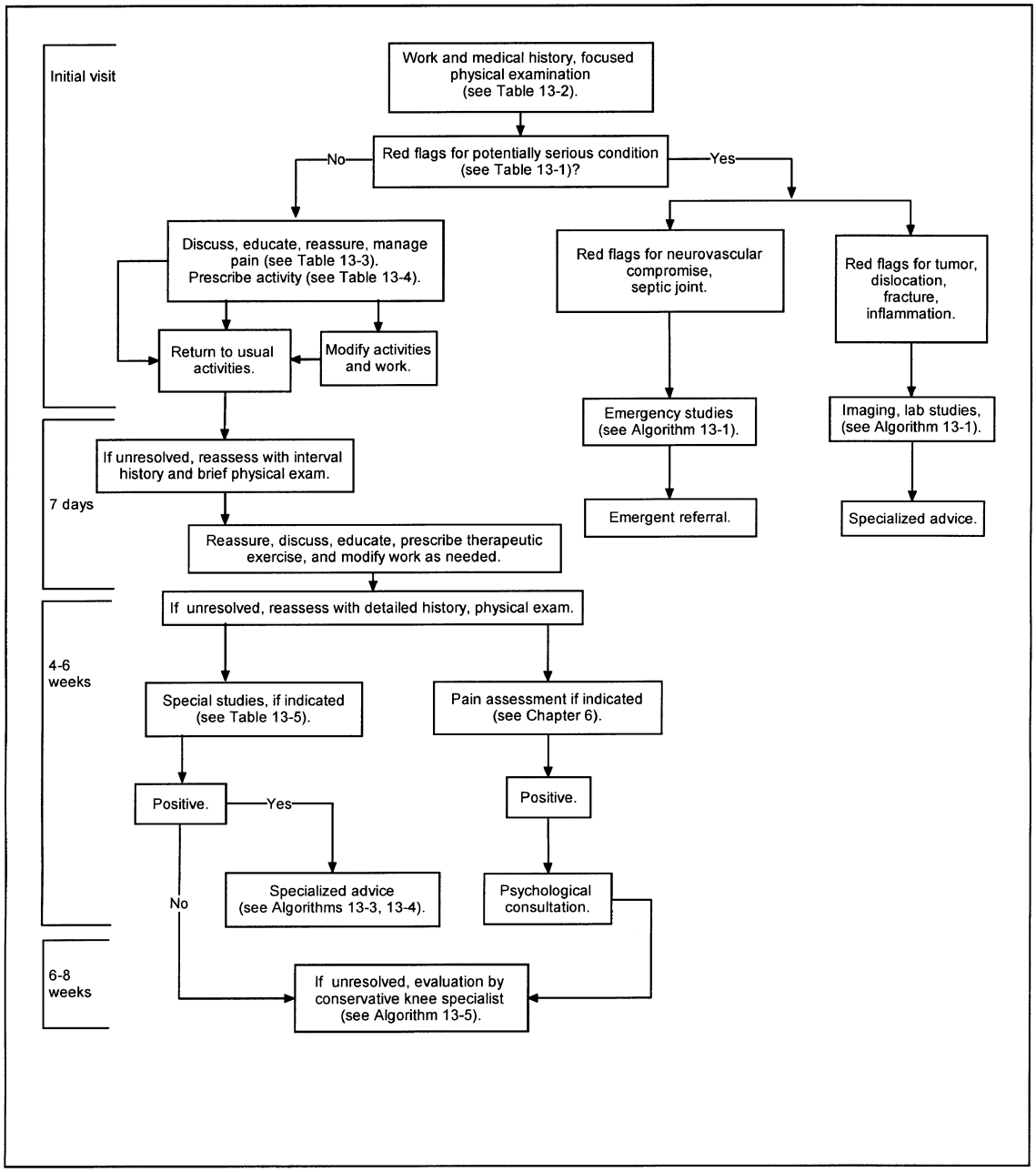
***Master Algorithm**. ACOEM Guidelines for Care of Acute and Subacute Occupational Knee Complaints*



13 Knee Complaints

General Approach and Basic Principles

Knee complaints that are potentially related to work are common problems presenting to occupational and primary care providers—they are among the ten most common causes of reported occupational complaints and workers' compensation claims. Knee complaints account for 7-8% of total benefits paid for workers' compensation medical care and temporary disability, ranking them in the top ten for financial severity. However, about a quarter of the total expense is incurred for surgical procedures whose efficacy is not supported by available evidence, as summarized in this guideline.

Recommendations on assessing and treating adults with potentially work-related knee problems are presented in this clinical practice guideline. Topics include the initial assessment and diagnosis of patients with acute and subacute knee complaints that potentially are work related; identification of red flags that may indicate the presence of a serious underlying medical condition; initial management; diagnostic considerations and special studies for identifying clinical pathology; work-relatedness; modified duty and activity; return to work; and 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 patients with acute and subacute knee complaints. The following text, tables, and numbered algorithms expand upon the master algorithm.

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

- The initial assessment of patients with acute and subacute knee problems focuses on detecting indications of potentially serious disease, termed red flags.
- In the absence of red flags, work-related knee complaints can be managed safely and effectively by occupational or primary care providers. The focus is on monitoring for complications, facilitating the

healing process, and facilitating return to work in modified- or full-duty.

- In the absence of red-flag signs or symptoms, evaluation and treatment can proceed in the acute phase for four to six weeks without performing special studies because the yield of treatment-altering findings is low and most patients' conditions improve within that period of time.
- Patients can be introduced to the concept of load and overload. Load is beneficial for the muscle, tendon, skeleton, and cartilage; overload is not beneficial. The adaptation of physical activities is crucial; total rest does more harm than good.
- Relieving discomfort can be accomplished most safely by temporary immobilization, reduction in weight bearing, and systemic nonprescription analgesics.
- Patients recovering from acute knee injury or infection should be encouraged to return to modified-duty work as soon as their condition permits.
- If symptoms persist beyond four weeks, referral for specialty care may be indicated.
- Nonphysical factors, such as psychosocial, workplace, or socioeconomic problems, may be investigated and addressed in cases of delayed recovery or return to work.

Initial Assessment

Thorough medical and work histories and a focused physical examination (see Chapter 2) are sufficient to assess the worker complaining of potentially work-related knee symptoms. The initial history and examination include evaluation for serious underlying conditions. This evaluation should consider the possibility of referred knee pain due to a disorder in another part of the body, particularly the low back or hip. Certain findings on the history and physical examination raise suspicion of serious underlying medical conditions known as red flags (see Table 13-1). Their absence rules out the need for special studies, referral, or inpatient care during the first four to six weeks, when spontaneous recovery is expected (provided any inciting workplace factors are mitigated). Knee complaints then can be classified into one of four working categories:

- **Potentially serious knee conditions:** fractures, dislocation, infection, neurovascular compromise, tumors, etc.
- **Mechanical disorders:** derangements of the knee related to acute trauma, such as ligament strain or meniscus or ligament tears
- **Degenerative disorders:** consequences of aging or repetitive use, or a combination thereof, such as patellofemoral syndrome (formerly commonly referred to as chondromalacia), bursitis, or tendinitis
- **Nonspecific disorders:** occurring in the knee and suggesting neither internal derangement nor referred pain

Table 13-1. Red Flags for Potentially Serious Knee Conditions

Disorder	Medical History	Physical Examination
Fractures	History of significant trauma	Bony crepitation Abnormal mobility Angulation of leg New deformity Point tenderness Inability to bear weight or walk
Dislocations	History of significant trauma Prior history of dislocation	Displaced patella Displaced tibia or fibula
Septic arthritis	Penetrating wound of the knee History of systemic infection Diabetes History of immunosuppression (e.g., transplant, chemotherapy, HIV)	Severe pain on motion Systemic signs of infection Local swelling and heat Abnormal complete blood count (CBC), erythrocyte sedimentation rate (ESR) Soft tissue swelling not consistent with effusion
Infected prepatellar bursitis	Minor trauma to prepatellar bursa area	No severe pain on motion Spreading local inflammation and cellulitis
Inflammation	History of autoimmune disease or gout Recurrent episodes Swollen joint Swelling in other joints	Local effusion, heat CBC, ESR may be abnormal Pain on motion
Tumor	History of primary tumor or metastatic disease	Local swelling Nontender mass
Compartment syndrome above or below the knee	History of fracture or other major trauma Very painful muscular compartment	Tense, very tender compartment Possibly distal signs of neurovascular compromise
Neurovascular compromise	History consistent with fracture or dislocation History of peripheral vascular disease History of diabetes Pain, pallor at or below the knee History of recent surgery, immobilization, or deep vein thrombosis	Decreased or absent pulse popliteal or pedal Pale, cold skin, distal to knee Paralysis of the distal lower extremity Painless swelling (Charcot's syndrome) Painful swelling in popliteal fossa or lower leg

Note: ICD-9 = *International Classification of Diseases,* 9th Edition.

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 ARE YOUR SYMPTOMS?

- Do you have pain, weakness, limited motion, popping, clicking, locking, recurrent swelling, or giving way?
- For traumatic injury: Was the area deformed? Did you lose any blood or have an open wound?
- If swelling is reported: How long was it following the injury that your knee became swollen?
- Are the symptoms located primarily in the knee? Do you have pain or other symptoms elsewhere (e.g., low back, hip)?
- Is the pain constant or intermittent? What makes the problem worse or better?

DO THESE SYMPTOMS LIMIT YOUR ACTIVITIES? IF SO, HOW?

- Can you walk or carry weight? For how long?
- Can you lift? How much weight?
- Are your symptoms worse when climbing or going down stairs or hills?

WHEN DID YOUR CURRENT LIMITATIONS BEGIN? WAS THERE A SPECIFIC INCITING EVENT THAT LED TO THE SYMPTOMS?

- 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? Do you use your knees? How? How often?

DO YOU HAVE OTHER MEDICAL PROBLEMS?

- Do you have any autoimmune or metabolic diseases, such as rheumatoid arthritis or gout?
- Do you have arthritis in any other joint?
- Have you had cancer?

WHAT DO YOU HOPE WE CAN ACCOMPLISH DURING THIS VISIT?

Knee complaints as described by the patient can sometimes be referred from other sources. Hip pathology can produce distal thigh symptoms and knee pain in the absence of knee pathology. Likewise, sciatic or femoral nerve irritation or hip disease can cause knee symptoms.

Physical Examination

Guided by the medical history, the physical examination includes:

- General observation of the patient
- Focused examination of the knee on the affected side
- Neurovascular screening

Care should be taken to document which knee—left or right—is the subject of the examination. Not infrequently, injured workers have prior workers' compensation claims that involve the opposite knee, or pain in the opposite knee that is unrelated to employment. Any ambiguity in documentation that identifies the knee being examined can lead to delay in acceptance of the patient's workers' compensation claim, delay in the authorization of time-loss benefits, delay in the authorization of payment of medical care, or even outright denial of the workers' compensation claim.

The physician should seek objective evidence of pathology that is consistent with the patient's subjective complaints. In many cases, careful examination will reveal one or more truly objective findings, such as swelling, deformity, atrophy, reflex changes or spasm. Any such findings should be thoroughly documented in the medical record both for reference during future visits, and for the value the information will have in the patient's workers' compensation claim. For some patients with knee complaints, however, there are no objective findings. Meticulous documentation of the patient's complaints at each visit is of the utmost importance in such cases.

Though it may seem a point too obvious to warrant mention, the physician should specifically note which knee—left or right—is the subject of the patient's complaints. Not infrequently, injured workers have prior workers' compensation claims that involve the opposite knee. Any ambiguity in documentation can lead to delay in acceptance of the patient's workers' compensation claim, delay in the authorization of time-loss benefits, delay in the authorization of payment of medical care, or even outright denial of the workers' compensation claim.

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A. Focused Knee Examination

Knee examinations should be performed in a thorough and careful manner in order to identify any clinically significant pathology that may be present. A considerable number of patients may present with findings such as grinding, clicking, popping, and pain, yet do not necessarily have clinically significant intraarticular pathology or require more than conservative care. Patients presenting with sensations of instability or locking require further investigation.

Initially, the patient's gait and the appearance of the knees can be observed during stance. Difficulty walking, as well as deformity (e.g., excessive varus or valgus), swelling, redness, and inability to fully extend are all observable in this manner. In the supine position, smaller effusions, tenderness and its location (e.g., at joint lines), and range of motion can be determined. The posterior structures of the knee also can be inspected and palpated, including the popliteal fossa. Collateral ligament stability can be checked by applying varus and valgus stress (pressure) with the joint slightly flexed. Cruciate ligament competence is determined by pulling the tibia forward at 30 degrees (Lachman test) and 90 degrees (drawer test). The knee also can be examined at 0 degrees. The McMurray test is limited to testing defects of the posterior horn.

A history of anterior knee pain and popping and clicking may suggest patellofemoral syndrome (PFS, formerly known as chondromalacia patella). Patients with tenderness over the patellar tendon or its insertion may have patellar tendinitis or Osgood-Schlatter disease, a congenital condition. Knee catching, locking, or swelling may be secondary to meniscus tears, patellofemoral instability or ligamentous injury. Patellar instability often presents as a constant dull pain.

B. Neurovascular Screening

The neurologic and vascular status of the knee and distal lower extremity can be routinely assessed. Evidence of lumbar disk disease, with radiculopathy and radiation to the knee, also may be sought because neurologic changes may be present in the lower extremity.

C. Assessing Red Flags

Signs of neurovascular compromise, unreduced dislocation, infection, or tumor that correlate with the patient's medical history and test results may indicate a need for immediate consultation. A medical history suggestive

of pathology originating somewhere other than in the knee may warrant examination of the back, hip, 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 13-2 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.

Table 13-2. Diagnostic Criteria for Non-red-flag Knee Conditions that Can Be Managed by Primary Care Physicians

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Meniscus tear (ICD-9 826.0, 836.0, 836.1, 836.11—new med, lat.—717.1-.3—old med, lat)	Squatting Twisting with foot planted (in younger workers) Repeated minor trauma (in older workers)	Locking of knee with flexion	Catching or locking of knee Quadriceps wasting (rare in acute phase)	MRI confirms tear (test indicated only if surgery is contemplated)
Collateral ligament tear (ICD-9 844.0.1)	Twisting Direct lateral or medial blow to the knee	Pain at lateral or medial side of knee	Excessive abduction or adduction at knee (> 30°) vs. other side when varus and valgus stress (pressure) is applied Tenderness at joint line Tenderness at origin, insertion of ligament	Stress films (not recommended but may be available) show ≥7-mm gap vs. other knee MRI can also confirm tear
Anterior cruciate tear (ICD-9 844.21, 717.83)	Noncontact pivot or twist of knee Direct blow to planted leg	Popping sound at injury site Immediate swelling Increased laxity	Positive Lachman's or anterior drawer sign Positive pivot-shift sign Hemarthrosis	Arthrometer reading 3 mm > that for other knee MRI confirms tear
Posterior cruciate tear (ICD-9 844.22, 717.84)	Blow to front of knee Severe injury of other structure with knee dislocation	Pain in interior knee	Positive posterior drawer test Sag sign positive	Arthrometer reading 3 mm > that for other knee MRI confirms tear

Table 13-2. (continued)

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Collateral ligament strain (ICD-9 844.0, 844.1)	Direct medial or lateral blow	Pain in lateral or medial knee Pain worse with weight bearing or rotation	Tenderness at joint lines laterally or medially with abduction or adduction Tenderness at origin or insertion of ligament	None
Cruciate ligament strain (ICD-9 844.2)	Noncontact pivot or twist of knee Direct blow to planted leg	Pain in interior knee	Pain but not displacement elicited by drawer and/or Lachman test	None
Patellofemoral syndrome (chondromalacia) (ICD-9 717.7)	Chronic vibration, impact Direct blow to patella Overuse	Popping or snapping Pain under patella with motion Pain on stairs, hills, quadriceps contraction	Tenderness under patella Grating under patella on motion	Possible misalignment on Merchant's view, with lateral displacement (inicated only if surgery is contemplated)
Effusion, nonspecific (ICD-9 719.06)	No history of acute trauma	Effusion may be worse with exercise	Effusion	Possible crystals in aspirate Possible positive serology for rheumatic disease
Patellar tendinitis (ICD-9 726.64)	Repeated minor trauma	Pain over patellar tendon	Tenderness over patellar tendon Pain on resisted quadriceps contraction	MRI is confirmatory (but not necessary except when considering surgery)
Prepatellar bursitis (ICD-9726.65)	Repeated minor trauma from kneeling work	Swelling over patella Inability to kneel due to swelling	Prepatellar bursal effusion	Aspirate positive for bacteria, etc., if infected
Nonspecific pain (ICD-9 719.46, 719.56, 719.76, 719.96)	Nonspecific No acute trauma	None	None	None
Patellar instability	Nonspecific	Knee catching, semilocking, swelling, constant dull pain	Abnormal patellar motion	None

Note: ICD-9 = *International Classification of Diseases,* 9th Edition.

Work-Relatedness

A thorough work history is crucial to establishing work-relatedness. See Chapter 2 for components of the work history.

Repeated trauma, for example crawling or working in a crouched position under load, is currently thought to contribute to tendinitis and nonspecific knee pain, although the strength of the association is not great. Working on the knees is thought to contribute to prepatellar bursitis. Trauma from vibration, such as jackhammer use, is thought to contribute to patellofemoral syndrome. Repetitive motion under load may contribute to meniscus damage in older workers. Acute trauma at work may cause acute meniscus tears, ligament strains, and ligament ruptures.

Patellar tendinitis and osteoarthritis usually do not have causative associations with acute trauma (see Chapter 1). However, aggravations of these conditions may have connection with work activities. Heavy workload, previous knee injury, and/or an overweight patient are all predictors of aggravation of osteoarthritis and can be addressed. The medical history becomes crucial in determining this relationship; nonwork as well as work activities have to be evaluated. If a history of past injury is associated with the onset of symptoms and the present complaint has the identical presentation, a relationship to the past injury may exist. It is important to establish the level of function that existed before the current health complaint. This is because the goal of treatment will be to return the patient at least to that state; because the underlying problem may well be chronic, its elimination may be unrealistic. The patient can be asked to identify when this level has been reached, because treatment beyond that point will likely be reduced to the level of maintenance and observation.

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 13-3 summarizes comfort options.

A number of treatment options are available to the clinician treating acute and subacute knee pain. These options include:

- Instruction in home exercise. Except in cases of significant injury, patients with knee problems can be advised to do early straight-leg-raising and active range-of-motion exercises, especially bicycling, as tolerated. The emphasis is on closed-chain exercises[1] and muscle re-

[1]Closed-chain exercises are those in which the feet remain in contact with the floor throughout the exercise. Squats are an example of closed-chain exercises. Conversely, open-chain exercises are those in which the feet do not maintain floor contact. Straight-leg extensions are open-chain exercises.

Table 13-3. Methods of Symptom Control for Knee Complaints

RECOMMENDED
Nonprescription Medications
Acetaminophen (safest) Nonsteroidal anti-inflammatory drugs (NSAIDs) (aspirin, ibuprofen)
Nonprescribed Physical Methods
Adjustment or modification of workstation, job tasks, or work hours and methods Stretching Specific knee exercises for range of motion and strengthening (avoid leg extensions for PFSs but not SLRs) At-home local applications of cold packs in first few days of acute complaints; thereafter, applications of heat packs Aerobic exercise
Prescribed Pharmaceutical Methods
Other NSAIDs
Prescribed Physical Methods
Initial and follow-up visits for education, counseling, and evaluation of home exercise

OPTIONS

Meniscus Tears	Collateral Ligament Strain	Collateral Ligament Tear
Brief partial weight bearing as needed Immobilizer only if needed Quadriceps strengthening	Partial weight bearing (crutches) for 1 week Immobilizer if needed Quadriceps strengthening	Partial weight bearing (crutches) for 2 weeks
Cruciate Ligament Strain	**Cruciate Ligament Tear**	**Patellofemoral Syndrome**
Weight bearing as tolerated Quadriceps strengthening	Partial weight bearing (crutches) for 2 weeks Immobilizer only if needed Quadriceps and hamstring strengthening	Knee sleeve Avoid activities involving knee flexion Quadriceps strengthening
Effusion	**Patellar Tendinitis**	**Prepatellar Bursitis**
Possible aspiration	Quadriceps strengthening	Possibly aspiration of bursa
Nonspecific Knee Pain		
Ice		

training. Instruction in proper exercise technique is important and a few visits to a physical therapist can serve to educate the patient about an effective exercise program. The clinician or therapist should teach the patient rehabilitation programs for knee problems.

- Patient's at-home applications of heat or cold packs may be used before or after exercises and are as effective as those performed by a therapist.

- Some studies have shown that transcutaneous electrical neurostimulation (TENS) units and acupuncture may be beneficial in patients with chronic knee pain, but there is insufficient evidence of benefit in acute knee problems.
- Sophisticated rehabilitation programs involving equipment should be reserved for significant knee problems as an alternative to surgery or for postoperative rehabilitation. Properly conducted, these programs minimize the active participation of the therapist and direct the patient to take an active role in the program by simply using the equipment after instruction and then graduating to a home program.
- Physical modalities, such as massage, diathermy, cutaneous laser treatment, ultrasound, and biofeedback have no scientifically proven efficacy in treating acute knee symptoms.
- Invasive techniques, such as needle aspiration of effusions or prepatellar bursal fluid and cortisone injections, are not routinely indicated. Knee aspirations carry inherent risks of subsequent intraarticular infection.
    - A reddened, hot, swollen area may be a sign of cellulitis or infected prepatellar bursitis; thus, aspirating the joint through such an area is not recommended because microorganisms may be introduced into a previously sterile joint space.
    - If a patient has severe pain with motion, septic effusion of the knee joint is a possibility, and referral for aspiration, Gram stain, culture, sensitivity, and possibly lavage may be indicated. Initial atraumatic effusions without signs of infection may be aspirated for diagnostic purposes.
    - There is a high rate of recurrence of effusions after aspiration, but the procedure may be worthwhile in cases of large effusions or if there is a question of infection in the bursa.
    - Patients with recurrent effusions who have a history of gout or pseudogout may need aspiration to rule out infection, but more likely will need it only for comfort, if at all. Osteoarthritis can present with effusions, but findings of crepitus, palpable osteophytes, and history of chronic symptoms are usually sufficient to make the differential diagnosis.
    - Swelling and sponginess anterior to the patella is consistent with a diagnosis of prepatellar bursitis.
- Other miscellaneous therapies have been evaluated and found to be ineffective. In particular, iontophoresis and phonophoresis have no proven efficacy.
- Manipulation does not appear to be effective in alleviating knee pain.

Activity Alteration

The principle of maximizing activities while recovering from a physical problem applies to knee problems as well as problems involving other parts of the body.

Non-weight-bearing exercises, such as swimming or floor exercises, can be carried out while allowing the affected knee to rest before undergoing specific exercises to rehabilitate the area at a later date. Weight-bearing exercises, as tolerated, can begin as soon as possible provided no exacerbation of structural damage will occur. Weight bearing helps avoid the adverse effects of non-weight-bearing, such as loss of muscle mass, loss of strength, and diffuse osteopenia. The knee disorders under discussion almost always can bear weight, as tolerated. For example, treatment could include a partial weight-bearing gait using crutches with the affected leg on the floor and with the weight distributed between crutches and leg by adjusting the amount of force applied with arms on the crutches. Even at the acute stage, however, patients can usually perform appropriate lower extremity exercises, and can remove the immobilizer for active range-of-motion exercises, at least twice a day. Using load-bearing exercises and movement is far more beneficial to the muscle, tendon, skeleton, and cartilage than is total rest, but it also is crucial to avoid overloading the knee.

Activities and postures that increase stress on a structurally damaged knee tend to aggravate symptoms. Patients with acute ligament tears, strains, or meniscus damage of the knee can often perform only limited squatting and working under load during the first few weeks after return to work. Patients with prepatellar bursitis should avoid kneeling. Patients with any type of knee injury or disorder will find prolonged standing and walking to be difficult, but return to modified-duty work is extremely desirable to maintain activities and prevent debilitation. A brace can be used for patellar instability, anterior cruciate ligament (ACL) tear, or medical collateral ligament (MCL) instability although its benefits may be more emotional (i.e., increasing the patient's confidence) than medical. Usually a brace is necessary only if the patient is going to be stressing the knee under load, such as climbing ladders or carrying boxes. For the average patient, using a brace is usually unnecessary. In all cases, braces need to be properly fitted and combined with a rehabilitation program.

Work Activities

Occupational clinicians often are called on to make specific recommendations about activities at work for patients with acute limitations due to knee problems. Work-activity modification can be discussed at the initial and subsequent encounters with patients. Education about avoiding painful positions may help the patient maintain partial activities and thus avoid debilitation. The patient's age, general health and condition, and perceptions of safe limits for walking, standing, stooping, twisting, and kneeling (noted on initial history) help in formulating recommendations on reasonable starting points for activity.

The clinician can make it clear to patients and employers that:

- Even moderately heavy, unassisted carrying, stooping, crouching, etc. may aggravate knee symptoms caused by any of the diagnoses under discussion.

- Any restrictions are intended to allow for spontaneous recovery or for the time necessary for the development of activity tolerance through exercise.

Table 13-4 provides a guide for recommendations on activity modification, and data on disability duration. These are intended to apply to patients without comorbidity or complicating factors, including legal or employment issues. The activity modification table is intended to provide activity-related guidance that will maximize the chances for a prompt recovery. The disability-duration data are presented to provide assistance in determining when the length of recovery has reached the point that reconsideration should be given to the diagnosed condition, the treatment plan, or the injured worker's degree of participation in that plan.

Follow-up Visits

Patients with knee complaints should have follow-up every three to five days, whether in person or with brief telephone or e-mail contact, by a midlevel practitioner or physical therapist who can counsel the patient about avoiding static positions, medication use, activity modification, and other concerns. The practitioner can 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 done on site or by telephone to avoid interfering with modified- or full-work activities.

Physician follow-up is appropriate 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 every seven to fourteen days if the patient is working.

Special Studies and Diagnostic and Treatment Considerations

Special studies are not needed to evaluate most knee complaints until after a period of conservative care and observation. The position of the American College of Radiology (ACR) in its most recent appropriateness criteria list the following clinical parameters as predicting absence of significant fracture and may be used to support the decision *not* to obtain a radiograph following knee trauma:

- Patient is able to walk without a limp
- Patient had a twisting injury and there is no effusion

The clinical parameters for ordering knee radiographs following trauma in this population are:

- Joint effusion within 24 hours of direct blow or fall
- Palpable tenderness over fibular head or patella

*Table 13-4. 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)
Meniscus tear	Weight-bearing as tolerated; no prolonged squatting, standing or walking. No stooping, crouching, or carrying	0-2 days	4-14 days	18 days	14%
Collateral ligament strain	Same as for meniscus tear	0-1 day	7-14 days	14 days	19%
Collateral ligament tear	Same as for meniscus tear	0-2 days	14-21 days	14 days	19%
Cruciate ligament strain	Same as for meniscus tear	0-1 day	7-10 days	14 days	19%
Cruciate ligament tear	Same as for meniscus tear	0-2 days	14-21 days	14 days	19%
Patellofemoral syndrome	Avoid activities involving knee flexation, e.g., frequent stair-climbing, hill-climbing, and prolonged walking	0 days	1-2 days	15 days	48%
Patellar tendinitis	Same as meniscus tear	0 days	2-7 days	15 days	48%
Prepatellar bursitis	Avoid kneeling, stooping, and crouching	0 days	2-14 days	15 days	48%
Effusion	Avoid prolonged standing, walking, stooping, crouching, and heavy carrying	0 days	2-5 days	11 days	31%
Regional knee pain	Same as for effusion	0 days	2-4 days	4 days	50%

* 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 extremity injury can return to modified duty immediately. Restrictions should take into consideration the opposite extremity also to prevent strain injuries to the uninjured extremity.
*** 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.

Table 13-5. Ability of Various Techniques to Identify and Define Knee Pathology

Technique	Meniscus Tear	Ligament Strain	Ligament Tear	Patello-femoral Syndrome	Tendinitis	Prepatellar Bursitis	Regional Pain
History	+ +	+ +	+ +	+ + + +	+ + +	+ +	+ +
Physical examination	+ + + +	+ + + +	+ + + +	+ +	+ + + +	+ + + +	+ +
Laboratory studies	0	0	0	0	0	0	0
Electromyography/nerve conduction velocity (EMG/NCV) studies	0	0	0	0	0	0	0
Imaging studies							
Radiography[1]	0	0	0	+	0	0	0
Bone scan[1]	0	0	0	+	0	0	0
Arthrography[1]	+ + +	0	+	0	0	0	0
Computed tomography (CT)[1]	0	0	0	0	0	0	0
Magnetic resonance imaging (MRI)[1]	+ + + +	+ + +	+ + + +	+ + +	+ + +	+ + +	0

[1] Risk of complications (e.g., infection, radiation) highest for arthrography, less for radiography and computer tomography (CT), and lowest for bone scan and MRI.

- Inability to walk (four steps) or bear weight immediately or within a week of the trauma
- Inability to flex knee to 90 degrees

Most knee problems improve quickly once any red-flag issues are ruled out. For patients with significant hemarthrosis and a history of acute trauma, radiography is indicated to evaluate for fracture.

Reliance only on imaging studies to evaluate the source of knee symptoms may carry a significant risk of diagnostic confusion (false-positive test results) because of the possibility of identifying a problem that was present before symptoms began, and therefore has no temporal association with the current symptoms. Even so, remember that while experienced examiners usually can diagnose an ACL tear in the nonacute stage based on history and physical examination, these injuries are commonly missed or overdiagnosed by inexperienced examiners, making MRIs valuable in such cases. Also note that MRIs are superior to arthrography for both diagnosis and safety reasons. Table 13-5 provides a general comparison of the abilities of different techniques to identify physiologic insult and define anatomic defects.

Surgical Considerations

Referral for surgical consultation may be indicated for patients who have:

- Activity limitation for more than one month; and
- Failure of exercise programs to increase range of motion and strength of the musculature around the knee.

Earlier, emergency consultation is reserved for patients who may require drainage of acute effusions or hematomas. Referral for early repair of ligament or meniscus tears is still a matter for study because many patients can have satisfactory results with physical rehabilitation and avoid surgical risk.

A. Anterior Cruciate Ligament (ACL) Tears

Anterior cruciate ligament reconstruction generally is warranted only for patients who have significant symptoms of instability caused by ACL incompetence. Anterior cruciate ligament tears often are followed by an immediate effusion of the knee. A history of frequent giving-way episodes, or falls during activities that involve knee rotation, is consistent with the condition. A physical examination in an acute setting may be unrevealing because of the effusion and immobilization of the knee. In addition, the physical examination may reveal clear signs of instability as shown by positive Lachman, drawer, and pivot-shift tests. It is important to confirm the clinical findings with MRI evidence of a complete tear in the ligament. Especially in cases involving partial ACL tears, substantial improvement in symptoms may occur with rehabilitation alone. In complete tears, consideration should be given to the patient's age, normal activity level, and the degree of knee instability caused by the tear. Surgical reconstruction of the ACL may provide substantial benefit to active patients, especially those under 50 years old. For the patient whose work or life does not require significant loading of the knee and other stressful conditions, ACL repair may not be necessary.

Complications of wound infection and untoward anesthetic events are possible but rare. Anterior cruciate ligament reconstruction is noted in the literature to have various rates of failure, and it is appropriate to warn the patient of this possibility. After the procedure, the rehabilitation period involves six months of intense concentration and work by the patient; the patient's willingness to undergo the rehabilitative process must be determined by the practitioner and may be discussed with the patient. Besides providing the patient with educational literature, the practitioner may want to have the patient meet with someone who is going through the rehabilitation process. Such a meeting might help the patient determine whether he or she will be able to follow through with the intense process. Older patients may be less motivated to go through rehabilitation, and the work environment can be examined before deciding upon the need for ACL repair.

B. Meniscus Tears

Arthroscopic partial meniscectomy usually has a high success rate for cases in which there is clear evidence of a meniscus tear—symptoms other than simply pain (locking, popping, giving way, recurrent effusion); clear signs of a bucket-handle tear on examination (tenderness over the suspected tear but not over the entire joint line, and perhaps lack of full passive flexion); and consistent

findings on MRI. However, patients suspected of having meniscal tears, but without progressive or severe activity limitation, can be encouraged to live with symptoms to retain the protective effect of the meniscus. If symptoms are lessening, conservative methods can maximize healing. In patients younger than 35, arthroscopic meniscal repair can preserve meniscal function, although the recovery time is longer compared to partial meniscectomy. Arthroscopy and meniscus surgery may not be equally beneficial for those patients who are exhibiting signs of degenerative changes.

C. Collateral Ligament Tears

Isolated collateral ligament tears have been shown to heal with excellent results without surgical intervention. When accompanying cruciate or meniscus injuries are ruled out, the patient can be treated non-operatively. Rehabilitative exercises will be needed.

D. Patellofemoral Syndrome

Although arthroscopic patellar shaving has been performed frequently for PFS, long-term improvement has not been proved and its efficacy is questionable. Severe patellar degeneration presents a problem not easily treated by surgery. Patellectomy and patellar replacements in reasonably active patients yield inconsistent results, and the procedures have a reasonable place only in treating patients with severe rheumatoid arthritis or another rheumatoid condition. Lateral arthroscopic release may be indicated in cases of recurrent subluxation of the patella, but surgical realignment of the extensor mechanism may be indicated in some patients.

E. Osteochondral Defects

Cartilage grafts and/or transplantations for osteochondral defects are still somewhat controversial despite some scientific evidence of their effectiveness. These procedures are technically difficult and require specific physician expertise. They may be effective in patients less than 40 years old with active lifestyles, exhibiting a singular, traumatically caused grade III or IV femoral condyle deficit. The diameter of the deficit should not exceed 20 mm for osteochondral autograft transplant system (OATS) procedures. The OATS technique could be a suitable and cost-effective therapy, possibly preventing, or, at least, delaying the development of osteoarthrosis. Grafts and transplants are not recommended for individuals with obesity, inflammatory conditions or osteoarthritis, other chondral defects, associated ligamentous or meniscus pathology, or who are greater than 55 years of age.

Summary of Recommendations and Evidence

See Table 13-6.

Table 13-6. Summary of Recommendations for Evaluating and Managing Knee Complaints

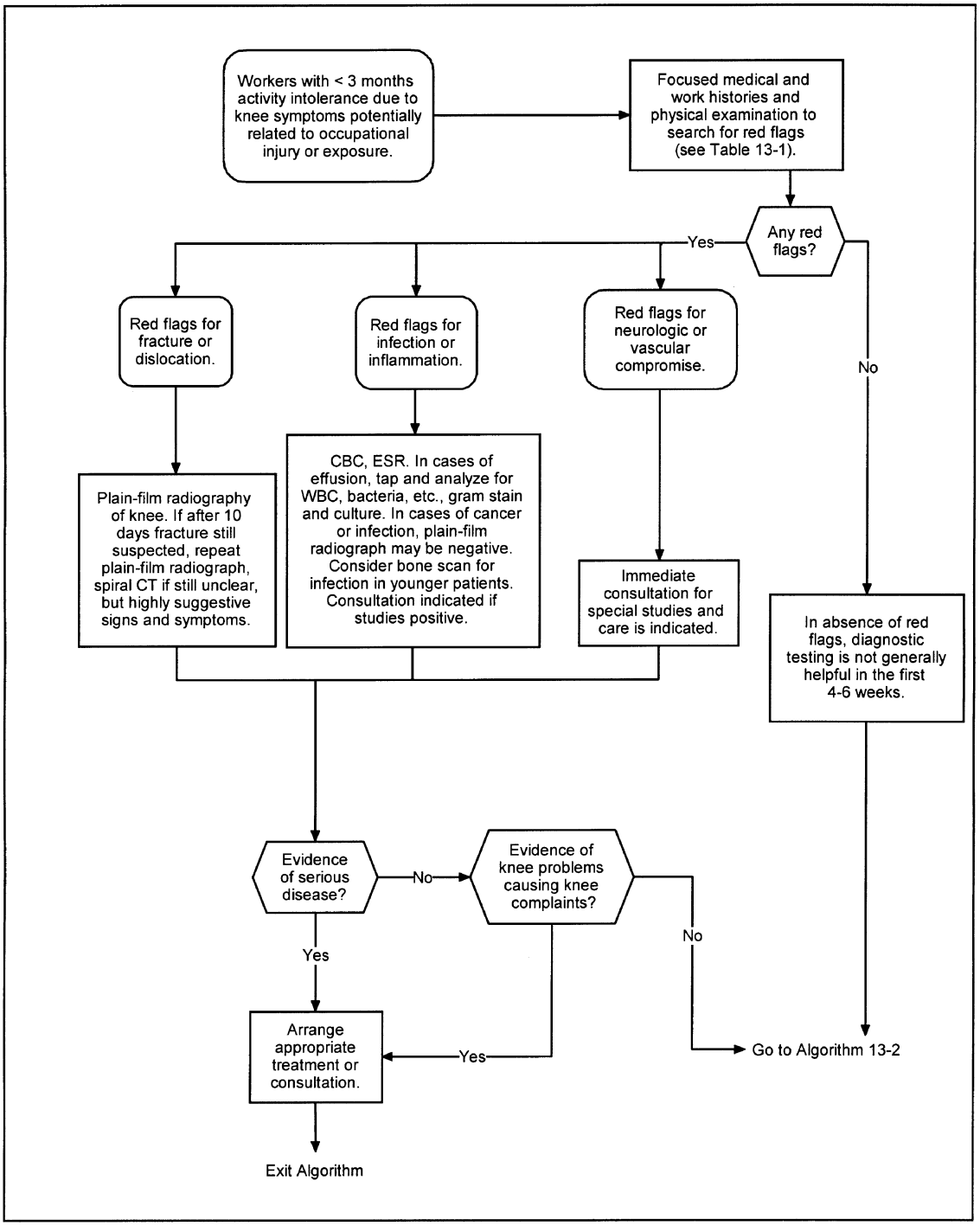
Clinical Measure	Recommended	Optional	Not Recommended
History	Basic history, with careful search for mechanism of injury (C, D)		
Physical exam	Focused physical exam, including ligament testing and careful search for any swelling (C, D)		
Patient education	Patient education Full disclosure of diagnostic accuracy, prognosis, and expectations of treatment (D)		
Medication (See Chapter 3)	Acetaminophen Aspirin (C, D)	Opioids for severe pain NSAIDs (C, D)	Use of opioids for more than 2 weeks (C, D)
Physical treatment methods	Nonoperative rehabilitation for medial collateral ligament injuries (C, D) Short postoperative rehabilitation for ACL repair prior to home exercise program (D) Conservative treatment for selected ruptures of the ACL (D) Exercises for cases of anterior knee pain or ligament strain(D)		Passive modalities without exercise program (D) Manipulation (D)
Aspirations and injections	Aspiration of tense acute effusions (D) Aspiration of tense prepatellar bursa (D)	Repeated aspirations or corticosteroid injections (D)	Aspiration through infected area (D)
Rest and immobilization	Short period of immobilization after an acute injury to relieve symptoms (C)	Functional bracing as part of a rehabilitation program (D)	Prophylactic braces (D) Prolonged bracing for ACL deficient knee (D)

Table 13-6. (continued)

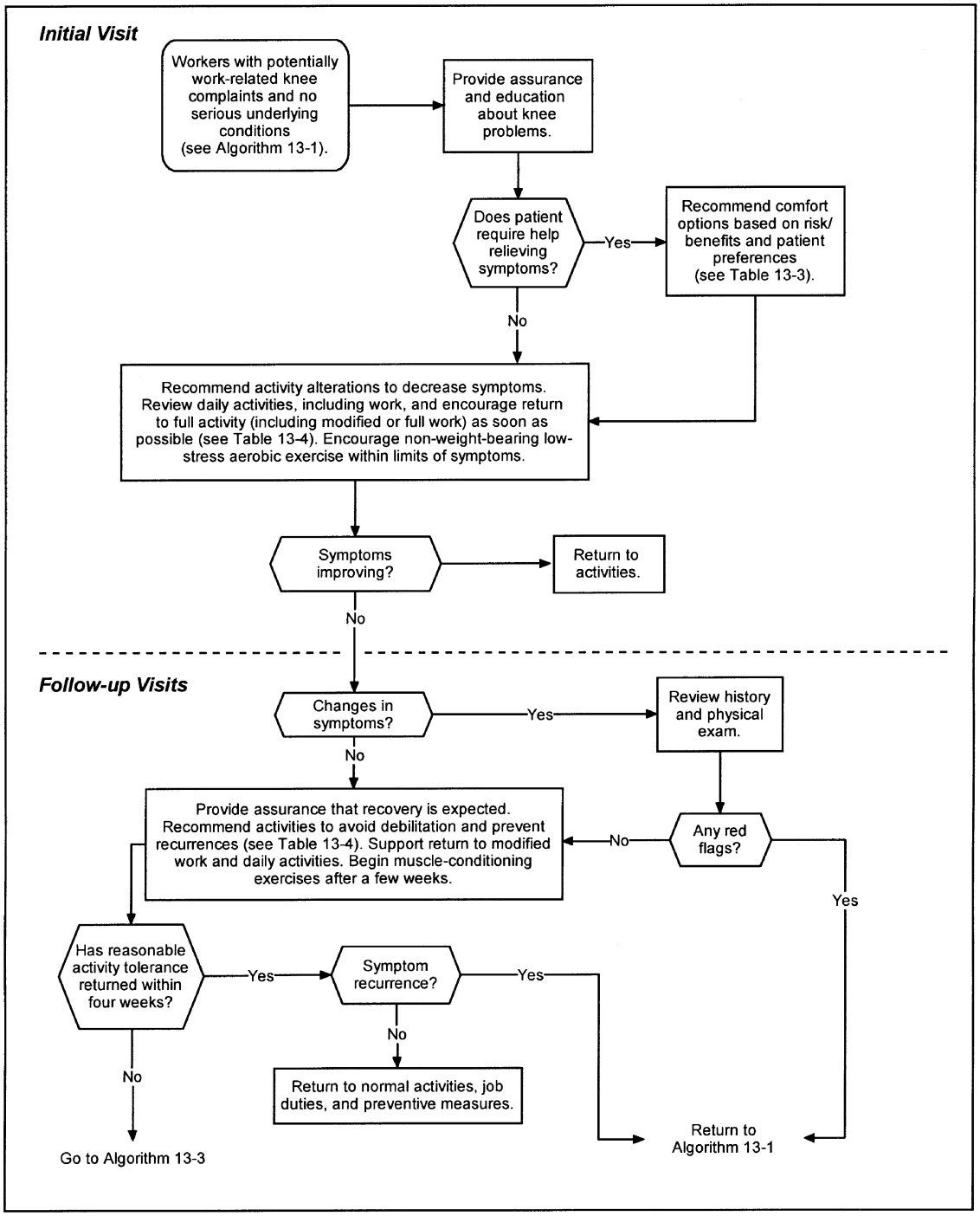
Clinical Measure	Recommended	Optional	Not Recommended
Activity and exercise	Stretching Aerobic exercise Maximal activity of other body parts while recovering from knee injury (D)		Excessive rest (may lead to generalized debilitation) (D)
Detection of neurologic abnormalities			Electrical studies (contraindicated for nearly all knee injury diagnoses) (D)
Radiography	Plain-film radiographs for suspected red flags (C)	Plain-film radiographs for tense hemarthroses (C)	Routine radiographic film for most knee complaints or injuries (C)
Imaging	MRI study to determine extent of ACL tear preoperatively (C)		MRI for ligament collateral tears (C)
Surgical considerations	Arthroscopic meniscectomy or repair for severe mechanical symptoms and signs or serious activity limitations if MRI findings are consistent for meniscal tear (C, D) ACL repair for symptomatic instability (i.e., serious activity limitation) if results of Lachman and pivot-shift tests and MRI are positive (C, D)	ACL reconstruction before rehabilitation has been attempted (C, D)	Surgical repair of isolated MCL ruptures (D) Immediate surgical reconstruction of all ACL tears on basis of MRI findings without physical findings confirming diagnosis or worker life demands requiring high knee performance (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 knee complaints).
D = Panel interpretation of information not meeting inclusion criteria for research-based evidence.

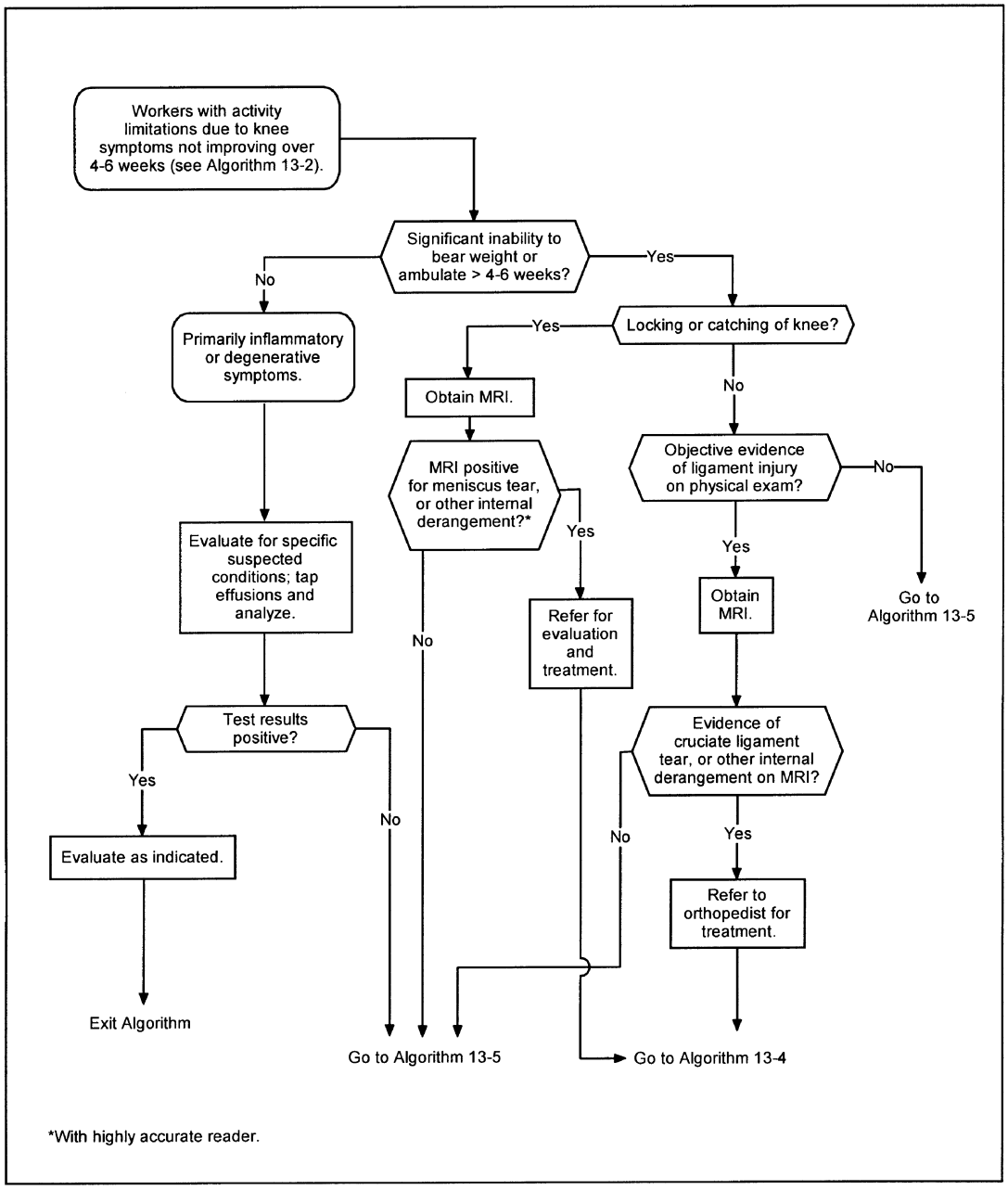
Algorithm 13-1. *Initial Evaluation of Occupational Knee Complaints*



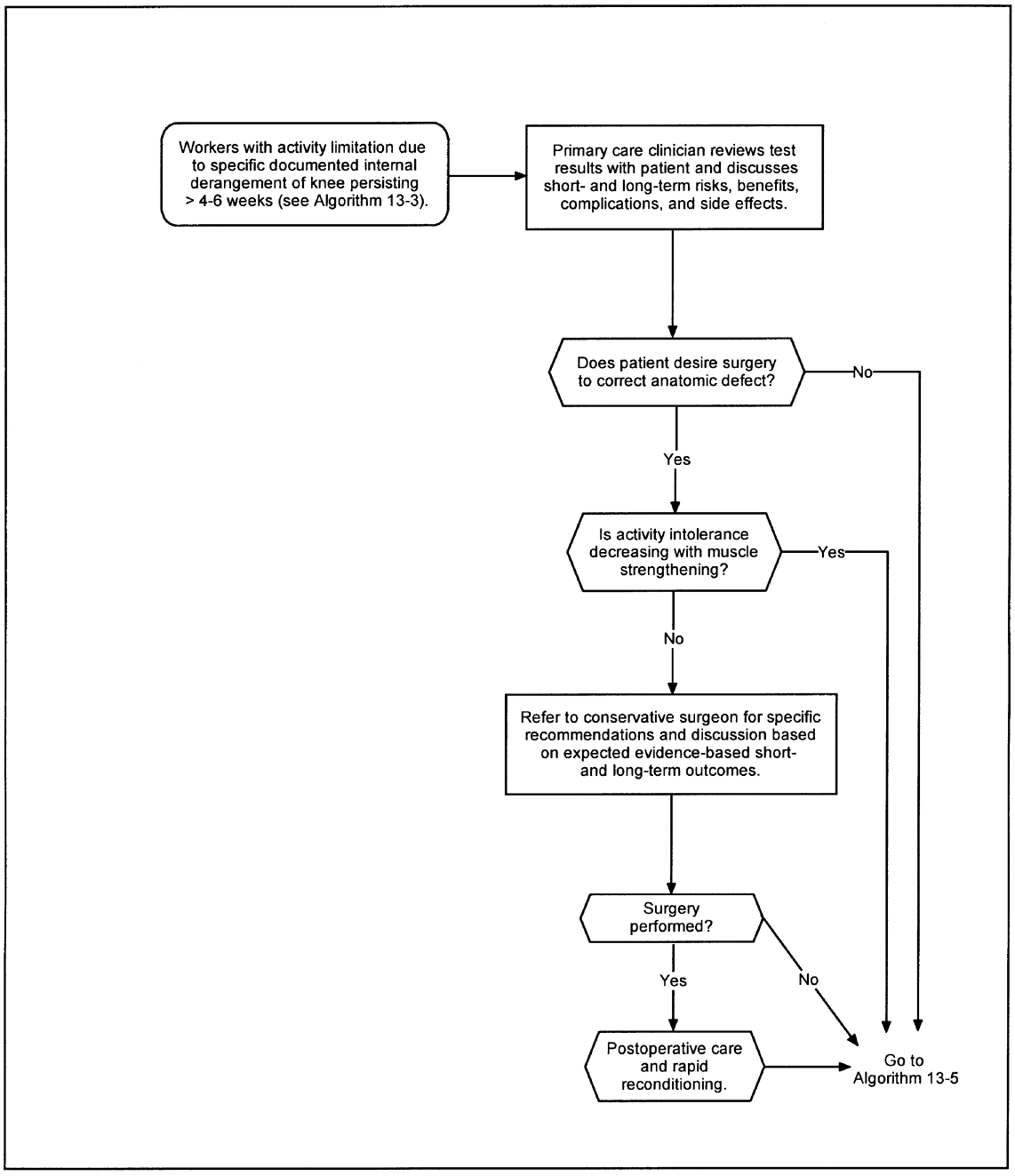
Algorithm 13-2. *Initial and Follow-up Management of Occupational Knee Complaints*



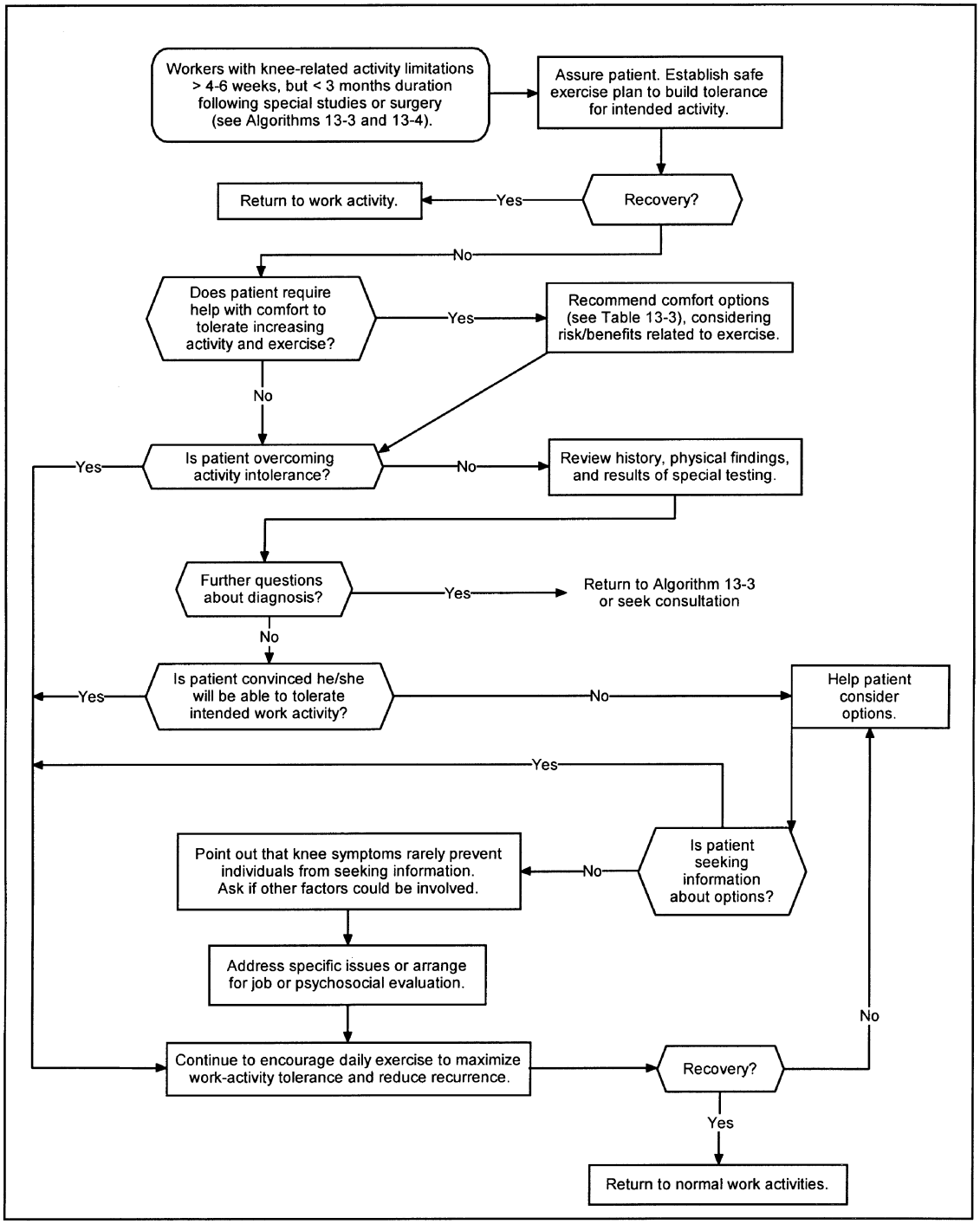
Algorithm 13-3. *Evaluation of Slow-to-recover Patients with Occupational Knee Complaints (Symptoms > 4 Weeks)*



Algorithm 13-4. *Surgical Considerations for Patients with Anatomic Evidence of Torn Meniscus or Ligament and Persistent Knee Symptoms*



Algorithm 13-5. *Further Management of Occupational Knee Complaints*



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