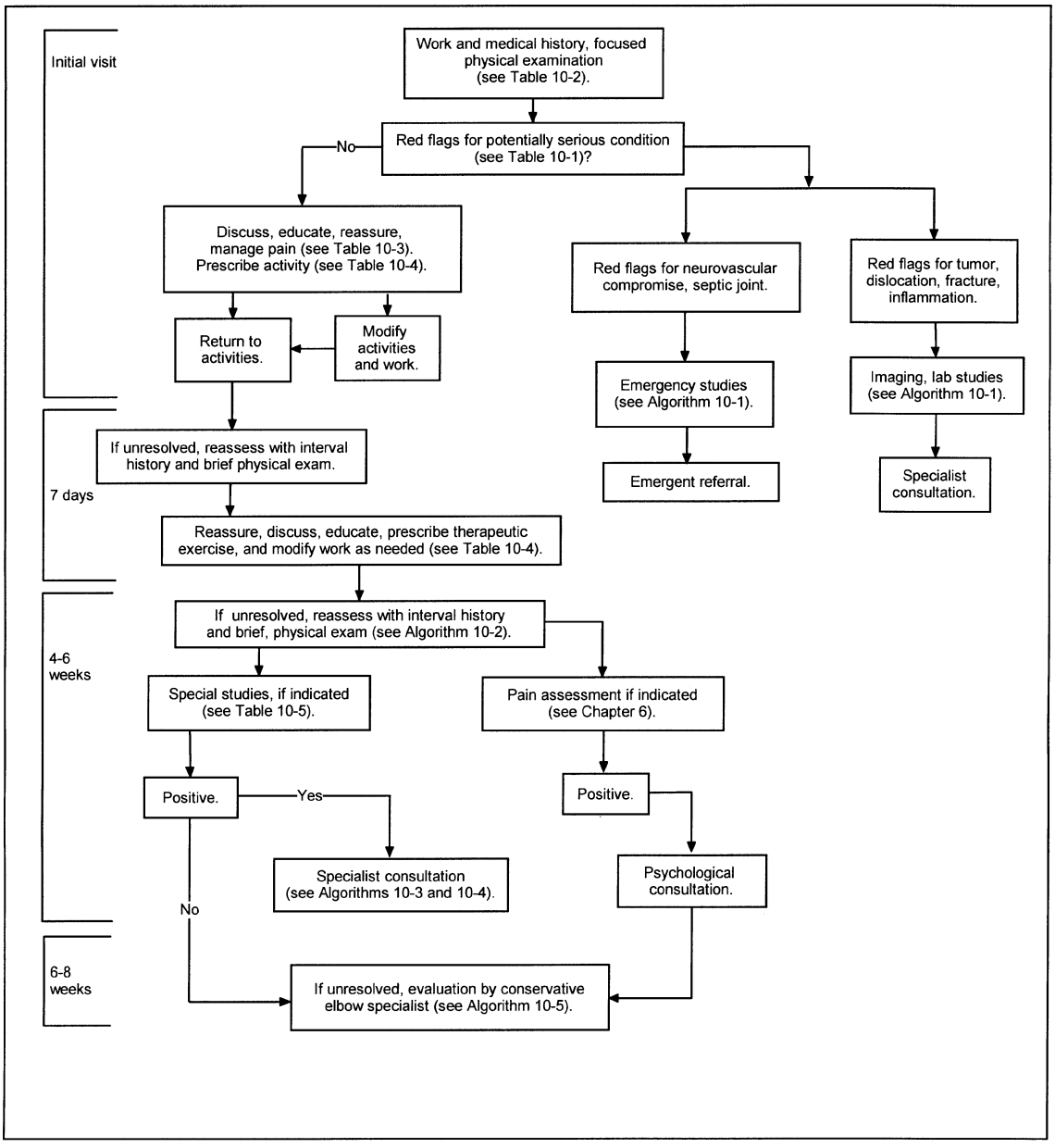
***Master Algorithm**. ACOEM Guidelines for Care of Acute and Subacute Occupational Elbow Complaints*



10 Elbow Complaints

General Approach and Basic Principles

Physicians often encounter work-related elbow complaints, which are among the most common causes of reported occupational injuries and workers' compensation claims. Elbow complaints account for about 2-3% of total lost workdays and 5-6% of claims and costs in workers' compensation, ranking them in the top ten for financial severity. Surgical procedures account for much of the total elbow-related expense, even though quality medical literature, summarized in this book, does not support the efficacy of such procedures.

This chapter presents recommendations on assessing and treating adults with elbow complaints that may be work related. Topics include the initial assessment and diagnosis of patients with acute and subacute elbow complaints; identifying 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, return to work, modified duty and activity; and further management considerations, including managing delayed recovery.

Algorithms for patient management are included. This chapter's master algorithm shows how physicians should generally manage patients with acute and subacute elbow complaints. The following text, tables, and numbered algorithms expand upon the master algorithm.

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

- The initial assessment of patients with acute and subacute elbow problems should focus on detecting indications of potentially serious disease, termed red flags, and determining an accurate diagnosis.
- In the absence of red flags, occupational or primary care providers can safely and effectively manage work-related elbow complaints. Management focuses on monitoring patients for complications, facilitating the healing process and return to work in modified or full duty.
- Relieving discomfort can be accomplished most safely by temporarily decreasing activities, immobilization if necessary, and systemic nonprescription analgesics.

- Patients recovering from acute and subacute elbow problems may be encouraged to return to modified work as soon as their condition permits.
- If symptoms persist beyond 4-6 weeks, referral for specialty care may be indicated.
- Nonphysical factors (such as psychosocial, workplace, or socioeconomic problems) should 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 for the initial assessment of workers complaining of potentially work-related elbow symptoms. This evaluation should consider the possibility that the elbow pain is due to a disorder in another part of the body, particularly the neck, shoulder, or forearm. Certain findings on the history and physical examination raise suspicion of serious underlying medical conditions; these are referred to as red flags (see Table 10-1). Their absence rules out the need for special studies, referral, or inpatient care during the first four weeks when spontaneous recovery is expected (provided any inciting workplace factors are mitigated). Then, elbow complaints can be classified into one of four working categories:

- **Potentially serious elbow condition:** fractures, acute dislocation, infection, or neurovascular compromise, which usually have preceding trauma;
- **Mechanical disorders:** derangements of the elbow related to acute trauma, such as ligament strain or tears; or repetitive use conditions leading to inflammation, nerve entrapment, and other problems;
- **Degenerative disorders:** consequences of aging or repetitive use, or a combination thereof, such as bursitis or tendinitis;
- **Nonspecific disorders:** occurring in the elbow 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 information. Discussion, or more specific inquiries, will usually produce the detail necessary for clinical decision-making:

1. WHAT ARE YOUR SYMPTOMS?

- Do you have pain, weakness, limited motion, or locking?
- For traumatic injuries: Was the area deformed? Did you lose any blood or have an open wound?

Table 10-1. Red Flags for Potentially Serious Elbow Conditions

Disorder	Medical History	Physical Examination
Fracture	History of significant trauma Fall on outstretched hand	Disturbance in the triangular relationship between the olecranon and the epicondyles Significant bruising, if subacute (unusual)
Dislocation	History of deformity with or without spontaneous or self reduction	Deformity consistent with dislocation Hemarthrosis
Infection	Diabetes History of immunosuppression (e.g., transplant, chemotherapy, HIV) History of systemic symptoms	Systemic signs of sepsis Localized heat, swelling, erythema
Tumor	History of cancer Weight loss	Palpable mass not consistent with usual diagnoses Tumor vessels
Inflammation	History of gout or pseudo-gout History of rheumatoid arthritis History of inflammatory arthritis	Effusion Findings of inflammatory arthritis
Rapidly progressive neurologic deficit	History of neurologic disease	Abnormal neurologic examination
Vascular compromise	History of diabetes History of fracture or dislocation	Decreased peripheral pulses

- Are your symptoms located primarily in the elbow? Do you have pain or other symptoms elsewhere, e.g., shoulder, forearm, hand?
- Are your symptoms constant or intermittent? What makes the problem worse or better?

2. HOW DO THESE SYMPTOMS LIMIT YOU?

- Can you flex your elbow to work? For how long?
- Do you have trouble turning a door knob or using a screwdriver (pronation/supination)?
- Can you lift? How much weight?

3. WHEN DID YOUR CURRENT LIMITATIONS BEGIN?

- Was there an event that precipitated the symptoms? How did they start?
- 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 elbow to perform them? How? How often?
- What are your hobbies (tennis, golf, etc.)? Do you use your elbow to perform them? How? How often?

4. DO YOU HAVE OTHER MEDICAL PROBLEMS?

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

5. WHAT DO YOU HOPE WE CAN ACCOMPLISH DURING THIS VISIT?

Elbow complaints, as described by the patient, can sometimes be consistent with radiating symptoms from the neck or shoulder, and the examining physician's diagnostic judgment is important in determining the source. For instance, mid-upper-arm pain on arm elevation is most likely related to a problem originating in the rotator cuff area, not the elbow, although patients may have pain in both areas. A complaint of painful numbness in the fourth and fifth fingers is usually due to ulnar nerve impingement at the elbow, but may be due to impingement of that nerve at the level of the wrist. In cases of complaints that are not clear disorders, a diagnosis of nonspecific pain should be used. Note that lateral elbow pain can be due to cervical disk disease, radial nerve entrapment, synovitis due to degeneration, or true epicondylitis (enthesitis).

Physical Examination

Guided by the medical history, the physical examination includes:

- General observation of the patient
- Focused examination of the forearm, arm, and elbow (on the affected side)
- Neurovascular screening

Though it may seem a point too obvious to warrant mention, the physician should specifically note which elbow—left or right—is the subject of the

patient's complaints. Not infrequently, injured workers have prior workers' compensation claims that involve the opposite elbow. 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 elbow 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. Focused Elbow Examination

Examining the elbow also includes examining the forearm. The elbow's range of motion should be determined both actively and passively. Limitation of motion or pain at the extremes of flexion or extension suggest an intraarticular abnormality. Atrophy of the muscles of the ulnar or radial hand intrinsics is an objective finding, but it arises only after weeks to months of problems. Deformities due to fractures are often subtle; dislocations may be associated with visible, objective findings of abnormalities. Signs of infection (redness, heat, swelling, tenderness, etc.) or gross tumor (vessels, palpable mass) may also be obvious. A medical history suggestive of pathology originating somewhere other than in the elbow may warrant examination of the neck, shoulder, forearm, or other areas.

B. Neurovascular Screening

Physicians should assess the neurologic and vascular status of the elbow and distal upper extremity, especially following dislocation. They also should seek evidence of cervical disc disease associated with radiculopathy that radiates to the elbow. C5 radiculopathy may result in weakness of elbow flexion, and T1 lesions may weaken the hand intrinsics in a manner that is similar to entrapment of the ulnar nerve. C6 radiculopathy can cause lateral elbow pain.

C. Assessing Red Flags

Physical examination evidence of neurovascular compromise, fracture, unreduced dislocation, infection, or tumor that correlates with the medical history and with test results may indicate a need for immediate consultation. The examination may further reinforce or reduce suspicions of tumor, infection, fracture, or dislocation.

Diagnostic Criteria

If the patient does not have red flags for serious conditions, the clinician can then determine which common musculoskeletal elbow disorder is present. The criteria presented in Table 10-2 follow the clinical thought process, from

Table 10-2. Diagnostic Criteria for Non-red-flag Elbow Conditions that Can Be Managed by Primary Care Physicians

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Test and Results
Lateral epicondylitis (ICD-9 726.32)	Repetitive overload (Possible) acute trauma	Pain in lateral elbow with resisted extension of wrist or gripping	Tenderness over epicondyle Normal elbow ROM Diffuse lateral elbow pain with repetitive wrist dorsiflexion	Positive resistance test results: pain with resisted extension of the wrist and fingers, resisted supination
Medial epicondylitis (ICD-9 726.31)	Repetitive overload (Possible) acute trauma	Pain in medial elbow with resisted flexion of wrist or gripping	Diffuse medial elbow pain with repeated wrist volarflexion Tenderness over epicondyle Normal elbow ROM	Positive resistance test results: pain with resisted flexion of the wrist and fingers, resisted pronation
Olecranon bursitis (noninfectious) (ICD-9 712.2, 712.3, 712.8, 726.32)	Leaning on elbow (Possible) acute trauma Repetitive flexion and extension Chronic irritation	Pain over olecranon bursa Swelling of bursa	Effusion/mass effect in bursa	Crystals if gout or pseudogout
Olecranon bursitis (infectious) (ICD-9 726.33)	Trauma Systemic infection	Progressive painful swelling Systemic symptoms	Erythema, heat and/or surrounding cellulitis Tenderness over bursa	Purulent tap, positive gram-stain results, positive culture results
Ulnar nerve entrapment (ICD-9 354.2)	(Possible) overuse or leaning on elbow	Pain or paresthesias in ulnar ring and all small fingers (palm-up position)	Reproduction of symptoms with percussion or compression of cubital tunnel Pain in ulnar ring and all of small fingers on full elbow flexion Weakness/atrophy of ulnar hand intrinsics and interosseous muscles (unusual/late)	NCV < 50 msec elbow to hand (depending on lab)

Table 10-2. (continued)

Probable Diagnosis or Injury	Mechanism	Unique Symptoms	Unique Signs	Test and Results
Radial nerve entrapment (ICD-9 354.3) (radial tunnel syndrome)	Repetitive use (very unusual)	Aching pain in extensor/ supinator area of forearm Pain/paresthesias in thumb and index finger	Reproduction of symptoms by percussion or compression of radial tunnel Pain on stressing extended middle finger Maximum tenderness four fingerbreadths below lateral epicondyle	Positive EMG
Contusion (ICD-9 923.11)	Direct blow Fall	Local pain	Normal range of motion Soft tissue swelling Ecchymosis	None
Nondisplaced radial head fracture (ICD-9813.05)	Fall on out-stretched hand	Pain on pronation and supination of hand	Maximal tenderness over radial head	Positive fat-pad sign on radiograph Fracture on radiograph
Nonspecific elbow pain (ICD-9 726.39)	Possibly overuse	None	None	None

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

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.

Work-Relatedness

Work-related symptoms commonly involve elbow complaints. A thorough work history is crucial to establishing work-relatedness. See Chapter 2 for components of the work history.

Repetitive work is currently thought to contribute to regional elbow pain and perhaps epicondylitis, although the strength of the association is not great. The association of repetitive or malpositioned work with nerve entrapment in the area of the elbow is not at all epidemiologically clear.

Epicondylitis and forearm tendinitis as well as nerve entrapments and olecranon bursitis have been attributed by some to employment activities. Such a conclusion requires a careful history about work tasks, non-work activities, and other risk factors, as well as a thoughtful, careful assessment of the relative contribution each makes to the patient's problem.

Acute work-related trauma can be associated with olecranon bursitis. Workstation modifications may be important to resolving the problem, and understanding the worksite and the employer's willingness to modify the workstation are crucial to maintaining the employee at work or minimizing disability time.

Initial Care

Comfort is often a patient's first concern. Nonprescription analgesics will provide sufficient pain relief for most patients with acute and subacute elbow 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 should guide the clinician's choice of recommendations. Table 10-3 summarizes comfort options.

Conservative care consists of activity modification, using epicondylitis

Table 10-3. Methods of Symptom Control for Elbow Complaints

RECOMMENDED
Nonprescription Medications
Acetaminophen (safest) NSAIDs (aspirin, ibuprofen)
Physical Modalities
Adjustment or modification of workstation, job tasks, or work hours and methods Specific elbow exercises for range of motion and strengthening At-home local applications of cold packs during first few days of acute complaint; thereafter application of heat packs, or cold packs as the patient prefers Arobic exercise to maintain general conditioning Initial and follow-up visits for education, counseling, and evaluation of home exercise
Prescribed Pharmaceutical Methods
Other NSAIDs (not recommended for nerve entrapment syndromes)

OPTIONS		
Epicondylitis	**Olecranon Bursitis**	**Nonspecific Elbow Pain**
Tennis elbow band Corticosteroid injection Wrist splint	Splint in extension if needed Elbow padding Activity modification Broad-spectrum antibiotics if elbow is infected	None
Ulnar Nerve Entrapment	**Radial Nerve Entrapment**	
Night extension splints	Cock-up wrist splint	

supports (tennis elbow bands), and using nonsteroidal anti-inflammatory drugs (NSAIDs) with the usual precautions and education. A cock-up wrist splint and NSAIDs are helpful in many cases of radial tunnel syndrome.

Most cases of sterile effusion of the olecranon bursa may be treated by padding the elbow and modifying activities. If the bursa is infected, aspiration or drainage as well as systemic antibiotics may be needed.

Physical Methods

Any one or more of a variety of physical methods may be appropriate in the treatment of a patient's elbow condition. These methods include:

- Instruction in home exercise. Except for cases of unstable fractures or acute dislocations, physicians should advise patients to do early range-of-motion exercises at home. Instruction in proper exercise technique is important, and a few visits to a good physical therapist can serve to educate the patient about an effective exercise program.
- 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 therapists.
- Published randomized clinical trials are needed to provide better evidence for the use of many physical modalities that are commonly employed. Some therapists use a variety of procedures; conclusions regarding their effectiveness may be based on anecdotal reports or case studies. Included among these modalities are massage, diathermy, extracorporeal shockwave therapy (ESWT), low-level laser therapy (LLLT), ultrasonography, transcutaneous electrical neurostimulation (TENS), electrical stimulation (E-STIM), iontophoresis, and biofeedback. In general, if tied to signs of objective progress within two to three weeks, it may be acceptable to use these modalities as an adjunct to a program of evidence-based functional restoration.
- The efficacy of needle acupuncture is not yet clearly supported by quality medical evidence. While limited existing studies support needle acupuncture for short-term relief of lateral elbow pain, clear evidence currently is insufficient to either support or refute using needle acupuncture to treat lateral epicondylitis; and discovery of potential adverse effects is inadequate. More trials, using adequate sample sizes, are needed before conclusions can be drawn regarding the effect of needle acupuncture on lateral epicondylitis.
- Physicians may consider referring the patient to a specialist for local anesthetic and corticosteroid injections into tender areas of epicondylitis and, possibly, injection in the area of the radial tunnel in the forearm for distal symptoms. In most cases, physicians should carry out conservative measures for four to six weeks before considering injections. Corticosteroid injections have been shown to be effective, at least in the short term; however, the evidence on long-term effects

is mixed, some studies show high recurrence rate among injection groups.

Activity Alteration

Careful advice regarding maximizing activities within the limits of symptoms is imperative once red flags have been ruled out. If a sling is needed for treatment of an elbow condition, the use of the sling should be for as short a time as necessary, and gentle exercise is desirable, even at this stage. Wrist supports to limit pronation and supination may be used in the acute management of lateral epicondylitis or tendinosis.

Activities and postures that increase stress on the elbow tend to aggravate symptoms. Consequently, consideration may be given to restrictions on lifting and repetitive flexion or extension following the onset of epicondylitis. Those with olecranon bursitis should limit direct pressure on the olecranon.

Conditioning exercises for muscles above and below the elbow are more mechanically stressful than aerobic exercise. To avoid debilitation, regular aerobic exercise may be appropriate. Elbow conditioning exercises are generally not advisable during the first few weeks of symptoms. Later, such exercises may help patients regain and maintain activity tolerance, particularly patients with epicondylitis and regional elbow pain. There is no evidence to indicate that elbow-specific or adapted exercise machines are effective for treating acute elbow problems.

Work Activities

Table 10-4 provides recommendations on activity modification and duration of absence from work. These guidelines are intended for patients without comorbidity or complicating factors, including legal or employment issues. The guidelines are targets. They provide a guide, from the perspective of physiologic recovery. Key factors to consider in disability duration are the patient's age and type of job. Workplace factors can be paramount, especially if the patient's regular work includes activities that are likely to worsen the condition. The clinician should make it clear to patients and employers that:

- Repetitive motions, or even moderately heavy unassisted lifting and carrying, may aggravate elbow symptoms caused by epicondylitis or bursitis.
- Any restrictions are intended to allow for spontaneous recovery or for the time necessary for the development of activity tolerance through exercise.

Measures to assist the patient in avoiding aggravating activities should include a review of work duties to decide whether modifications can be accomplished,

*Table 10-4. 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)
Epicondylitis	Avoid symptom-aggravating activities, e.g., lifting, carrying, keyboard work. Also workstation assessment to insure optimal ergonomics, as appropriate.	1 day	7 days	22 days	66%
Olecranon bursitis	Avoid the above activities, but more importantly, avoid direct pressure on the olecranon area.	1 day	3 days	22 days	66%
Ulnar nerve entrapment	Avoid the above activities, especially direct pressure on the ulnar groove. Also workstation assessment to insure optimal ergonomics, as appropriate.	1 day	7 days	21 days	33%
Radial nerve entrapment	See Epicondylitis above	1 day	7 days	13 days	58%
Regional elbow pain	Avoid any aggravating activities	0 days	3 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.

and to determine whether modified duty is available. Every attempt should be made to maintain the patient at maximal levels of activity, including work activities.

Follow-up Visits

Patients with potentially work-related elbow complaints should have follow-up visits every three to five days by a midlevel practitioner who can counsel the patient about avoiding static positions, medication use, activity modification, and other concerns. Practitioners should take care to answer questions and make these sessions interactive so the patient is 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.

Follow-up by the physician should 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 every seven to fourteen days if the patient is working.

Special Studies and Diagnostic and Treatment Considerations

Criteria for ordering imaging studies are:

- Emergence of a red flag
- Physiologic evidence of tissue insult or neurologic dysfunction
- Failure to progress in a strengthening program intended to avoid surgery

For most patients presenting with true elbow problems, special studies are not needed unless a four-week period of conservative care and observation fails to improve symptoms. Most patients improve quickly, provided red-flag conditions are ruled out. There are a few exceptions:

- Plain-film radiography to rule out osteomyelitis or joint effusion in cases of significant septic olecranon bursitis
- Electromyography (EMG) and nerve conduction velocity (NCV) study if cervical radiculopathy is suspected as a cause of lateral arm pain
- Nerve conduction velocity study and, possibly, EMG if severe nerve entrapment is suspected on the basis of physical examination and denervation atrophy is likely

For patients with limitations of activity after four weeks and unexplained physical findings such as effusion or localized pain (especially following exercise), imaging may be indicated to clarify the diagnosis and assist reconditioning. Imaging findings should be correlated with physical findings.

In general, an imaging study may be an appropriate consideration for a patient whose limitations due to consistent symptoms have persisted for one month or more, as in the following cases:

- When surgery is being considered for a specific anatomic defect, e.g., preoperative plain-film radiography when incision and drainage of an infected olecranon is indicated
- To further evaluate potentially serious pathology, such as a possible tumor, when the clinical examination suggests the diagnosis

Surgical Considerations

The timing of a referral for surgery should be consistent with the condition that has been diagnosed. Conditions that produce objective evidence of nerve

entrapment and that do not respond to non-surgical treatment can be considered for surgery when treatment failure has been documented. Conditions of inflammatory nature may take many months to heal and the timing of a surgical consultation referral should take into consideration the normal healing time.

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

- Limitations of activity for more than six months
- Failed to improve with exercise programs to increase range of motion and strength of the musculature around the elbow
- Clear clinical and electrophysiologic, or imaging evidence of a lesion that has been shown to benefit in both the short and long term from surgical repair

Emergency consultation is reserved for patients who require drainage or aspiration of acute septic effusions or hematomas and/or drainage of infected bursitis or who have severe acute nerve impingement. Table 10-5 provides a general comparison of the abilities of different techniques to identify physiologic insult and define anatomic defects.

If surgery is a consideration, counseling regarding likely outcomes, risks and benefits, and especially expectations is very important. If there is no clear indication for surgery, referring the patient to a physical medicine practitioner may help resolve the symptoms.

Table 10-5. Ability of Various Techniques to Identify and Define Elbow Pathology

Technique	Identify Physiologic Insult	Define Anatomic Defect
History	+ +	+ +
Physical examination		
Motor	+ + +	+ +
Sensory	+ + +	+ +
Palpation (tendinitis, bursitis)	+ +	+ + + +
Laboratory studies	+ + + + (infection)	0
EMG/NCN	+ + + +	0
Imaging studies (osteomyelitis or fracture)		
Radiography[1]	0	+ + +
Bone scan[1]		+ + +
Arthrography[1]	0	+
Computed tomography (CT)[1]	0	+ + + +
Magnetic resonance imaging (MRI)[1]	0	+ + + +

[1] Risk of complications (e.g., infection, radiation) highest for contrast CT or arthrography; second highest for myelography; relatively less for bone scan, radiography, and CT; lowest for MRI.

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

A. Ulnar Nerve Entrapment

There are two main areas for entrapment of the ulnar nerve at the elbow. The first is in the condylar groove and the more distal is in the cubital tunnel. Many cases of condylar groove ulnar neuropathy are mistakenly labeled as cubital tunnel syndrome without a localization of the problem. Surgery for ulnar nerve entrapment is indicated after establishing a firm diagnosis on the basis of clear clinical evidence and positive electrical studies that correlate with clinical findings. A decision to operate presupposes that a significant problem exists, as reflected in significant activity limitations due to the specific problem and that the patient has failed conservative care, including use of elbow pads, removing opportunities to rest the elbow on the ulnar groove, workstation changes (if applicable), and avoiding nerve irritation at night by preventing elbow flexation while sleeping. Before proceeding with surgery, patients must be apprised of all possible complications, including wound infections, anesthetic complications, nerve damage, and the possibility that surgery will not relieve symptoms.

B. Radial Nerve Entrapment (Radial Tunnel Syndrome)

This condition, which causes proximal forearm aching and pain, and sometimes dysesthesias in the hand, only rarely requires surgical release. A decision to operate presupposes that a significant problem exists, as reflected in significant activity limitations due to the specific problem, and that the patient has failed conservative care. Possible complications of surgery for radial nerve entrapment are the same as those for entrapment of the ulnar nerve, with the exception of nerve dislocation. Scarring also may be a factor.

C. Olecranon Bursa Excision

Although it is a rare consequence of the condition, persistent olecranon bursal effusions may interfere with activities to a degree that warrants surgical excision. Once again, education the patient regarding expectations from surgery and complications is necessary.

D. Lateral Epicondylitis

Lateral epicondylitis is a painful condition of the elbow, the etiology of which is not fully understood. There is currently a debate regarding whether it is an inflammatory condition or an enthesopathy. Consequently, there is a debate as to whether treatment with anti-inflammatories is appropriate. Conservative care should be maintained for a minimum of six to twelve months. At this time there are no published randomized controlled studies that indicate that surgery is warranted for this condition.

Summary of Guideline Recommendations

See Table 10-6.

Table 10-6. Summary of Recommendations for Evaluating and Managing Elbow Complaints

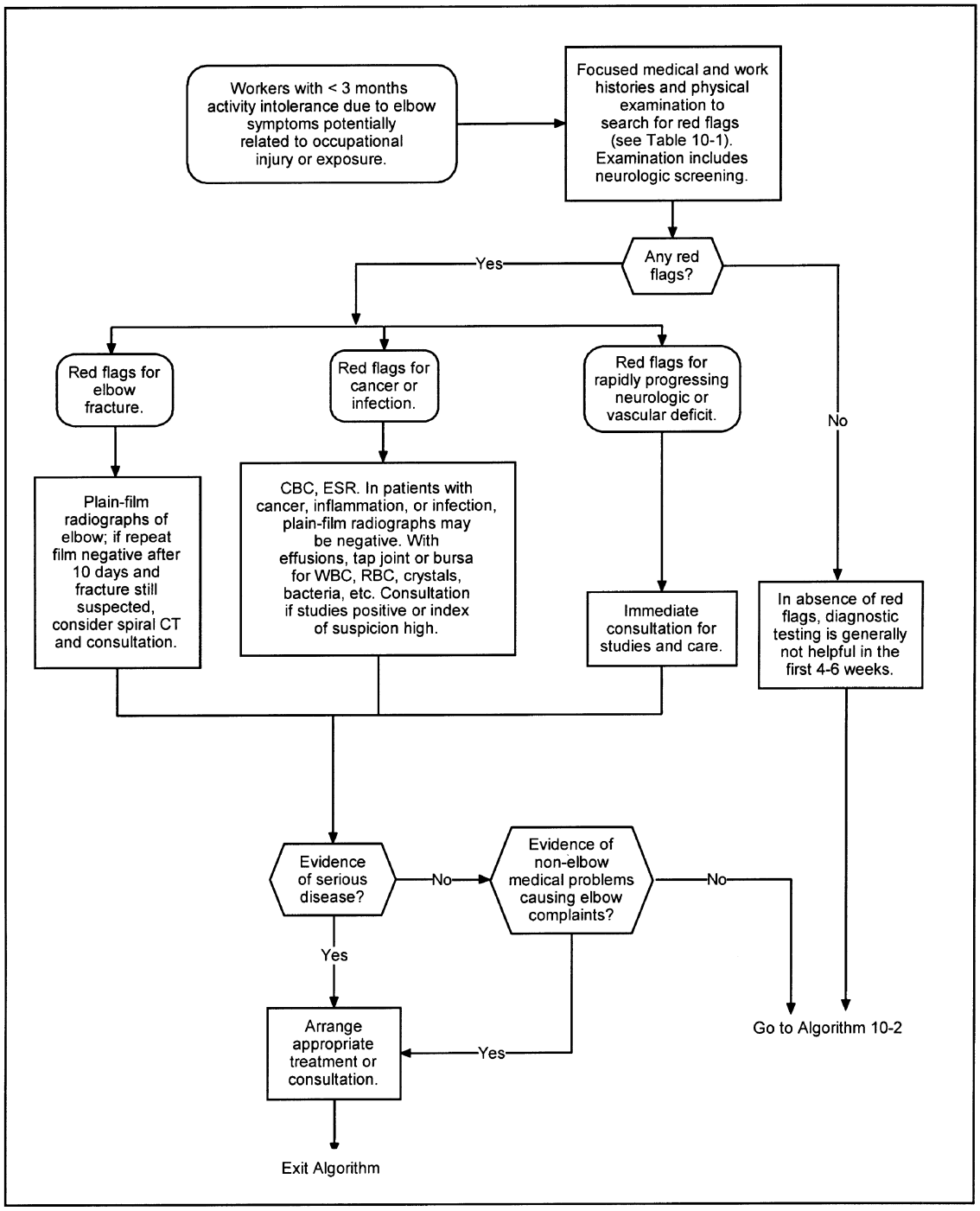
Clinical Measure	Recommended	Optional	Not Recommended
History and physical exam	Basic history and exam (search for red flags for tumor, infection, systemic disease) (D) Occupational and nonoccupational activity history (C, D)		
Patient education	Patient education regarding diagnosis, prognosis, expectations of treatment, etc. (D)		
Medication (See Chapter 3)	Acetaminophen (C) NSAIDs (B)	Opioids (D) Topical medications (C, D)	
Physical treatment methods	Physician recommendations for range-of-motion instruction and strengthening exercises in epicondylitis patients (D)	Exercise instruction by a therapist for epicondylitis (D) At-home applications of heat or cold packs (D) Other physical modalities based on objective results for a 2-3-week trial (D)	Use of passive modalities by a therapist (D)
Injections		Acupuncture based on objective results after a 2-3-week trial (D) Local corticosteroid injection for epicondylitis (C, D)	Corticosteroid injection into olecranon bursa (C)
Rest and immobilization	Immobilization with a sling for a brief period for severe symptoms (D)	Trial of casting for severe recalcitrant epicondylitis (D) Tennis elbow bands for conservative treatment (D)	

Table 10-6. (continued)

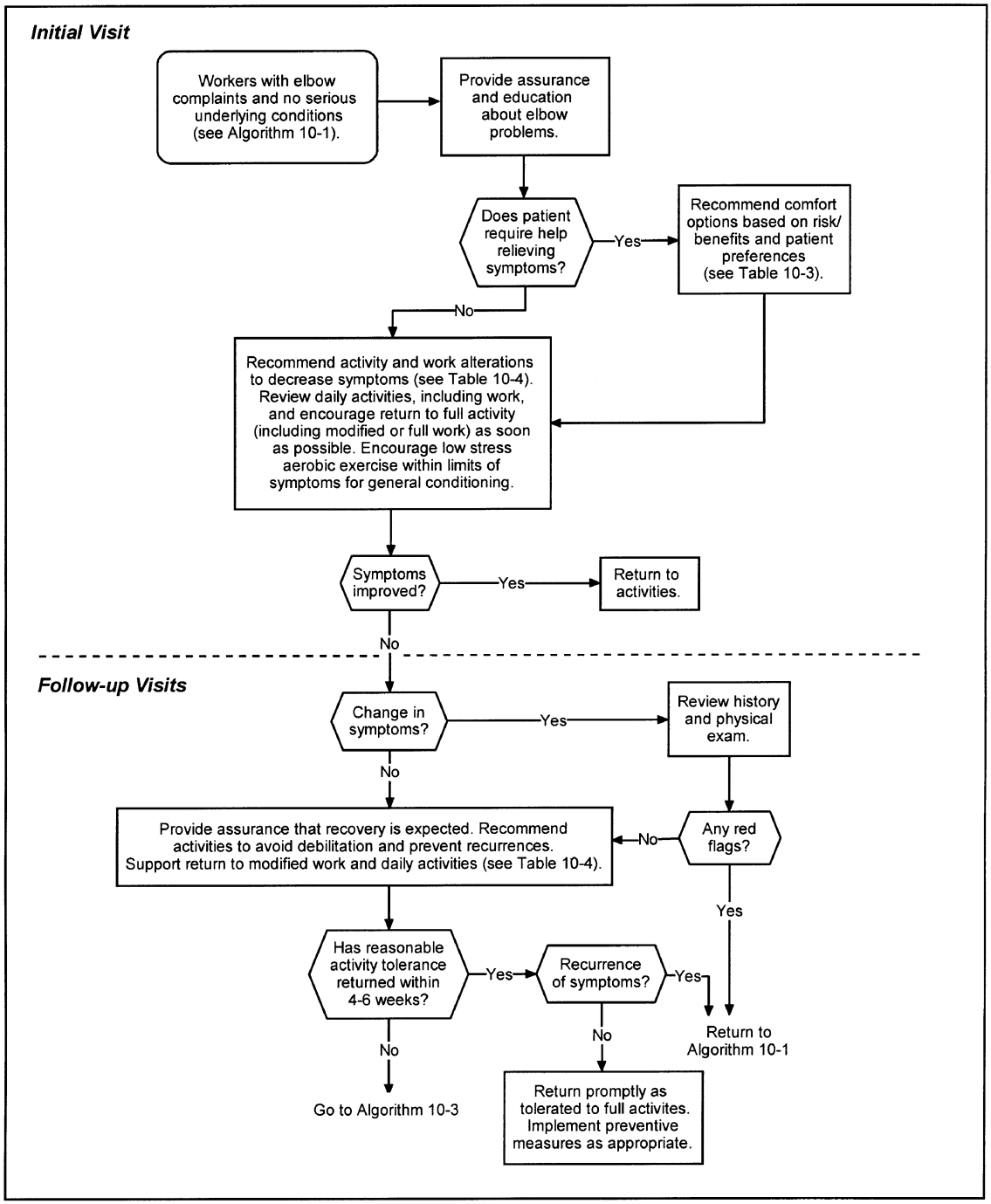
Clinical Measure	Recommended	Optional	Not Recommended
Activity and exercise	Stretching (D) Aerobic exercise (D) Activity modification (D)		
Detection of neurologic abnormalities	NCV to confirm ulnar nerve entrapment if conservative treatment fails (D)	EMG to distinguish radial entrapment from lateral epicondylitis if history and physical exam are equivocal (D)	EMG/NCV before conservative treatment (D)
Radiography and other imaging studies	Plain-film radiography for red-flag cases (D)	MRI for suspected ulnar collateral ligament tears (C)	Repeat plain-film radiography for readings with "fat pad sign" (D) MRI for epicondylitis (D)
Surgical considerations	Ulnar nerve transposition for patients with significant activity limitation and delayed NCV (D) Debridement of inflammatory or scarred tissue for patients with epicondylitis if conservative treatment fails (C) Excision and closure over drains for infected olecranon bursitis not responsive to IV antibiotics (D) Radial tunnel decompression for failure of conservative treatment and positive EMG (D)		Excision of olecranon bursa due to metabolic arthritis (rather than medical treatment) (D) Ulnar or radial nerve surgery in the presence of normal electrical studies (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 elbow disorders).
D = Panel interpretation of information not meeting inclusion criteria for research-based evidence or consensus.

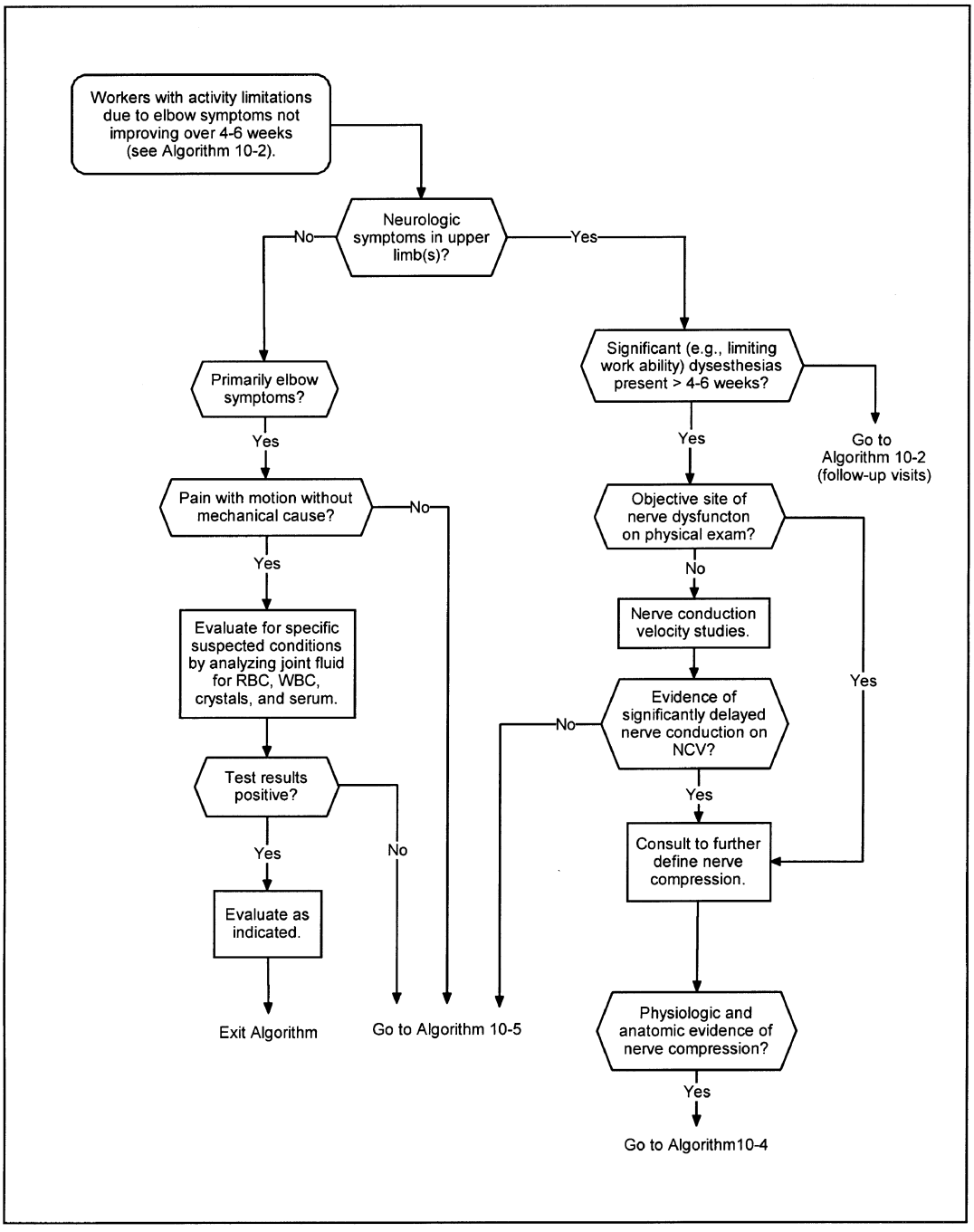
Algorithm 10-1. *Initial Evaluation of Occupational Elbow Complaints*



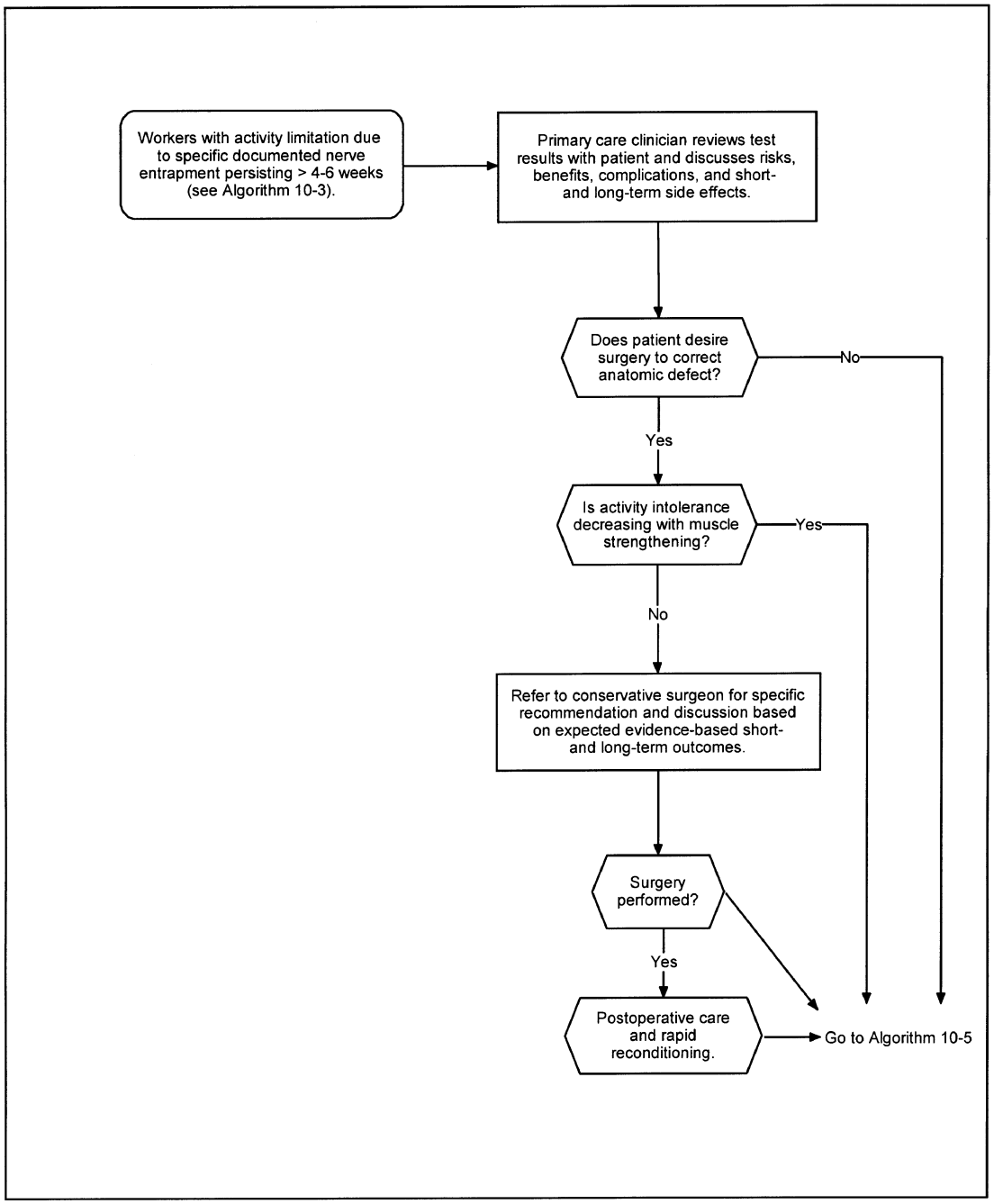
Algorithm 10-2. *Initial and Follow-up Management of Occupational Elbow Complaints*



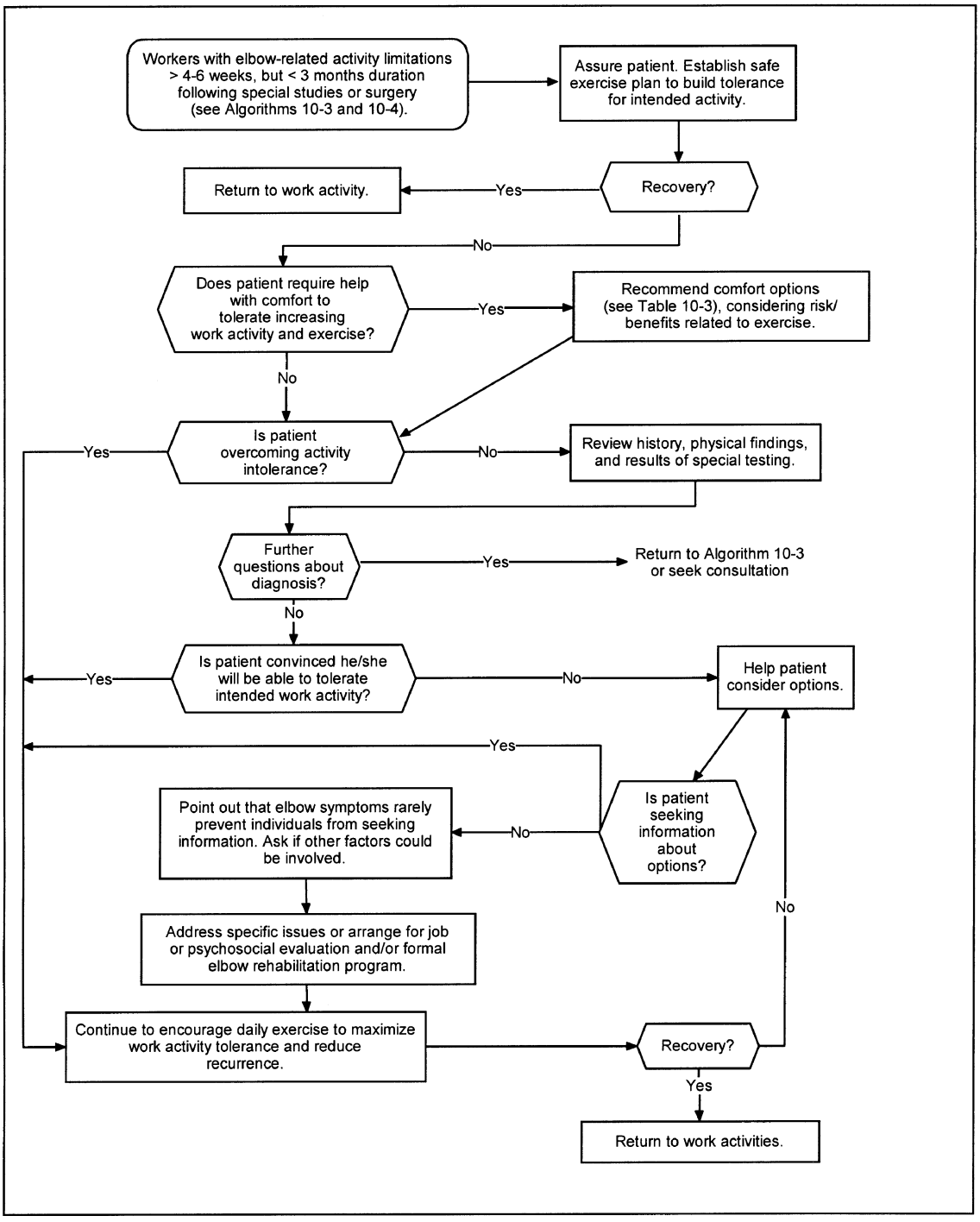
Algorithm 10-3. *Evaluation of Slow-to-recover Patients with Occupational Elbow Complaints (Symptoms > 4 Weeks)*



Algorithm 10-4. *Surgical Considerations for Patients with Anatomic and Physiologic Evidence of Nerve Compression Coupled with Persistent Elbow Complaints*



Algorithm 10-5. *Further Management of Occupational Elbow Complaints*



References

EPIDEMIOLOGY

Khan KM, Cook JL, Kannus P, Maffulli N, Bonar SF. Time to abandon the "tendinitis" myth. *BMJ*. 2002;324(7338):626-7.

Kivi P. Rheumatic disorders of the upper limbs associated with repetitive occupational tasks in Finland in 1975-1979. *Scand J Rheumatol*. 1984;13: 101-7.

Kurppa K, Viikari-Juntura E, Kuosma E, et al. Incidence of tenosynovitis or peritendinitis and epicondylitis in a meat-processing factory. *Scand J Work Environ Health*. 1991;17:32-7.

Viikari-Juntura E, Kurppa K, Kuosma E, et al. Prevalence of epicondylitis and elbow pain in the meat-processing industry. *Scand J Work Environ Health*. 1991;17:38-45.

HISTORY AND PHYSICAL EXAMINATION

American Academy of Orthopaedic Surgeons. *Athletic Training and Sports Medicine*. 2nd ed. Rosemont, Ill: American Academy of Orthopaedic Surgeons; 1994.

Green D. *Operative Hand Surgery*. New York, NY: Churchill Livingstone; 1982.

MEDICATION

See also Chapter 3 references.

Green S, Buchbinder R, Barnsley L, et al. Nonsteroidal anti-inflammatory drugs (NSAIDs) for treating lateral elbow pain in adults (Cochrane Review). In: *The Cochrane Library*. Issue 2; 2002. Oxford: Update Software.

INJECTIONS

Hay EM, Paterson SM, Lewis M, Hosie G, Croft P. Pragmatic randomised controlled trial of local corticosteroid injection and naproxen for treatment of lateral epicondylitis of elbow in primary care. *BMJ*. 1999;9;319(7215): 964-8.

Nevelos AB. The treatment of tennis elbow with triamcinolone acetonide. *Curr Med Res Opin*. 1980;6:507-9.

Newcomer KL, Laskowski ER, Idank DM, McLean TJ, Egan KS. Corticosteroid injection in early treatment of lateral epicondylitis. *Clin J Sport Med*. 2001;11(4):214-22.

Smidt N, van der Windt DA, Assendelft WJ, Deville WL, Korthals-de Bos IB, Bouter LM. Corticosteroid injections, physiotherapy, or a wait-and-see policy for lateral epicondylitis: a randomised controlled trial. *Lancet*. 2002;359(9307):657-62.

Weinstein PS, Canoso JJ, Wohlgethan JR. Long-term follow-up of corticosteroid injection for traumatic olecranon bursitis. *Ann Rheum Dis.* 1984;43: 44-6.

ACTIVITY AND EXERCISE

Viikari-Juntura E. Tenosynovitis, peritendinitis and the tennis elbow syndrome. *Scand J Work Environ Health.* 1984;10:443-9.

RADIOGRAPHY AND OTHER IMAGING PROCEDURES

de Beaux AC, Beattie T, Gilbert F. Elbow fat pad sign: implications for clinical management. *J R Coll Surg Edinb.* 1992;37:205-6.

Sugimoto H, Ohsawa T. Ulnar collateral ligament in the growing elbow: MR imaging of normal development and throwing injuries. *Radiology.* 1994;192:417-22.

Timmerman LA, Schwartz ML, Andrews JR. Preoperative evaluation of the ulnar collateral ligament by magnetic resonance imaging and computed tomography arthrography: evaluation in 25 baseball players with surgical confirmation. *Am J Sports Med.* 1994;22:26-31; discussion 32.

SURGICAL CONSIDERATIONS

Buchbinder R, Green S, Bell S, Barnsley L, Smidt N, Assendelft WJJ. Surgery for lateral elbow pain (Cochrane Review). In: *The Cochrane Library.* Issue 2; 2002. Oxford: Update Software.

Foster RJ, Edshage S. Factors related to the outcome of surgically managed compressive ulnar neuropathy at the elbow level. *J Hand Surg.* 1981;6: 181-92.

Mowlavi A, Andrews K, Lille S, Verhulst S, Zook EG, Milner S. The management of cubital tunnel syndrome: a meta-analysis of clinical studies. *Plast Reconstr Surg.* 2000;106(2):327-34.

Vangsness CT Jr, Jobe FW. Surgical treatment of medial epicondylitis: results in 35 elbows. *J Bone Joint Surg [Br].* 1991;73:409-11.

PHYSICAL TREATMENT METHODS

Basford JR, Sheffield CG, Cieslak KR. Laser therapy: a randomized, controlled trial of the effects of low intensity Nd:YAG laser irradiation on lateral epicondylitis. *Arch Phys Med Rehabil.* 2000;81(11):1504-10.

Boddeker I, Haake M. Extracorporeal shockwave therapy in treatment of epicondylitis humeri radialis. A current overview. *Orthopade.* 2000;29(5): 463-9.

Buchbinder R, Green S, White M, Barnsley L, Smidt N, Assendelft WJJ. Shock wave therapy for lateral elbow pain (Cochrane Review). In: *The Cochrane Library.* Issue 2; 2002. Oxford: Update Software.

Demirtas RN, Oner C. The treatment of lateral epicondylitis by iontophoresis

of sodium salicylate and sodium diclofenac. *Clin Rehabil.* 1998;12(1):23-9.

Fink M, Wolkenstein E, Karst M, Gehrke A. Acupuncture in chronic epicondylitis: a randomized controlled trial. *Rheumatology (Oxford).* 2002;41(2):205-9.

Green S, Buchbinder R, Barnsley L, et al. Acupuncture for lateral elbow pain (Cochrane Review). *Cochrane Database Syst Rev.* 2002;(1):CD003527.

Klaiman MD, Shrader JA, Danoff JV, Hicks JE, Pesce WJ, Ferland J. Phonophoresis versus ultrasound in the treatment of common musculoskeletal conditions. *Med Sci Sports Exerc.* 1998;30(9):1349-55.

Simunovic Z, Trobonjaca T, Trobonjaca Z. Treatment of medial and lateral epicondylitis—tennis and golfer's elbow—with low level laser therapy: a multicenter double blind, placebo-controlled clinical study on 324 patients. *J Clin Laser Med Surg.* 1998;16(3):145-51.