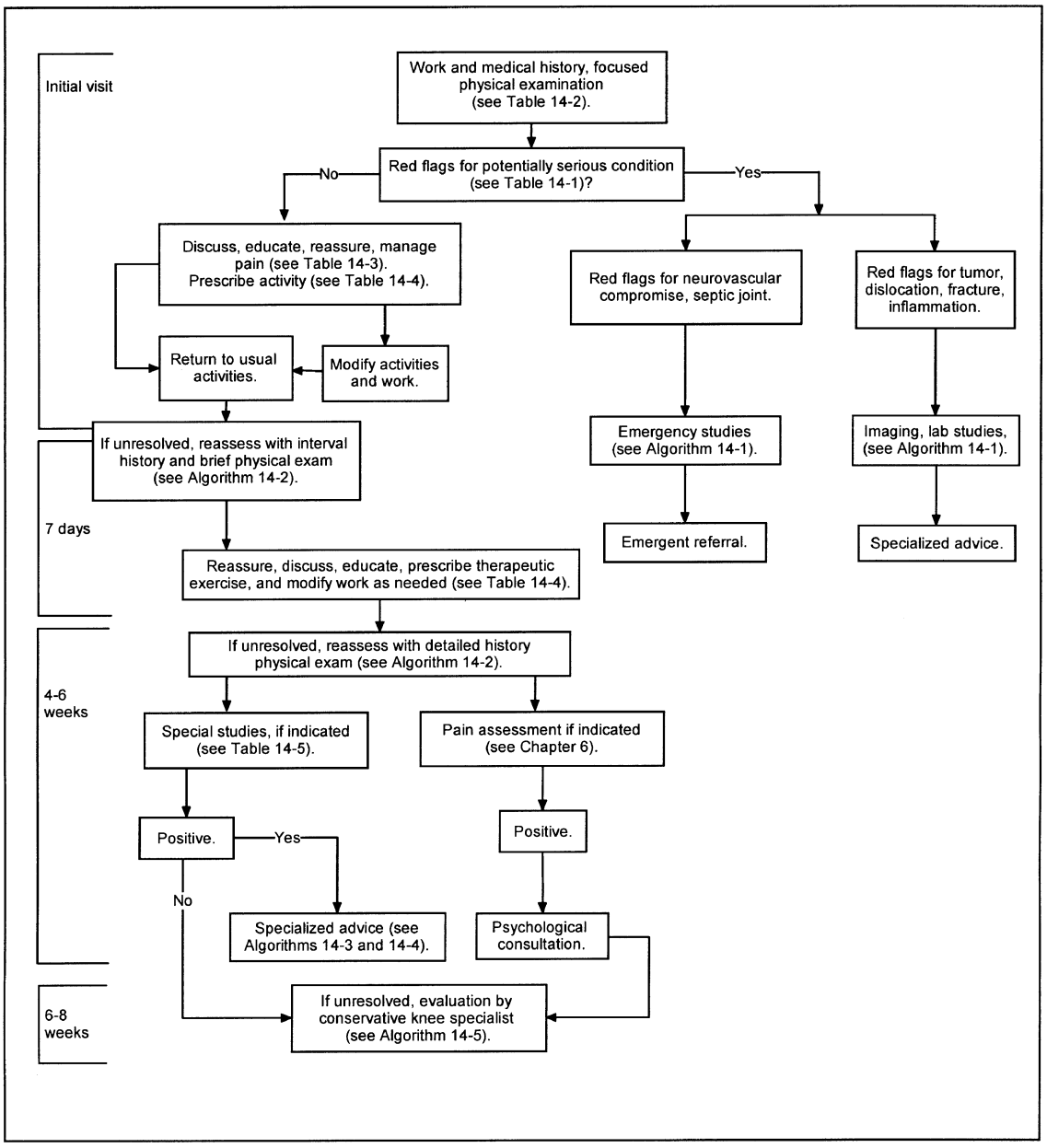
***Master Algorithm**. ACOEM Guidelines for Care of Acute and Subacute Occupational Ankle and Foot Complaints*



14 Ankle and Foot Complaints

General Approach and Basic Principles

Foot and ankle complaints that are potentially work related are common problems presenting to occupational and primary care providers; they are among the ten most common causes of reported work-related health complaints and workers' compensation claims. These complaints account for about 15% of claims, 7% of costs, and 6 to 7% of total lost workdays in workers' compensation, ranking them in the top ten for financial severity as well.

Recommendations for assessing and treating adults with potentially work-related ankle and foot problems are presented in this clinical practice guideline. Topics include the initial assessment and diagnosis of patients with acute and subacute ankle or foot complaints that may be 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 identification of clinical pathology, work-relatedness, modified duty and activity, return to work, and further considerations, including the management of delayed recovery.

Algorithms for patient management are included. This chapter's master algorithm schematizes the recommended way primary care and occupational medicine practitioners should manage patients with acute or subacute ankle and foot complaints. The following text, tables, and numbered algorithms amplify the guidelines of the master algorithm.

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

- The initial appropriate assessment of patients with ankle and foot problems focuses on detecting red-flag indicators of potentially serious injury or disease.
- In the absence of red flags, work-related foot and ankle complaints can be safely and effectively managed by occupational or primary care providers. The focus is on monitoring for complications, facilitating activity and the healing process, and facilitating return to work in a modified- or full-duty capacity.

- Relieving discomfort can be accomplished most safely by temporary immobilization, elevation, use of heat and cold, restricted weight bearing, and systemic nonprescription analgesics.
- Patients recovering from acute foot and ankle injury or infection should be encouraged to return to modified work as soon as their condition permits.
- If symptoms persist more than four weeks, referral for specialty care may be indicated.
- Nonphysical factors, such as psychosocial, workplace, or socioeconomic problems and non-anatomic pain, should be addressed in an effort to resolve delayed recovery.

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 foot or ankle symptoms. The initial medical history and examination involves evaluating for serious underlying conditions, including sources of foot and ankle pain in other parts of the body. Certain findings in this assessment raise suspicion of serious underlying medical conditions, which are referred to as red flags (see Table 14-1). 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 contributing workplace factors are mitigated). Foot and ankle complaints can then be classified into one of four working categories:

- **Potentially serious foot and ankle conditions:** fractures, acute dislocation, neurovascular compromise, tendon rupture, or infection
- Acu**te mechanical disorders:** derangements of the foot or ankle related to acute trauma, such as ligament strain
- **Chronic mechanical or degenerative disorders:** possible consequences of aging or repetitive use, or a combination thereof, such as degenerative arthritis and chronic tendinitis, tenosynovitis, or tendinosis
- Referred pain or paresthesias
- **Nonspecific disorders:** occurring in the foot or ankle and suggesting neither internal derangement nor referred 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):

Table 14-1. Red Flags for Potentially Serious Ankle and Foot Conditions

Disorder	Medical History	Physical Examination
Fracture	History of significant trauma History of abnormal mobility History of deformity with or without spontaneous or self-reduction Painful swelling of ankle or foot	Significant swelling Significant bruising or hematoma Deformity of ankle or foot Abnormal mobility Bony crepitus
Dislocation	History of significant ankle or foot trauma History of ankle or foot deformity with or without spontaneous reduction or self-reduction	Swelling Possible deformity of ankle or foot
Infection	History of swelling of ankle or foot with increasingly red, hot area on the ankle or foot History of fever or chills History of diabetes or immunosuppression (e.g., transplant, chemotherapy, HIV)	Palpable mass Local heat, swelling, erythema Systemic signs of sepsis
Inflammation	History of inflammatory arthritis or autoimmune disease	Swelling and effusion of ankle or foot
Rapidly progressive neurologic compromise	History of neuropathy, decreased or absent sensation History of neurologic disease History of diabetes History of dislocation or fracture	Decreased sensation in feet and ankles Loss of vibratory or positional sense Dermatomal distribution Absent ankle jerk Motor loss in specific distribution Painless swelling (Charcot's joint)
Rapidly progressive vascular compromise	History of diabetes History of peripheral vascular disease or bypass grafts History of dislocation or fracture	Decreased or absent foot and ankle pulses Decreased capillary filling Cold, pale extremity
Acute gout	History of sudden recurring attacks of joint pain in the toes	Swelling Red, tender, warm first metatarsal joint
Achilles rupture	History of trauma Sharp pain to the Achilles tendon, may be accompanied by loud pop	Swelling and bruising Inability to point foot downward and stand or walk comfortably

WHAT ARE YOUR PROBLEMS WITH YOUR FOOT OR ANKLE?

- When did they begin?
- Did a specific inciting event cause the symptoms?
- Are your problems pain, weakness, and/or limited motion in your ankle or foot?
- For traumatic injuries: Was the area deformed or bent? Did you lose any blood or have an open wound?
- Are the problems located primarily in the foot or ankle? Do you have pain or other problems elsewhere (e.g., low back, knee)?
- Are your problems constant or intermittent?
- What makes the problem worse?
- What makes the problem better?
- What can't you do, and/or what do you have difficulty doing as a result of these problems?
- Can you walk or bear weight? For how long?
- How long have your activities been limited? More than four weeks?
- Have your problems changed?
- 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?
- What activities cause problems for you?
- 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? Is this problem limiting you in those activities? If so, how? How often?
- What would you like to be able to do that you cannot do now?
- Do you have other medical problems?
- What do you hope we can accomplish during this visit?

A medical history suggesting pathology originating somewhere other than in the foot or ankle may warrant examination of the back, knee on the affected side, or other areas.

Physical Examination

Guided by the medical history, the preferred method of physical examination includes:

- General observation of the patient
- Regional examination of the feet and ankles
- Neurologic screening

In most cases, the examination is subjective because patient response or interpretation is required for findings on the examination. Some patients with foot or ankle problems have no objective findings. Some will present with painful or excessive range of motion and areas of tenderness or stiffness (loss of mobility). Atrophy is an objective finding and may be present in long-standing cases. A "frozen" area (marked loss of motion) may be present, as may signs of infection or deformity due to fracture or dislocation, although these cases are much less common than nonspecific pain.

Though it may seem a point too obvious to warrant mention, the physician should specifically note which ankle or foot—left or right—is the subject of the patient's complaints. Not infrequently, injured workers have prior workers' compensation claims that involve the opposite ankle or foot. 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.

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 ankle or foot 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.

A. Regional Foot and Ankle Examination

In the recommended focused foot and ankle examination, the clinician observes the foot for heel position and arch shape as the patient bears weight. Inspecting the medial and lateral aspects of the foot and ankle can help determine the most likely site of injury because swelling and ecchymosis often occur over the site of injury. Deformities due to fractures or dislocations may be visible abnormalities. Signs of infection (e.g., redness, heat, swelling) also may be visible.

Carefully palpate the foot for tender areas, and assess the lateral and medial ligamentous structures of the ankle. The distal fibula, distal tibia, proximal fibula, and proximal fifth metatarsal should be palpated because they are the areas most often injured in avulsion fractures. Inspecting and palpating the tendinous insertions of the leg muscles also may aid in the diagnosing the injury and rule out a more serious condition, such as an Achilles tendon rupture. The range of motion of the foot and ankle should be determined both actively

and passively, for instance, by asking the patient to move the foot and ankle within the limits of symptoms and then engaging in gentle range of motion of the joints (rear foot, midfoot, forefoot, toes) passively for comparison. Resisted range of motion may be used to assess strength and the presence of injury in associated muscles. Atrophy of calf muscles is an objective finding, but one that arises only after weeks to months of problems.

Ligamentous testing can be performed to assess the presence of ankle instability. It includes the anterior drawer test, talar tilt test, and squeeze test. Observe adjacent ankle structures, such as the tendons. The anterior drawer test is performed with the foot in neutral position. Hold the foot firmly at the heel while applying a backward, posterior force to the tibia. If significant anterior displacement of the foot relative to the distal tibia can be felt, it indicates a significant injury to the anterior talofibular ligament. The talar tilt test gently applies inversion force to the affected ankle; due to immediate post-injury pain, this examination may best be performed after pain has subsided. A positive test indicates lateral ligamentous laxity. Findings from both the anterior drawer test and talar tilt test can be compared with the unaffected, contralateral ankle. The squeeze test may be used if medial injury or severe lateral injury has taken place. Place the hands about six inches distal to the knee with thumbs on the fibula and fingers on the medial tibia. Then squeeze the leg to bring the fibula and tibia together. Pain during this test indicates syndesmotic injury, and prolonged recovery is likely.

Observe weight-bearing skeletal alignment of the foot and ankle in relation to the whole body for local skeletal malalignment and correlated and compensatory motions and postures. Observe foot and ankle motion during gait; during other work-related tasks and other home-related tasks. Is pain the limiter of the task? Observe:

- Strength
- Pain location, intensity, link with activity
- Stiffness
- Balance
- Ligamentous laxity
- Joint accessory motion

B. Neurovascular Screening

Assessment of the neurologic and vascular status of the foot and ankle (including skin temperature, peripheral pulses, and the motor, reflex, and sensory status of the foot and ankle as well as the more proximal surrounding structures) is recommended. Observe the skin for trophic changes. Examination of lumbosacral nerve root function also is in order because L5 radiculopathy can affect the foot and toe extensors and S1 radiculopathy can affect plantar flexion (see Chapter 12). Patients with peripheral neuropathy (e.g., diabetics) may have decreased sensation in the foot or ankle and neuropathic joints

presenting as acute swelling or inflammation. Peripheral nerve entrapment may be manifested as foot drop if the peroneal nerve at the knee is involved or, rarely, as a tarsal tunnel syndrome, presenting as numbness of the plantar surface of the foot and toes. Foot drop also can be seen in L5 neuropathy due to an L4-5 disc protrusion.

C. Assessing Red Flags

Physical examination evidence of neurovascular 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, tendon rupture, metabolic disorder, fracture, or dislocation.

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 14-2 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 make a correct diagnosis.

Table 14-2. 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
Ankle sprain (ICD-9 845.0; medial 845.01, lateral 845.02)	Inversion of ankle Eversion of ankle	Pain at or below lateral or medial malleolus Swelling over or near malleolus	Swelling at or below malleolus Tenderness over medial or lateral ankle ligament With severe sprain, positive drawer sign for instability	None (radiograph negative if obtained)
Forefoot sprain (ICD-9 845.10)	Plantar flexion, extension, or inversion beyond range	Dorsal foot pain Swelling of dorsal foot	Swelling in dorsum of foot Tenderness over dorsum of foot	None (radiograph negative if obtained)
Ankle or foot tendonitis (ICD-9 726.71)	Acute overuse Repetitive trauma	Heel cord pain Pain over specific tendon unit with flexion or extension	Pain over muscle/tendon unit on motion or resisted motion of tendon unit Tenderness of involved tendon	None

Table 14-2. (continued)

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Tests and Results
Neuroma (ICD-9 355.6)	Prolonged weight bearing Idiopathic	Gradual onset of pain and paresthesias on both sides of web space	Reproduction of symptoms by pressing metatarsals together or pressing the web space	None
Metatarsalgia (ICD-9 726.70)	Prolonged weight bearing Degenerative changes Idiopathic	Gradual onset of pain under metatarsal heads with weight bearing	Reproduction of metatarsal pain on compression Decreased tissue padding under metatarsal heads	None
Bunion, hallux valgus (ICD-9 727.1, 735.0)	Prolonged weight bearing Degenerative change	Lateral deviation of first toe Pain in first toe from overlap with tight footwear	Lateral angulation of great toe	Metatarsal angle of > 14 degrees
Plantar fasciitis (ICD-9 728.71)	Weight bearing (on hard surfaces) Idiopathic	Pain across sole of foot Pain with 1st step upon rising in the morning	Tenderness on compression of plantar fascia	None
Heel spur (ICD-9 726.73)	Prolonged weight bearing Degenerative change Idiopathic	Pain at heel with weight bearing First steps upon rising in A.M. very painful in heel	Point tenderness over plantar calcaneus	Ragiograph positive for plantar calcaneal spur (if obtained)
Metatarsal stress fracture (ICD-9 825.25)	Repetitive load	Pain in the dorsal forefoot on weight bearing	Point tenderness over metatarsal shaft	Radiograph positive later in course of disorder Bone scan or spiral CT positive
Toe fracture (ICD-9 826.1)	Direct trauma	Pain at fracture site (possibly)	Point tenderness Deformity Hematoma	Positive radiograph
Nonspecific foot or ankle pain (ICD-9 719.47, 719.57)	Unknown	Nonspecific pain in foot or ankle	None	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.

Determining whether a complaint of a foot or ankle disorder is work related requires careful analysis and weighing all associated or apparently causal factors operative at the time (see Chapter 4). A predominance of work factors suggests that worksite intervention is appropriate. A cluster of cases in a work group suggests a greater probability of associated work-design or management factors.

Prolonged weight bearing may aggravate Morton's neuroma, metatarsalgia, hallux valgus, and plantar fasciitis, although the strength of the association is not great. Acute trauma at work can be associated with tendinitis, tenosynovitis, and ligament strains. Stress fractures can be related to a recent increase in walking or weight-bearing activities. The relation of "chronic strain" or degenerative joint disease to work in the absence of specific traumatic exposures has not been documented in well-designed studies.

Initial Care

Comfort is often a patient's first concern. Nonprescription analgesics, short-term non-weight bearing, cold application and elevation will provide sufficient pain relief for most patients with acute and subacute symptoms. If treatment response is inadequate (e.g., 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 14-3 summarizes initial treatment options.

Physical Methods

- Instruction in home exercise may be considered. Except for cases of fractures, acute dislocations, or infection, patients may be advised to do early passive range-of-motion exercises at home. Instruction in proper exercise technique is important, and instruction by a physical therapist can educate the patient about an effective exercise program.
- Patients may use applications of heat or cold at home before or after exercises; these are as effective as those performed by a therapist. Applying cold regularly for 36 to 48 hours following acute injury and swelling is beneficial.
- Elevation and a brief period of non-weight bearing may be effective for pain management and resolution of swelling.
- Manipulation has not been shown to be effective in alleviating foot or ankle pain.

Table 14-3. Methods of Symptom Control for Ankle and Foot Complaints

RECOMMENDED
Nonprescription Medications
Acetaminophen (safest) NSAIDs (aspirin, ibuprofen, naproxen)
Physical Methods
Adjust or modify workstation, job tasks, or work hours and methods Stretching Specific foot and ankle exercises for range of motion and strengthening At-home applications of cold during first few days of acute complaint; thereafter, applications of heat or cold as patient prefers, unless swelling persists—then use cold Initial and follow-up visits for education, counseling, and evaluation of home exercise Aerobic exercise
Prescribed Pharmaceutical Methods
Other NSAIDs

OPTIONS

Ankle Sprain	**Tendinitis/Tenosynovitis**	**Forefoot Sprain**
Cold and elevation of foot Splint or immobilization in severe cases Gradual, early resumption of weight bearing as tolerated	Splint, temporary cast or surgical shoe if needed	Splint or surgical shoe if needed Encourage partial weight bearing
Neuroma	**Metatarsalgia**	**Hallux Valgus**
Toe separator at affected web space Wide shoes	Metatarsal arch bars Arch supports Rigid orthotics	Soft, wide shoes
Plantar Fasciitis	**Heel Spur**	**Nonspecific Ankle or Foot Pain**
Heel donut Soft, supportive shoes Rigid orthotics	Heel donut Air sole shoes	Activity as tolerated
Toe Fracture		
Buddy taping Splint or temporary cast if needed		

- Physical modalities, such as massage, diathermy, cutaneous laser treatment, ultrasound, transcutaneous electrical neurostimulation (TENS) units, and biofeedback have no scientifically proven efficacy in treating acute ankle or foot symptoms, although some are used commonly in conjunction with an active therapy program, such as therapeutic exercise. Insufficient high quality scientific evidence exists to determine clearly the effectiveness of these therapies.
- Limited evidence exists regarding extracorporeal shock wave therapy (ESWT) in treating plantar fasciitis to reduce pain and improve function. While it appears to be safe, there is disagreement as to its efficacy. Insufficient high quality scientific evidence exists to determine clearly the effectiveness of this therapy.
- Invasive techniques (e.g., needle acupuncture and injection procedures) have no proven value, with the exception of corticosteroid injection into the affected web space in patients with Morton's neuroma or into the affected area in patients with plantar fasciitis or heel spur if four to six weeks of conservative therapy is ineffective.
- Other miscellaneous therapies have been evaluated and found to be ineffective or minimally effective. In particular, iontophoresis and phonophoresis have little or no proven efficacy in treating foot and ankle complaints.
- Rigid orthotics (full-shoe-length inserts made to realign within the foot and from foot to leg) may reduce pain experienced during walking and may reduce more global measures of pain and disability for patients with plantar fasciitis and metatarsalgia.
- Night splints, as part of a treatment regimen that may include stretching, range-of-motion (ROM) exercises and nonsteroidal anti-inflammatory drugs (NSAIDs), may be effective in treating plantar fasciitis, though evidence is limited.
- There is limited evidence for the effectiveness of impulse compression or coupled electrical stimulation treatment to accelerate delayed fracture union.

Activity Alteration

Careful advice regarding maximizing activities within the limits of symptoms is imperative once red flags have been ruled out. Putting joints at rest in a brace or splint should be for as short a time as possible. Gentle exercise at the initial phase of recovery is desirable. For instance, partial weight bearing involves placing the affected foot or ankle on the ground with crutches on either side and having the patient place as much weight as possible on the foot, with the rest of the weight on the crutches. This practice is preferable to complete non-weight bearing. If the nature of the injury does not prohibit them, gentle range-of-motion exercises several times a day within limits of pain is better than complete immobilization. Toes exposed in a splint should

be exercised; knee range-of-motion exercises should be performed; and straight-leg raising exercises should be done to maintain quadriceps strength.

Activities and postures that increase stress on a structurally damaged ankle or foot tend to aggravate symptoms. Correct undesirable correlated and compensatory motions and postures if possible. Weight bearing may be limited during the first few weeks, with gradual return to full weight bearing. Weight bearing with orthotics often returns function toward normal very quickly.

Work Activities

Table 14-4 provides a guide for activity modification and duration of absence from work. These recommendations apply to patients without comorbidity or complicating factors, including employment or legal issues. They are targets to provide a guide from the perspective of physiologic recovery. Key factors to consider in disability duration are age and type of job, especially if the regular work includes activities likely to worsen the condition. It is important for the clinician to clarify with patients and employers that:

- Even moderately heavy weight bearing and carrying may aggravate foot and ankle symptoms caused by tendinitis, plantar fasciitis, heel spurs, metatarsalgia, and some other conditions.
- Any restrictions are intended to allow for spontaneous recovery or time to build activity tolerance through exercise.

Follow-up Visits

Patients with ankle and foot complaints may have initial follow-up every three to five days by a midlevel practitioner or physical therapist who can provide counseling about avoiding static positions, medication use, activity modification, and other concerns. Care should be taken 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 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 work is needed, or after appreciable healing or recovery is expected. Later 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

For most cases presenting with true foot and ankle disorders, special studies are usually not needed until after a period of conservative care and observation. Most ankle and foot problems improve quickly once any red-flag issues are ruled out. Routine testing, i.e., laboratory tests, plain-film radiographs of the foot or ankle, and special imaging studies are not recommended during the

*Table 14-4. 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)
Ankle sprain	Partial to full weight-bearing	0-2 days	7-21 days	7 days	21%
Forefoot sprain	Partial to full weight-bearing	0-2 days	7-21 days	7 days	21%
Ankle or foot tendinitis	Weight-bearing as tolerated, but prolonged standing and walking should be avoided	0-1 day	7-21 days	41 days	63%
Neuroma (aggravation)	Same as for ankle or foot tendinitis	0-5 days	Indefinite	20 days	38%
Metatarsalgia	Same as for ankle or foot tendinitis	0-2 days	5 days	41 days	63%
Hallux valgus (aggravation) Hallux limitus	Same as for ankle or foot tendinitis	0-3 days	10-14 days	13 days	79%
Plantar fasciitis	Same as for ankle and foot tendinitis	0-2 days	10-14 days	3 days	61%
Heal spur (aggravation)	Same as for ankle and foot tendinitis	0-2 days	7-14 days	41 days	63%
Metatarsal stress fracture	Splint or case and partial weight-bearing	0-1 day	6 weeks	20 days	12%
Toe fracture	Buddy tape and open shoes Exposure to further trauma should be carefully avoided	0 days	1-2 weeks	13 days	21%
Regional foot and ankle pain	Allow all activities as tolerated Avoid activities that aggravate symptoms but start range-of-motion and conditioning exercises	0-2 days	5 days	4 days	49%

* 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 1995, 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.

first month of activity limitation, except when a red flag noted on history or examination raises suspicion of a dangerous foot or ankle condition or of referred pain.

In particular, patients who have suffered ankle injuries caused by a mechanism that could result in fracture can have radiographs if the Ottawa Criteria are met. This will markedly increase the diagnostic yield for plain radiography. The Ottawa Criteria are rules for foot and ankle radiographic series. An ankle radiographic series is indicated if the patient is experiencing any pain in the:

- Malleolar area, and any of the following findings apply: a) tenderness at the posterior edge or tip of the lateral malleolus; b) tenderness at the posterior edge or tip of the medial malleolus; or c) inability to bear weight both immediately and in the emergency department.
- Midfoot area, and any of the following findings apply: a) tenderness at the base of the fifth metatarsal; b) tenderness at the navicular bone; or c) inability to bear weight both immediately and in the emergency department.

Radiographic evaluation may also be performed if there is rapid onset of swelling and bruising; if patient's age exceeds 55 years; if the injury is high-velocity; in the case of multiple injury or obvious dislocation/subluxation; or if the patient cannot bear weight for more than four steps.

For patients with continued limitations of activity after four weeks of symptoms and unexplained physical findings such as effusion or localized pain, especially following exercise, imaging may be indicated to clarify the diagnosis and assist reconditioning. Stress fractures may have a benign appearance, but point tenderness over the bone is indicative of the diagnosis and a radiograph or a bone scan may be ordered. Imaging findings should be correlated with physical findings.

Disorders of soft tissue (such as tendinitis, metatarsalgia, fasciitis, and neuroma) yield negative radiographs and do not warrant other studies, e.g., magnetic resonance imaging (MRI). Magnetic resonance imaging may be helpful to clarify a diagnosis such as osteochondritis dissecans in cases of delayed recovery.

Cases of hallux valgus that fail conservative treatment merit standing plain films to plan surgery, and consultation with the potential surgeon is recommended. Sprains are frequently seen after emergency room treatment in which radiographs are obtained to rule out fractures. Minimal sprains can be treated symptomatically without films. Table 14-5 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 without signs of functional improvement
- Failure of exercise programs to increase range of motion and strength of the musculature around the ankle and foot
- Clear clinical and imaging evidence of a lesion that has been shown to benefit in both the short and long term from surgical repair

Earlier, emergency consultation is reserved for patients who may require drainage of acute effusions or hematomas. Referral for early repair of ligament tears is controversial and not common practice. Repairs are generally reserved

Table 14-5. Ability of Various Techniques to Identify and Define Ankle and Foot Pathology

Technique	Sprain	Ligament Tear	Tendinitis	Neuroma	Metarsalgia	Hatallux Valgus	Fasciitis	Heel Spur	Metatarsal Fracture	Toe Fracture
History	++	++	++	++++	+++	+++	++	++	++	++++
Physical examination	++++	++++	++++	++++	++++	++++	++++	++++	+++	+++
Laboratory studies	0	0	0	0	0	0	0	0	0	0
Imaging studies										
Radiography	0	0	0	0	0	++	0	++	++	+++
Computed tomography (CT)	0	0	0	0	0	0	0	0	+++	+++
Magnetic resonance imaging (MRI)	0	++	++	++	0	0	0	0	0	0
Bone scan	0	0	0	0	0	0	0	0	++++	+++

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

for chronic instability. Most patients have satisfactory results with physical rehabilitation and thus avoid the risks of surgery. If there is no clear indication for surgery, referring the patient to a physical medicine practitioner may help resolve the symptoms.

A. Neuroma

If a patient with a neuroma has persistent pain in a web space despite using toe separators, along with temporary relief from local cortisone injections, surgical removal of the neuroma may be indicated. Besides the usual counseling about possible wound complications and complications of anesthesia, the patient can be informed that the operation is not always effective because the surgeon may be unable to find the neuroma and excise it. Always counsel the patient about expectations for surgery so that he or she can make an informed decision about whether or not to proceed with surgery.

B. Hallux Valgus

Failure of conservative treatment (e.g., using wider shoes and/or arch supports, or aspiration of an overlying bursa) may lead to consideration of surgery. However, surgery should not be performed for cosmetic purposes because surgical complications such as infection can worsen appearance and a good functional result is the goal of treatment. Counseling patients about the postoperative course and recovery period is required because they may otherwise underestimate the length of time for recovery and the postoperative pain involved.

Summary of Recommendations and Evidence

See Table 14-6.

Table 14-6. Summary of Recommendations for Evaluating and Managing Ankle and Foot Complaints

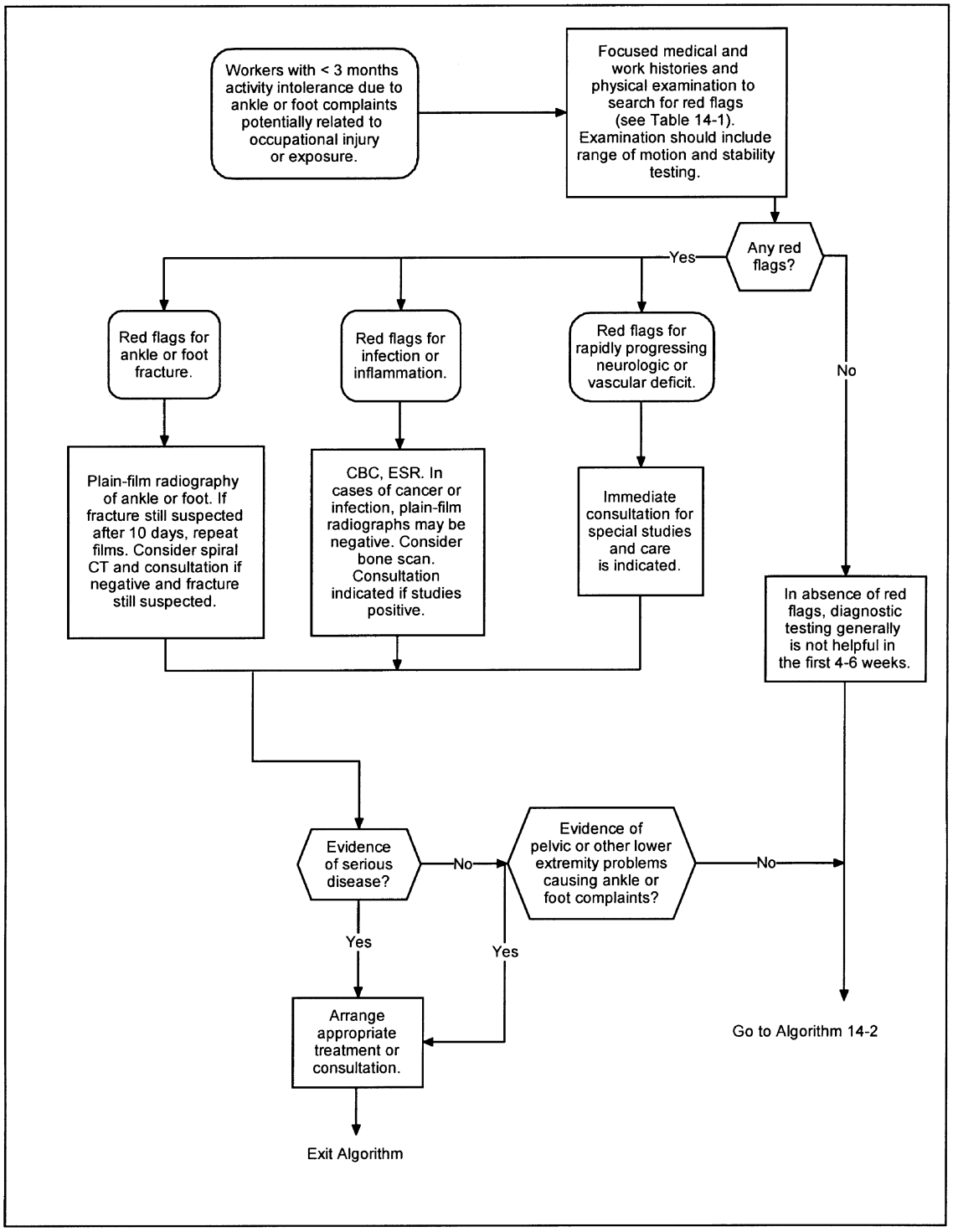
Clinical Measure	Recommended	Optional	Not Recommended
History and physical exam	Basic history and physical exam, including evaluation of ability to bear weight, tenderness, and ligament stability (C)		
Patient education	Patient education regarding diagnosis, prognosis, and expectations of treatment (D)		
Medication (See Chapter 3)	Acetaminophen (C) NSAIDs (B)	Opioids, short course (C) NSAID creams (D)	Use of opioids for more than 2 weeks (C)
Injections	For patients with point tenderness in the area of a heel spur, plantar fasciitis, or Morton's neuroma, local injection of lidocaine and cortisone solution (D)		Repeated or frequent injections (D)
Physical treatment methods	For acute injuries, at-home ice applications, range-of-motion and strengthening exercises, as taught by primary provider (D)	Pneumatic or pulse devices to reduce swelling (C) ESWT for plantar fasciitis (C) Coupled electrical stimulation or impulse compression for fracture (C)	Passive physical therapy modalities, except as initial aid prior to home exercises (D) Laser treatment (B)
Rest and immobilization (e.g., braces, supports)	For acute injuries, immobilization and weight bearing as tolerated; taping or bracing later to avoid exacerbation or for prevention (C) For acute swelling, rest and elevation (D) For appropriate diagnoses, rigid orthotics, metatarsal bars, heel donut, toe separator (C)	Tension night splints for plantar fasciitis (B)	Prolonged supports or bracing without exercise (due to risk of debilitation) (D)

Table 14-6. (continued)

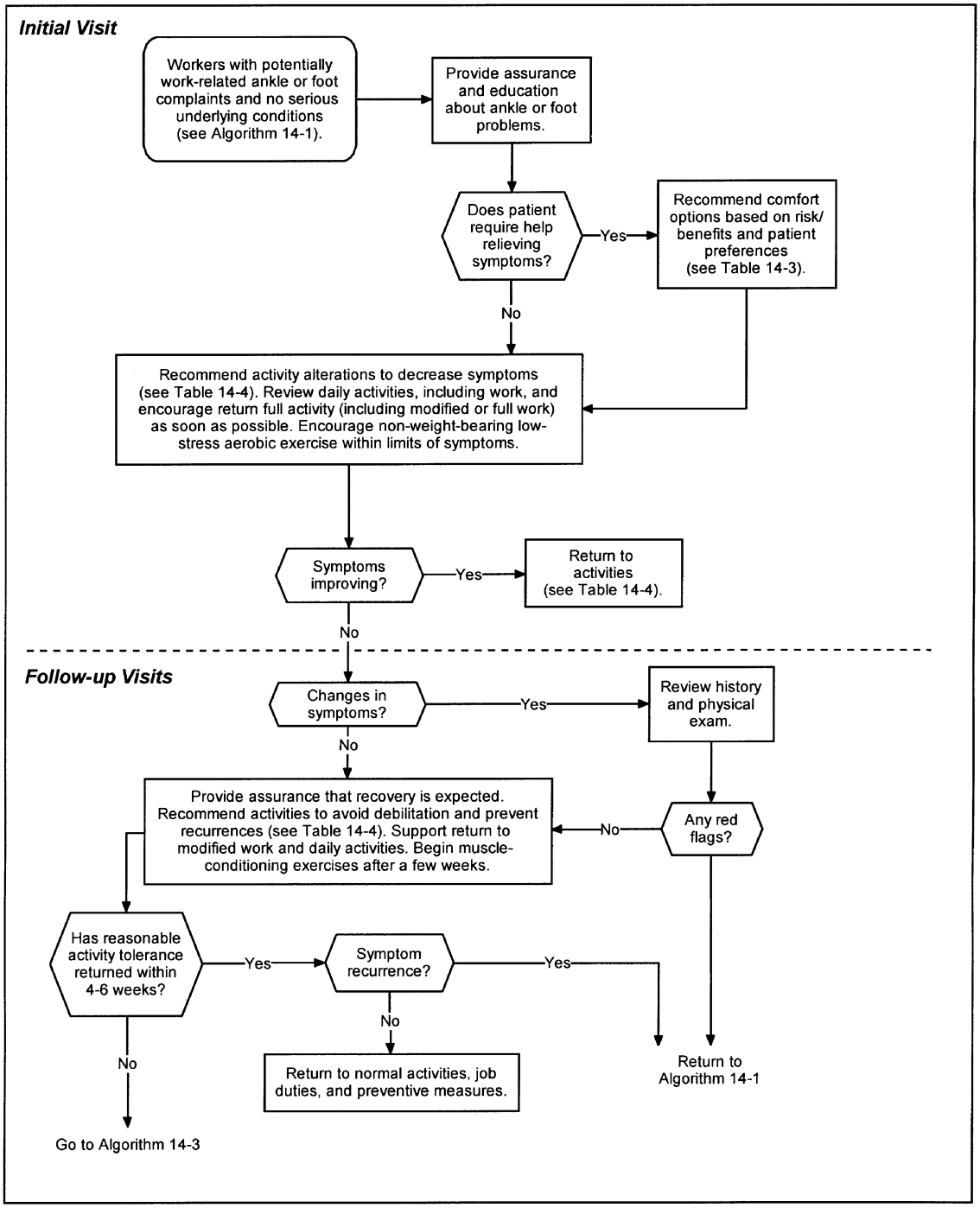
Clinical Measure	Recommended	Optional	Not Recommended
Activity and exercise	Stretching Aerobic exercise Maintenance of general activity to avoid debilitation (C) Early mobilization of patients with ankle sprain (C)		Full activity in presence of swelling and other signs of acute trauma (D)
Detection of physiologic abnormalities			Electrical studies for routine foot and ankle problems without clinical evidence of tarsal tunnel syndrome or other entrapment neuropathies (D)
Radiography	Plain-film radiographs only for patients with acute ankle injuries who have signs identified in Ottawa Criteria ankle rules (B) Further evaluation if radiographic films show ankle effusion > 13 mm anteriorly (C)		Routine plain-film radiographs for ankle injuries (B) Routine radiographic films for soft tissue diagnoses (D)
Surgical considerations	Bunionectomy if conservative treatment fails and radiographs are positive for > 14-degree intermetatarsal angle (D) Excision of neuroma if conservative treatment (injections, toe separator) fails (D) Reconstruction of lateral ankle ligament for symptomatic patients with ankle laxity demonstrated on physical exam and positive stress films (C)		Diagnostic arthroscopy of ankle if diagnosis obtainable by other non-invasive method (D) Arthroscopy of ankle for synovial impingement before conservative care, including injections, is tried (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 foot or ankle complaints).
D = Panel interpretation of evidence not meeting inclusion criteria for research-based evidence.

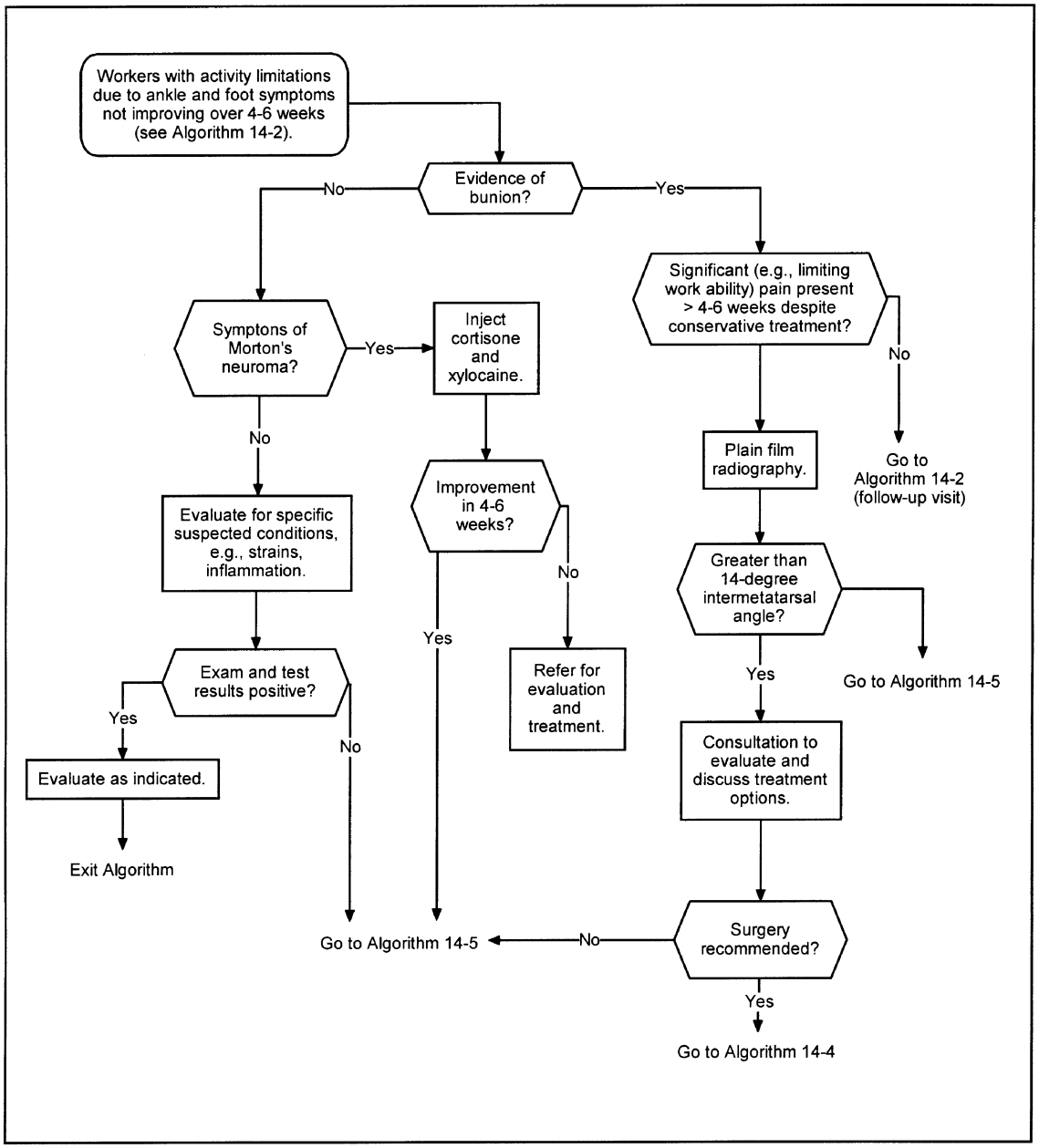
Algorithm 14-1. *Initial Evaluation of Occupational Ankle and Foot Complaints*



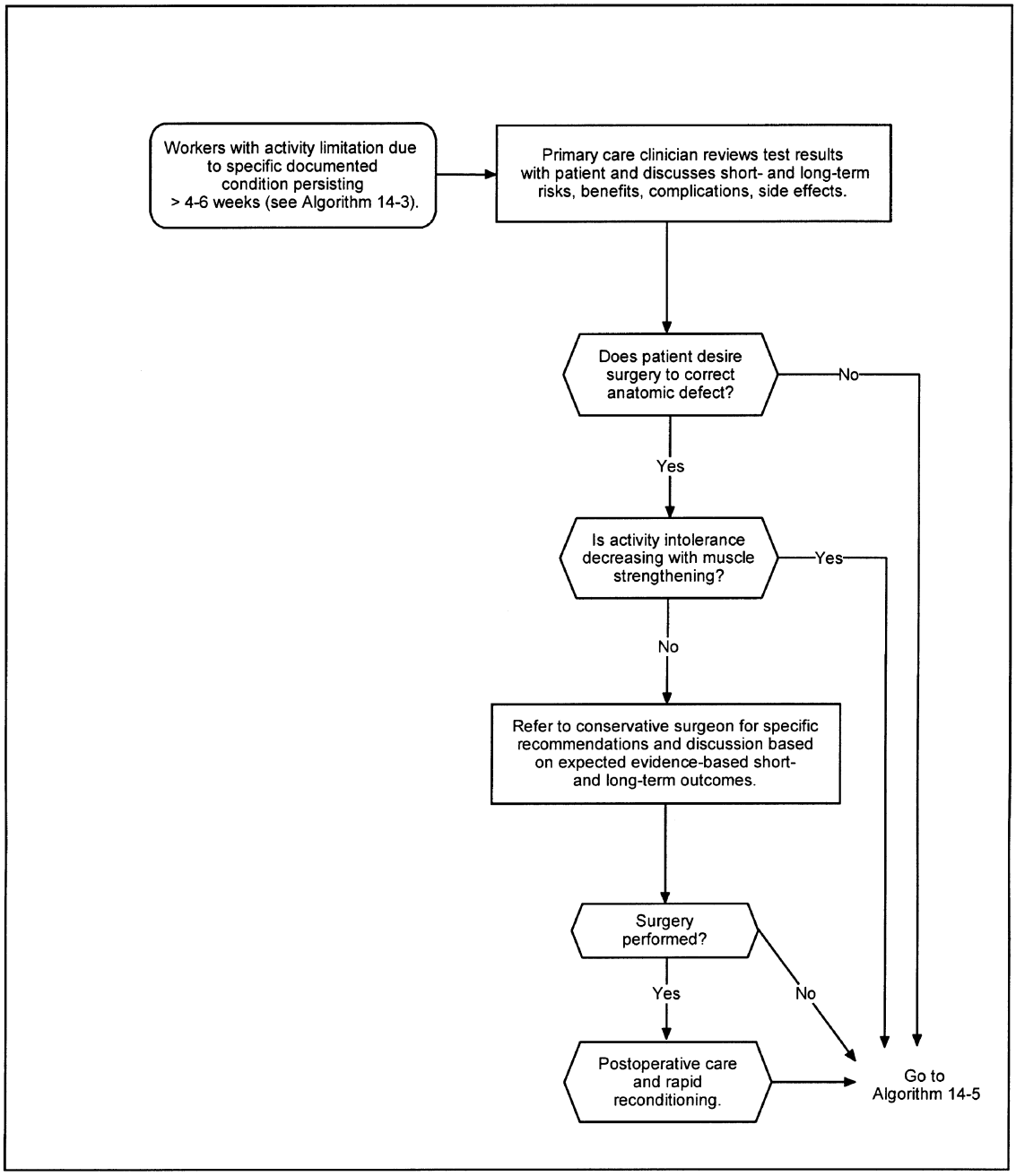
Algorithm 14-2. *Initial and Follow-up Management of Occupational Ankle and Foot Complaints*



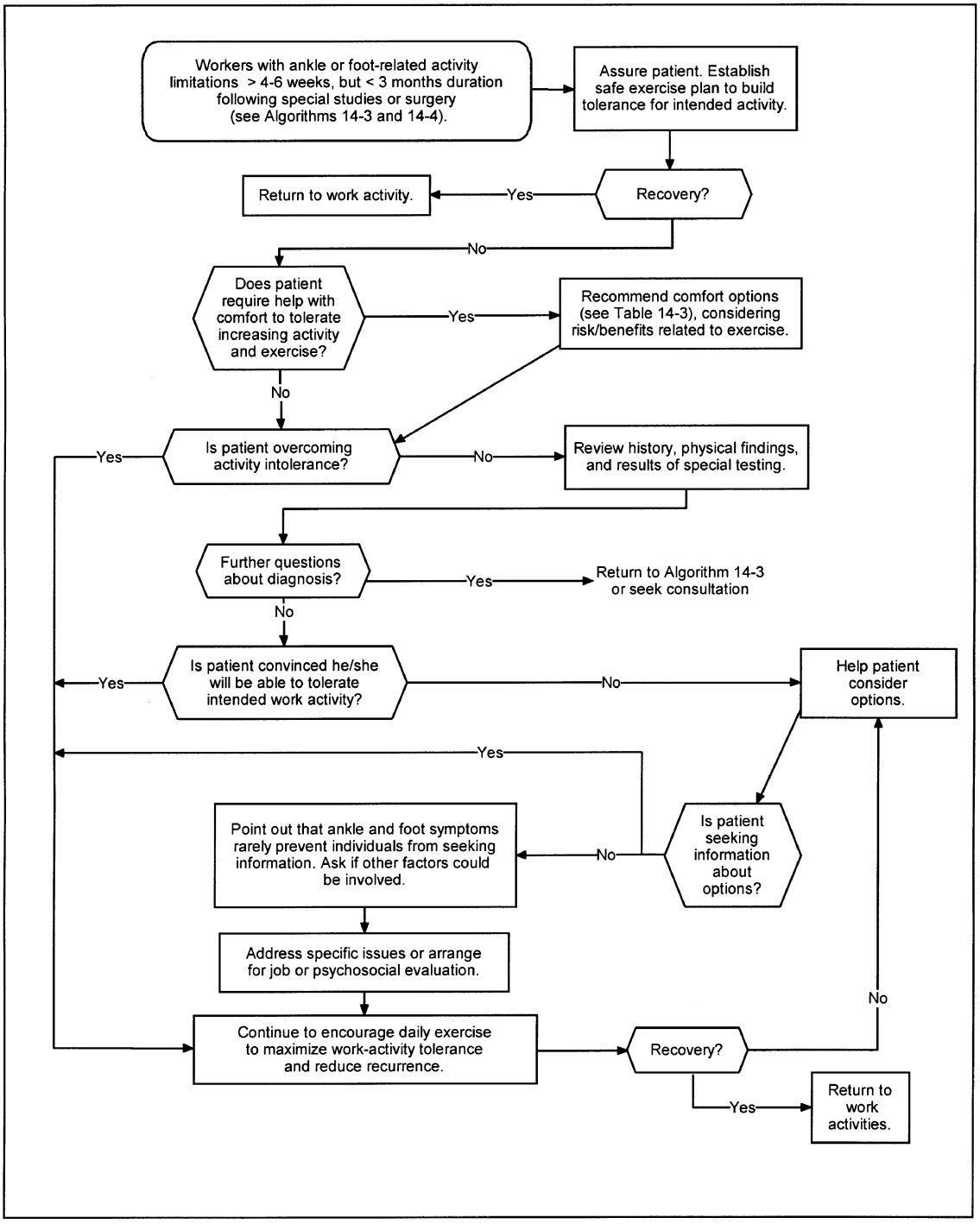
Algorithm 14-3. *Evaluation of Slow-to-recover Patients with Occupational Ankle and Foot Complaints (Symptoms > 4 Weeks)*



Algorithm 14-4. *Surgical Considerations for Patients with Anatomic and Physiologic Evidence of Bunion, or Morton's Neuroma, and Persistent Symptoms*



Algorithm 14-5. *Further Management of Occupational Ankle and Foot Complaints*



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