

# **Carpal Tunnel Syndrome**

## **Diagnosis and Treatment Guideline**



**State of Oregon  
Department of Consumer & Business Services  
Workers' Compensation Division**

**Written by Scott K. Ross, M.D., M.B.A., M.P.H.**

**Edited by Mark A. Melgard, M.S., M.D.**

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# **Acknowledgments**

The Oregon Department of Consumer & Business Services, Workers' Compensation Division, gratefully acknowledges the contributions of the CTS advisory group:

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This guideline is designed to assist clinicians in the diagnosis, evaluation, and treatment of first-onset carpal tunnel syndrome (CTS). It is not intended to replace a practitioner's clinical judgment nor establish a protocol for all patients with CTS. Some patients will not fit the clinical situations contemplated by this guideline and it will rarely establish the only appropriate clinical approach to a problem.

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# Introduction

Practice guidelines are defined as “systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances.” (Institute of Medicine, 1990)

This carpal tunnel syndrome (CTS) treatment guideline has been prepared by the Oregon Department of Consumer & Business Services (DCBS), Workers’ Compensation Division (WCD), in collaboration with a multidisciplinary group of healthcare providers. It is intended as a guide to providers treating injured workers under the Oregon Workers’ Compensation Act.

In 1990, the Oregon legislature directed the Workers’ Compensation Division to “establish utilization and treatment standards for all medical services provided under this chapter.” ORS 656.248(11).

To begin this process, staff from the Information Management Division, Research & Analysis Section, and the Workers’ Compensation Division conducted literature searches, research into process and methods, and interviews with people involved in developing medical treatment standards. The resulting position paper offered specific recommendations for developing, implementing, and maintaining treatment guidelines.

The project had three primary goals: 1) challenge healthcare providers to “drive” the process and content of the guideline; 2) explicitly “marry” the treatment guideline to outcomes research; and 3) develop an implementation plan focused on education and continuous clinical quality improvement.

An advisory group of healthcare providers was appointed by the WCD Medical Director. This advisory group reviewed existing CTS treatment guidelines, interviewed various provider groups, and reviewed current medical literature regarding the diagnosis and treatment of carpal tunnel syndrome. At the beginning of the project, the advisory group adopted as its central theme a quote by Dr. William J. Mayo, “**The best interest of the patient is the only interest to be considered.**” This philosophy has been the guiding principle throughout the guideline development process.

The advisory group defined its objective precisely: “to develop a multidisciplinary guideline in the form of a clinical algorithm for the differential diagnosis and treatment of first-onset carpal tunnel syndrome.” Representatives of the following provider associations were invited to present testimony to the advisory group: acupuncture, chiropractic, medicine, naturopathy, occupational therapy, and physical therapy. A pilot guideline and a clinical algorithm was then developed after consideration of all available information.

This guideline represents the “end of the beginning.” It has always been the advisory group’s intent that outcomes research be “married” to the treatment guideline, continuously enhancing it over time. Health outcomes research will foster continuous clinical-quality improvement of the guideline with an emphasis on education, research, and quality healthcare.

The Oregon Department of Consumer & Business Services, Workers’ Compensation Division, gratefully acknowledges the contributions of the CTS advisory group: **Elias Dickerman, M.D., Ph.D.; Janet L. Fabricius, D.C.; Mark L. Jewell, M.D.; and Scott K. Ross, M.D., M.B.A., M.P.H.**

We welcome and appreciate feedback from providers, workers, employers, insurers, and any other stakeholders in Oregon’s workers’ compensation system. Please address comments to the Medical Director, WCD, 350 Winter Street NE, Room 330, Salem OR 97310.

Education is the cornerstone of any effective treatment guideline. Providers are encouraged to use this document as a tool for educating patients, employers, insurers, and the community as a whole.

No treatment plan is complete without addressing the issues of patient education, wellness, and prevention.

Thorough documentation and justification for any treatment must be provided. Proper documentation will expedite patient care and assist all parties in understanding the worker's clinical course and treatment plan. Failure to follow this guideline, without clear documentation to support such actions may prompt insurers to question the appropriateness or necessity of services rendered pursuant to ORS 656.327 and OAR 436-10-046.

## **Treatment guideline principles**

The purpose of this guideline is to ensure high-quality medical care for injured workers while limiting inappropriate care and unnecessary delays in return to work.

Time frames specified herein begin on the date of initial treatment, not the date of injury. Treatment duration can, of course, be affected by factors such as patient compliance and availability of services. Active participation and emphasis on patient responsibility are recommended. An exercise program should stress improving strength, endurance, and flexibility. Positive treatment results include measurable functional gains, improved sensation, and dexterity.

***If a treatment is not producing positive results within 3-4 weeks, it should be re-evaluated, modified, or discontinued.***

Psychological evaluation may be useful for cases that fail to progress despite appropriate treatment. Indications for surgery must be fully documented. All surgical interventions must be based on the positive correlation of clinical findings, clinical course, and diagnostic tests.

Early return to work is encouraged as long as the activity will not aggravate the recovery. Practitioners should provide restrictions if returning a worker to modified duty. The provider must fully understand the physical demands of the worker's job before releasing the patient to full duty and should request clarification from the employer if necessary.

## **Carpal Tunnel Syndrome**

### **Definition**

Carpal tunnel syndrome (CTS) is a common disorder with symptoms involving the median nerve. The median nerve is vulnerable to compression and injury in the palm and at the wrist, where it is bounded by the wrist (carpal) bones and the transverse carpal ligament. CTS is a combination of finger, hand, and arm distress with symptoms that reflect sensory or motor compromise. It most commonly occurs in adults older than 30, particularly women.

### **History**

A detailed history of work and non-work activities is essential and should include duration, evolution, and anatomic location of all symptoms.

**A history of suspected CTS should elicit the following details:**

- 1. Character of symptoms:** tingling, swelling, numbness, pain (dull, aching discomfort), hand weakness.

2. **Frequency:** episodic or constant, nocturnal.
3. **Duration:** days, weeks, months.
4. **Location:** anatomic correlation, unilateral or bilateral.
5. **Association with hand positions or activity:** repetitive forceful wrist motions, vibrating/oscillating tools, static postures with extremes of wrist flexion or extension.
6. **Onset:** relation to specific work or non-work activities.
7. **Relief:** shaking the hand, vacation (time away from work or aggravating non-work activities), hanging the hand over the edge of the bed.
8. **Review of systems:** CTS can be associated with other medical conditions including, but not limited to: endocrine disorders (diabetes, thyroid disease), pregnancy, obesity, rheumatologic conditions (arthritis), trauma, multiple sclerosis.
9. **Work and non-work activities:** type of work, length of time in this particular job, recent changes in work or unaccustomed work, relationship between work and onset of symptoms, relief with vacation, other work (second job, self-employment), hobbies (biking, crocheting).

***A patient-completed hand diagram (copy attached) describing the location and quality of sensory symptoms is recommended.***

## **Physical examination**

Both upper extremities must be thoroughly evaluated. Any objective findings should correlate with the patient's history and symptoms.

**The physical examination should contain the following components:**

1. **Inspection and palpation:** deformity, misalignment, swelling, atrophy of thenar muscle or other intrinsic musculature, joint range of motion.
2. **Testing abductor pollicis brevis (APB):** Place hand on flat surface with palm up; patient raises thumb to point to ceiling; examiner checks resistance to force exerted to push thumb down toward index finger; strength is graded using a 0-5 scale.
3. **Motor function:** Evaluate entire upper extremity.
4. **Pinch and grip strength:** baseline measurements, reassess during treatment.
5. **Sensory examination:** anatomic distribution, sensory deficit (pinprick, light touch, 2-point discrimination).
6. **Additional evaluation of upper extremity and neck:** Rule out conditions that may mimic CTS; consider proximal entrapment syndrome at the antecubital fossa, axilla, thoracic outlet, etc. Record reflexes and rule out cervical radiculopathy.
7. **Tinel's sign:** gentle tapping over the median nerve at the volar wrist crease to produce paresthesias in median nerve distribution.
8. **Phalen's sign:** flexion of wrist to produce paresthesias in median nerve distribution within 60 seconds.

# Diagnostic testing

Carpal tunnel syndrome represents a clinical diagnosis that can be confirmed with diagnostic testing.

**1. Electrodiagnostic testing (EDT):** Includes nerve conduction studies (NCS) and electromyography (EMG).

**a. Indications for Testing:**

- Patients do not improve with 1-4 weeks of conservative treatment.
- Surgery is being considered.
- To rule out other nerve entrapment or radiculopathy.

**Nerve Conduction Studies (NCS):**

- May localize source of CTS symptoms/signs and confirm the clinical diagnosis.
- May be normal in small percentage of actual CTS cases.
- If NCS are normal, the diagnosis of CTS *must* be supported by accurate history and physical findings.

**Expected findings in CTS:**

- Abnormalities of the median distal sensory or motor latencies or conduction through the carpal tunnel region.
- Electromyographic changes in the thenar eminence in the absence of proximal abnormalities (less common).
- Guidelines to upper limits of normal latencies:

|                                     |                                |
|-------------------------------------|--------------------------------|
| Median distal motor latency .....   | 4.2 msec/8 cm                  |
| Median distal sensory latency ..... | (wrist-digit) 3.5 msec/14 cm   |
| Median intrapalmar latency .....    | (palm-wrist) 2.2 msec/8 cm     |
| Median segmental difference.....    | (cm-cm, "inching") 0.4 msec/cm |

**Note:** Hand temperature should be controlled (86-93 degrees F/30-34 degrees C). Colder temperatures may prolong latencies and slow nerve conduction velocities. Electromyographers may use different distances and/or latency values; normative data should be available from these laboratories to establish the criteria for CTS.

**b. Electromyography (EMG):**

- Indicated if acute and/or chronic neurogenic changes are suspected.
- May differentiate CTS from proximal nerve entrapment, radiculopathy, or myopathy.

**Comments**

- The majority of patients with CTS documented by electrodiagnostic testing do not require routine repeat testing or serial NCS/EMG studies.
- In suspected CTS with normal studies, dynamic testing (pre- and post-exercise) simulating work and/or non-work activities may be helpful.
- Repeat studies at appropriate intervals (3-4 months) may demonstrate progression of the conduction abnormality.
- Additional testing may be indicated in post-op cases that remain symptomatic.

- Individuals with a diagnosed CTS on one side may have abnormal NCS on the opposite side. Surgery should not be performed unless symptomatic.

**2. Quantitative sensory testing:**

- Available methods include ridge detection, thermal thresholds, graphesthesia, Von Frey hairs, mechanical vibratory discrimination, tactile pulses, Semmes-Weinstein monofilaments. These tests are not currently recommended as a clinical indicator of CTS and are considered adjuncts to the physical examination.

**3. Portable Distal Motor Latency Testing (neurometer):**

- May have some value as a screening tool but not currently recommended as a clinical indicator of CTS.
- Not a substitute for electrodiagnostic testing.

**4. Laboratory Testing:**

- Rarely indicated unless patient’s symptoms/signs warrant specific laboratory testing to rule out underlying disease.

**5. Imaging Studies: X-rays, CT, MRI, Ultrasound.**

- Generally not indicated except in acute trauma, bony deformity.

## **Therapeutic modalities**

**Non-operative treatment (may include concurrent use of the following):**

**1. Splinting of the wrist:**

- Neutral position or slight extension.
- Should fit appropriately and comfortably without significant compression of the wrist or limitation of hand function.
- Specific instructions must be provided to the patient about when and how the splint is to be worn.
- May be more useful at night.
- If a rigid splint is used initially, the patients should be weaned to a soft splint after 2-4 weeks.
- Reassessment is indicated if no improvement after 3-4 weeks.
- Document and verify patient compliance.

Time to produce effects: ..... 3-4 weeks  
 Frequency of treatment ..... continuous, at night, task-related  
 Optimum duration ..... 4-8 weeks  
 Maximum duration ..... 12 weeks

**2. Modification of activities:**

- Provider must evaluate the patient’s current job description (including specific job tasks).

- Worksite and ergonomic evaluation may be indicated.
- Evaluation of both work and non-work activities should address repetitive, forceful wrist motions and extremes of flexion/extension. Consider all the following activities: lifting, pushing, pulling, awkward and/or sustained postures, hot and cold environments, repetitive motions tasks, sustained hand grip, tool usage, and exposure to vibration.
- Provider should document all recommended job/activity modifications in detail for patient and employer.

### **3. Medications:**

- Use of medication plays a secondary role in treatment of CTS and should not be the sole treatment modality. Narcotic medications should be reserved for severe pain and should be prescribed only within strict time, quantity, and duration parameters.

#### **a. Non-steroidal anti-inflammatory drugs (NSAID, includes aspirin):**

- Individual patient response is unpredictable and may necessitate trial of more than one class of NSAID.

#### **b. Analgesics: strength of medication determined by level of distress.**

#### **c. Vitamin B6:**

- Possibly effective to reduce pain.

#### **d. Steroid injection into carpal tunnel:**

- Not widely used.
- May offer only temporary relief.
- Involves possible injury to median nerve.

#### **e. Muscle relaxants:**

- Muscle relaxants and benzodiazepines are not considered effective in the treatment of carpal tunnel syndrom.

### **4. Physical modalities:**

- Physical modalities play a secondary role in the treatment of CTS and should not be the sole treatment. There is a lack of consensus regarding the effectiveness of this treatment and further research may define need.
- Providers should offer instruction in a home program of therapeutic exercises to improve flexibility, mobility, strength, and proper work techniques.

### **5. Manipulation of the wrist (carpal) bones:**

- There is a lack of consensus regarding the effectiveness of this treatment and further research may define need.

***If a treatment is not producing positive results within 3-4 weeks, it should be re-evaluated, modified, or discontinued.***

## Referral criteria

Consistent with accepted medical practice, consultation with other healthcare providers may be initiated at any time by the attending physician.

If the worker is not improving or has a documented, well-defined clinical and electrophysiological CTS, the attending physician should refer the worker for surgical consideration.

## Surgical intervention

Surgical intervention should be considered only if the worker has a positive history and physical exam *and* abnormal nerve conduction studies *and* failure of conservative management.

### 1. Criteria for surgical decompression of the median nerve at the carpal tunnel might include:

- a. Severe compression of the median nerve as documented by motor and sensory nerve dysfunction associated with electrodiagnostic signs of denervation of thenar muscles.
- b. Persistence of pain, numbness or dysesthesia in the median nerve distribution with accompanying sensory or motor signs, despite appropriate conservative treatment.
- c. Repeated improvements of symptoms/signs with conservative treatment followed by flare-ups with return to full-work status; this may be an indication for a permanent change in work rather than an indication for surgery.

2. **There are two accepted techniques of surgical release:** open or endoscopic. These can be performed under local, regional, or general anesthesia. Exploration and decompression of the median nerve is the most commonly performed surgery. Additional surgical procedures such as tenosynovectomy, opponensplasty, simultaneous Guyon's canal exploration, and neurolysis are seldom indicated in initial-onset CTS. Indications for any of these additional procedures must be completely documented.

If surgery is contemplated in a patient with normal nerve conduction studies, a second opinion should be obtained prior to the surgery.

The majority of carpal tunnel surgeries take place in an outpatient setting; however, under certain circumstances an inpatient setting may be appropriate.

3. **Pre-operative period:** Patient compliance with a program of pre-operative education is extremely important. Pre-operative teaching expedites recovery and involves the worker as an active participant in his/her treatment.

Pre-operative teaching may include:

- Instruction in post-operative exercises which will maintain flexibility, strength, and range of motion.
- Education about post-operative expectations and limitations (return to work, time frame expected for total recovery, wound care).

4. **Post-operative period:** Referral may be made for supervised instruction in an exercise program during the immediate post-operative period. *Treatment pursuant to such referrals should be limited to a duration of 2-3 weeks.* This care should focus on instructing the worker in a home exercise program.

Following carpal tunnel release, the majority of workers will be able to resume modified work activities.

Most workers are able to resume their regular activities within 4-8 weeks after surgery. If symptoms persist beyond 6-8 weeks, the worker should be re-evaluated. Some degree of improvement will continue for 4-6 months. However, this should not prevent the worker from resuming activities nor should most workers require active interventions during this phase of their recovery. Once additional material improvement is not expected, the worker should be found medically stationary.

Nerve conduction studies may not normalize following carpal tunnel surgery, despite relief of symptoms. However, in the majority of workers, electrodiagnostic test results will improve significantly or return to normal within six months of surgery.

## **For physician use**

### **Rating system for hand diagrams**

- 1) **Classic** - tingling, numbness, or decreased sensation with or without pain in at least two of digits 1, 2, or 3. Palm and dorsum of the hand excluded; wrist pain or radiation proximal to the wrist allowed.
- 2) **Probable** - same as for classic, except palmar symptoms allowed unless confined solely to ulnar aspect.
- 3) **Possible** - tingling, numbness, decreased sensation and/or pain in at least one of digits 1, 2, or 3.
- 4) **Unlikely** - no symptoms in digits 1, 2, or 3.

# Hand diagram

Please draw on the hand diagram the areas of each hand where pain, numbness, tingling, or other types of discomfort have occurred in a typical day during the past two (2) weeks.

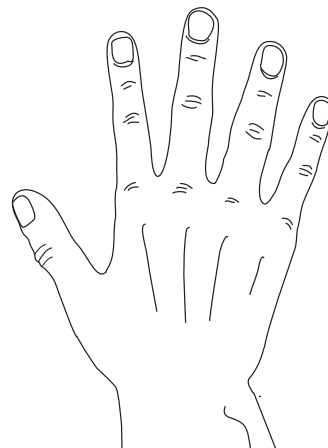
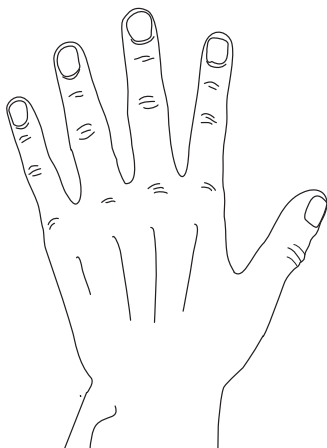
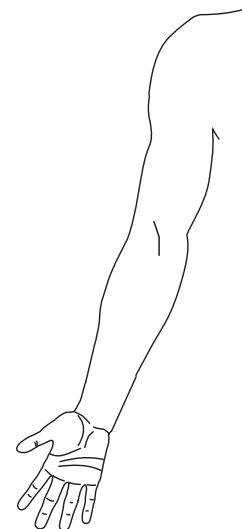
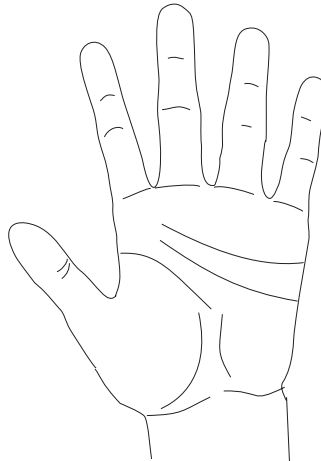
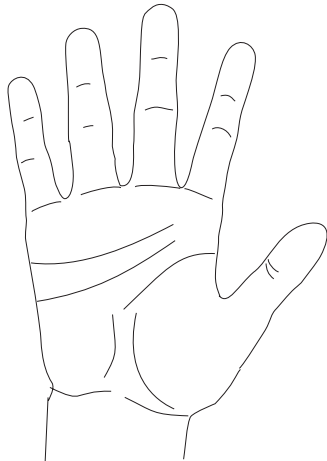
Key: xxxx-pain

//// - numbness/tingling

0000 - other discomfort (please describe \_\_\_\_\_)

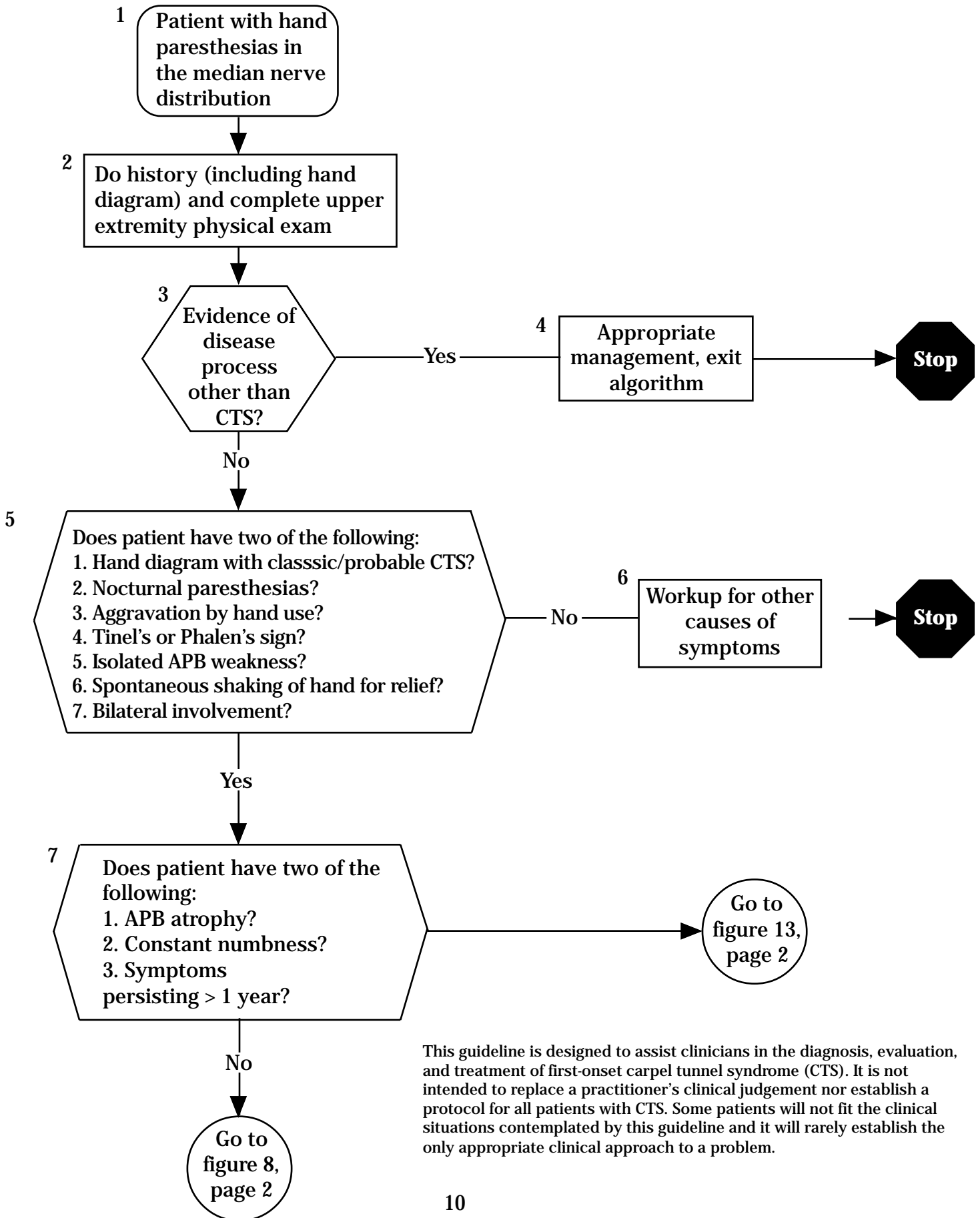
Left hand

Right hand

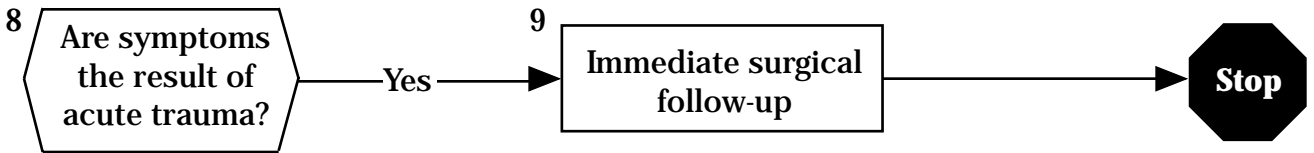


# Management of patients with first-onset carpal tunnel syndrome algorithm

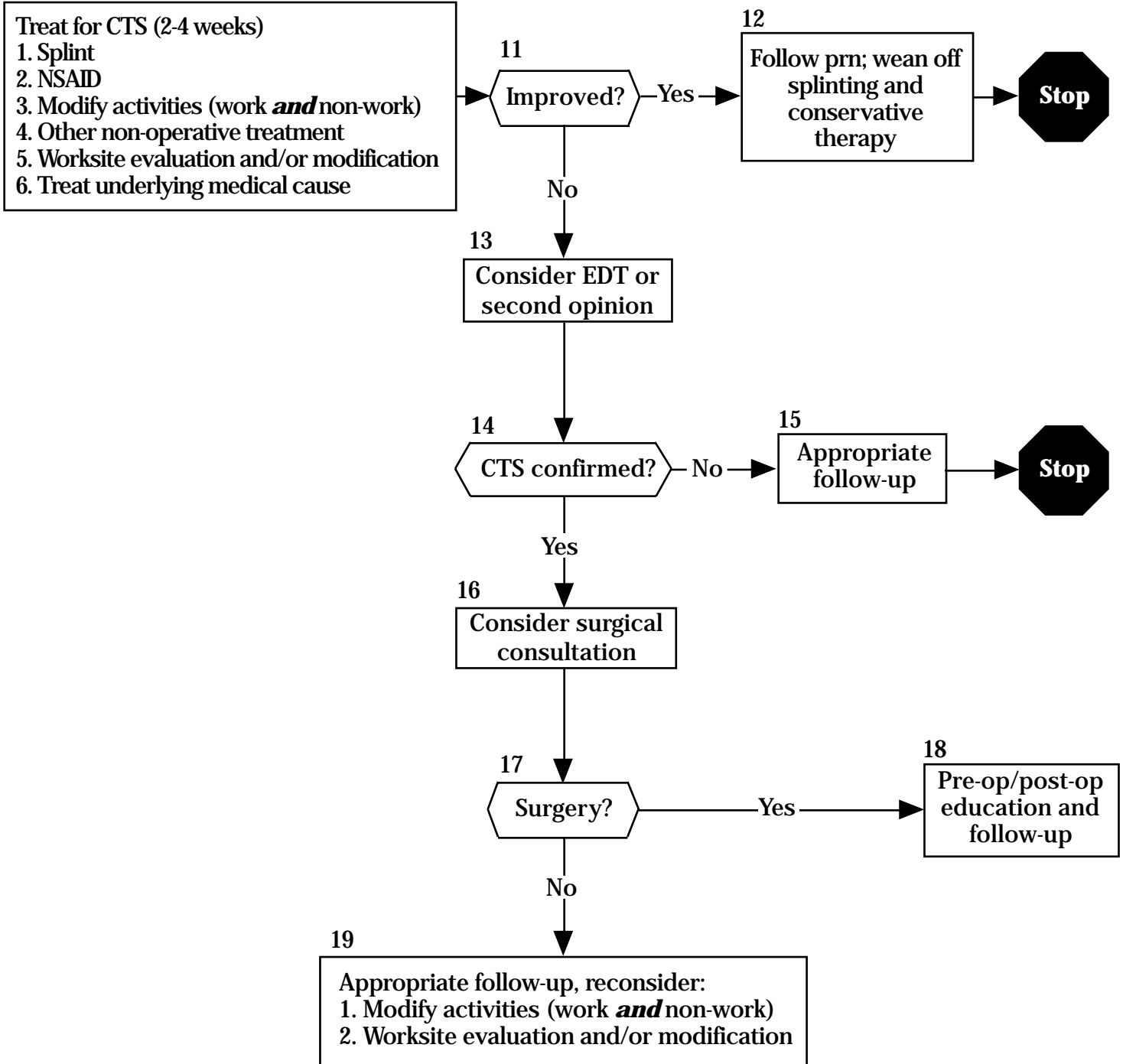
*Refer to text for details*



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