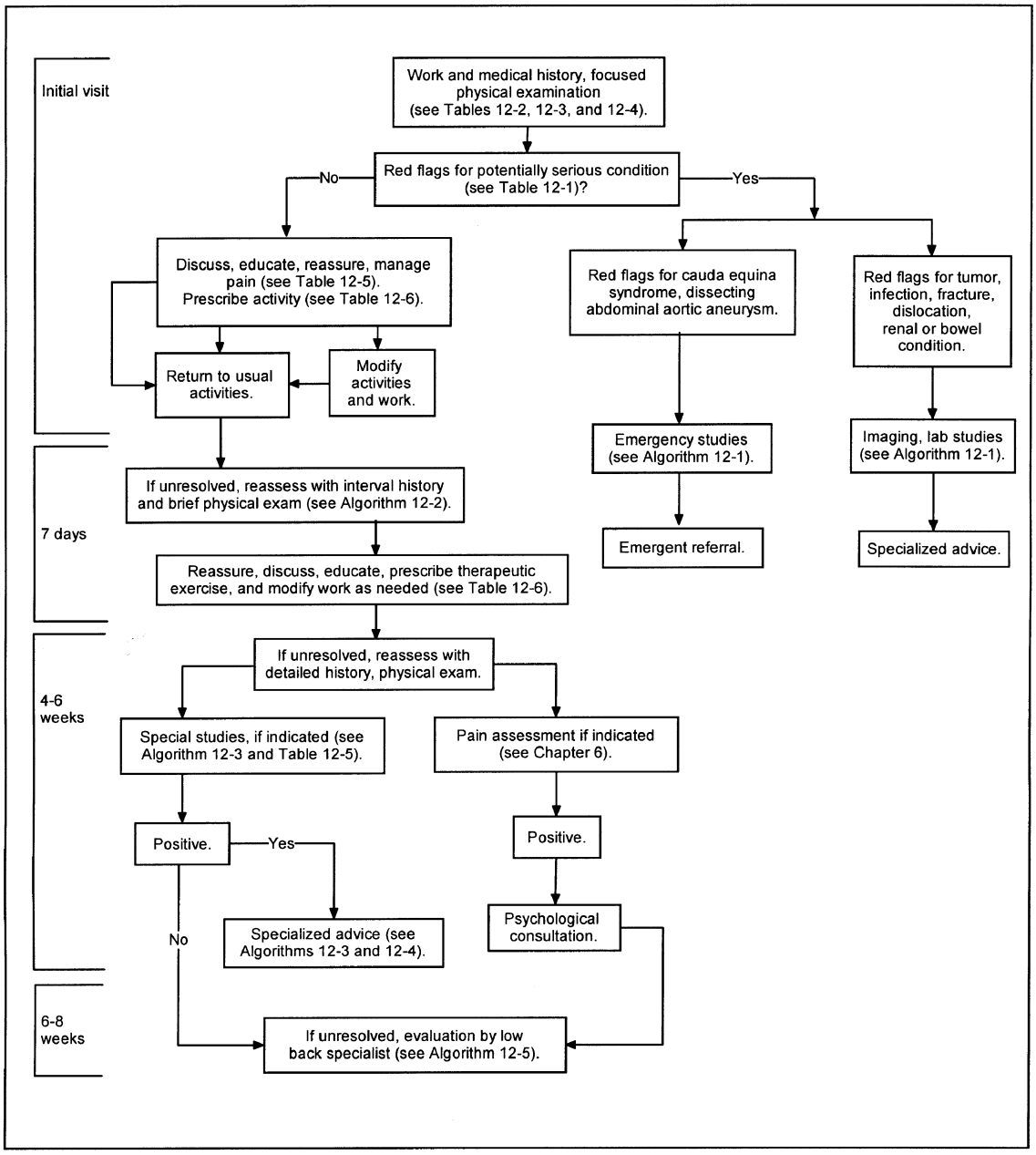
***Master Algorithm**. ACOEM Guidelines for Care of Acute and Subacute Occupational Low Back Complaints*



12 Low Back Complaints

General Approach and Basic Principles

Low back complaints that may be work related are the most common problems presented to occupational health and primary care providers. They are the most common cause of reported occupational complaints and workers' compensation claims. These complaints account for about 30% of both cases reported to the Bureau of Labor Statistics and workers' compensation claims. They are disproportionately expensive, accounting for 30-40% of costs as well.

Recommendations on assessing and treating adults with potentially work-related low back problems (i.e., activity limitations due to symptoms in the low back of less than three months duration) are presented in this clinical practice guideline. Topics include the initial assessment and diagnosis of patients with acute and subacute low back complaints that are potentially work related, identification of red flags that may indicate the presence of a serious underlying medical condition, initial management, diagnostic considerations and special studies to identify clinical pathology, work-relatedness, modified duty and activity, and return to work as well as further management considerations, including the management of delayed recovery.

Algorithms for patient management are included. This chapter's master algorithm schematizes how primary care and occupational medicine practitioners generally can manage acute or subacute low back complaints. The following text, tables, and numbered algorithms expand upon the master algorithm.

The principal recommendations for assessing and treating patients with low back complaints are as follows:

- The initial assessment of patients with low back problems focuses on detecting indications of potentially serious disease, termed red flags.
- In the absence of red flags, imaging and other tests are not usually helpful during the first four to six weeks of low back symptoms.
- Relieving discomfort can be accomplished most safely by nonprescription medication or an appropriately selected nonsteroidal anti-

inflammatory drug (NSAID), appropriate adjustment of activity, and use of thermal modalities such as ice and/or heat.

- Primary care or occupational physicians can effectively manage acute and subacute low back problems conservatively in the absence of red flags.
- To avoid undue back irritation and debilitation from inactivity, some activity or job modification may be helpful in the acute period. Most patients will not require bed rest. Bed rest may lead to a slower recovery and result in longer periods of sick leave. Bed rest has potential debilitating effects, and its efficacy in treating acute low back pain is unproven. Maintaining ordinary activity, as tolerated, leads to the most rapid recovery.
- Low-stress aerobic activities can be safely started after the first two weeks of symptoms to help avoid debilitation. Careful stretching exercises within the normal range of motion may be helpful to avoid further restriction of motion. Exercises to strengthen low back and abdominal muscles are commonly delayed for several weeks, but early stage lumbar stabilization exercises can be used without aggravation of symptoms.
- Encourage patients recovering from acute and subacute low back problems to return to modified- or full-duty work as soon as possible. Having patients continue their normal activities, within limits permitted by pain, leads to more rapid recovery than either bed rest or back-mobilizing exercises.
- The strongest medical evidence regarding potential therapies for low back pain indicates that having the patient return to normal activities has the best long-term outcome. Many invasive and noninvasive therapies are intended to cure the pain, but no strong evidence exists that they accomplish this as successfully as therapies that focus on restoring functional ability without focusing on the pain. In these cases, the traditional medical model of "curing" the patient does not work well. Furthermore, the patient should be aware that returning to normal activities most often aids recovery. Patients should be encouraged to accept responsibility for their recovery rather than expecting the provider to provide an easy "cure." This process will promote using activity rather than pain as a guide, and it will make the treatment goal of return to work more obvious in the occupational setting.
- If symptoms persist, further evaluation may be indicated.
- Within the first three months of low back symptoms, only patients with evidence of severe spinal disease or severe, debilitating symptoms, and physiologic evidence of specific nerve root compromise, confirmed by appropriate imaging studies, can be expected to benefit from surgery.
- More than 80% of patients with symptoms of lumbosacral nerve root irritation due to herniated disks (nucleus pulposus) eventually recover with or without surgery.
- Nonphysical factors (such as psychosocial, workplace, or socioeconomic problems) can be investigated and addressed in cases of delayed recovery or return to work.

- Clinicians can greatly improve the patient's response to back symptoms by providing assurance, encouraging activity, and emphasizing that more than 90% of low back pain complaints resolve without any specific therapies. While patients may be looking for a clear-cut diagnosis for their low back pain, the risk to them of a suggested "cure" for this assumed diagnosis may be worse than their symptoms.

Initial Assessment

Thorough medical and work histories and a focused physical examination (see Chapter 2) are sufficient for the initial assessment of a patient complaining of potentially work-related low back symptoms. In this assessment, certain findings, referred to as red flags, raise suspicion of serious underlying medical conditions (Table 12-1). Their absence rules out the need for special studies, referral, or inpatient care during the first four weeks, during which time spontaneous recovery is expected (provided any associated workplace factors are mitigated). Findings of the medical history and physical examination may also alert the clinician to other pathology (not of low back origin) that can present as low back complaints. Low back complaints can then be classified into one of three working categories, although common factors may be operative in all three and, thus, confound this classification:

- Potentially serious low back disorders, including acute fractures, acute dislocations, infection, tumor, progressive neurologic deficit, or cauda equina syndrome

Table 12-1. Red Flags for Potentially Serious Low Back Conditions

Disorder	Medical History	Physical Examination
	SPINAL DISORDERS	
Fracture	Major trauma, such as vehicular accident or fall from height Minor trauma or strenuous lifting, in older or potentially osteoporotic patients Percussion tenderness over specific spinous processes	
Tumor	Severe localized pain over specific spinal processes History of cancer Age > 50 years Constitutional symptoms, such as recent unexplained weight loss Pain that worsens when patient is supine Pain at night or at rest	Tenderness over spinous process and percussion tenderness Decreased range of motion due to protective muscle spasm

Table 12-1. (continued)

Disorder	Medical History	Physical Examination
Infection	Risk factors for spinal infection: recent bacterial infection (e.g., urinary tract infection); IV drug abuse; diabetes; or immune suppression (due to corticosteroids, transplant, or HIV) Constitutional symptoms, such as recent fever, chills, or unexplained weight loss	Tenderness over spinous processes Decreased range of motion Vital signs consistent with systemic infection (late): • Tachycardia • Tachypnea • Hypotension • Elevated temperature • Pelvic or abdominal mass or tenderness
Cauda equina syndrome Saddle anesthesia	Direct blow or fall, with axial loading Perianal/perineal sensory loss Recent onset of bladder dysfunction, such as urinary retention, increased frequency, or overflow incontinence Severe or progressive neurologic deficit in lower extremities	Unexpected laxity of the bladder* or anal sphincter Major motor weakness: quadriceps (knee extension weakness); ankle plantar flexors, evertors, and dorsiflexors (foot drop) Spastic (thoracic) or flaccid (lumbar) paraparesis Increased (thoracic) or decreased (lumbar) reflexes
Progressive neurologic deficit	Severe low back pain Progressive numbness or weakness	Significant progression of weakness Significant increased sensory loss New motor weakness Radicular signs
EXTRASPINAL DISORDERS		
Dissecting abdominal aortic aneurysm	Excruciating low back pain History of atherosclerotic disease History of hypertension	Pulsatile midline abdominal mass
Renal colic	Excruciating pain from costovertebral angle to testis or labia History of urolithiasis	Possible tenderness at costovertebral angle
Retrocecal appendix	Constipation Subacute onset without inciting event	Low grade fever
Pelvic inflammatory disease	Vaginal discharge Pelvic pain Prior episode	Uterine tenderness Pelvic mass Cervical discharge
Urinary tract infection	Dysuria History of UTIs	Suprapubic tenderness

* Adapted from Bigos: by history.

- Degenerative disorders, including consequences of aging or repetitive use, or a combination thereof, such as degenerative disk disease and osteoarthritis
- Nonspecific disorders, including benign, self-limited disorders with unclear etiology, such as regional low back pain

Medical History

Asking the patient open-ended questions, such as those listed below, allows the clinician to gauge the need for further discussion or specific inquiries to obtain more detailed information (see also Chapter 2).

WHAT EXACTLY WERE YOU DOING WHEN SYMPTOMS BEGAN?

(It is important to obtain all information necessary to document the biomechanical forces of injury.)

- Did symptoms develop immediately, gradually, or after a period of delay?

WHAT ARE YOUR SYMPTOMS?

- Do you have pain, numbness, weakness, stiffness?
- For traumatic injuries: Was the area deformed? Did you lose any blood or have an open wound?
- Is the discomfort located primarily in your low back? Do you have pain or other symptoms elsewhere?
- Have you lost control of your bowel or bladder? Are you soiling your undergarments?
- Do you have fever, night sweats, or weight loss?
- When did your symptoms begin? Have you ever had symptoms like this before? Are your symptoms constant or intermittent? What makes the problem worse or better?
- What is the day pattern to your pain? Better in the morning or evening? Worse as the day progresses? Do you have a problem sleeping? What position is most comfortable? Is there any pain with cough, sneezing, deep breathing, or laughing?
- How do these symptoms limit you?
- How long can you sit, stand, walk, bend?
- Can you lift? How much weight (use items such as gallons of milk, groceries, etc. as examples)?
- Does your pain prevent you from sleeping?

Table 12-2. Symptoms of Lumbar Nerve Root Compromise

Root Level	Pain or Paresthesia	Motor Weakness
L1	Back, radiating to upper anterior thigh and groin	Hip flexion
L2	Back, radiating to anterior mid-thigh	Hip flexion and adduction, knee extension
L3	Back, radiating to anterior thigh and inner knee	Hip flexion and adduction, knee extension
L4	Back, radiating to lateral thigh, front and medial leg, and medial foot	Hip adduction, knee extension, foot inversion
L5	Back, radiating to lateral leg and dorsal foot (especially first web space)	Hip abduction, foot and great toe extension
S1	Back, radiating to back of thigh and lateral leg and foot	Knee flexion, plantar flexion

WHEN DID YOUR CURRENT LIMITATIONS BEGIN? WAS THERE A SPECIFIC INCITING EVENT? HOW DID THE LIMITATIONS DEVELOP?

- How long have your activities been limited? More than four weeks?
- Have your symptoms changed? How?
- Have you had similar episodes previously?
- Have you had previous testing or treatment? With whom?
- What do you think caused the problem? How do you think it is related to work?
- What are your specific job duties? How long do you spend performing each duty on a daily basis?
- What other activities (hobbies, workouts, sports) do you engage in? At home or elsewhere? Do you use your back to perform them? Any heavy lifting? How? How often?
- Do you have other medical problems?
- What do you hope we can accomplish during this visit?

Determining whether or not there is lumbosacral nerve root compromise (and if so, the level of compromise) is critical. Symptoms correlating with specific dermatomal levels of compression and possible motor weakness are shown in Table 12-2.

Physical Examination

Guided by the medical history, the physical examination includes:

- General observation of the patient, including stance and gait
- Regional examination of the low back

- Examination of organ systems related to appropriate differential diagnosis
- Neurologic screening
- Testing for lumbosacral nerve root tension
- Monitoring pain behavior during range-of-motion and while seated as a clue to origin of the problem

The objective parts of the low back examination are testing reflexes and circumferential measurements for atrophy. All other findings require the patient's cooperation. Patients who present with a complaint of leg pain may, in fact, have a disorder of the low back.

A. Observation and Regional Back Examination

Observing the patient's stance and gait is useful to guide the regional low back examination. Incoordination or abnormal use of the extremities may indicate the need for specific neurologic testing. Severe guarding of low-back motion in all planes may add credence to a suspected diagnosis of spinal or intrathecal infection, tumor, or fracture. However, because of the marked variation among persons with symptoms and those without, range-of-motion measurements of the low back are of limited value.

Vertebral point tenderness to palpation, when associated with other signs or symptoms, is suggestive but not specific for spinal fracture or infection. Palpable soft-tissue tenderness, by itself, is an even less specific, less reliable finding.

B. Neurologic Screening

The neurologic examination focuses on a few tests that reveal evidence of nerve root impairment, peripheral neuropathy, or spinal cord dysfunction. Most herniated disks in the lumbar spine involve the L5 nerve root (L4-5 disk) and the S1 nerve root (L5-S1 disk). The clinical features of lumbosacral nerve root compression are summarized in Table 12-3.

1. TESTING FOR MUSCLE STRENGTH

There are no specific muscle tests for the L1 to L3 nerve roots. The iliopsoas, the main flexor of the hip, is innervated by L1, L2, and L3 and is tested by asking the patient to flex the hip against resistance. The L4 nerve root can best be tested by evaluating the strength of ankle inversion and the strength of the quadriceps, which also is innervated by L2 and L3. The L5 nerve root, when compromised, may cause weakness of the great toe extensor on the affected side. In severe cases, the ankle dorsiflexors also may be weak and, if so, the patient will have foot drop during gait. The S1 root generally supplies the plantar flexors of the foot and ankle, but motor weakness is harder to detect due to the bulk and normal strength of these muscles (gastrocnemius,

Table 12-3. Physical Examination Correlates of Lumbosacral Nerve Root Dysfunction

Root Level	Sensory Deficit	Motor Weakness	Reflex Loss
L1	Upper anterior thigh below inguinal ligament to groin	Hip flexion	
L2	Anterior mid-thigh	Hip flexion and adduction; knee extension	
L3	Anterior lower thigh and inner knee	Hip flexion and adduction; knee extension	
L4	Back, radiating to lateral thigh and front and medial leg	Hip adduction; knee extension	Knee jerk
L5	Back, radiating to lateral leg and dorsal and lateral foot	Foot and great toe extension; hip abduction	
S1	Back, radiating to back of thigh and lateral leg and foot	Knee flexion; plantar flexion	Ankle jerk

soleus). The recommended test to detect S1 root compromise is repeated toe raises. Hamstring weakness may also be detected by this test.

2. CIRCUMFERENTIAL MEASUREMENTS

Muscle atrophy can be detected by bilateral circumferential measurements of the calf and thigh. Differences of less than 2 centimeters in measurement of the two limbs at the same level can be a normal variation. Symmetric muscle bulk and strength are expected unless the patient has a relatively long-standing neurologic impairment or disorder of the lower extremity muscle or joint.

3. REFLEXES

Loss of, or decrease in, the ankle jerk reflex indicates interruption of the reflex arc, as may be found in S1 nerve root compromise, such as L5-S1 disk herniation. For the other nerve root level commonly involved, L5 (the L4-L5 disk), there is no reflex change except for the posterior tibial tendon reflex, which is difficult to elicit. When abnormal, the knee jerk reflex indicates an L4 root problem (L3-L4 disk). This level of involvement is much less common.

4. SENSORY EXAMINATION

Sensory examination for nerve root compromise in the low back includes pinprick and light-touch testing. In general, the dorsal foot (especially the first web space), ankle, and calf areas are correlated with the L5 root, and the lateral foot is correlated with the S1 root. It is important to keep in mind

the subjective nature of sensory testing and the influence that past exams may have on a patient with a history of back problems. Light pinprick should not elicit a painful response. If it does, ask patients if this replicates their typical low back pain and ask if the pain is superficial or deep. If the pain *is* typical of their low back pain or if it is described as deep, this suggests a non-organic basis for the pain.

5. PHYSICAL EXAMINATION TESTS

To be successful, the treatment of low back pain generally must be based upon a correct diagnosis. For a variety of reasons, a patient's response on any single test may not be reflective of the presence of identifiable, underlying pathology. When ambiguity or inconsistency in test results prompts a concern regarding the correct diagnosis or the appropriate treatment approach, corroborative testing may be indicated.

A number of tests are commonly employed to distinguish between physiologic and nonphysiologic responses:

- Most common among these are axial loading simulation, fixed pelvic rotation, exaggerated pain response, distraction simulation testing, and evaluation for nondermatomal and myotomal symptoms, referred to collectively as "Waddell's signs."
- The straight-leg-raising test is meant to detect irritation of the lumbar nerve roots by mechanically pulling on the sciatic nerve, and thus the root, as it goes around the posterior hip. Straight-leg raising should be tested in both sitting and lying positions. When sitting, extend and flex the knee while asking if there is any knee pain. The knee should then be left fully extended and the patient asked if there is ankle pain with plantar and dorsiflexion. If a true radicular component is present the patient should not easily tolerate full extension of the knee with dorsiflexion of the ankle in the sitting position—the typical response would be instead for the patient to lean back and complain of radiating pain. If there is no such response in the sitting position but there is a positive-lying straight-leg raise, a non-organic basis for the pain is suggested.
- Other tests, such as popliteal (posterior knee) compression, are designed for the same purpose.

These tests are subjective and can be confusing if the patient is simply having generalized pain that is increased by raising the leg. Results of the test are also influenced by repeated examinations in patients with a recurrent history of back problems. A negative test is generally a good prognostic sign. A positive test for lumbar nerve root irritation generally produces pain that radiates below the knee, and that follows a precise radicular distribution consistent with the nerve root involved. Crossed-straight-leg raises are the most highly specific test of sciatic nerve tension.

C. Assessing Red Flags and Indications for Immediate Referral

Physical-examination evidence of severe neurologic compromise that correlates with the medical history and test results may indicate a need for immediate consultation. The examination may further reinforce or reduce suspicions of tumor, infection, fracture, or dislocation. A history of tumor, infection, abdominal aneurysm, or other related serious conditions, together with positive findings on examination, warrants further investigation or referral. A medical history that suggests pathology originating somewhere other than in the lumbosacral area may warrant examination of the knee, hip, abdomen, pelvis or other areas.

Diagnostic Criteria

If the patient does not have red flags for serious conditions, the clinician can then determine which common musculoskeletal disorder is present. The criteria presented in Table 12-4 follow the clinical thought process, from the mechanism of illness or injury to unique symptoms and signs of a particular disorder and, finally, to test results, if any tests are needed to guide treatment at this stage. The ICD-9 coding system assigns codes based upon pathophysiologic mechanisms. Specific ICD-9 codes are frequently required for reimbursement for medical services. However, for at least 90% of low back pain cases,

Table 12-4. Diagnostic Criteria for Non-red-flag Conditions that Can Be Managed by Primary Care Physicians

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Acute lumbar strain (ICD-9 846.0, 846.1, 846.2, 846.3, 846.8, 846.9, 847.1, 847.2, 847.4, 847.9)	Lifting under load/ significant force Twisting, turning Bending Fall Direct blow	Low back pain that does not radiate below the knee Loss of range of motion	Paraspinous muscle spasm Nonrotational scoliosis of lumbar spine	None indicated for 4-6 weeks
Lumbosacral nerve root compression, with radiculopathy (ICD-9 722.1, 722.2, 722.5, 722.6, 722.7, 722.9)	Degenerative changes Possible aggravating factors	Leg pain Numbness Weakness, all in specific distribution Abnormal gait	Reflex changes Motor weakness in specific distribution Sensory changes in specific distribution Positive straight-leg raising Positive crossed straight-leg raising	None indicated for 4-6 weeks unless compression is severe or progressive

Table 12-4. (continued)

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Sciatica (ICD-9 724.3)	Possibility of traumatic or idiopathic origin	Pain and dysesthesias in the distribution of the sciatic nerve	None	None
Spinal stenosis (ICD-9 724.0, 724.01, 724.02) (aggravation)	Degenerative changes Congenital disorder	Nonspecific low back and leg pain Leg pain worse with activity (pseudo-claudication)	Straight-leg-raising test negative Symptoms reproduced by patient's sustained hyper-extension of spine while standing Straight-leg-raising test may be positive if performed immediately after patient has exercised	CT or MRIpositive for stenosis
Postlaminectomy syndrome (ICD-9 722.81, 722.83)	Scarring after surgery or other invasive procedures	Pain and dysesthesias at level of nerve root operated on (see Table 12-2)	Specific neurologic findings at level of nerve root operated on (see Table 12-2)	MRI with gactolinium positive for scarring
Regional low back pain (ICD-9 721.2, 721.3, 721.57, 724.1, 724.2, 724.5, 724.6, 724.7, 724.8, 756.1, 756.11, 756.12, 756.17, 307.89)	Unknown (idiopathic)	Nonspecific low back pain	None	None

ICD9 = *International Classification of Diseases*, 9th Edition.

the ICD-9 codes utilized are overly specific. The pathophysiologic correlates for lumbar sprain and strain, for example, have not been determined.

Work-Relatedness

Low back complaints, most of which are multifactorial in origin, can be related to work in a variety of ways (see Chapter 1). Physical factors that can contribute to regional low back pain include heavy physical work (especially with rapid lifting), bending, stretching and reaching, pushing or pulling, and prolonged sitting or standing. Employment-related factors such as task enjoyment, mo-

notony, job satisfaction, and emotional distress also have been shown to correlate with the incidence of low back pain. There are no known factors that correlate with radiculopathy. Heavy lifting in bent or twisted postures, exposure to vibration, and driving for extended periods have been correlated with herniated disks, as has smoking. Sciatica has been associated with cumulative work stress. Age, cardiovascular fitness, obesity, and non-work stress are other factors that have been correlated with low back pain. Many cases are idiopathic, as the mechanism of regional back pain has not yet been elucidated. It also should be noted that the existence of a correlation between various factors and low back pain does NOT indicate that a causal relationship has actually been demonstrated, as association is not equivalent to causation. Very specific description of work-duty repetitions, and the length of time they take to perform would be needed to ascertain the probable relationship between work and these conditions.

There is no evidence for the effectiveness of lumbar supports in preventing back pain in industry. Proper lifting techniques and discussion of general conditioning should be emphasized, although teaching proper lifting mechanics and even eliminating strenuous lifting fails to prevent back injury claims and back discomfort, according to some high-quality studies.

Recurrence of regional low back pain is not uncommon, regardless of whether or not the pain is work related. In fact, a prior history of low back pain or sciatica is a powerful predictor of a future episode. It is not clear, however, whether a recurrence of the complaint represents a recurrence of a quantifiable physical injury, because pain is a subjective experience, and the anatomic pathology of regional low back pain has not been well documented. If an underlying condition is aggravated at work, it is important to document the course of pain and activity limitation due to the aggravating factors. Restoration to the prior activity level is the goal. When that level has been reached, the effects of the aggravation can be said to have ceased. At that point, cure and relief have been accomplished.

Initial Care

Comfort is often a patient's first concern. Nonprescription analgesics will provide sufficient pain relief for most patients with acute and subacute symptoms. If treatment response is inadequate (i.e., if symptoms and activity limitations continue), prescribed pharmaceuticals or physical methods can be added. Comorbid conditions, side effects, cost, and provider and patient preferences guide the clinician's choice of recommendations. Table 12-5 summarizes comfort options.

Physical Methods

- Manipulation appears safe and effective in the first few weeks of back pain without radiculopathy. Of note is that most studies of manipulation have compared it with interventions other than therapeutic exer-

Table 12-5. Methods of Symptom Control for Low Back Complaints

RECOMMENDED
Nonprescription Medications
Acetaminophen (safest)
NSAIDs (aspirin, ibuprofen)
Physical Therapeutic Interventions
Adjustment or modification of workstation, job tasks, or work hours and methods
Stretching
Specific low back exercises for range of motion and strengthening
At-home local applications of cold in first few days of acute complaint; thereafter, applications of heat or cold
Relaxation techniques
Aerobic exercise
1-2 visits for education, counseling, and evaluation of home exercise for range of motion and strengthening
Prescribed Pharmaceutical Methods
Other nonsteroidal anti-inflammatory drugs (NSAIDs)
Short-term muscle relaxants for acute spasms
Short-term opiates are rarely recommended, but may be used if symptoms are severe and accompanied by objective findings, for no more than two weeks

OPTIONS

Lumbar Disk Protrusion with Radiculopathy	**Lumbar Strain**	**Sciatica**
2 days bed rest if symptoms are severe	1-2 days rest if symptoms are severe	1-2 days rest if symptoms are severe
Spinal Stenosis	**Postlaminectomy Syndrome**	**Regional Low Back Symptoms**
Instruction in body mechanics	2 days bed rest if symptoms are severe	1-2 days rest if symptoms are severe

cise, hence its value as compared with active, rather than passive, therapeutic options is unclear. Nonetheless, in the acute phases of injury manipulation may enhance patient mobilization. If manipulation does not bring improvement in three to four weeks, it should be stopped and the patient reevaluated. For patients with symptoms lasting longer than one month, manipulation is probably safe but efficacy has not been proved.

- A trial of manipulation for patients with radiculopathy may also be an option. There is consensus on its utility among practitioners who perform it, when radiculopathy is not progressive, and large series and cohort studies suggest value for some forms of manipulation.

Randomized trials are under way. As with any promising intervention in the absence of definitive high-quality evidence, careful attention to patient response to treatment is critical. Many passive and palliative interventions can provide relief in the short term but may risk treatment dependence without meaningful long-term benefit. Such interventions may be used to the extent they are aimed at facilitating return to normal functional activities, particularly work.

- Manipulation under anesthesia (MUA) cannot be recommended at the present time because high quality studies do not exist and the procedure has significant associated risks.
- Traction has not been proved effective for lasting relief in treating low back pain. Because evidence is insufficient to support using vertebral axial decompression for treating low back injuries, it is not recommended.
- Physical modalities such as massage, diathermy, cutaneous laser treatment, ultrasound, transcutaneous electrical neurostimulation (TENS) units, percutaneous electrical nerve stimulation (PENS) units, and biofeedback have no proven efficacy in treating acute low back symptoms. Insufficient scientific testing exists to determine the effectiveness of these therapies, but they may have some value in the short term if used in conjunction with a program of functional restoration. Insufficient evidence exists to determine the effectiveness of sympathetic therapy, a noninvasive treatment involving electrical stimulation, also known as interferential therapy. At-home local applications of heat or cold are as effective as those performed by therapists.
- Acupuncture has not been found effective in the management of back pain, based on several high-quality studies, but there is anecdotal evidence of its success.
- Invasive techniques (e.g., local injections and facet-joint injections of cortisone and lidocaine) are of questionable merit. Although epidural steroid injections may afford short-term improvement in leg pain and sensory deficits in patients with nerve root compression due to a herniated nucleus pulposus, this treatment offers no significant long-term functional benefit, nor does it reduce the need for surgery. Despite the fact that proof is still lacking, many pain physicians believe that diagnostic and/or therapeutic injections may have benefit in patients presenting in the transitional phase between acute and chronic pain.
- There are conflicting studies concerning the effectiveness of prolotherapy, also known as sclerotherapy, in the low back. Lasting functional improvement has not been shown. The injections are invasive, may be painful to the patient, and are not generally accepted or widely used. Therefore, using prolotherapy for low back pain is not recommended.
- There is good quality medical literature demonstrating that radiofrequency neurotomy of facet joint nerves in the cervical spine provides good temporary relief of pain. Similar quality literature does not exist regarding the same procedure in the lumbar region. Lumbar facet

neurotomies reportedly produce mixed results. Facet neurotomies should be performed only after appropriate investigation involving controlled differential dorsal ramus medial branch diagnostic blocks.

- Other miscellaneous therapies, such as magnet therapy, have been evaluated and found to be ineffective or minimally effective.
- Some studies support neuroreflexotherapy (the temporary implantation of epidermal devices in trigger points in the back and referred tender points in the ear), but the procedure is invasive, and some questions exist regarding its potential benefit versus risk and cost.
- Lumbar supports have not been shown to have any lasting benefit beyond the acute phase of symptom relief.
- Moderate evidence suggests that back schools have better short-term effects than other treatments for chronic low back pain, and that such schools are more effective in an occupational setting than in a non-occupational setting. No good evidence supports using back schools for prevention, as opposed to treatment.
- Behavioral therapy may be an effective treatment for patients with chronic low back pain, but it is still unknown what type of patient benefits most from what type of behavioral treatment. Some studies provide evidence that intensive multidisciplinary bio-psycho-social rehabilitation with a functional restoration approach improves pain and function.

Activity Alteration

Bed rest has been used as a treatment for acute low back pain; however, debilitation and irritation can result from prolonged bed rest. The most severe cases of low back pain can be treated with one to two days of bed rest, but bed rest is not advisable as routine treatment.

Activities causing an increase in low back symptoms should be reviewed with the patient and modifications advised. Driving, workstation positions, repetitive motions, and other activities (that may or may not be obvious to the patient) may require modification.

While the patient is recovering from low back symptoms, activities that do not aggravate symptoms can be maintained, and exercises to prevent debilitation due to inactivity can be advised. The patient should be informed that this may temporarily increase symptoms. Work activity modification is an important part of any treatment regimen. Advice on how to avoid aggravating activities includes a review of work duties to decide whether or not modifications can be accomplished without employer notification and to determine whether modified duty is available. Making every attempt to maintain the patient at maximal levels of activity, including work activities, is recommended. Aerobic exercise is beneficial as a conservative management technique, and exercising as little as 20 minutes twice a week can be effective in managing low back pain.

Work Activities

Table 12-6 provides recommendations on activity modification and duration of absence from work. These guidelines are intended for patients without comorbidity or complicating factors, including employment or legal issues. They are targets to provide a guide from the perspective of physiologic recovery. The clinician can make it clear to patients and employers that:

- Even moderately heavy lifting, carrying, or working in awkward positions may aggravate back symptoms from low back strain or lumbosacral nerve root irritation, for example; and

*Table 12-6. Guidelines for Modification of Work Activities and Disability Duration**

Disorder	Activity Modifications and Accommodation	Recommended Target for Disability Duration**		NHIS Experience Data***	
		With Modified Duty	Without Modified Duty	Median (cases with lost time)	Percent (no lost time)
Lumbar strain	Bed rest for 1-2 days if needed for severe symptoms Avoid aggravating activities (e.g., bending, lifting, stooping, prolonged standing, walking, sitting) until full activity possible	0-2 days	7-14 days	13 days	19%
Lumbar disk protrusion, with radiculopathy	Bed rest for 2 days if needed for severe symptoms Avoid aggravating activities (e.g., bending, lifting, stooping, prolonged standing, walking, sitting) until full activity possible	0-4 days	7-14 days	29 days	36%
Spinal stenosis (aggravation)	Changes in position to avoid symptoms	0-4 days	7-14 days	16 days	19%
Post-laminectomy syndrome	Same as for lumbar disk protrusion, with referral to surgeon if patient does not improve	0-4 days	7-14 days	29 days	39%
Sciatica	Bed rest for 1-2 days if needed for severe symptoms	0-4 days	7-14 days	8 days	45%
Regional low back pain	Bed rest for 1-2 days if needed for severe symptoms	0-2 days	7-10 days	5 days	39%

* These are general guidelines based on consensus or population sources and are never meant to be applied to an individual case without consideration of workplace factors, concurrent disease or other social or medical factors that can affect recovery.
** These parameters for disability duration are "consensus optimal" targets as determined by a panel of ACOEM members in 1996, and reaffirmed by a panel of ACOEM members in 2002. In most cases, persons with one non-severe injury can return to modified duty immediately.
*** Based on the CDC NHIS (National Health Interview Survey), as compiled and reported in the 8th annual edition of *Official Disability Guidelines (ODG)*, © 2002 Work Loss Data Institute, all rights reserved.

- Any restrictions are intended to allow for spontaneous recovery or for time to build activity tolerance through exercise.

Measures to assist the patient in avoiding aggravating activities include a review of work duties to decide whether modifications can be made without employer notification and to determine whether modified duty is available. Make every attempt to maintain the patient at maximal levels of activity, including work activities.

Follow-up Visits

Patients with potentially work-related low back complaints should have follow-up every three to five days by a midlevel practitioner or physical therapist who can counsel the patient about avoiding static positions, medication use, activity modification, and other concerns. Health practitioners should take care to answer questions and make these sessions interactive so that the patient is fully involved in his or her recovery. If the patient has returned to work, these interactions may be conducted on site or by telephone to avoid interfering with modified- or full-work activities.

Physician follow-up can occur when a release to modified-, increased-, or full-duty is needed, or after appreciable healing or recovery can be expected, on average. Physician follow-up might be expected every four to seven days if the patient is off work and seven to fourteen days if the patient is working.

Special Studies and Diagnostic and Treatment Considerations

Lumbar spine x rays should not be recommended in patients with low back pain in the absence of red flags for serious spinal pathology, even if the pain has persisted for at least six weeks. However, it may be appropriate when the physician believes it would aid in patient management.

Unequivocal objective findings that identify specific nerve compromise on the neurologic examination are sufficient evidence to warrant imaging in patients who do not respond to treatment and who would consider surgery an option. When the neurologic examination is less clear, however, further physiologic evidence of nerve dysfunction should be obtained before ordering an imaging study. Indiscriminant imaging will result in false-positive findings, such as disk bulges, that are not the source of painful symptoms and do not warrant surgery. If physiologic evidence indicates tissue insult or nerve impairment, the practitioner can discuss with a consultant the selection of an imaging test to define a potential cause (magnetic resonance imaging [MRI] for neural or other soft tissue, computer tomography [CT] for bony structures).

Electromyography (EMG), including H-reflex tests, may be useful to identify subtle, focal neurologic dysfunction in patients with low back symptoms lasting more than three or four weeks. Diskography is not recommended for assessing patients with acute low back symptoms.

Table 12-7 provides a general comparison of the abilities of different techniques to identify physiologic insult and define anatomic defects. An imaging study may be appropriate for a patient whose limitations due to consistent symptoms have persisted for one month or more to further evaluate the possibility of potentially serious pathology, such as a tumor.

Relying solely on imaging studies to evaluate the source of low back and related symptoms carries a significant risk of diagnostic confusion (false-positive test results) because of the possibility of identifying a finding that was present before symptoms began and therefore has no temporal association with the symptoms. Techniques vary in their abilities to define abnormalities (Table 12-7). Imaging studies should be reserved for cases in which surgery is considered or red-flag diagnoses are being evaluated. Because the overall false-positive rate is 30% for imaging studies in patients over age 30 who do not have symptoms, the risk of diagnostic confusion is great.

Magnetic resonance (MR) neurography may be useful in isolating diagnoses that do not lend themselves to back surgery, such as sciatica caused by piriformis syndrome in the hip. However, MR neurography is still new and needs to be validated by quality studies.

Recent studies on diskography do not support its use as a preoperative indication for either intradiskal electrothermal (IDET) annuloplasty or fusion. Diskography does not identify the symptomatic high-intensity zone, and concordance of symptoms with the disk injected is of limited diagnostic value (common in non-back issue patients, inaccurate if chronic or abnormal psy-

Table 12-7. Ability of Various Techniques to Identify and Define Low Back Pathology

Technique	LS Strain	Disk Protrusion	Cauda Equina Syndrome	Spinal Stenosis	Post-laminectomy Syndrome
History	+ +	+ +	+ +	+ + +	+ + +
Physical examination	+ +	+ + +	+ + + +	+ +	+ + +
Laboratory studies	0	0	0	0	0
Imaging studies					
Radiography[1]	0	+	+	+ +	+
Computerized tomography (CT)[1,2]	0	+ + +	+ + +	+ + +	+ +
Magnetic resonance imaging (MRI)[1,2]	0	+ + + +	+ + + +	+ + +	+ + + +
Electromyography (EMG), sensory evoked potentials (SEPs)	0	+ + +	+	+	+

[1] Risk of complications (e.g., infection, radiation) highest for myeloCT, second highest for myelography, and relatively less for bone scan, radiography, and CT.

[2] False-positive results in up to 30% of people over age 30 who do not have symptoms and up to 50% in those over age 40.

Note: Number of plus signs indicates relative ability of technique to identify or define pathology.

chosocial tests), and it can produce significant symptoms in controls more than a year later. Tears may not correlate anatomically or temporally with symptoms. Diskography may be used where fusion is a realistic consideration, and it may provide supplemental information prior to surgery. This area is rapidly evolving, and clinicians should consult the latest available studies. Despite the lack of strong medical evidence supporting it, diskography is fairly common, and when considered, it should be reserved only for patients who meet the following criteria:

- Back pain of at least three months duration.
- Failure of conservative treatment.
- Satisfactory results from detailed psychosocial assessment. (Diskography in subjects with emotional and chronic pain problems has been linked to reports of significant back pain for prolonged periods after injection, and therefore should be avoided.)
- Is a candidate for surgery.
- Has been briefed on potential risks and benefits from diskography and surgery.

Surgical Considerations

Within the first three months after onset of acute low back symptoms, surgery is considered only when serious spinal pathology or nerve root dysfunction not responsive to conservative therapy (and obviously due to a herniated disk) is detected. Disk herniation, characterized by protrusion of the central nucleus pulposus through a defect in the outer annulus fibrosis, may impinge on a nerve root, causing irritation, back and leg symptoms, and nerve root dysfunction. The presence of a herniated disk on an imaging study, however, does not necessarily imply nerve root dysfunction. Studies of asymptomatic adults commonly demonstrate intervertebral disk herniations that apparently do not cause symptoms. Some studies show spontaneous disk resorption without surgery, while others suggest that pain may be due to irritation of the dorsal root ganglion by inflammogens (metalloproteinases, nitric oxide, interleukin-6, prostaglandin E2) released from a damaged disk in the absence of anatomical evidence of direct contact between neural elements and disk material. Therefore, referral for surgical consultation is indicated for patients who have:

- Severe and disabling lower leg symptoms in a distribution consistent with abnormalities on imaging studies (radiculopathy), preferably with accompanying objective signs of neural compromise
- Activity limitations due to radiating leg pain for more than one month or extreme progression of lower leg symptoms
- Clear clinical, imaging, and electrophysiologic evidence of a lesion that has been shown to benefit in both the short and long term from surgical repair
- Failure of conservative treatment to resolve disabling radicular symptoms

If surgery is a consideration, counseling regarding likely outcomes, risks and benefits, and, especially, expectations is very important. Patients with acute low back pain alone, without findings of serious conditions or significant nerve root compromise, rarely benefit from either surgical consultation or surgery. If there is no clear indication for surgery, referring the patient to a physical medicine practitioner may help resolve the symptoms.

Before referral for surgery, clinicians should consider referral for psychological screening to improve surgical outcomes, possibly including standard tests such as the second edition of the Minnesota Multiphasic Personality Inventory (MMPI-2). In addition, clinicians may look for Waddell signs during the physical exam.

Many patients with strong clinical findings of nerve root dysfunction due to disk herniation recover activity tolerance within one month; there is no evidence that delaying surgery for this period worsens outcomes in the absence of progressive nerve root compromise. With or without surgery, more than 80% of patients with apparent surgical indications eventually recover. Although surgery appears to speed short- to mid-term recovery, surgical morbidity (recovery and rehabilitation time and effects) and complications must be considered. Surgery benefits fewer than 40% of patients with questionable physiologic findings. Moreover, surgery increases the need for future surgical procedures with higher complication rates. In good surgery centers, the overall incidence of complications from first-time disk surgery is less than 1%. However, for older patients and repeat procedures, the rate of complications is dramatically higher. Patients with comorbid conditions, such as cardiac or respiratory disease, diabetes, or mental illness, may be poor candidates for surgery. Comorbidity should be weighed and discussed carefully with the patient. Following surgery, exercise is much better than manipulation for rehabilitation.

A. Lumbosacral Nerve Root Decompression

Direct methods of nerve root decompression include laminotomy, standard diskectomy, and laminectomy. Chemonucleolysis with chymopapain is an example of an indirect method. Indirect chemical methods are less efficacious and have rare but serious complications (e.g., anaphylaxis, arachnoiditis). Percutaneous diskectomy is not recommended because proof of its effectiveness has not been demonstrated. Recent studies of chemonucleolysis have shown it to be more effective than placebo, and it is less invasive, but less effective, than surgical diskectomy; however, few providers are experienced in this procedure because it is not widely used anymore. Surgical diskectomy for carefully selected patients with nerve root compression due to lumbar disk prolapse provides faster relief from the acute attack than conservative management; but any positive or negative effects on the lifetime natural history of the underlying disk disease are still unclear. Given the extremely low level of evidence available for artificial disk replacement or percutaneous endoscopic laser diskectomy (PELD), it is recommended that these procedures be regarded as experimental at this time.

B. Intradiskal Electrothermal Annuloplasty

Intradiskal electrothermal annuloplasty may show some advantages over diskectomy, but IDET is operator dependent and not considered ready for wholesale use by the public. Early outcomes may exaggerate the efficacy of IDET because some who initially improve later deteriorate. In addition, studies of IDET have relied on diskography, a technique not well supported by the medical evidence.

C. Implantable Spinal Cord Stimulators

Implantable spinal cord stimulators are rarely used and should be reserved for patients with low back pain for more than six months duration who have not responded to the standard nonoperative or operative interventions.

D. Management of Spinal Stenosis

Spinal stenosis usually results from soft tissue and bony encroachment of the spinal canal and nerve roots. It has a gradual onset and usually manifests as a degenerative process after age 50. Evidence does not currently support a relationship with work. The surgical treatment for spinal stenosis is usually complete laminectomy. Elderly patients with spinal stenosis who tolerate their daily activities usually do not require surgery unless bowel or bladder dysfunction develops. Surgery is rarely considered in the first three months after onset of symptoms, and a decision to proceed with surgery should not be based solely on the results of imaging studies. Some evidence suggests that patients with moderate to severe symptoms may benefit more from surgery than from conservative treatment.

E. Spinal Fusion

Except for cases of trauma-related spinal fracture or dislocation, fusion of the spine is not usually considered during the first three months of symptoms. Patients with increased spinal instability (not work-related) after surgical decompression at the level of degenerative spondylolisthesis may be candidates for fusion. There is no scientific evidence about the long-term effectiveness of any form of surgical decompression or fusion for degenerative lumbar spondylosis compared with natural history, placebo, or conservative treatment. There is no good evidence from controlled trials that spinal fusion alone is effective for treating any type of acute low back problem, in the absence of spinal fracture, dislocation, or spondylolisthesis if there is instability and motion in the segment operated on. It is important to note that although it is being undertaken, lumbar fusion in patients with other types of low back pain very seldom cures the patient. A recent study has shown that only 29% assessed themselves as ''much better'' in the surgical group versus 14% ''much better'' in the nonfusion group (a 15% greater chance of being ''much better'') versus a 17% complication rate (including 9% life-threatening or reoperation).

Summary of Evidence and Recommendations

See Table 12-8.

Table 12-8. Summary of Recommendations for Evaluating and Managing Low Back Complaints

Clinical Measure	Recommended	Optional	Not Recommended
History and physical exam	Basic history (B) History of cancer or infection (B) Signs or symptoms of cauda equina syndrome (C) History of significant trauma (C) Psychosocial history (C) Straight- and crossed-leg raising tests (B) Focused neurologic exam (B)	Pain drawing and visual analog scale (D)	
Patient education	Patient education about low back symptoms (B) Back school in occupational settings (C)	Back school in nonoccupational settings (C)	
Medication (See Chapter 3)	Acetaminophen (C) NSAIDs (B)	Opioids, short course (C) Muscle relaxants (C) Phenylbutazone (C)	Using opioids for more than 2 weeks (C) Oral corticosteroids (C) Colchicine (B) Antidepressants (C)
Physical treatment methods	Manipulation of low back during first month of symptoms without radiculopathy (C)	Manipulation for patients with radiculopathy (C) Relaxation techniques (D) At-home applications of local heat or cold to low back (D) Shoe insoles (C) In occupational setting, corset for prevention (C)	Manipulation for patients with undiagnosed neurologic deficits (D) Prolonged course of manipulation (longer than 4 weeks) (D) Traction (B) TENS (C) Biofeedback (C) Shoe lifts (D) Corset for treatment (D)

Table 12-8. (continued)

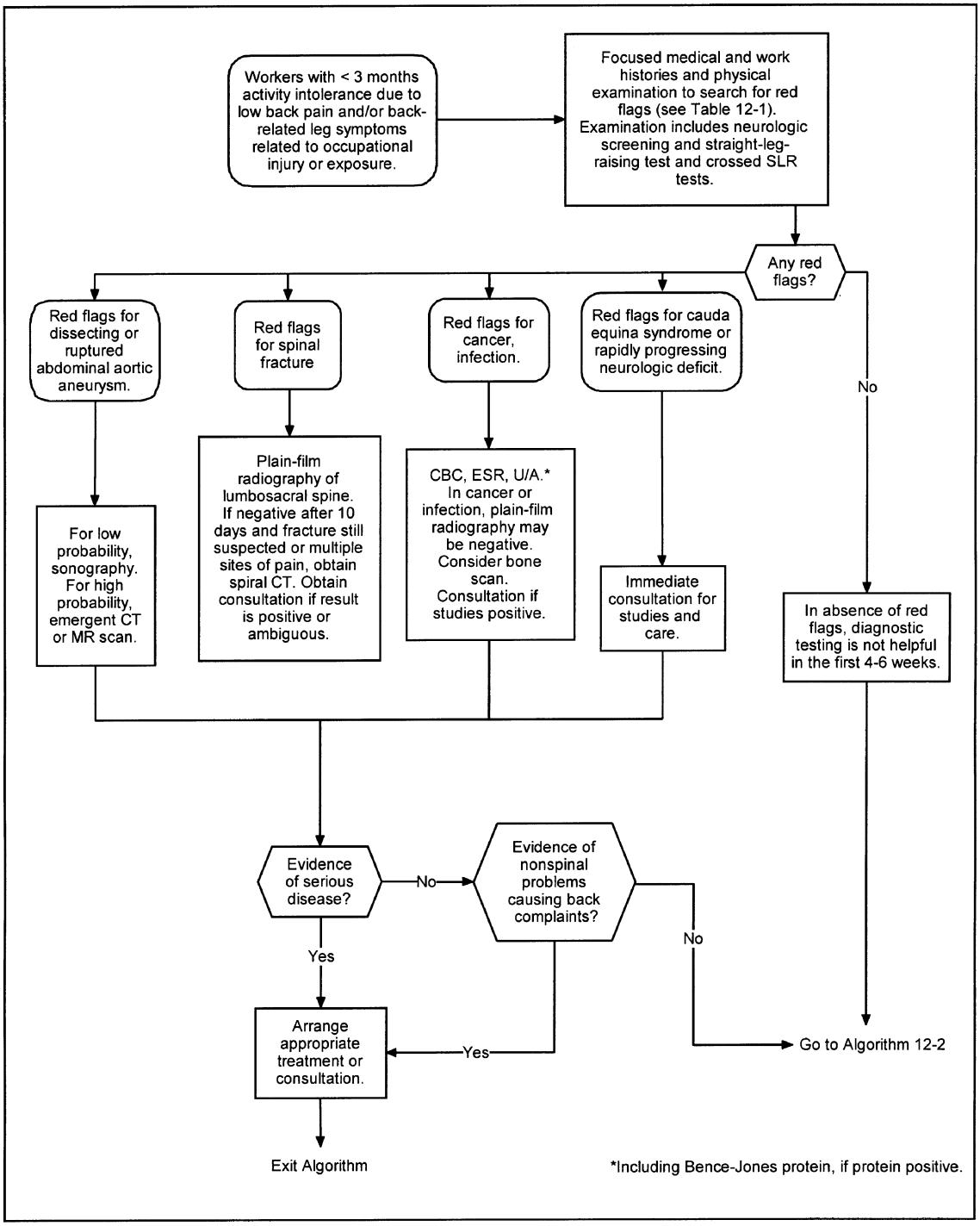
Clinical Measure	*Recommended*	*Optional*	*Not Recommended*
Injections		Epidural corticosteroid injections for radicular pain, to avoid surgery (C) Needle acupuncture (D)	Epidural injections for back pain without radiculopathy (D) Trigger-point injections (C) Ligamentous injections (C) Facet-joint injections (C)
Bed rest		Bed rest for 2 days for severe radiculopathy (D)	Bed rest for more than 2 days (B)
Activities and exercise	Temporary avoidance of activities that increase mechanical stress on spine (D) Gradual return to normal activities (B) Low-stress aerobic exercise (C) Conditioning exercises for trunk muscles after 2 weeks (C)		Back-specific exercise machines (D) Therapeutic stretching of back muscles (D)
Detection of physiologic abnormalities	If no improvement after 1 month, consider: Bone scan (C) Needle EMG and H-reflex tests to clarify nerve root dysfunction (C) SEPs to assess spinal stenosis (C)		EMG for clinically obvious radiculopathy (D) Surface EMG and F-wave tests (C) Thermography (C)
Radiographs of lumbosacral spine	When red flags for fracture are present (C) When red flags for cancer or infection are present (C)		Routine use during first month of symptoms in absence of red flags (B) Routine oblique views (B)
Imaging	CT or MRI when cauda equina, tumor, infection, or fracture are strongly suspected and plain film radiographs are negative (C) MRI test of choice for patients with prior back surgery (D) Assure quality criteria for imaging tests (B)	Myelography or CT myelography for preoperative planning if MRI is unavailable (D) MR neurography (D)	Using imaging test before 1 month in absence of red flags (B) Diskography or CT diskography (C)

Table 12-8. (continued)

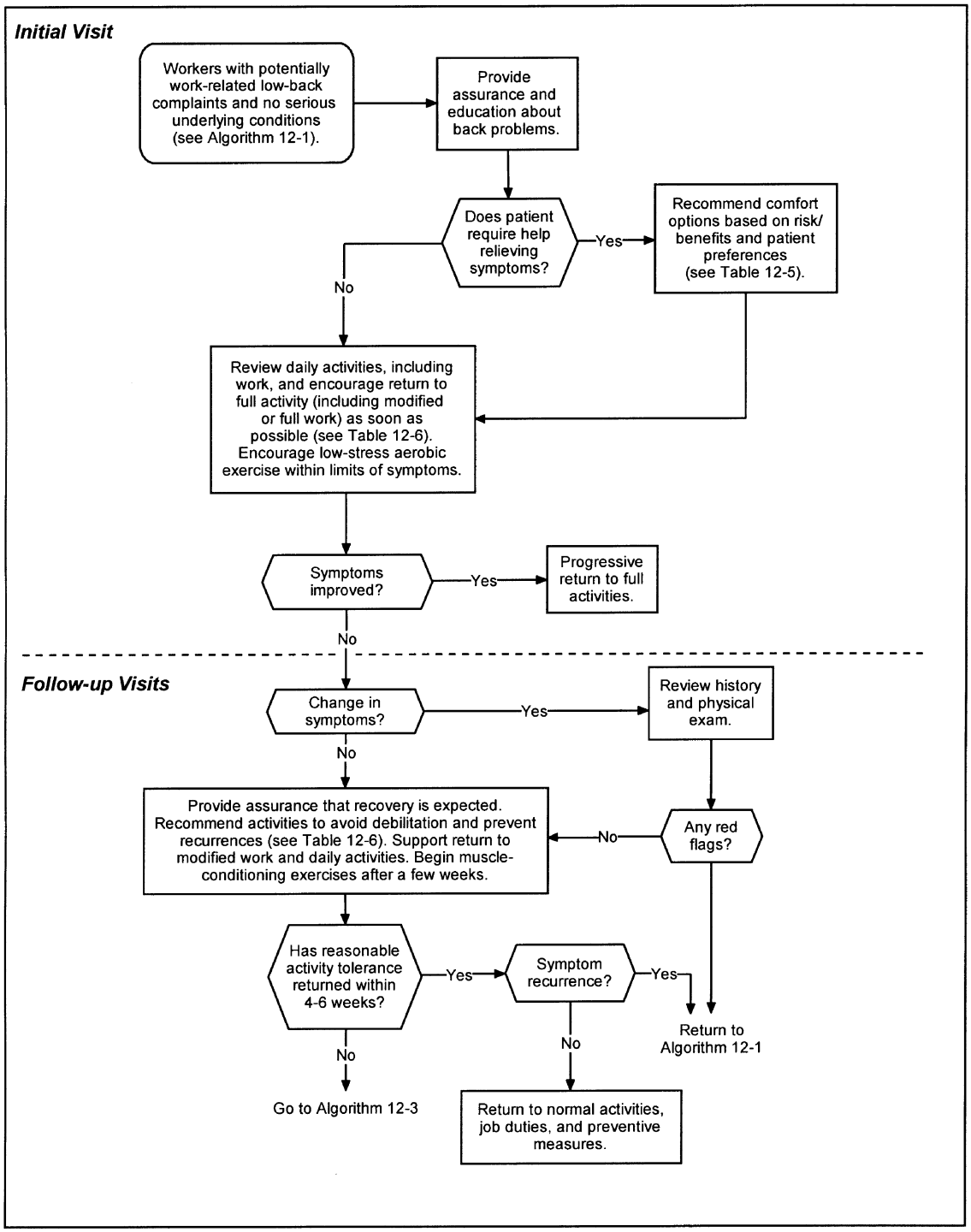
Clinical Measure	Recommended	Optional	Not Recommended
Surgical considerations	Discuss surgical options with patients with persistent and severe sciatica and clinical evidence of nerve root compromise if symptoms persist after 4-6 weeks of conservative therapy (B) Standard diskectomy or microdiskectomy for herniated disk (procedures have similar efficacy) (B)	Chymopapain, used after ruling out allergic sensitivity, acceptable but less efficacious than diskectomy to treat herniated disk (C)	Disk surgery in patients with back pain alone, no red flags, and no nerve root compression (D) Surgery for spinal stenosis within the first 3 months of symptoms (D) Surgery for spinal stenosis when justified by imaging test rather than patient's functional status (D) Spinal fusion in the absence of fracture, dislocation, complications of tumor, or infection (C)
Psychosocial factors	Social, economic, and psychological factors can alter patient's response to symptoms and treatment (B)	Referral for evaluation prior to surgical intervention (C)	Referral for extensive evaluation and treatment prior to exploring patient expectations or psychosocial factors (D)

A = Strong research-based evidence (multiple relevant, high-quality scientific studies).
B = Moderate research-based evidence (one relevant, high-quality scientific study or multiple adequate scientific studies).
C = Limited research-based evidence (at least one adequate scientific study of patients with low back complaints).
D = Panel interpretation of information not meeting inclusion criteria for research-based evidence.

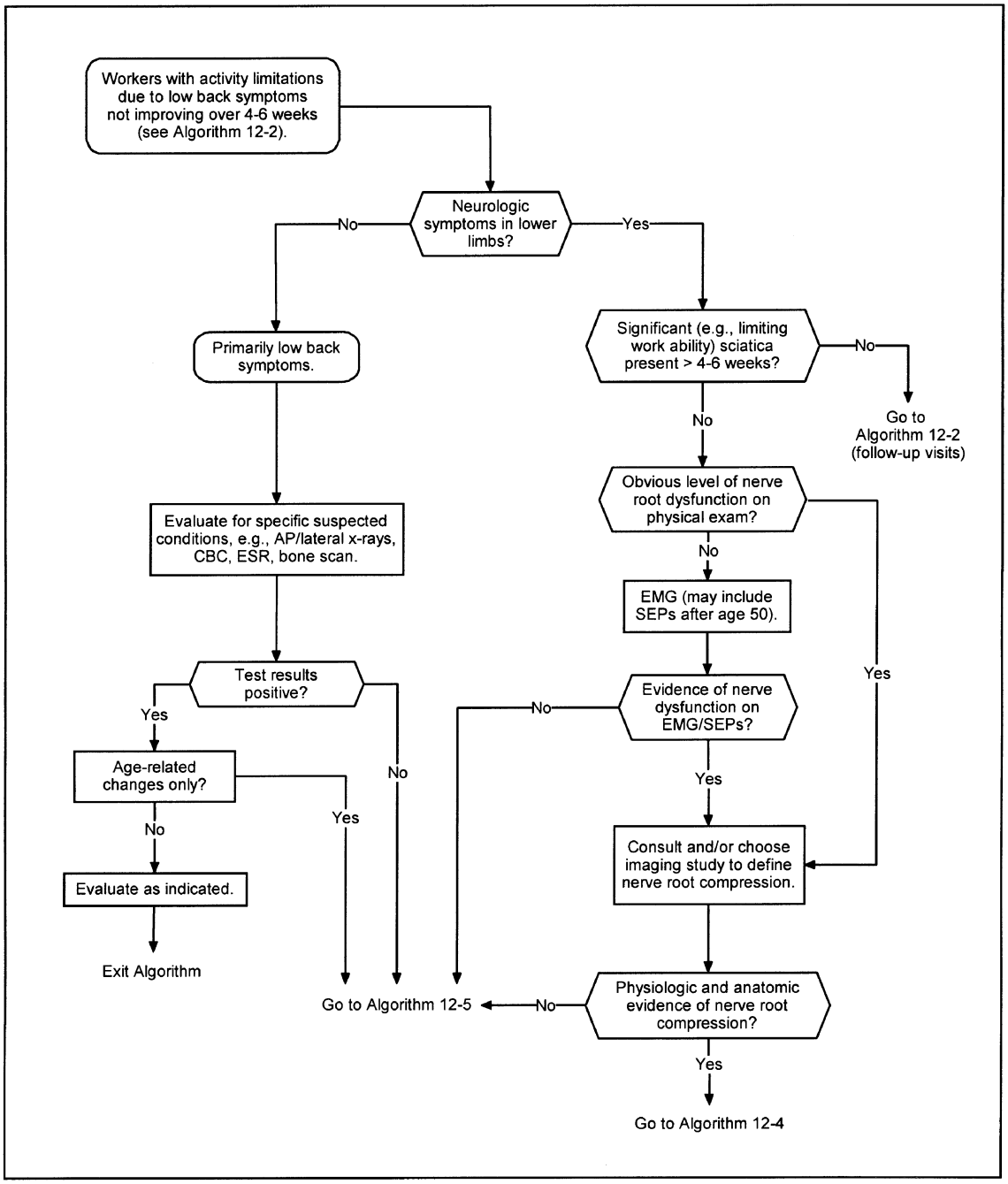
Algorithm 12-1. *Initial Evaluation of Occupational Low Back Complaints*



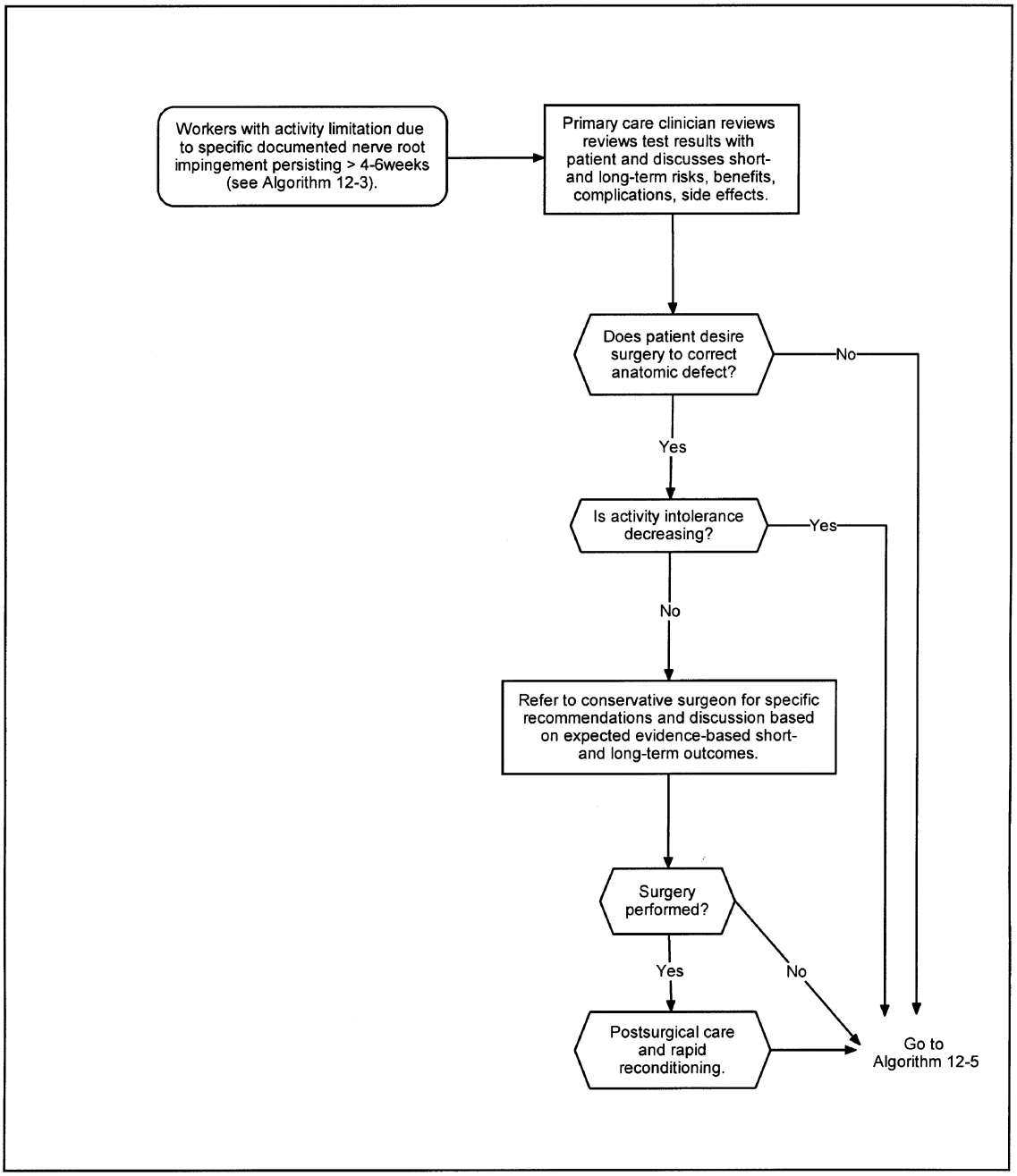
Algorithm 12-2. *Initial and Follow-up Management of Occupational Low Back Complaints*



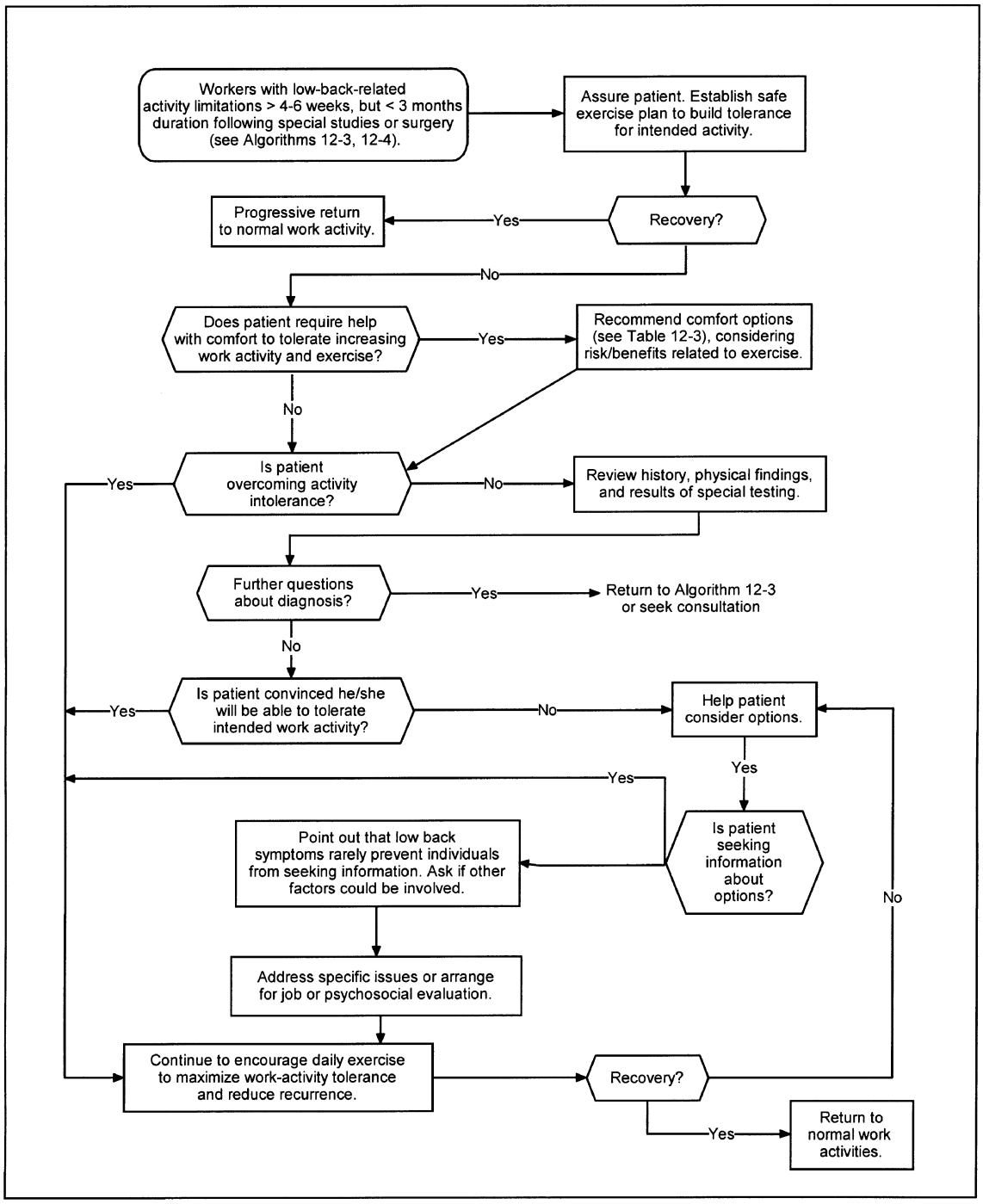
Algorithm 12-3. *Evaluation of Slow-to-recover Patients with Occupational Low Back Complaints (Symptoms > 4 Weeks)*



Algorithm 12-4. *Surgical Considerations for Patients with Anatomic and Physiologic Evidence of Nerve Root Compression and Persistent Low Back Symptoms*



Algorithm 12-5. *Further Management of Occupational Low Back Complaints*



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Note: The following references are additions to the 373 references cited in *Acute Low Back Problems in Adults.* (Bigos SJ, Bowyer O, Braen G, et al. *Acute Low Back Problems in Adults, Clinical Practice Guideline No. 14*, Rockville, Md: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research, AHCPR Pub. No. 95-0642, 1994.) Those references have been reviewed and are incorporated herein.

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