

**American College of Radiology
ACR Appropriateness Criteria®**

Clinical Condition: **Low Back Pain**

Variant 1: **Uncomplicated. No red flags. (Red flags defined in text.)**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without contrast	2		None
X-ray lumbar spine	2		Low
CT myelography lumbar spine	2	Usually accompanied by plain film myelogram.	Med
X-ray myelography lumbar spine	2	Usually done in conjunction with CT.	Low
NUC bone scan targeted	2		Med
CT lumbar spine without contrast	2		Med
MRI lumbar spine without and with contrast	2		None
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 2: **Low velocity trauma, osteoporosis, and/or age >70.**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without contrast	8		None
CT lumbar spine without contrast	6	MRI preferred. CT useful if MRI contraindicated or unavailable.	Med
X-ray lumbar spine	6		Low
NUC bone scan targeted	4		Med
MRI lumbar spine without and with contrast	3		None
CT myelography lumbar spine	1	Usually accompanied by plain film myelogram.	Med
X-ray myelography lumbar spine	1	Usually done in conjunction with CT.	Low
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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Clinical Condition:**Low Back Pain****Variant 3:****Suspicion of cancer, infection, or immunosuppression.**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without contrast	8		None
MRI lumbar spine without and with contrast	7		None
X-ray lumbar spine	5		Low
NUC bone scan targeted	5		Med
CT lumbar spine without contrast	4		Med
X-ray myelography lumbar spine	2	Usually done in conjunction with CT.	Low
CT myelography lumbar spine	2	Usually accompanied by plain film myelogram.	Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 4:**Radiculopathy.**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without contrast	8		None
CT lumbar spine without contrast	5		Med
MRI lumbar spine without and with contrast	5	Indicated if noncontrast MRI nondiagnostic or confusing.	None
CT myelography lumbar spine	5	MRI preferred. May be indicated if MRI contraindicated or nondiagnostic. Usually accompanied by plain film myelogram.	Med
X-ray lumbar spine	3		Low
X-ray myelography lumbar spine	2	Usually done in conjunction with CT.	Low
NUC bone scan targeted	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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Clinical Condition:**Low Back Pain****Variant 5:****Prior lumbar surgery.**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without and with contrast	8	Differentiate disc versus scar.	None
CT lumbar spine without contrast	6	Most useful in post fusion patients or when MRI contraindicated or confusing.	Med
MRI lumbar spine without contrast	6	Contrast often necessary.	None
CT myelography lumbar spine	5	Usually accompanied by plain film myelogram.	Med
X-ray lumbar spine	5	Flex/extension may be useful.	Low
NUC bone scan targeted	5	Helps detect and localize painful pseudoarthrosis.	Med
X-ray myelography lumbar spine	2	Usually done in conjunction with CT.	Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 6:**Cauda equina syndrome.**

Radiologic Procedure	Rating	Comments	RRL*
MRI lumbar spine without contrast	9	Use of contrast depends on clinical circumstances.	None
MRI lumbar spine without and with contrast	8	Use of contrast depends on clinical circumstances.	None
CT myelography lumbar spine	6	Useful if MRI nondiagnostic or contraindicated. Usually accompanied by plain film myelogram.	Med
CT lumbar spine without and with contrast	4	May be indicated if MRI is confusing or contraindicated and myelography not feasible. Use of contrast depends on clinical circumstances.	High
X-ray lumbar spine	3		Low
NUC bone scan targeted	2		Med
X-ray myelography lumbar spine	2	Usually done in conjunction with CT.	Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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LOW BACK PAIN

Expert Panel on Neurologic Imaging: William G. Bradley, Jr, MD, PhD¹; David J. Seidenwurm, MD²; James A. Brunberg, MD³; Patricia C. Davis, MD⁴; Robert Louis De La Paz, MD⁵; Pr. Didier Dormont⁶; David B. Hackney, MD⁷; John E. Jordan, MD⁸; John P. Karis, MD⁹; Suresh Kumar Mukherji, MD¹⁰; Patrick A. Turski, MD¹¹; Franz J. Wippold II, MD¹²; Robert D. Zimmerman, MD¹³; Michael W. McDermott, MD¹⁴; Michael A. Sloan, MD, MS.¹⁵

Summary of Literature Review

Introduction

Acute low back pain (LBP) with or without radiculopathy (pain radiating down the leg(s)) is one of the most common health problems in the United States and is the leading cause of disability for persons younger than age 45. The cost of evaluating and treating acute LBP runs into billions of dollars annually, not including time lost from work [1].

Because of the high prevalence and high cost of dealing with this problem, government agencies have sponsored extensive studies that are now part of the growing body of literature on this subject. One of the earlier comprehensive studies was carried out in Quebec and was reported in the journal *Spine* in 1987 [2]. The U.S. Department of Health and Human Services convened a 23-member multidisciplinary panel of experts to review all of the literature on this subject, grade it, and develop a "Clinical Practice Guideline," which was published in December 1994 [3]. States have also convened similar panels in recent years, largely because of the rapidly rising workers' compensation claim burden being imposed on state budgets by LBP management [4].

It is now clear from the above studies and others that *uncomplicated* acute LBP is a benign, self-limited condition that does not warrant any imaging studies [5]. The vast majority of these patients are back to their usual activities within 30 days [1-3]. The challenge for the clinician, therefore, is to distinguish that small segment within this large patient population that should be

evaluated further because of suspicion of a more serious problem.

Indications of a more complicated status, often termed "red flags," include the following [2,6]:

- 1) Recent significant trauma, or milder trauma, age >50
- 2) Unexplained weight loss
- 3) Unexplained fever
- 4) Immunosuppression
- 5) History of cancer
- 6) IV drug use
- 7) Prolonged use of corticosteroids, osteoporosis
- 8) Age >70
- 9) Focal neurologic deficit progressive or disabling symptoms
- 10) Duration greater than 6 weeks

Radiographs

Radiographs are recommended when any of the above red flags are present [3,4]. Lumbar radiographs may be sufficient for the initial evaluation of the following red flags [3,4]

- 1) Recent significant trauma (at any age)
- 2) Osteoporosis
- 3) Age >70

The initial evaluation of the LBP patient may require further imaging if red flags such as suspicion of cancer or infection are present [3,4].

Isotope Bone Scans

The role of the isotope bone scan in patients with acute LBP has changed in recent years with the wide availability of magnetic resonance imaging (MRI) and especially contrast-enhanced MRI. The bone scan is a moderately sensitive test for detecting the presence of tumor, infection, or occult fractures of the vertebrae but not for specifying the diagnosis [3,4]. The yield is *very* low in the presence of normal radiographs and laboratory studies and highest for patients with known malignancy [7]. The test is contraindicated in pregnancy.

High-resolution isotope imaging, including single photon emission computed tomography (SPECT), may localize the source of pain in patients with articular facet osteoarthritis prior to therapeutic facet injection [8]. Similar scans may be helpful in detecting and localizing the site of painful pseudoarthrosis following lumbar spinal fusion [9].

Plain and contrast-enhanced MRI has the ability to demonstrate inflammatory, neoplastic, and most traumatic lesions as well as show anatomic detail not available on isotope studies [10]. Gadolinium-enhanced MRI reliably

¹Principal Author, University of California-San Diego, San Diego, Calif; ²Panel Chair, Radiological Associates of Sacramento, Sacramento, Calif; ³University of California-Davis Medical Center, Sacramento, Calif; ⁴ Northwest Radiology Consultants, Atlanta, Ga; ⁵Columbia University Medical Center, New York, NY; ⁶Hôpital de la Salpêtrière, Assistance-Publique-Hôpitaux de Paris, France; ⁷Beth Israel Medical Center, Boston, Mass; ⁸Memrad Medical Group, Inc., Long Beach, Calif; ⁹SW Neuro-Imaging, Phoenix, Ariz; ¹⁰University of Michigan Health System, Ann Arbor, Mich; ¹¹University of Wisconsin, Madison, Wis; ¹²Mallinckrodt Institute of Radiology, Saint Louis, MO; ¹³New York Hospital-Cornell University Medical Center, New York, NY; ¹⁴University of California-San Francisco, San Francisco, Calif, American Association of Neurological Surgeons; ¹⁵Carolinas Medical Center, Charlotte, NC, American Academy of Neurology.

Reprint requests to: Department of Quality & Safety, American College of Radiology, 1891 Preston White Drive, Reston, VA 20191-4397.

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shows the presence and extent of spinal infection and is useful in assessing therapy [11]. MRI has therefore taken over the role of the isotope scan in many cases where the location of the lesion is known. The isotope scan remains invaluable when a survey of the entire skeleton is indicated (eg, for metastatic disease).

Magnetic Resonance Imaging, Computed Tomography, Myelography, Myelography/CT

Uncomplicated acute LBP (no red flags) does not warrant the use of any of these imaging studies [2-4]. The early indiscriminate use of expensive imaging procedures in this common clinical setting has caused large increases in worker's compensation costs and in some cases has led to the perception that computed tomography (CT) and MRI of the lumbar spine are not worth the cost [10,12,13]. Adding to this controversy is the fact that nonspecific lumbar disc abnormalities are common, and can be demonstrated readily on myelography, CT, and MRI, even in asymptomatic patients [14-17].

The appropriate use of these imaging procedures is an important challenge that has been extensively addressed in the major reviews referenced herein [2-4]. For example, LBP complicated by "red flags" suggesting infection or tumor may justify early use of CT or MRI even if radiographs are negative [3]. The most common indication for the use of these imaging procedures, however, is the clinical setting of LBP complicated by radiating pain (radiculopathy, sciatica) or cauda equina syndrome (bilateral leg weakness, urinary retention, saddle anesthesia), usually due to herniated disc and/or canal stenosis.

Magnetic Resonance Imaging

MRI of the lumbar spine has become the initial imaging modality of choice in complicated LBP, displacing myelography and CT in recent years. MRI is particularly efficacious for detecting "red flag" diagnoses, particularly using the STIR and fat-saturated T2 fast-spin-echo sequences. MR with contrast is useful for suspected infection and neoplasia. In postop patients, enhanced MRI allows distinction between disc and scar when there is extension of tissue beyond the interspace.

Computed Tomography

CT scans provide superior bone detail but are not quite as useful in depicting disc protrusions when compared with multiplanar MRI. With the added value associated with high quality reformatted sagittal and coronal plane images, CT is useful for depiction of spondylolysis, pseudoarthrosis, scoliosis, and for post-surgical evaluation of bone graft integrity, surgical fusion, and instrumentation [18].

Myelography/CT

"Plain" myelography was the mainstay of lumbar herniated disc diagnosis for decades. It is now usually combined with post-myelography CT. The combined study is complementary to plain CT or MRI and occasionally more accurate in diagnosing disc herniation, but suffers the disadvantage of requiring lumbar puncture and contrast injection [19-22]. It may also be useful in surgical planning.

Thermography, Discography, CT Discography

Expert panels agreed that these imaging modalities were either too nonspecific (thermography) or carry additional risk (discography) that is not warranted in view of the efficacy of other less invasive imaging procedures [3,4]. When other studies fail to localize the cause of pain, discography may occasionally be helpful. Although the images often depict nonspecific aging or degenerative changes, the injection itself may reproduce the patient's pain, which may have diagnostic value [23].

Acute low back pain	Lumbosacral pain of less than 6-weeks duration or with progressive or disabling symptoms.
Radiculopathy	Dysfunction of a nerve root, usually caused by compression or irritation of the root.
Spinal stenosis	Narrow bony canal that may cause radiculopathy, or cauda equina syndrome.
Herniated disc	Herniation of the disc material beyond the confines of the interspace.
Sciatica	Pain radiating down the leg(s) below the knee along the distribution of the sciatic nerve, usually due to mechanical pressure and/or inflammation of lumbosacral nerve root(s).
Cauda equina syndrome	Compression of multiple nerve roots, often resulting in bilateral motor weakness (legs), urine retention, saddle anesthesia.

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