation of symptoms and findings on physical exam to determine the significance.

Exclusions: Fusion assessment



**Nonspecific neck pain (moderate or severe) without neurologic symptoms or red flags and:**

- Failure of conservative therapy (including uncontrolled pain and/or marked disability, pain increasing during conservative therapy, and moderate to severe pain and/or dysfunction persisting after an appropriate trial of conservative therapy for 8-12 weeks); or
- Evaluation for injection therapy or surgery

**Strong recommendation for imaging:**

- MRI

**Conditional recommendation for imaging:**

- CT in a patient unable to undergo MRI
- CT in a patient undergoing surgical planning following MRI
- CT as the initial study without contraindications to MRI

**Conditional recommendation against imaging:**

- Bone scan

**Recommendation against imaging:**

- CT myelography without neurogenic claudication and/or radiculopathy
- PET

Level of Evidence: Moderate

Clinical notes:

- Clinicians should consider using validated tools to assess and follow pain and disability.
- Practitioners should emphasize that acute neck back pain is nearly always benign, generally resolves within 1-6 weeks, and the first-line treatment for neck pain is conservative care.
- Conservative care may consist of manipulation, exercise therapy, physical therapy, cognitive behavioral therapy, multidisciplinary rehabilitation, pharmacologic therapy, or time (for patients unable or unwilling to undergo available noninvasive treatments).
- Clinicians should consider alternative or additional layers of conservative care if the patient is not improving at the time of re-evaluation at 2-6 weeks.
- Clinicians should consider the use of x-ray, depression screening (PHQ-2), and a fear avoidance survey at the time of re-evaluation at 2-6 weeks.
- In referring patients with nonspecific low back pain who have failed noninvasive therapies, other published guidelines suggest referring patients to a spine specialist after a period of 8-12 weeks.

Exclusions: Fusion assessment