Lumbar Back Pain: From the Common to the Critical

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Emergency department experience teaches that most episodes of low back pain, as severe and temporarily disabling as they may be, are not manifestations of serious pathology—but you cannot afford to miss the ones that are. The authors explain how to make your assessment both sensitive and specific every time.

By William Alley, MD, and Barry Knapp, MD, FACEP

Dr. Alley is a third-year resident and **Dr. Knapp** is associate professor of emergency medicine and emergency ultrasound fellowship director in the department of emergency medicine at Eastern Virginia Medical School in Norfolk, Virginia.

Back pain is one of the most common complaints encountered in the emergency department. It is estimated that at least two-thirds of the population of the United States will suffer from it at some point in their lives,[1] and a study published last year reported that expenditures related to back pain have been rising more rapidly than overall health expenditures.[2]

Experience shows that a majority of back pain episodes involve no acute pathology and are self-limited, and when one exhaustive workup after another fails to produce true structural findings that explain symptomatology, the danger of complacency arises. It is critical for the emergency physician to have a well-thought-out approach to these cases that serves to exclude, with evidence-based reasoning, the few serious diagnoses that must not be missed.

This review will outline some of the more common causes of lumbar back pain seen in the emergency department as well as the more emergent ones that require further diagnostics and specialty consultation, highlighting risk factors, distinguishing signs and symptoms, and patient management guidelines.

LISTEN FOR THE "RED FLAGS"

Eliciting a detailed history, with special attention to certain “red flags,” is critical to determining the etiology of a patient’s back pain.

Age is the first of the red flags. Back pain in patients aged 20 to 50 years is likely to be due to a benign musculoskeletal cause rather than a more serious pathology such as fracture, cancer, or spinal stenosis.[3] The risk of these more serious causes, as well as intra-abdominal causes such as abdominal aortic aneurysm, rises after age 50. The incidence of congenital, developmental, and bony abnormalities such as spondylolisthesis or spondylolysis as causes of acute low back pain is greater

in patients under age 20.

A history of cancer or significant recent weight loss increases the pretest probability of spinal metastatic disease, most commonly from breast, lung, or prostate cancer.[4]

When a history of fever, immunosuppression, immunocompromise, or intravenous drug abuse is present, infectious etiologies need to be strongly considered. Spinal infection is usually by hematogenous spread, either from intravenous drug abuse or skin infections. Urinary tract infections have also been implicated.[4]

New or progressive neurologic deficits should raise concern for spinal stenosis and, most gravely, epidural compression syndrome. Evidence of saddle anesthesia, bowel incontinence, urinary retention associated with overflow incontinence, or bilateral sciatica requires further emergent workup and neurosurgical consultation.

Major trauma is an obvious risk factor for spinal fracture or spinal injury. In patients older than 50 years, trauma in the mild to moderate range is an indication for imaging because their age and loss of bone density predispose them to vertebral fracture. In the elderly, even minor trauma such as ground-level falls should be evaluated for fracture. The workup for traumatic low back pain is beyond the scope of this article, but in general, if the mechanism appears to be sufficient and the patient has significant physical examination findings, fracture and neurologic injury must be ruled out. Note that if one spinal fracture is found, the entire spine should be imaged, because another fracture may be present.

Often-overlooked aspects of the history are failure to respond to medical therapy or symptom duration exceeding one month, either of which weighs in favor of further diagnostic testing. Again, episodic back pain in adults is benign and short-lived in the vast majority of cases, resolving with conservative management within six weeks. Pain that does not improve with symptomatic care is less likely to be benign and deserves further investigation.

In a similar fashion, pain that is worse at rest or unrelenting at night is worrisome for cancer or ankylosing spondylitis. Typically, back pain related to benign muscle strains or disc pathology is relieved when the patient is motionless in a comfortable position. When this is not the case, the chance of serious systemic or structural disease is greater.

Beyond these red flags, the psychosocial attributes that may affect the patient’s perception of back pain should be considered. Numerous studies have linked back pain with depression, job dissatisfaction, and multiple other associated psychosocial factors.[5] In the emergency department, psychosocial stressors may escape notice entirely because they are not often considered a priority in the

initial evaluation and assessment of back pain. However, understanding that such relationships exist can aid the physician in treatment decisions and follow-up planning in order to maximize benefit to the patient.

POWER OF THE PHYSICAL

A careful and goal-directed physical examination, beginning with vital signs, is an important aid in ruling out many etiologies of back pain.

Fever is neither sensitive nor specific and will most often be due to a coincidental infectious cause, usually viral. Nevertheless, the possibility that it indicates spinal or urinary tract infection must be considered.

Examination of the back should start with visualization of the skin. This is easily left out, especially in today's emergency department where overcrowding mandates the use of hallway medicine. Even the most savvy physician has done an extensive and costly workup only to later recognize the skin rash associated with herpes zoster. Regardless, all patients with back pain should be in a gown in order to facilitate a complete back examination. The presence of erythema, warmth, or purulent drainage may indicate infection. Bruising or swelling may be noted in patients with a history of trauma. Spinous processes should be palpated and percussed individually to determine if there is tenderness at a certain level, which may be found in infection, cancer, or fracture.

The abdominal examination is important because visceral causes account for some cases of low back pain. Many intra-abdominal processes, from menstrual and other gynecologic disorders to early stages of retrocecal appendicitis, can present with this complaint. Auscultation for bruits, which may indicate aneurysm, should be included. Palpation for masses or aortic enlargement may also reveal a not-so-obvious source of pain.

Finally, neurologic examination is used to determine the presence of sciatic nerve symptoms as well as any other sensory or motor deficits. The straight leg raise tests for radicular (dermatomal) pain. The patient lies supine with legs straight. The examiner lifts the leg on the affected side, supporting the heel with one hand and holding the leg straight at the knee with the other. The test is positive if the patient notes pain radiating below the knee between 30 and 70 degrees of hip flexion.

The seated straight leg raise has been used to confirm or as a substitute for the supine straight leg raise test. This test is performed by having the patient sit with hips and knees flexed 90 degrees. The examiner straightens the patient's leg on the affected side until the patient notes pain radiating down the leg below the knee. While this test may also be positive in patients with lumbar radiculopathy, most commonly caused by disk herniation, it is less sensitive and no more

specific than the supine straight leg raise and should not be regarded as a substitute for it.[6]

Sensation testing should start with light touch with the goal of detecting deficits at specific spinal nerve roots. If any deficits are found, the physician should test that spinal nerve root for deficits in proprioception, vibration, pain, and temperature sensation. Strength testing follows in a similar manner. Again, the goal is to determine whether there are any deficits at specific spinal nerve roots. The L4, L5, and S1 nerve roots are tested because these spinal nerves innervate muscle groups individually: the extensors of the quadriceps, the dorsiflexors of the great toe and ankle, and the plantar flexors of the great toe and ankle, respectively. Reflexes of the lower extremities should also be tested. The patellar reflex relates to L3-L4 and the Achilles reflex, to S1. The Babinski sign (dorsiflexion of the great toe in response to lateral plantar stimulation) can indicate upper motor neuron damage to the spinal cord in the thoracic or lumbar region.

A digital rectal examination should be performed in patients who complain of incontinence, neurologic deficits, or severe pain to assess for decreased rectal tone. This is also a good time to test for saddle anesthesia and to palpate for prostate or rectal masses.

Finally, in patients whose history or physical examination suggests an epidural compression syndrome, a postvoid residual measurement should be done. Evidence of increased postvoid residual is concerning in these patients, even in the absence of a report of incontinence, and requires further diagnostic studies.

CRITERIA FOR DIAGNOSTIC TESTING

The choice of which diagnostic studies to perform in the emergency department should be based on the patient's history, including the presence or absence of risk factors, as well as the physical examination findings. The literature is full of studies and expert recommendations citing the overuse of laboratory and radiologic studies for acute low back pain.[7-9] There is very little disagreement that in patients without red flags, a trial of conservative management with pain control and return to normal activity is warranted without any further workup.[7-11]

Appropriate laboratory tests if there is suspicion of tumor or infection include complete blood count, erythrocyte sedimentation rate (ESR), and urinalysis to help rule out systemic causes.[9,12,13] Urinalysis may help elucidate whether the patient's pain is referred from a urinary tract infection or renal disease. It may also be useful subsequent to the initial diagnosis in determining the source for bacterial or neoplastic seeding of the spine. Additional laboratory tests may be useful depending on the clinical situation, especially if other visceral pathology is considered.

Radiological studies should be reserved for cases in which the physician has a high suspicion for emergent pathology. Clinical guidelines for the workup of low back pain have changed very little over the past decade and a half. Plain radiographs are the initial study of choice if fracture is suspected. They are also useful in the presence of red flags for cancer or infection if an ESR is also drawn, because a normal x-ray along with a normal ESR virtually rules out both diagnoses.[4,14]

Emergent magnetic resonance imaging (MRI) is the study of choice in the workup of possible spinal infection or tumor, especially if plain films or ESR are abnormal, and in the presence of severe or progressive neurologic deficits in which an epidural compression syndrome is considered. Limiting the use of MRI for low back pain to those two situations saves health care dollars and is not associated with worse outcomes.[15-17] It also avoids the problem of back pain being falsely attributed to minor findings such as disk abnormalities that are also seen in asymptomatic patients, as multiple studies have shown.[4,18] Since back pain spontaneously resolves within two weeks in as many as 90% of patients,[19,20] early diagnosis of such MRI findings may not only mislead patient care but add to the patient's psychological stress.

Computed tomography is another option for imaging if MRI is not available. It is not as useful for evaluating disk pathology, but confers some advantages in the assessment of vertebrae and posterior aspects of the spine.[8] For this reason, it has value in the setting of trauma if plain radiographs are negative but suspicion for fracture is still high. It is also useful for identifying intra-abdominal pathology that may cause referred back pain, such as aortic aneurysm or appendicitis.

SPECIFIC ETIOLOGIES OF LUMBAR PAIN

The differential diagnosis for low back pain is quite broad (see Table below). The majority of causes are musculoskeletal, with infection, neoplasm, and visceral causes making up the rest.[3,14,21] Up to 85% of low back pain cannot be given a definitive diagnosis because symptoms often do not correlate with imaging studies.[9] Following is a brief review of some important specific causes of back pain and their management from an emergency medicine perspective, in order from more serious to less serious.

TABLE. Differential Diagnosis of Low Back Pain in Adults

Mechanical low back pain (97%)	**Nonmechanical spinal conditions (1%)**	**Visceral disease (2%)**
lumbar strain, sprain (70%)	neoplasia (0.7%)	aortic aneurysm
degenerative processes (10%)	infection	pancreatitis
herniated disk (4%)	inflammatory arthritis	peptic ulcer disease

spinal stenosis (3%)		pyelonephritis
trauma		ureterolithiasis
spondylolisthesis		prostatitis
spondylolysis		endometriosis
congenital disease		pelvic inflammatory disease
Data extracted from: Jarvik JG, Deyo RA[4]; Gilbert FJ et al[15]; Chou R et al[17]; Sorensen et al.[24]		

Epidural compression syndromes. The term *epidural compression syndrome* encompasses multiple syndromes that involve spinal cord compression, including cauda equina syndrome, conus medullaris syndrome, and spinal cord compression at other sites. The presentation and treatment for these are similar. Malignancy is the cause in 85% to 90% of cases.[22,23] Most of the remainder are caused by spinal epidural hematoma, spinal epidural abscess, or central disk herniation.[23]

A history consistent with epidural compression syndromes usually includes back pain, sciatica, and neurologic deficits. Urinary retention is common. Signs of sensory loss such as saddle anesthesia may be seen. Progression tends to be rapid, but the duration of symptoms is not helpful in ruling out serious pathology.

Physical examination findings vary based on the level and amount of compression. In cauda equina and conus medullaris syndromes, urinary retention and saddle anesthesia are classic. Higher spinal cord compressive lesions will produce symptoms in the legs as well, necessitating a careful neurologic examination to attempt to determine the level of the lesion.

If an epidural compression syndrome is suspected, MRI should be done emergently. If MRI is not available or is contraindicated, CT myelography would be the next study of choice. High-dose steroids should be given immediately, especially if malignancy is considered as the cause. Steroids have been reported to improve postradiation ambulation in patients with spinal cord compression due to malignancy.[23,24] However, data are lacking for improved outcomes when other causes of spinal cord compression are found. Given that nearly nine of 10 cases of epidural compression syndromes are caused by malignancy and time to treatment is important, presumptive treatment with intravenous steroids is advised. Consultation with a neurosurgeon regarding this decision may be appropriate.

If epidural compression syndrome is confirmed, the treatment depends on the cause. A neurosurgical consult to consider decompressive surgery is almost always required. Time from onset to the time of decompression is important, because data suggest that early decompression is associated with better

outcomes.[25] Prognosis depends a great deal on pretherapeutic functional status. Helweg-Larson and colleagues found that of 74 patients who were nonambulatory at the time of diagnosis, 21 were able to walk afterward. In that same study, only 18% of patients requiring a urinary catheter before treatment required one afterward.[26]

Spinal infections. Infectious causes of back pain account for only a very small percentage of acute back pain episodes, but must be considered in any patient with fever and back pain, especially if a history of intravenous drug use or immunosuppression is present. As previously noted, a spinal infection will usually have been caused by hematogenous spread from other sites. *Staphylococcus aureus* is the most commonly isolated organism.[23,27] Vertebral osteomyelitis, spinal epidural abscess, and septic discitis must all be considered. Workup for these is essentially the same, but treatment differs and needs to be started promptly.

Vertebral osteomyelitis tends to present in an indolent fashion, with patients seeking treatment sometimes weeks after the onset of symptoms.[23] Physical examination may show tenderness of the spinous processes of the involved vertebrae. Neurologic examination is usually normal, with only 28% to 35% of patients having mild neurologic deficits.[28] Laboratory workup should include an ESR, which is elevated in the vast majority of cases. Blood cultures should be ordered if the diagnosis is confirmed. Magnetic resonance imaging is the radiological study of choice.

Spinal epidural abscess likely falls within the same disease spectrum as vertebral osteomyelitis. It, too, frequently presents in an indolent fashion with nonspecific symptoms. The classic triad of fever, back pain, and neurologic deficits is present in only about 20% of patients.[28] These patients also tend to have tenderness of the spinous processes of affected vertebrae. They should be carefully evaluated for evidence of epidural compression syndromes, though this rarely occurs. Again, laboratory workup should involve an ESR, and MRI is the radiological study of choice.

Septic discitis lies in the middle of the spectrum between vertebral osteomyelitis and spinal epidural abscess. As would be expected, history, physical examination, and workup are similar.

Medical management is the norm for vertebral osteomyelitis and septic discitis, preferably guided by culture from tissue samples.[23,27] Duration of treatment usually ranges from six to 12 weeks.[23] The treatment for spinal epidural abscess, on the other hand, is mainly surgical. Delay in diagnosis and surgical decompression and drainage has been associated with worse neurologic outcomes.[28] Antibiotic therapy is also necessary, usually for four to six weeks.[23]

Disk herniation. Most commonly, herniated disks occur in patients aged 30 to 55

years at the two lowest disks, involving the L5 and S1 nerve roots.[4] Although disk herniation can cause low back pain, studies have often shown the presence of herniated disks in asymptomatic adults.[4,18] The diagnosis is virtually assured in a patient presenting with sciatica, a complaint associated with disk herniation in 95% of cases. However, it is important to keep in mind that this leaves one in 20 patients with another, possibly more serious cause of sciatica such as spinal stenosis, tumor, or infection. If any red flags are present in suspected disk herniation, further evaluation may be warranted. Otherwise, the patient can be discharged with instructions to treat the pain with a nonsteroidal anti-inflammatory drug (NSAID) or acetaminophen for four to six weeks.[29] The same is true even if the patient has had advanced diagnostic testing, as long as no serious pathology that needs immediate inpatient treatment or consultation has been found. About 60% of patients will note improvement in symptoms at six weeks.[30]

Spinal stenosis. Narrowing may occur in the central spinal canal or laterally, in the neural foramina, causing pain due to nerve root compression. Most frequently, this is a degenerative process affecting older adults.[4] The most common symptom is neurogenic claudication, pain radiating from the back into the buttocks, thigh, and lower leg. This pain is exacerbated by lumbar extension and improves with lumbar flexion.[31] In one study, the classic signs of neurogenic claudication (back pain radiating to the buttocks and pain with standing that is relieved by sitting) were up to 93% sensitive for lumbar spinal stenosis.[31,32]

Not all pain radiating into the buttocks is secondary to spinal stenosis. Vascular claudication and hip pathology should also be considered. In vascular claudication, the pain does not vary with lumbar extension and flexion and is exacerbated by exertion. Examination of the hip should help distinguish between conditions such as osteoarthritis of the hip and the effects of lumbar spinal stenosis.

There is no need for routine imaging in lumbar spinal stenosis. In fact, one study found that 20% of asymptomatic subjects older than 60 years of age had evidence of stenosis on MRI, raising the question of how well these findings correlate with pain.[18] Four to six weeks of NSAIDs and activity is the treatment of choice, with muscle relaxants or opioids as possible adjuncts. Follow-up should be scheduled to monitor for improvement or worsening. Unfortunately, improvement in symptoms is not as common with conservative management, and the patient may eventually require neurosurgical intervention, but not on an emergent basis.[31]

ACUTE NONSPECIFIC BACK PAIN

Most of the complaints of back pain that prompt a visit to the emergency department, including muscle strains and sprains, fall into the acute nonspecific category. Typically, these patients have mild to moderate pain aggravated by

activity and relieved by rest. A history of heavy lifting or repetitive stress may be present; however, many patients cannot trace their pain to any particular event. In the absence of significant risk factors, these patients do not need any laboratory or radiological testing. In the presence of risk factors, nonspecific back pain should be diagnosed only when appropriate workup has been finished and was normal.

Much research has been devoted to the treatment of acute nonspecific back pain (defined as pain of less than six weeks' duration). The American College of Physicians recommends conservative management for four weeks with pain control and advice to remain active.[17] A systematic review of 51 randomized controlled trials showed favorable evidence for NSAIDs versus placebo.[33] Comparison of NSAIDs with acetaminophen in the same review yielded mixed results. Given these results, an NSAID or acetaminophen is considered first-line therapy for acute nonspecific back pain.

There is also ample evidence favoring the addition of a muscle relaxant, such as metaxolone, to an NSAID regimen for these patients. In a systematic review, van Tulder and colleagues found strong evidence that muscle relaxants were superior to placebo in the treatment of acute low back pain, and showed improved efficacy in combination with NSAIDs versus NSAIDs alone.[34] Given these data, muscle relaxants should be considered as adjunctive therapy along with NSAIDs for acute low back pain. However, the physician must also consider, and inform the patient of, the risks of sedation and eventual dependence (some more than others) associated with these drugs. They should be used cautiously and only for short periods of time.

The same can be said for opioids used for acute low back pain. When van Tulder and colleagues reviewed six small studies comparing NSAIDs with opioids, no statistically significant difference was found between them.[33] However, anecdotal evidence has shown that a short course of opioid pain relievers may be useful. Side effects must also be weighed in the decision to prescribe these medications.

Patients should be instructed to stay active, although they may have to modify their activities somewhat for a short period of time. Historically, they were advised to maintain bed rest, but studies have shown no benefit from it—and at least one found detriment. In a literature review on the subject by Waddell and colleagues, bed rest of any duration slowed recovery time, increased days out of work, and increased chronicity of back pain.[35]

Multiple additional treatment options are often considered by physicians, including epidural steroid injections, acupuncture, massage, lumbar supports, electromyographic biofeedback, transcutaneous elec- trical nerve stimulation, and temperature treatments including ultrasound. None of these treatment modalities has proved convincingly beneficial upon evidence-based review, and their use in acute care settings is probably unwarranted.

CHRONIC NONSPECIFIC BACK PAIN

The treatment of chronic nonspecific back pain in an acute care setting is somewhat less defined. The most pressing concern in these patients is that they are at higher risk for serious pathology given that their symptoms have persisted for more than six weeks. The most prudent course of action for the emergency physician is to review the patient's previous workup to be certain that abnormalities have not been missed. If a sufficient workup has not yet been completed, it may be wise to do so at that point. Any new findings should, of course, be treated appropriately.

If no abnormal findings are uncovered, treatment follows as noted above for acute nonspecific back pain. Acetaminophen and NSAIDs are appropriate given their low cost and general tolerability. Muscle relaxants[34] and opioids[36] have both been shown to have some efficacy in the treatment of chronic low back pain with short-term use. Only a few pills should be prescribed, with an explicit understanding between physician and patient that the patient will follow up with his or her primary care physician in the very near future.

ECONOMIZE WITHOUT COMPROMISE

While the majority of patients will have non-emergent causes for their low back pain and will recover within a very short period of time, a small but significant percentage will have serious pathology that must be evaluated and treated promptly. The workup should be driven by risk factors. Most patients will require no workup. However, if physical examination does not rule out the serious causes of low back pain, such as epidural compression syndromes, infection, or malignancy, laboratory testing followed by diagnostic imaging should begin without delay. Using this approach will help limit the number of unnecessary studies performed without compromising patient care or safety.

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