

Evaluation and Treatment of Low Back Pain in Adult Patients

Christopher R. Hemmer

It is estimated that over 80% of adults will have difficulty with low back pain during their lifetime. Back pain is generally described as acute, subacute, and chronic based on the duration of symptoms. Although most back pain complaints are self-resolved and not considered emergent, some do hold an increased level of urgency. Recognizing red flags early in the evaluation is crucial to expedite appropriate treatment. In the absence of red flags routine imaging should be avoided. A single standard of care for patients with low back pain has not been established. The myriad of diagnoses and treatment choices makes it difficult to develop a single algorithm for management. Nonspecific low back pain is a prevalent complaint in primary care and acute care settings. Most patients with acute/subacute low back pain will resolve regardless of the modality used or not used.

Introduction

Low back pain is one of the most common complaints for which patients seek treatment. It is estimated that over 80% of adults will have difficulty with low back pain during their lifetime (Deyo et al., 2006). Back pain is generally described as acute, subacute, and chronic based on the duration of symptoms. Acute back pain is defined as common, self-limiting, and lasting less than 4 weeks. Subacute back pain is defined as lasting between 4 and 12 weeks. Patients in this category have an increased risk of transitioning into chronic back pain defined as pain lasting greater than 3 months (Chou., 2014). The significant increase in treatment costs for low back is ubiquitous. A study by the Journal of American Medical Association found total spending for spine-related pathology was the third most costly just below diabetes and heart disease. Spending on diabetes and spine have risen the most over the last 18 years (Dieleman et al., 2016). Directly related costs include office visits, medications, imaging, invasive procedures, and surgeries. Indirect costs include those associated with disability, loss of wages, and productivity.

Risk factors for patients developing back pain include but are not limited to smoking, obesity, age, female gender, physically strenuous work, sedentary lifestyle, psychologically demanding work, low educational attainment, workers' compensation, job dissatisfaction, and history of psychological disorders such as anxiety, depression, and somatization disorders (Katz, 2006).

Etiology

A detailed history and physical examination will help the clinician distinguish between the causes of the back pain. Nonspecific back pain in primary care is the most common cause and can account for approximately 85% of presentations (Devo et al., 2006). It is paramount to obtain a detailed history to determine whether the back pain is of a common mechanical nature versus a more urgent situation such as cauda equina syndrome. The history and physical examination will help the provider distinguish between the etiologies causing pain, such as vertebral body, discogenic, facet joints (zygapophyseal), posterior elements, sacroiliac (SI), or myofascial (muscle/tendon). Although most back pain complaints are self-resolving and not considered emergent, some do hold an increased level of urgency. Diagnoses that are deemed urgent include spinal cord compression (cauda equina syndrome), epidural abscess, diskitis/ osteomyelitis, and metastatic disease. Less critical low back diagnoses with an atypical pain presentation include vertebral compression fracture and radicular complaints, which can be caused by various pathologies such as herniated disk, spinal stenosis, and degenerative neuroforaminal stenosis (see Table 1).

History and Physical Examination

Obtaining a detailed history is essential to help differentiate the cause of the patient's complaint. Determine where the patient has their discomfort by asking them to point out the area on themselves. Close attention to the dermatomal distribution pattern will provide key information for the astute practitioner. For example, in the case of a herniated disc, pain will be very specific to

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TABLE 1. BACK PAIN ETIOLOGY				
Possible Diagnosis				
Degenerative disc, instability such as spondylolisthesis, myofascial				
Herniated disk (common 20–40 years old), stenosis (more common older than 50 years)				
Tumor				
Infection, tumor				
Gallbladder, renal, pancreatitis, abdomi- nal aortic aneurysm, endometriosis, intra-articular hip				

the compressed nerve root, as opposed to reporting that the "whole leg hurts." Avoid trusting the patients' use of medical terms such as "sciatica," as often the use of these medical terms by nonmedical persons can be incorrect. Anatomically, is the pain isolated to one side or both, and does it radiate, and if so, where? How long does the pain last? For example, is it painful only with positional changes, or does it get better with movement? Does the patient have any history of prior back problems, and if so, how were they treated in the past? Other questions to help identify a more urgent cause of the symptoms include the following red flags:

- Night sweats, fever, or chills (concerns for malignancy)
- Bowel bladder changes including retention/saddle anesthesia (concerning for severe compression/ cauda equine syndrome)
- Difficulty walking, steps, foot slapping, worsening paresthesia in the lower extremities (would suggest neurological compression such as herniation or stenosis)
- Any recent infections including bladder, prostate, pneumonia, or dental (could suggest infectious etiology such as epidural abscess, psoas abscess, or diskitis/osteomyelitis
- Is the patient high risk for other issues such as immune suppression, intravenous (IV) drug abuse, or secondary gain (Roscoe & Nishihira, 2016)?

Once a detailed history is collected, then inspection is the next step in determining what may be causing the back pain. The examination should start by watching the patient walk into the examination room if possible or observing the patient seated when you enter the examination room (are they sitting onto one side, rubbing their leg, lying on the table, or antalgic gait). Inspection also includes physically looking at the patients back and extremities for anatomical abnormalities such as spasm, muscle fasciculation, atrophy, scoliosis, swelling, kyphosis, rash, or lesion (see Figures 1 and 2). Lastly, evaluating the range of motion of the lumbar spine may be necessary (Chou et al., 2007).



FIGURE 1. Acute shingles. May cause neuropathic pain mimicking sciatica. Note the dermatomal pattern of the rash. Reprinted with permission from Christopher Hemmer, DNP, ANP, ONP-C, FAANP.



FIGURE 2. Note the atrophy of the left calf when compared to the right lower extremity. Reprinted with permission from Christopher Hemmer, DNP, ANP, ONP-C, FAANP.

- Flexion of the lumbar spine (bending at the waist): 40°–60° of movement, watch for compensatory movements in the thoracic spine. The normal lumbar lordosis should flatten. Watch for jerky or painful movements, and note how far forward the patient performs the flexion.
- Extension: 20°–35° of movement: The patient must place hands on hips to stabilize the movement and not compensate with pelvic movements.
- Lateral flexion (right/left): 15°–20°, the patient runs their hand down the side of the leg while attempting not to make any forward or backward movements. Compare with other side, and note the amount of rotation performed together with the flexion.
- Rotation: 3°–18° can be performed in standing or sitting (to eliminate compensatory hip movement).

Palpation and percussion are useful tools in the spine examination. Palpating for trigger points or spasticity in various muscle groups can help differentiate between myofascial versus osseous etiology. Palpation of the major muscle groups for the lower extremities should be performed to evaluate tone and bulk compared side to side. Percussion of the spinous processes is important and can suggest fracture, vertebral metastases, and possibly even infection when clinically point tender. This is not to suggest that a patient with tenderness all over the back has this clinical concern. Also, be sure to percuss the costophrenic angles for costovertebral angle tenderness, which could suggest renal etiology masquerading as back pain.

Neurological examination for the spine includes how well the nerves are working with the muscle to perform various tasks. One of the essential components of the spine examination is strength grading. Strength grading is not entirely subjective. There are grading scales that are used to assess strength. A commonly accepted scale for this is the Medical Research Council Manual Muscle Testing scale, referenced as "x"/ 5 for each muscle group examined (Williams, 1956) (see Table 2). A standard examination for the lower lumbar nerve roots (L5 and S1) is the ability to toe and heel walk, which is examining the ability to perform plantar flexion (S1) and dorsiflexion (L5). Other lower extremity strength testing includes knee extension that targets L3-4 (L4 nerve root) and hip flexors, which examine L2-3 (L3 nerve root) (Blumenfeld, 2010) (see Table 3 and Figure 3). One should note that there can be some "crossover," which means the patient may have less or better strength than

TABLE 2. STRENGTH SCORING

Grade	Strength Measured
0	Total paralysis
1	Palpable or visible contraction, no active movement
2	Active movement, unable to move against gravity
3	Active movement against gravity
4	Active movement against gravity with some degree of resistance
5	Active movement with full resistance (normal)

IABLE 3. MOTOR EXAMINATION IN LOWER EXTREMITIES				
L2–3 Hip flexors (femoral nerve), also hip abduction				
L3–4	Quadriceps/knee extension			
L4-5	Ankle dorsiflexion (peroneal nerve), extensor hallucis longus great toe			
L5–S1	Plantar flexion (tibial nerve)			
S2,3,4	Bowel bladder control			

expected when compared with imaging because of multiple nerve root innervation.

Provocative testing for the lumbar spine includes straight leg raise (SLR) test, which can be completed either seated or lying supine. This commonly used test is performed by passively raising the leg of the affected side while dorsiflexing the foot. Pain that is reproduced into the leg is consistent with a positive straight leg test. Back pain alone with SLR is *not* considered a positive finding. It should be noted that radicular pain reproduced in the symptomatic leg by raising the opposite leg of pathology is consistent with lumbar radicular pathology and is called an opposite straight leg test. For example, pain in the symptomatic right leg is reproduced by raising the left leg, which would be the asymptomatic side (Blumenfeld, 2010). Similar to the SLR is a femoral stretch test, which is completed with the patient prone.



Data from: Bigos S, Bowyer O, Braen G, et al. Acute Low Back Problems in Adults. Clinical Practice Guideline, Quick Reference Guide Number. 14. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research, AHCPR Pub. No. 95-0643. December 1994.

FIGURE 3. Testing for lumbar nerve root compromise. Reproduced with permission from *Evaluation of Low Back Pain in Adults*, by S. G. Wheeler, J. E. Wipf, T. O. Staiger, et al., 2019, Waltham, MA: UpToDate. Copyright © 2019 UpToDate, Inc. For more information visit www.uptodate.com.

338 Orthopaedic Nursing • November/December 2021 • Volume 40 • Number 6

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This test is achieved by raising the symptomatic leg into extension with the knee slightly flexed. If pain is reproduced into the anterior thigh, this can suggest nerve root irritation between L2, 3, and 4 (Sandella & Daetwyler, 2018).

The evaluation of SI dysfunction has become more common over the years. Pathology that affects the SI joint can also mimic low back pain. It has been suggested that when more than one test reproduces SI pain that this joint is likely responsible for the symptoms. Physical examination to evaluate for SI pathology is flexion, abduction, external rotation (FABER), which can be a provocative test for SI dysfunction (Sandella & Panchbhavi, 2018). Another test is the Gaenslen test, which is performed by having the patient in a supine position and flexing one hip while extending the contralateral hip. A positive result is noted when pain is reported in the posterior pelvic region. When the history and physical examination makes the clinician suspicious for SI dysfunction, the gold standard for confirmation of this diagnosis is a fluoroscopyguided injection with significant relief of symptoms (Putukian & Miller, 2021).

Deep tendon reflexes (DTRs) can be achieved using a reflex hammer and striking the extremity to produce a reflex amplitude. When a reflex is difficult to elicit, the examiner can use reinforcement techniques to help produce a reflex (Blumenfeld, 2010). These techniques include clasping hands and trying to pull them apart while the reflex is attempted. Another form of distraction can be to have the patient squeeze their fist just before the reflex is percussed to allow a natural response. Absent or exaggerated reflexes are sometimes observed in nonpathological patients. However, abnormal reflexes can help in determining the cause of pathology (see Table 4). If the reflex is symmetrical and no other signs or symptoms are discovered, then further workup is probably not needed (Goldberg, 2018). Typical DTR of the lower extremity includes patella reflex, which is innervated primarily from the L4 nerve root, the Achilles reflex, which is activated from the S1 nerve root, and much less frequently the L5 reflex, which is examined by striking the internal medial hamstring but is rarely examined (see Table 5). Reflexes are subjectively graded by the examiner and attention should be to any asymmetry of the reflex (Blumenfeld, 2010).

Lastly, examining for saddle anesthesia, which would affect the S2, 3, and 4 nerve roots, can be completed with light touch in the perineum region. Decreased sensation in this region should be addressed aggressively for possible cauda equina syndrome, although rare,

TABLE 4. ABNORMAL REFLEXES

Reflex (Hyper/Hypo)	Clinical Suggestion
Absent/reduced	It can be found without other symp- toms may be normal. However, when seen with muscle weakness, atrophy, or fasciculation may sug- gest lower motor neuron disease
Exaggerated	Very brisk reflexes, may produce clo- nus, suggests upper motor neuron disease (myelopathy)

TABLE 5. LOWER EXTREMITY REFLEXES					
Primary Spinal					
Reflex	Nerve	Grade			
Patella	L4	0 = Absent			
		1 = Present but slightly diminished			
		2 = Average patient			
		3 = Slightly increased from average (brisk)			
		4 = Very brisk/clonus			
Medial hamstring	L5 (not commonly evaluated)				
Achilles	S1				

must be recognized. Further, if a patient has a clinical history and decreased sensation in the saddle region, then a rectal examination for tone should be carried out asking the patient to bear down to evaluate the degree of sphincter tone (Hall, 2014).

When the practitioner obtains a complete history and a thorough examination, many of the grim diagnoses can be excluded or made very low likelihood without advanced imaging. However, in the presence of concerning findings with history and examination, an expedited referral to a spine specialist as well as appropriate imaging should be obtained expeditiously.

Imaging

In the absence of red flags discussed earlier, routine spinal imaging should be avoided (see Figure 4). Inappropriate imaging can lead to irrelevant findings and trigger additional costly and unneeded modalities (Devo et al., 2014). Although many patients "feel" better about imaging, this does not improve clinical outcomes. Patient education must include that "abnormal" findings such as degenerative changes are prevalent, especially as patients increase in age and may not correlate to their presenting symptoms. Patients with ongoing back pain in the absence of red flags for greater than 4–6 weeks can consider x-ray imaging of the lumbar spine (Chou et al., 2007); magnetic resonance imaging (MRI) may be considered in cases where there are strong indications for imaging (e.g., neurological deficits, saddle anesthesia, infection, current or recent cancer, or compression fracture), and there are no contraindications (e.g., metal in the eye, pacemaker, and cochlear implant). When there is a high suspicion of infection or tumor involving the lumbar spine, then MRI with and without IV contrast is recommended. However, imaging for radicular symptoms or neurological abnormality typically does not require the routine use of contrast. In patients who are not MRI compatible, imaging via computer-aided tomography (CT) without IV or oral contrast can be utilized. CT myelography is superior to CT alone when evaluating the spine's neurological anatomy (Patel et al., 2016). When in doubt, consult your radiology service to discuss which imaging is most appropriate for each patient.

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Orthopaedic Nursing • November/December 2021 • Volume 40 • Number 6 339



MRI: magnetic resonance imaging; MM: multiple myeloma; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; CT: computed tomography. * Lumbar spine MRI without contrast is usually appropriate. If there is concern for cancer or infection or if there is history of prior surgery at the site, MRI without and with contrast is recommended. CT with contrast is the alternative exam if MRI is contraindicated. UDTODate[®]

FIGURE 4. Acute low back pain: Considerations for imaging. Reproduced with permission from: *Evaluation of Low Back Pain in Adults*, by S. G. Wheeler, J. E. Wipf, T. O. Staiger, et al., 2019, Waltham, MA: UpToDate. Copyright © 2019 UpToDate, Inc. For more information visit www.uptodate.com.

Treatment

A single standard of care for patients with low back pain has not been established. The myriad of diagnoses and treatment choices make it difficult to develop a single algorithm for management (Daham et al., 2011). Treatment is usually divided into surgical, pharmacological, and the least aggressive nonpharmacological. Nonpharmacological treatment is often the best initial recommendation for nonspecific back pain in the absence of any red flags. Bed rest has not demonstrated efficacy in the treatment of low back pain. When comparing patients treated with bed rest to those who have been as active as possible, the active group had better outcomes (Daham et al., 2011). In subacute low back pain, there is some evidence that activity improves outcomes. In acute low back pain, exercise therapy is as effective as either no treatment or other conservative measures (Hayden et al., 2005). Most agree that initiating physical therapy can provide benefits along with modalities and education to the patient. Studies have shown that patient education with acute and subacute complaints seems to be effective; however, for those patients with chronic low back pain, results are still unclear (Engers et al., 2008). The use of lumbar supports is no more beneficial than other interventions and did not improve the outcomes of those with or without use. There is limited information on the use of spinal manipulation for acute low back pain treatment. There does not seem to be any discernible benefit to using spinal manipulation over other recommended therapies. However, it should be noted that studies are

340 Orthopaedic Nursing • November/December 2021 • Volume 40 • Number 6 © 2021 by National Association of Orthopaedic Nurses

limited in the use of this modality (Rubinstein et al., 2012).

Pharmacological management can be used if the patient is not progressing or has plateaued without improvement. Medication management should begin with the use of acetaminophen and/or nonsteroidal antiinflammatories (NSAIDs). NSAIDs are effective for short-term symptomatic relief in patients with acute and chronic low back pain without sciatica. The use of COX-2 inhibitors compared with traditional NSAIDs demonstrated fewer side effects (Roelofs et al., 2008). Muscle relaxants are also commonly used and have been shown to be effective in nonspecific low back pain. There are limited studies to suggest whether muscle relaxants are more effective than analgesics or NSAIDs alone. There is evidence that using muscle relaxants with NSAIDs has added benefit. Unfortunately, many muscle relaxants are central acting, have a sedative effect, and must be used cautiously, especially in older patients (Roscoe & Nishihira, 2016). The use of systemic glucocorticoids does not have any significant data to support routine use. The American College of Physicians has suggested that the use of oral steroids be avoided in nonspecific low back but can benefit patients with a radicular component (Chou et al., 2017). The use of opioid medication has been under significant scrutiny in the recent past. The Centers for Disease Control and Prevention (CDC) has stated that opioids should not be the first-line medication. When using opioids, it is strongly recommended that short-acting be used with the lowest effective dose for a brief time not to exceed 7 days (CDC, 2018). Other pharmacological modalities that can be considered for subacute pain include antidepressants (selective serotonin reuptake inhibitor and serotonin and norepinephrine reuptake inhibitor), antiepileptics (gabapentin, pregabalin), topical agents (lidocaine patches), and herbal products such as cannabidiol (CBD) oil, which is more anecdotal than evidence based. More invasive treatment options such as myofascial injections, facet injections, epidural steroid injections, selective nerve root injections, spinal cord stimulators, and operative management should be reserved for those who specialize in treating spinal disorders. Consultation with physiatrists, pain rehabilitation (PMR) specialists, and pain management should be considered in patients who do not respond to traditional modalities. Orthopaedic spine surgery or neurosurgical spine should be consulted urgently in patients who present with "red flags."

Conclusion

Nonspecific low back pain is a prevalent complaint in primary care and acute care settings. Most patients with acute/subacute low back pain will resolve regardless of the modality used or not used. Unfortunately, no data exist to suggest the superiority of one nonpharmacological modality to the next. There is some agreement that the use of NSAIDs should be first-line pharmacological therapy for nonspecific low back pain patients as well as adding other modalities (both pharmacological and nonpharmacological) as needed. The provider needs to consistently recognize pathologies (red flags) that require a more urgent tone through a detailed history and physical examination. This process can help decrease unnecessary imaging that can lead to higher costs as well as inaccurate diagnoses.

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Orthopaedic Nursing • November/December 2021 • Volume 40 • Number 6 341

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