CME CREDIT

EDUCATIONAL OBJECTIVE: Readers will recognize red flags indicating serious causes of back pain

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Back pain made simple: An approach based on principles and evidence

ABSTRACT

In cases of low back pain, the goal is to detect serious problems and to prevent the pain from becoming chronic by promptly detecting risk factors. The authors lay out a simple, evidence-based approach to low back pain.

KEY POINTS

Most back pain has no recognizable cause and is therefore termed "mechanical" or "musculoskeletal." Underlying systemic disease is rare.

Most episodes of back pain are not preventable.

Confounding psychosocial issues are common.

A careful, informed history and physical examination are invaluable; diagnostic studies, however sophisticated, are never a substitute. Defer them for specific indications.

Refer patients only if they have underlying disease or progressive neurologic dysfunction or do not respond to conservative management.

Encouragement of activity is benign and perhaps salutary for back pain and is desirable for general physical and mental health. Evidence to support bed rest is scant.

Few if any treatments have been proven effective for low back pain.

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Low back pain should be understood as a remittent, intermittent predicament of life. Its cause is indeterminate, but its course is predictable. Its link to work-related injury is tenuous and confounded by psychosocial issues, including workers' compensation. It challenges function, compromises performance, and calls for empathy and understanding.[1]

In this brief paper, we offer a simple approach to one of the most common human afflictions, based on principles and evidence.

WHY IS BACK PAIN IMPORTANT?

Low back pain is common and affects people of all ages. It is second only to the common cold as the most common affliction of mankind, and it is among the leading complaints bringing patients to physicians' offices. Its lifetime prevalence exceeds 70% in most industrialized countries, with an annual incidence of 15% to 20% in the United States.

Its social and economic impact is substantial. It is the most frequent cause of disability for people under age 45. In 2005, the mean age- and sex-adjusted medical expenditure among respondents with spine problems was $6,096 vs $3,516 in those without spine problems, and it had increased by 65% (adjusted for inflation) from 1997 to 2005.[2]

WHAT ARE THE GOALS AND PRINCIPLES OF MANAGING LOW BACK PAIN?

The goals of management for patients with low back pain are to:

TABLE 1

Red flags suggesting a serious back condition

DISORDER	HISTORY	FINDINGS ON PHYSICAL EXAMINATION
All	Duration of pain > 1 month Bed rest with no relief	
Cancer	Age ≥ 50 years History of cancer Unexplained weight loss	Neurologic findings Lymphadenopathy
Compression fracture	Age ≥ 50 years (> 70 years is more specific) Significant trauma History of osteoporosis Corticosteroid use Substance abuse	
Infection	Fever or chills Recent skin or urinary tract infection Immunosuppression Injection drug use	Fever (temperature > 100°F or 38°C) Tenderness over spinous processes

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Most back pain is regional, musculoskeletal, and mechanical

- Decrease the pain
- Restore mobility
- Hasten recovery so the patient can resume normal daily activities as soon as possible
- Prevent development of a chronic recurrent condition: low back pain is considered acute when it persists for less than 6 weeks, subacute between 6 weeks and 3 months, and chronic when it lasts longer than 3 months
- Restore and preserve physical and financial independence and comfort.

Principles of management

- Most back pain has no recognizable cause and is therefore termed "mechanical" or "musculoskeletal."
- Underlying systemic disease is rare.
- Most episodes of back pain are unpreventable.
- Confounding psychosocial issues are often contributory, important, and relevant.
- A careful, informed history and physical examination are invaluable; diagnostic studies, however technologically sophisticated, are never a substitute.
- Defer diagnostic studies for specific indications.
- Refer patients only if they have underlying disease or progressive neurologic dysfunction, or if they do not respond to conservative management.
- Encouragement of activity is benign and perhaps salutary for back pain and is desirable for general physical and mental health; there is only scant evidence to support bed rest.[3]
- Few if any treatments have been proven effective for low back pain.
- Talking to the patient and explaining the issues involved are critical to successful management.[4]

INITIAL CONSIDERATIONS WHEN EVALUATING A PATIENT

When encountering a patient with back pain, the initial consideration is whether the symp-

TABLE 2

Physical findings associated with specific nerve root impingement

NERVE ROOT	WEAKNESS	ALTERED SENSATION	ALTERED REFLEXES
L2	Iliopsoas	Anterior thigh, groin	None
L3	Quadriceps	Anterior and lateral thigh	Patellar
L4	Quadriceps, ankle dorsiflexion (heel-walking)	Medial ankle and foot	Patellar
L5	Great-toe dorsiflexion	Dorsum of foot	None
S1	Ankle plantar flexion (toe-walking)	Lateral plantar foot	Achilles

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toms are regional—ie, local, mechanical, and musculoskeletal—or if they reflect a systemic disease. It is also important to look for evidence of social or psychological distress that may amplify, prolong, or confound the pain or the patient's perception of it.

What are the clues to a systemic process?

Red flags of a serious, systemic cause of low back pain are presented in TABLE 1. Other symptoms that may indicate a systemic cause include night pain (also seen with disk disease and neurocompression), pain with recumbency (malignancy), back pain with morning stiffness lasting for more than 1 hour (spondyloarthropathy), cauda equina syndrome (overflow incontinence, saddle anesthesia, and paraparesis), and other systemic and constitutional symptoms.

Does the patient have a regional low back syndrome?

Regional low back syndromes account for 90% of the causes of low back pain. They are usually mechanical in origin.

Regional back pain is due to overuse of a normal mechanical structure (muscle strain, "lumbago") or is secondary to trauma, deformity, or degeneration of an anatomical structure (herniated nucleus pulposus, fracture, and spondyloarthropathy, including facet joint arthritis). Chronic regional back syndromes include osteoarthritis of the spine (ie, spondylosis), spinal stenosis, and facet joint arthropathy.

Characteristically, mechanical disorders are exacerbated by certain physical activities, such as lifting, and are relieved by others, such as assuming a supine position.

Does the patient have sciatica or another nerve root compression syndrome?

The obvious manifestation of nerve root irritation is usually sciatica, a sharp or burning pain radiating down the posterior or lateral aspect of the leg usually to the foot or the ankle and often associated with numbness or paresthesias. The pain is sometimes aggravated by coughing, sneezing, or the Valsalva maneuver. It is most commonly seen in lumbar disk herniation, cauda equina syndrome, and spinal stenosis.

A good history and physical examination are key to excluding rare systemic causes of low back pain

Might the patient have spinal stenosis?

More than 20% of people over age 60 have radiographic evidence of lumbar spinal canal stenosis, even if they have no symptoms.[5] For this reason, the diagnosis of spinal stenosis as a cause of low back pain must be based on the history and physical examination.

The classic history of spinal stenosis is that of neurogenic claudication ("pseudoclaudication"), which is pain that occurs in the legs after walking or prolonged standing and is relieved with sitting. It may sometimes be associated with a varying and transient neurologic

deficit. Lumbar flexion increases and lumbar extension decreases the cross-sectional area of the spinal canal—hence, the relief of symptoms of spinal stenosis on stooping or bending forward. Pain is commonly perceived in the back, buttock, or thigh and is elicited by prolonged lumbar extension.

On neurologic examination, about 50% of patients with spinal stenosis have a deficit in vibratory sensibility, temperature sensitivity, or muscle strength. The nerve root involved is most commonly L5, followed by S1 and L4.

Many patients have balance disturbance (wide-based gait or Romberg sign), particularly later in the course of the disorder, with normal cerebellar signs ("pseudocerebellar" presentation).

Patients with bilateral hip osteoarthritis may present with similar symptoms of buttock or thigh pain, which can be distinguished with the above clinical examination. Rotation of the hip is painful in osteoarthritis but not in spinal stenosis. If both conditions overlap, injection of a steroid or lidocaine in the painful hip should decrease the pain associated with hip osteoarthritis.

Defer diagnostic studies for specific indications

Does the patient have evidence of neurologic compromise?

Assessment of neurologic compromise requires a thorough history for evidence of muscle weakness, gait disturbances, paresthesias, numbness, radicular pain, and bowel or bladder disturbances. The neurologic examination includes testing muscle strength, evaluating sensation and reflexes (TABLE 2), and analyzing the gait.

Muscle strength is tested by examining the:

- L2 nerve root (which supplies the iliopsoas muscle and is tested by hip flexion)
- L3 nerve root (quadriceps, tested by knee extension)
- L4 nerve root (tibialis anterior, assessed by evaluating ankle dorsiflexion and inversion at the subtalar joint)
- L5 nerve root (extensor hallucis longus and extensor digitorum longus, tested by asking the patient to dorsiflex the great toe, then the other toes)
- S1 nerve root (flexor hallucis longus, flexor digitorum longus, and tendoachilles, tested by asking the patient to plantar-flex the great toe, then the other toes, and then the ankle).

The patient is also asked to walk a few steps on the toes and then on the heels. Inability to toe-walk indicates S1 nerve root involvement; inability to heel-walk may indicate L4 or L5 involvement. If the patient cannot heel-walk, ask him or her to squat; inability to do so indicates L4 problems.[6]

Radiculopathy. Detecting and locating the cause of radiculopathy may be helpful. In L3-L4 disk herniation, there is pain and paresthesia with numbness and hypalgesia in the anteromedial thigh and the knee. In L4-L5 disk herniation, there is usually involvement of the exiting L5 nerve root, which presents as numbness or paresthesias in the anterolateral calf, great toe, first web space, and medial foot. In L5-S1 disk herniation, the S1 nerve root is involved, presenting as numbness and hypalgesia in the fifth toe, lateral aspect of the foot, sole, and posterolateral calf and thigh.

Reflexes. Exaggerated or decreased reflexes do not always indicate a neurologic abnormality, but reflex asymmetry is significant. The knee-jerk reflex is diminished in L3-L4 nerve root involvement, and the ankle-jerk reflex is diminished with S1 nerve root involvement. The Babinski sign indicates pyramidal tract involvement.

Gait. Observe the patient's gait as he or she rises and moves to the examining table, to determine whether it is shortened, asymmetrical, or antalgic.[7] Also note any foot drop, which may indicate a potentially serious problem (L5 radiculopathy).

What is an adequate examination of the back?

A good back examination can elicit important information about the cause and the extent of back pain. It includes inspection, palpation, and range of movement of the spine along with a detailed neurologic examination.

Inspect it for any deformities, scoliosis, asymmetry, paraspinal muscle spasm, unusual hair growth, listing to one side, decrease or increase in lumbar lordosis, or muscle atrophy or fasciculation.

Palpate it for paraspinal muscle spasm, warmth, and localized bone pain.

Move it. The normal ranges of motion of the lumbar spine are 15 degrees of extension, 40 degrees of flexion, 30 degrees of lateral bending, and 40 degrees of lateral rotation to each side.

Assess it. This includes estimating the tone and nutrition of the muscles, testing their strength (TABLE 2), examining vibratory or proprioception and pinprick sensation in each dermatome (see below), testing the Achilles and patellar reflexes, and looking for the Babinski sign and clonus. In addition, perform the straight-leg-raising and the cross-straight-leg-raising tests, which are positive in most patients with lower lumbar disk herniations.

The femoral stretch test is usually positive in upper lumbar disk herniations (L2-L3, L3-L4). It is performed with the patient in the prone position, with the knee being gradually flexed from full extension. Pain radiating along the anterior aspect of the thigh indicates a positive test.

The examination of the spine must be supplemented with examination of the hip and sacroiliac joints, since back pain may be a referred symptom from any pathology affecting these joints.

When should patients be referred to a specialist?

Patients should be referred to a neurologist, neurosurgeon, orthopedist, or other specialist if they have cauda equina syndrome; severe or progressive neurologic deficits; infections, tumors, or fractures compressing the spinal cord; or, perhaps, no response to conservative therapy for 4 to 6 weeks for patients with a herniated lumbar disk or 8 to 12 weeks for those with spinal stenosis.

If there is profound motor involvement at the time of the initial evaluation, patients must be promptly given systemic corticosteroids such as methylprednisolone (Medrol) or dexamethasone (Decadron) to decrease spinal cord edema.

Are there signs of psychological distress?

Psychosocial factors can significantly affect pain and functional disability in patients who have low back pain.[8,9] These are known as "yellow flags" and are better predictors of treatment outcome than physical factors.[10] Anatomically inappropriate signs may be helpful in identifying psychological distress as a result of or as an amplifier of low back symptoms.

Waddell et al[11] proposed five categories of these nonorganic signs. These are:

- Inappropriate tenderness that is superficial or widespread
- Pain on simulated axial loading by pressing on the top of the head or simulated spine rotation
- Distraction signs such as inconsistent performance between straight-leg-raising in the seated position vs the supine position
- Regional disturbances in strength and sensation that do not correspond with nerve root innervation patterns
- Overreaction during the physical examination.

The occurrence of any one of the signs is of limited value, but positive findings in three of the five categories suggest psychological distress.[11]

Which diagnostic studies are useful, cost-effective, and supported by evidence?

Since most abnormalities found on imaging studies are nonspecific, such studies are not necessary during the initial evaluation of acute low back pain unless there are red flags that suggest a more ominous source of pain.

Instead of bed rest, encourage early ambulation, as pain permits

Routine plain lumbosacral spine radiographs with anteroposterior and lateral views may be appropriate initially if the patient has risk factors for vertebral fractures (TABLE 1), or if the patient does not improve after a course of conservative treatment (usually 4–6 weeks).

Magnetic resonance imaging (MRI) is the preferred test if one suspects a tumor, infection, disk pathology, or spinal stenosis.

Computed tomography (CT) shows bony details better than MRI does. Hence, it is preferred when one needs to evaluate bony details (fractures, scoliosis) and when there are contraindications to MRI, as in patients with metal implant devices and those who are claustrophobic (although now there are "open system" MRI machines, in which the feeling of claustrophobia is much less).

MRI and CT should not be ordered routinely, but only for specific indications to answer specific questions, when specific findings would indicate specific treatment.

In most cases, contrast is not needed for CT or MRI to rule out common causes of low back pain, except in cases of suspected intraspinal tumor. Patients with compromised renal function who need contrast for CT need to be hydrated before the scan to lower the risk of contrast-induced nephropathy. These patients are also at higher risk of nephrogenic fibrosing dermopathy when they receive gadolinium contrast for MRI.

Bone scans can be used to look for infections or fractures not noted on plain radiography. However, MRI provides similar or better diagnostic accuracy without radiation.

Electrodiagnostic studies may be used in patients with radiculopathy when clinical examination suggests multilevel root lesions, when symptoms do not match imaging studies, and when patients have breakaway weakness (fluctuating levels of strength in one or more muscle groups).

Other useful diagnostic and laboratory studies may include the erythrocyte sedimentation rate to screen for malignancy and infection when these are suspected, blood culture for osteomyelitis, and bone aspiration and biopsy for histopathologic diagnosis of infection, malignancy, or other lesions.

Acetaminophen and NSAIDs are the drugs of choice to alleviate back pain

WHICH TREATMENTS ARE SUPPORTED BY ROBUST EVIDENCE?

The primary treatment of low back pain should be conservative care, reassurance, and education, allowing patients to improve on their own and helping them cope with their predicament.

Limited bed rest. While 2 or 3 days of limited bed rest may help improve symptoms in patients who have acute radiculopathy, several studies have shown that long periods of bed rest are not beneficial for acute or subacute low back pain.[12] Encouraging activity modification allows patients with nonspecific back pain or radicular symptoms to remain active while avoiding activities that may aggravate pain and is shown to lead to a more rapid recovery than bed rest.[13,14] The most common situations to avoid are prolonged sitting or standing.[15] Low-stress aerobic activities, especially walking, are the best early activities.[15]

Exercise is one of the only evidence-based, effective treatments for chronic low back pain.[16] The most commonly prescribed exercises are aimed at retraining the multifidus (a back muscle) and transversus abdominis (a deep abdominal muscle), supplemented with exercises for the pelvic floor and breathing control.

Nonsteroidal anti-inflammatory drugs (NSAIDs) **and acetaminophen** (Tylenol) are the drugs of choice for pain control in acute back pain[17,18] and are as effective as muscle relaxants or opioids.

Muscle relaxants and opioids offer few advantages over NSAIDs and acetaminophen, except when there is severe muscle spasm associated with the back pain or if acetaminophen or NSAIDs do not relieve the pain. Muscle relaxants and opioids are both associated with more severe adverse effects. If prescribed, they should be used for a short, clearly defined period (1 to 2 weeks).[19]

Epidural corticosteroids, when used for sciatica, give mild to moderate short-term improvement in leg pain and sensory deficit but no significant long-term functional benefit or reduction in the need for surgery.[20]

Surgery may be considered in cases of cauda equina syndrome, which is a surgical emergency; severe or progressive neurologic deficit; infections, tumors, and fractures compressing the spinal cord; mechanical instability of the back; and, perhaps, intractable pain (leg pain equal to or greater than back pain) with a positive straight-leg-raising test and no response to conservative therapy.

The term "instability" implies an abnormal motion under physiologic loads. Lumbar instability is defined as translation of more than 4 mm or 10 degrees of angular motion between flexion and extension on an upright lateral radiograph.

Although Weinstein et al[21] showed that patients with spinal stenosis who underwent surgery showed significantly more improvement in all primary outcomes than did patients treated nonsurgically, many patients can be effectively treated without surgery.

WHAT SHOULD BE REMEMBERED ABOUT LOW BACK PAIN?

Low back pain is a common and costly medical condition with only a weak correlation

between symptoms and pathologic changes, resulting in a lack of objective clinical findings on which a definitive diagnosis can be based.[22] Most back pain has no recognizable cause and is usually regional and musculoskeletal. Back pain as a result of an underlying systemic disease is rare and needs to be excluded by a good history and physical examination. Diagnostic studies are best reserved for specific indications.

Referral to a specialist is warranted when the patient is not responding to conservative treatment, when a progressive neurologic deficit or cauda equina syndrome is noted or suspected, or when the patient has an underlying malignancy, infection, fracture, or spinal instability.

Bed rest is best avoided, and activity within the limits of pain is encouraged. NSAIDs and acetaminophen are usually the drugs of choice for controlling acute low back pain.

Ultimately, the goal for clinicians is to identify serious conditions and to prevent the back pain from becoming chronic pain by promptly identifying the various risk factors.

Refer if there are red flags or if conservative measures fail

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