



**New York
Carpal Tunnel Syndrome
Medical Treatment Guidelines**

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Table of Contents

A	GENERAL GUIDELINE PRINCIPLES.....	1
A.1	MEDICAL CARE.....	1
A.2	RENDERING OF MEDICAL SERVICES.....	1
A.3	POSITIVE PATIENT RESPONSE.....	1
A.4	RE-EVALUATE TREATMENT.....	1
A.5	EDUCATION.....	2
A.6	DIAGNOSTIC TIME FRAMES.....	2
A.7	TREATMENT TIME FRAMES.....	2
A.8	SIX-MONTH TIME FRAME.....	2
A.9	DELAYED RECOVERY.....	2
A.10	ACTIVE INTERVENTIONS.....	3
A.11	ACTIVE THERAPEUTIC EXERCISE PROGRAM.....	3
A.12	DIAGNOSTIC IMAGING AND TESTING PROCEDURES.....	3
A.13	SURGICAL INTERVENTIONS.....	3
A.14	PRE-AUTHORIZATION.....	4
A.15	PERSONALITY/PSYCHOLOGICAL/PSYCHOSOCIAL EVALUATIONS.....	4
A.16	PERSONALITY/PSYCHOLOGICAL/PSYCHOSOCIAL INTERVENTION.....	5
A.17	FUNCTIONAL CAPACITY EVALUATION (FCE).....	5
A.18	RETURN TO WORK.....	5
A.19	JOB SITE EVALUATION.....	6
A.20	GUIDELINE RECOMMENDATIONS AND MEDICAL EVIDENCE.....	6
A.21	EXPERIMENTAL TREATMENT.....	7
A.22	INJURED WORKERS AS PATIENTS.....	7
A.23	SCOPE OF PRACTICE.....	7
B	INTRODUCTION.....	8
C	HISTORY TAKING AND PHYSICAL EXAMINATION.....	8
C.1	HISTORY OF PRESENT INJURY.....	8
C.2	PAST HISTORY.....	9
C.3	PHYSICAL EXAMINATION.....	10
C.4	LABORATORY TESTING.....	10
C.5	ESTABLISHING WORK-RELATEDNESS.....	10

D	MAKING THE DIAGNOSIS	12
D.1.	SIGNS AND SYMPTOMS	12
D.2.	SPECIFIC PHYSICAL EXAM FINDINGS.....	12
D.3.	DIAGNOSTIC TESTING PROCEDURES	13
D.3.a	Electrodiagnostic (EDX) Testing.....	13
D.3.b	Radiographic Tests.....	16
D.3.c	Other Tests	16
E	NON-OPERATIVE TREATMENT PROCEDURES	17
E.1	INITIAL TREATMENT.....	17
E.2	PATIENT EDUCATION.....	17
E.3	CONTINUATION OF ACTIVITIES	17
E.4	MEDICATIONS AND MEDICAL TREATMENT	17
E.4.a	Vitamin B6	18
E.4.b	Oral Steroids	18
E.4.c	Orthotics/Immobilization with Splinting.....	18
E.4.d	Steroid Injections	19
E.4.e	Therapy: Active	19
E.4.f	Therapy: Passive.....	22
E.4.g	Ongoing Maintenance Care.....	25
F	SURGERY	26
F.1.	SURGICAL INDICATIONS/CONSIDERATIONS	26
F.1.a	Surgery as Initial Therapy	27
F.1.b	EDX Studies	27
F.2	OPERATIVE PROCEDURES.....	28
F.2.a	Techniques	28
F.3	POSTOPERATIVE TREATMENT	28
F.3.a	Home Therapy	28
F.3.b	Mobilization	29
F.3.c	Rehabilitation.....	29
F.3.d	Considerations for Repeat Surgery.....	29
APPENDIX.....		31
TABLE A.	Differential Diagnosis of Upper Extremity Musculoskeletal and Peripheral Nerve Conditions.....	31
TABLE B.	Specific Peripheral Nerve Diagnoses	33
INDEX.....		35
REFERENCES		37

A GENERAL GUIDELINE PRINCIPLES

The principles summarized in this section are key to the intended application of the New York State Medical Treatment Guidelines.

Medical Care

A.1 MEDICAL CARE

Medical care and treatment required as a result of a work-related injury should be focused on restoring functional ability required to meet the patient's daily and work activities and return to work, while striving to restore the patient's health to its pre-injury status in so far as is feasible.

A.2 RENDERING OF MEDICAL SERVICES

Any medical provider rendering services to a workers' compensation patient must utilize the Treatment Guidelines as provided for with respect to all work-related injuries and or illnesses.

A.3 POSITIVE PATIENT RESPONSE

Positive results are defined primarily as functional gains that can be objectively measured. Objective functional gains include, but are not limited to, positional tolerances, range of motion, strength, endurance, activities of daily living, cognition, psychological behavior, and efficiency/velocity measures that can be quantified. Subjective reports of pain and function should be considered and given relative weight when the pain has anatomic and physiologic correlation.

A.4 RE-EVALUATE TREATMENT

If a given treatment or modality is not producing positive results, the provider should either modify or discontinue the treatment regime. The provider should evaluate the efficacy of the treatment or modality 2 to 3 weeks after the initial visit and 3 to 4 weeks thereafter. Reconsideration of diagnosis should also occur in the event of poor response to a rational intervention.

Education

A.5 EDUCATION

Education of the patient and family, as well as the employer, insurer, policy makers and the community should be a primary emphasis in the treatment of work-related injury or illness. Practitioners must develop and implement effective educational strategies and skills. An education-based paradigm should always start with communication providing reassuring information to the patient. No treatment plan is complete without addressing issues of individual and/or group patient education as a means of facilitating self-management of symptoms and prevention of future injury.

Time Frames

A.6 DIAGNOSTIC TIME FRAMES

Diagnostic time frames for conducting diagnostic testing commence on the date of injury. Clinical judgment may substantiate the need to accelerate or decelerate the time frames discussed in this document.

A.7 TREATMENT TIME FRAMES

Treatment time frames for specific interventions commence once treatment is initiated, not on the date of injury. Obviously, duration may be impacted by disease process and severity, patient compliance, as well as availability of services. Clinical judgment may substantiate the need to accelerate or decelerate the time frames discussed in this document.

A.8 SIX-MONTH TIME FRAME

Since the prognosis drops precipitously for returning an injured worker to work once he/she has been temporarily totally disabled for more than six months, the emphasis within these guidelines is to move patients along a continuum of care and return to work within a six-month time frame, whenever possible.

A.9 DELAYED RECOVERY

For those patients who are failing to make expected progress 6-12 weeks after an injury, re-examination in order to confirm the accuracy of the diagnosis should be made. Thereafter, consideration of an alternate treatment program should be made. This may include an interdisciplinary rehabilitation program and may also include a psychosocial evaluation.

Treatment Approaches

A.10 ACTIVE INTERVENTIONS

Active interventions emphasizing patient responsibility, such as therapeutic exercise and/or functional treatment, are generally emphasized over passive modalities, especially as treatment progresses. Generally, passive and palliative interventions are viewed as a means to facilitate progress in an active rehabilitation program with concomitant attainment of objective functional gains.

A.11 ACTIVE THERAPEUTIC EXERCISE PROGRAM

Active therapeutic exercise program goals should incorporate patient strength, endurance, flexibility, range of motion, coordination, and education. This includes functional application in vocational or community settings.

A.12 DIAGNOSTIC IMAGING AND TESTING PROCEDURES

Clinical information obtained by history taking and physical examination should be the basis for selection and interpretation of imaging procedure results. All diagnostic procedures have variable specificity and sensitivity for various diagnoses.

When a diagnostic procedure, in conjunction with clinical information, provides sufficient information to establish an accurate diagnosis, a second diagnostic procedure will be redundant if it is performed only for diagnostic purposes. At the same time, a subsequent diagnostic procedure (that may be a repeat of the same procedure, when the rehabilitation physician, radiologist or surgeon documents the study was of inadequate quality to make a diagnosis) can be a complementary diagnostic procedure if the first or preceding procedures, in conjunction with clinical information, cannot provide an accurate diagnosis.

It is recognized that repeat imaging studies and other tests may be warranted by the clinical course and to follow the progress of treatment in some cases. It may be of value to repeat diagnostic procedures (e.g. imaging studies) during the course of care to reassess or stage the pathology when there is progression of symptoms or findings, prior to surgical interventions and therapeutic injections when warranted, and postoperatively to follow the healing process. Regarding CT examinations, it must be recognized that repeat procedures result in an increase in cumulative radiation dose and associated risks.

A.13 SURGICAL INTERVENTIONS

Contemplation of surgery should be within the context of expected functional outcome. The concept of "cure" with respect to surgical

treatment by itself is generally a misnomer. All operative interventions must be based upon positive correlation of clinical findings, clinical course and imaging, and other diagnostic tests. A comprehensive assimilation of these factors must lead to a specific diagnosis with positive identification of pathologic condition(s). For surgery to be performed to treat severe pain, there should be clear correlation between the pain symptoms and objective evidence of its cause.

A.14 PRE-AUTHORIZATION

All diagnostic imaging, testing procedures, non-surgical and surgical therapeutic procedures within the criteria of the medical treatment guidelines and based on a correct application of the medical treatment guidelines are considered authorized, with the exception of following procedures: Lumbar Fusion, Artificial Disc Replacements, Vertebroplasty, Kyphoplasty, Electrical Bone Growth Stimulators, Spinal Cord Stimulators, Osteochondral Autograft, Autologous Chondrocyte Implantation, Meniscal Allograft Transplantation and Knee Arthroplasty (Total or Partial Knee Joint Replacement). These are not included on the list of pre-authorized procedures. Providers who want to perform one of these procedures must request pre-authorization from the carrier before performing the procedure.

A.15 PERSONALITY/PSYCHOLOGICAL/PSYCHOSOCIAL EVALUATIONS

In select patients, diagnostic testing procedures may be useful when there is a discrepancy between diagnosis, signs, symptoms, clinical concerns or functional recovery. Psychological testing should provide differentiation between pre-existing depression versus injury-caused depression, as well as post-traumatic stress disorder, and other psychosocial issues that may include work or non-work-related issues.

For those patients who fail to make expected progress 6 to 12 weeks after an injury and whose subjective symptoms do not correlate with objective signs and tests, reexamination in order to confirm the accuracy of the diagnosis should be made. Formal psychological or psychosocial evaluation may be considered.

A professional fluent in the primary language of the patient is strongly preferred. When such a provider is not available, services of a professional language interpreter must be provided.

Frequency: One time visit for evaluation. If psychometric testing is indicated by findings in the initial evaluation, time for such testing should not exceed an additional two hours of professional time.

A.16 PERSONALITY/PSYCHOLOGICAL/PSYCHOSOCIAL INTERVENTION

Following psychosocial evaluation, when intervention is recommended, such intervention should be implemented as soon as possible. This can be used alone or in conjunction with other treatment modalities.

- Time to produce effect: 2 to 8 weeks.
- Optimum duration: 6 weeks to 3 months.
- Maximum duration: 3 to 6 months. Counseling is not intended to delay but to enhance functional recovery. For select patients, longer supervision may be required, and if further counseling is indicated, documentation of the nature of the psychological factors, as well as projecting a realistic functional prognosis, should be provided by the authorized treating practitioner every 4 to 6 weeks during treatment.

Return to Work

A.17 FUNCTIONAL CAPACITY EVALUATION (FCE)

Functional capacity evaluation is a comprehensive or more restricted evaluation of the various aspects of function as they relate to the patient's ability to return to work. Areas such as endurance, lifting (dynamic and static), postural tolerance, specific range-of-motion, coordination and strength, worker habits, employability, as well as psychosocial, cognitive, and sensory perceptual aspects of competitive employment may be evaluated. Components of this evaluation may include: (a) musculoskeletal screen; (b) cardiovascular profile/aerobic capacity; (c) coordination; (d) lift/carrying analysis; (e) job-specific activity tolerance; (f) maximum voluntary effort; (g) pain assessment/psychological screening; (h) non-material and material handling activities; (i) cognitive; (j) visual; and (k) sensory perceptual factors.

In most cases, the question of whether a patient can return to work can be answered without an FCE.

A.18 RETURN TO WORK

For purposes of these guidelines, return to work is defined as any work or duty that the patient is able to perform safely. It may not be the patient's regular work. Ascertaining a return to work status is part of medical care, should be included in the treatment and rehabilitation plan, and is normally addressed at every outpatient visit. A description of patient's status and task limitations is part of any treatment plan and should provide the basis for restriction of work activities when warranted. Early

return to work should be a prime goal in treating occupational injuries given the poor return to work prognosis for a patient who has been out of work for more than six months.

A.19 JOB SITE EVALUATION

The treating physician may communicate with the employer or his designee, either in person or by telephone, to obtain information regarding the demands of the patient's pre-injury job, including a description of the exertional demands of the job, the need for repetitive activities, load lifting, static or awkward postures, or any other factors that would pose a risk of re-injury or impedance of convalescence. When return to work at the patient's previous job task/setting is not feasible, given the clinically determined restrictions on the patient's activities, inquiry should also be made about modified duty work settings, and a similar set of questions should be posed by the physician about work activities/demands in modified duty jobs.

Ideally, the physician would gain the most information from an on-site inspection of the job settings and activities, but it is recognized that this may not be feasible in most cases. If job videos/CDs/DVDs are available from the employer, these can contribute valuable information.

Frequency: 1 or 2 calls

- 1st call: Patient is in a functional state where the patient can perform some work.
- 2nd call: Patient has advanced to state where the patient is capable of enhanced functional demands in a work environment.

The physician shall document the conversation on a form prepared by the Workers' Compensation Board.

Any medical provider rendering services to a workers' compensation patient must utilize the Treatment Guidelines as provided for with respect to all work-related injuries and or illnesses.

Other

A.20 GUIDELINE RECOMMENDATIONS AND MEDICAL EVIDENCE

The Workers' Compensation Board (the Department and its Advisors including medical and other professionals) have not independently evaluated or vetted the scientific medical literature used in support of

these Guidelines, but have relied on the methodology used by the developers of various guidelines utilized and referenced in these Guidelines.

A.21 EXPERIMENTAL TREATMENT

Medical treatment that is experimental and not approved for any purpose, application or indication by the FDA is not permitted under these Guidelines.

A.22 INJURED WORKERS AS PATIENTS

In these Guidelines, injured workers are referred to as *patients*, recognizing that in certain circumstances there is no doctor-patient relationship.

A.23 SCOPE OF PRACTICE

These Guidelines do not address scope of practice or change the scope of practice.

B INTRODUCTION

This document is a guideline for physicians who treat injured patients with work-related carpal tunnel syndrome (CTS). Both documentation of appropriate symptoms and signs and a statement attesting to probable work-relatedness must be present for a CTS claim.

C HISTORY TAKING AND PHYSICAL EXAMINATION

Establish the foundation/basis for and dictate subsequent stages of diagnostic and therapeutic procedures. When findings of clinical evaluations and those of other diagnostic procedures are not complementing each other, generally the objective clinical findings should have preference. The medical records should reasonably document the following:

C.1 HISTORY OF PRESENT INJURY

1. Age, hand dominance, gender.
2. Onset: date of onset, triggering event (if present) versus gradual onset. Activity at/or before onset of symptoms.
3. Nature of symptoms: pain, numbness, tingling, weakness, swelling, stiffness, temperature change, moisture change, color change.
4. Any history of pain, intermittent or constant, and intensity. A pain scale (0 = no pain, and 10 = worst imaginable pain) may be used. The use of a patient-completed pain drawing, Visual Analog Scale (VAS), is highly recommended.
5. Use comprehensive pain diagrams to better localize pain symptoms.
6. Evaluate the patient's overall pain behavior. The behavior should be consistent with the current pain levels reported by the patient.
7. Provocative and alleviating factors (occupational and non-occupational): identify the specific physical factors that are aggravating or alleviating the problem,
8. Sleep disturbances.
9. Other associated signs and symptoms noted by the injured worker.

10. Ability to perform work activities and activities of daily living (ADL's). Assess the overall degree of restriction or combination of restrictions.
11. Discussion of any symptoms present in the uninjured extremity.

C.2. PAST HISTORY

1. Prior injuries to the same area including specific prior treatment and any prior supportive devices.
2. Past injury/symptoms involving the upper extremities, trunk and cervical spine.
3. Past personal injury or disease that resulted in temporary or permanent job limitation.
4. Medical conditions associated with CTS: The following are examples of medical conditions which have been commonly seen in association with CTS conditions. These require treatment and may impact the recovery of the work-related injury.
 - a. Arthropathies including connective tissue disorders, rheumatoid arthritis, systemic lupus erythematosus, gout, osteoarthritis and spondyloarthropathy;
 - b. Diabetes mellitus, including family history or gestational diabetes;
 - c. Hypothyroidism, especially in older females;
 - d. Obesity;
 - e. Pregnancy.
5. History of smoking and alcohol use; history of substance abuse.
6. Descriptive history of previous hobbies that may be relevant to CTS.
7. Medication history, including - birth control pills, corticosteroid use, and other prescription and non-prescription medication, and
8. Psychosocial history.

C.3. PHYSICAL EXAMINATION

The evaluation of any patient with suspected CTS should begin at the neck and upper back and then proceed down to the fingers and include the contralateral region. It should include evaluation of vascular and neurologic status, and describe any dystrophic changes or variation in skin color or turgor. A description of the patient's general posture (e.g., neck rotation, shoulder depression, spine kyphosis), and anthropometric measurements, (e.g. body mass index (BMI)) may prove useful. Additional physical exam components may be necessary based on past medical history.

A neurological examination typically includes bilateral assessments of light touch sensation, pinprick, two-point sensation as applicable, motor strength, and reflexes. Similar assessments of the upper extremities, including a vascular assessment, may be performed. Special care to evaluate for polyneuropathic processes such as diabetic neuropathy is recommended. Vibratory sense and Achilles reflexes are frequently lost in diabetic neuropathy.

For purposes of differential diagnostic discrimination, the Appendix provides a list of other common upper extremity conditions, including pertinent signs and symptoms.

C.4. LABORATORY TESTING

Laboratory tests are generally accepted, well-established, and widely used procedures. Patients should be carefully screened at the initial exam for signs or symptoms of diabetes, hypothyroidism, pregnancy, arthritis, and related inflammatory diseases.

Laboratory tests are rarely indicated at the time of initial evaluation unless there is reasonable clinical suspicion of a specific condition listed above.

C.5. ESTABLISHING WORK-RELATEDNESS

CTS may result from numerous conditions, including inflammatory or non-inflammatory arthropathies, recent or remote wrist trauma or fractures, diabetes mellitus, obesity, hypothyroidism, pregnancy, and genetic factors.^{1 2}In the unusual instance that CTS is acutely, traumatically induced, e.g., a patient has both CTS and concomitant trauma (fracture or dislocation), the treatment may require prompt carpal tunnel release. Work-related activities may also cause or contribute to the development of CTS.

To establish a diagnosis of work-related carpal tunnel syndrome, all of the following are required:

1. Exposure: Workplace activities that contribute to or cause CTS, and
2. Outcome: A diagnosis of CTS that meets the diagnostic criteria under Section D, and
3. Relationship to work: This includes a statement of the probability that the illness or injury is work-related. The presence of concurrent disease does not eliminate the possibility of work-relatedness of any specific case.

Work-related CTS is most often associated with activities requiring extensive, forceful, repeated or prolonged use of the hands and wrists, particularly if these potential risk factors are present in combination (e.g., force and repetition or force and posture). Usually, one or more of the following work conditions occurs on a regular basis to support work-relatedness:

1. Forceful use, particularly if repeated.
2. Repetitive hand use combined with some element of force, especially for prolonged periods.
3. Constant firm gripping of objects.
4. Moving or using the hand and wrist against resistance or with force.
5. Exposing the hand and wrist to strong regular vibrations.
6. Regular or intermittent pressure on the wrist.

D MAKING THE DIAGNOSIS

D.1. SIGNS AND SYMPTOMS

A diagnosis of CTS requires symptoms suggestive of median nerve entrapment at the wrist supported by physical examination findings. Prior to surgery, confirmation of the diagnosis by electrodiagnostic studies (EDX) is required. Typical symptoms of CTS may include numbness, tingling, or pain in the volar aspects of one or both hands, especially noted after work or at night. Nocturnal symptoms are prominent in a majority of patients. Patients frequently awaken at night or early morning and shake their hands to relieve these symptoms. The location of these symptoms may be reported as involving the entire hand or localized to the palmar surfaces of the thumb and first two or three fingers. A hand pain diagram may be useful in localizing sensory symptoms of CTS. Weakness of the hands or dropping objects are more ominous signs that may suggest muscle damage. Presence of such symptoms in the clinical context of a possible CTS diagnosis requires prompt consideration to EDX and surgical treatment.

D.2. SPECIFIC PHYSICAL EXAM FINDINGS

No single physical finding is diagnostic of CTS. Multiple tests should be recorded with the patient's exact response. Final diagnosis is dependent on a correlation of symptoms, physical exam findings, and EDX testing where appropriate, as any of these alone can be false positive or false negative.

1. The clinical diagnosis should be suspected whenever the patient has: 1) a history of paresthesia in one or more of the following digits: thumb, index, and middle finger; and 2) at least one of the physical exam signs listed below. Provocative tests must recreate symptoms in the median nerve distribution.
 - Phalen's sign/reverse Phalen's sign.
 - Tinel's sign over the carpal tunnel.
 - Compression test.
 - Weakness of the abductor pollicis brevis (see discussion EDX studies).
 - Thenar atrophy may be present, usually late in the course (see discussion of EDX studies).

- Sensory loss to pinprick, light touch, two-point discrimination or Semmes Weinstein monofilament test in a median nerve distribution.
2. Evaluation of the contralateral wrist should be performed.
 3. Evaluation of the proximal upper extremity and cervical spine for other conditions, for example, cervical radiculopathy, thoracic outlet syndrome, other peripheral neuropathies, and other musculoskeletal conditions.
 4. Myofascial findings requiring treatment may present in additional soft tissue areas. When present, these should be identified and treated in accordance with medical treatment guidelines.

D.3. DIAGNOSTIC TESTING PROCEDURES

D.3.a Electrodiagnostic (EDX) Testing

Electrodiagnostic tests are well-established and widely accepted for evaluation of patients suspected of having CTS. The results are sensitive and specific for the diagnosis when clinical symptoms are present. Studies may confirm the diagnosis or direct the examiner to alternative conditions. In those cases where EDX studies are indicated, they should be conducted in accordance with the CTS practice parameters of the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM).

The EDX study is to include median motor and median sensory nerve conduction velocity results (NCV). If abnormal, then comparison to ipsilateral ulnar motor/sensory and contralateral median motor/sensory should be made. Needle electromyography (EMG) of a sample of muscles innervated by the C5 to T1 spinal roots, including paraspinal muscles and a thenar muscle innervated by the median nerve of the symptomatic limb, is required. EDX findings in CTS reflect slowing of median motor distal latency and sensory conduction (velocity) across the carpal tunnel region due to demyelination or axonopathy (axonal loss). Axonal loss, when present, is demonstrated by EMG abnormality in median-nerve-supplied thenar muscles.

- D.3.a.i To ensure accurate testing, hand temperature should be maintained at 30-34C, preferably recorded from the hand/digits. For temperature below 30C, the hand should be warmed.
- D.3.a.ii Any of these nerve conduction study findings must be accompanied by positive findings of median nerve symptoms to establish the diagnosis.

- a) Slowing of median distal sensory and/or motor distal latency across the carpal tunnel region.
- b) Electromyographic changes in the median thenar muscles in the absence of proximal abnormalities.
- c) Suggested guidelines for the upper limits of normal latencies:
 - 1. Median distal motor latency (DML) at onset: 4.5msec/8cm distance from the wrist to abductor pollicis brevis muscle.
 - 2. Median distal sensory peak latency (DSL): 3.6msec/14cm antidromic (from wrist to middle and/or index finger).
 - 3. Median intrapalmar peak latency (palm/wrist): 2.2msec/8cm.
 - 4. Median-ulnar palmar sensory distal latency difference greater than 0.3msec. Comparison of the median sensory distal latency to the ulnar sensory distal latency, known as “ringdiff,” improves sensitivity and specificity and helps to control for other confounding variables such as temperature, age, height, and other patient-specific variability.³
 - 5. Median-radial latency difference to the thumb greater than 0.5 msec. Known as “thumbdiff,” this test is acquired similar to the “ringdiff” but the distance of the stimulator to the recording is 10 cm.
 - 6. Orthodromic palmar stimulation greater than 0.4 msec. Known and “palmdiff.” The median and ulnar nerves are stimulated in the mid-palm at 8 cm distal to the wrist recording.
 - 7. Combined sensory index (CSI), the sum of three comparison tests (CSI = thumbdiff + ringdiff + palmdiff) greater than 0.9 msec. Improves reliability, sensitivity and specificity in the diagnosis of CTS.⁴
- d) Variability from the suggested guideline values is acceptable because laboratories establish their own norms. In all cases, normative values are to be provided with the electro-diagnostic evaluation.

- D.3.a.iii When there is clinical suspicion of polyneuropathy supported by history or physical examination, it may be worthwhile to perform EDX testing in the lower extremities (such as sensory conduction study of the sural nerve); however, lower extremity studies are not otherwise indicated in the routine evaluation of suspected CTS. Clinical correlation is required due to the occurrence of false positive and false negative results. Symptoms of CTS may occur with normal EDX studies, especially early in the clinical course.

An EDX (NCV and EMG) study should be scheduled when expedited surgical intervention is contemplated because of the presence of the following findings:

- thenar atrophy;
- motor weakness in the muscles supplied by the median nerve.

In the above circumstances, EDX studies may be of value even if the patient does not want to undergo surgery.

- D.3.a.iv The following EDX studies are not recommended:

- 1) multiple median F wave parameters
- 2) median motor nerve residual latency

- D.3.a.v The following EDX studies are not recommended and not acceptable to confirm a clinical diagnosis of CTS:

- 1) hand held conduction devices such as electroneurometer
- 2) portable automatic electrodiagnostic devices
- 3) sympathetic skin response
- 4) current perception threshold measurements
- 5) quantitative sensory testing

- D.3.a.vi Frequency of Studies/Maximum Number of Studies

- 1) Indications for initial testing:

- a) Patients with clinically significant CTS who do not improve symptomatically or functionally with conservative measures for CTS over a 3 to 4 week period.
 - b) Patients in whom the diagnosis is in question and who are symptomatic for at least 3 weeks.
 - c) To rule out other nerve entrapments, or alternative radiculopathy.
 - d) Patients for whom surgery is contemplated in accordance with Section F.1.
- 2) A repeat study may be performed:
- a) At 3 months or longer when the initial studies were normal and CTS is still suspected.
 - b) At 8 to 12 weeks for inadequate clinical improvement with non-surgical treatment.
 - c) Postoperative 3 to 6 months for persistent or recurrent symptoms following carpal tunnel release, unless an earlier evaluation is required by the surgeon.

D.3.b Radiographic Tests

An x-ray of the wrist should be performed if there is limited range of motion of the wrist on clinical examination or if there is a history of prior wrist fracture.

D.3.c Other Tests

Imaging, MRI, and sonography are not recommended at this time unless a space occupying lesion is suspected.

E NON-OPERATIVE TREATMENT PROCEDURES

E.1 INITIAL TREATMENT

- Medications such as: over-the-counter nonsteroidal anti-inflammatory (NSAIDs), or other analgesics for symptomatic relief.
- Wrist splint at night.
- Restriction of activities such as forceful gripping, awkward wrist posture, and repetitive wrist motion.

E.2 PATIENT EDUCATION

Patient education should include instruction in self-management techniques, including sleeping postures that avoid excessive wrist flexion; ergonomics; and a home therapy program that includes heat treatment, stretching exercises, and nerve gliding, to provide symptomatic relief.

E.3 CONTINUATION OF ACTIVITIES

Continuation of normal daily activities is an accepted and well-established recommendation for CTS with or without neurologic symptoms. Complete work cessation should be avoided if possible. All patients should be encouraged to return to work as soon as possible. This process may be best facilitated with modified duty, particularly when the job demands exceed the patient's capabilities due to the workplace injury. Recommendations for ergonomic assessments to evaluate or reduce exposure may be of value for treatment and future intervention/prevention.

E.4 MEDICATIONS AND MEDICAL TREATMENT

Use of medications in the treatment of CTS is appropriate for controlling acute and chronic pain and inflammation. All drugs should be used within the boundaries of recognized medical practice according to the patient's needs. A thorough medication history, including use of alternative and over the counter medications, should be performed at the time of the initial visit and updated periodically.

Nonsteroidal anti-inflammatory medications (NSAIDs), oral steroids, and diuretics, have not been shown to have significant long-term beneficial effect in treating CTS. Although NSAIDs are not curative, they and other analgesics may provide symptomatic relief.

E.4.a Vitamin B6

Randomized trials have demonstrated conflicting results. Higher doses may result in development of a toxic peripheral neuropathy. In the absence of definitive literature showing a beneficial effect, use of Vitamin B6 cannot be recommended unless there is a documented medical condition that results in Vitamin B6 deficiency or a significant nutritional problem.

E.4.b Oral Steroids

Oral steroids have been shown to have short-term symptomatic benefit but no long-term functional benefit. There is good evidence that local steroid injection is superior to oral steroids at 3 months. Given this and the problematic systemic effects of oral steroids, they are not recommended. It may occasionally be appropriate to use oral steroids for patients with severe CTS symptoms who refuse injections and who have no risk factors for adverse effects. For recommendations on the use of steroid injections, see E.4.d.

E.4.c. Orthotics/Immobilization with Splinting

There is some evidence that splinting leads to more improvement in symptoms and hand function than watchful waiting alone. Because of limited patient compliance with day and night splinting in published studies, evidence of effectiveness is limited to nocturnal splinting. Splints should be loose and soft enough to maintain comfort while supporting the wrist in a relatively neutral position. This can be accomplished by using a soft or rigid splint with a metal or plastic support. Some splints include immobilization of the metacarpal-phalangeal joints. Splint comfort is critical and may affect compliance. Off-the-shelf splints are usually sufficient, although custom thermoplastic splints may provide a better fit for certain patients.

Splints may be effective when worn during sleep hours or during portions of the day, depending on activities. Most studies show that full-time night splinting for a total of 4 to 6 weeks is the most effective protocol. Depending on job activities, intermittent daytime splinting can also be helpful. Splint use is rarely mandatory. Providers should be aware that over-usage is counterproductive, and should counsel patients to avoid over-usage.

Splinting is generally effective for milder cases of CTS. Long-term benefit beyond 3 months has not been established. An effect should be seen in 1 to 4 weeks. Splinting is more likely to have some long-term benefit in patients who have less severe paresthesias and pain during sleep hours (less than 6/10) and who have had symptoms for less than 1 year.

- **Time to Produce Effect:** 1 to 4 weeks. If after 4 weeks the patient has partial improvement, continue to follow since neuropathy may worsen even in the face of diminished symptoms.
- **Frequency:** During sleep hours. Daytime intermittent, depending on symptoms and activities.
- **Optimum Duration:** 4 to 8 weeks.
- **Maximum Duration:** 2 to 4 months. If symptoms persist, consideration should be given to either repeating electrodiagnostic studies or to more aggressive treatment.

E.4.d. Steroid Injections

Steroid injections may decrease inflammation and allow the therapist to progress with rehabilitation therapy. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections should be used with caution for patients under 30 years of age.

After steroid injections, some patients can have improved symptoms for one year.

Lower doses of steroids appear to be as effective as higher doses. There is good evidence that injections have better results at 3 months than oral steroids. If following the first injection, symptomatic relief is followed by recurrent symptoms, the decision to perform a second injection must be weighed against alternative treatments such as surgery. Surgery may give more definitive relief of symptoms.

- **Time to Produce Effect:** 1 to 2 injections. If the first injection is unsuccessful and symptoms continue, the second injection should be performed by a specialist with expertise in the anatomy of the upper extremity.
- **Maximum Frequency:** 3 injections in one year.

Diabetics who are candidates for steroid injections should be counseled that a blood glucose increase may be apparent post-intervention, but effects should not last longer than approximately two days.

E.4.e. Therapy: Active

The following active therapies are widely used and accepted methods of care for a variety of work-related injuries. They are based on the philosophy that therapeutic exercise and/or activity are beneficial for

restoring flexibility, strength, endurance, function, range of motion, and alleviating discomfort. Active therapy requires an internal effort by the individual to complete a specific exercise or task, and thus assists in developing skills promoting independence to allow self-care after discharge. This form of therapy requires supervision from a therapist or medical provider such as verbal, visual, and/or tactile instructions. At times a provider may help stabilize the patient or guide the movement pattern but the energy required to complete the task is predominately executed by the patient.

Patients should be instructed to continue active therapies at home as an extension of the treatment process in order to maintain improvement levels. Follow-up visits to reinforce and monitor progress and proper technique are recommended. Home exercise can include exercise with or without mechanical assistance or resistance and functional activities with assistive devices. The following active therapies and modalities are listed in alphabetical order.

E.4.e.i **Activities of Daily Living (ADL)** are well-established interventions that involve instruction, active-assisted training, and/or adaptation of activities or equipment to improve a person's capacity in normal daily activities such as self-care, work re-integration training, homemaking, and driving.

- Time to Produce Effect: 4 to 5 treatments.
- Frequency: 3 to 5 times per week.
- Optimum Duration: 4 to 6 weeks.
- Maximum Duration: 6 weeks.

E.4.e.ii **Functional Activities** are interventions that involve the use of therapeutic activity to enhance mobility, body mechanics, employability, coordination, and sensory motor integration.

- Time to Produce Effect: 4 to 5 treatments.
- Frequency: 3 to 5 times per week.
- Optimum Duration: 4 to 6 weeks.
- Maximum Duration: 6 weeks.

E.4.e.iii **Nerve Gliding exercises** consist of range of motion (ROM) exercises of the upper extremity and neck that produce tension and longitudinal movement along the length of the median and other nerves of the upper extremity.

These exercises are based on the principle that the tissues of the peripheral nervous system are designed for movement, and that tension and glide (excursion) of nerves may have an effect on neurophysiology through alterations in vascular and axoplasmic flow. The exercises are simple to perform and can be done by the patient after brief instruction. Biomechanical principles have been more thoroughly studied than clinical outcomes. Large, well-designed randomized trials have been lacking. There is some evidence from a systematic review that nerve gliding is more effective than no treatment.

- Time to Produce Effect: 2 to 4 weeks.
- Frequency: Up to 5 times per day by patient (patient-initiated).
- Optimum Duration: 2 provider-directed sessions.
- Maximum Duration: 3 provider-directed sessions.

E.4.e.iv **Neuromuscular Re-education** is the skilled application of exercise with manual, mechanical, or electrical facilitation to enhance strength, movement patterns, neuromuscular response, proprioception, kinesthetic sense, coordination education of movement, balance, and posture. Indications include the need to promote neuromuscular responses through carefully timed proprioceptive stimuli, to elicit and improve motor activity in patterns similar to normal neurologically developed sequences, and improve neuromotor response with independent control.

- Time to Produce Effect: 2 to 6 treatments.
- Frequency: 3 times per week.
- Optimum Duration: 4 to 8 weeks.
- Maximum Duration: 8 weeks.

E.4.e.v **Therapeutic Exercise** with or without medical assistance or resistance may include isoinertial, isotonic, isometric,

and isokinetic types of exercises. Indications include: reduce edema, improve muscle strength, improve connective tissue strength and integrity, increase bone density, promote circulation to enhance soft tissue healing, improve muscle recruitment, increase range of motion, and promote normal movement patterns. Can also include complementary/alternative exercise such as movement therapy (with oversight of a physician or other appropriate healthcare professional).

- Time to Produce Effect: 2 to 6 treatments.
- Frequency: 3 to 5 times per week.
- Optimum Duration: 4 to 8 weeks.
- Maximum Duration: 8 weeks.

E.4.f. Therapy: Passive

Most of the following passive therapies and modalities are generally well-accepted methods of care for a variety of work-related injuries. These include treatment modalities that do not require energy expenditure on the part of the patient. They are principally effective during the early phases of treatment and are directed at controlling symptoms such as pain, inflammation, and swelling to improve the rate of healing soft tissue injuries. They should be used in adjunct with active therapies to help control swelling, pain, and inflammation during the rehabilitation process. They may be used intermittently as a therapist deems appropriate or regularly if there are specific goals with objectively measured functional improvements during treatment.

The following passive therapies and modalities are listed in alphabetical order.

E.4.f.i **Acupuncture:** There is some evidence that acupuncture may be effective in symptom relief. No studies have demonstrated long-term functional benefit. This treatment may be used in conjunction with an active therapy program for non-surgical patients who do not improve with splinting and activity modification. It is not known if there are any long-term deleterious neurological effects from acupuncture.

Optimum duration: limited to 10 sessions over 5 weeks.

E.4.f.ii **Electrical Stimulation (Unattended):** Once applied, requires minimal on-site supervision by the physician or non-physician provider. Indications include pain,

inflammation, muscle spasm, atrophy, and decreased circulation.

Electrical stimulation is rarely used in cumulative trauma conditions. It may be appropriate in rare situations when nerve damage or other work-related issues have resulted in muscle atrophy and the patient is unable to engage in sufficient active therapy to increase muscle mass.

- Time to Produce Effect: 2 to 4 treatments.
- Frequency: Varies, depending upon indication, between 2 to 3 times/day to 1 time/week. Provide home unit if frequent use.
- Optimum Duration: 2 to 4 weeks.
- Maximum Duration: Home unit as needed.

E.4.f.iii **Iontophoresis, Magnets or Laser Acupuncture:** There is no evidence for the use of iontophoresis, magnets or laser acupuncture. Therefore these interventions are not recommended.

E.4.f.iv **Low Level Laser:** There is no evidence that low level laser therapy alone is beneficial in changing the outcome for patients with CTS and therefore it is not recommended.

E.4.f.v **Manual Therapy Techniques:** There is no evidence supporting manipulation of the spine for treatment of CTS. There is no clear evidence supporting carpal bone mobilization or manual therapy. However, other myofascial components that may occur with CTS may be treated with manual therapy.

E.4.f.vi **Massage Manual or Mechanical:** Massage is manipulation of soft tissue with broad ranging relaxation and circulatory benefits. This may include stimulation of acupuncture points and acupuncture channels (acupressure), and techniques that include pressing, lifting, rubbing, pinching of soft tissues by or with the practitioners' hands. Indications include edema, muscle spasm, adhesions, the need to improve peripheral circulation and range of motion, or to increase muscle relaxation and flexibility prior to exercise.

- Time to Produce Effect: Immediate.
- Frequency: 1 to 2 times per week.
- Optimum Duration: 6 weeks.
- Maximum Duration: 2 months.

E.4.f.vii

Paraffin Bath: A superficial heating modality that uses melted paraffin to treat irregular surfaces such as the hand. Accepted indications include the need to enhance collagen extensibility before stretching, reduce muscle guarding, or reduce inflammatory response.

- Time to Produce Effect: 1 to 4 treatments.
- Frequency: 1 to 3 times per week.
- Optimum Duration: 4 weeks.
- Maximum Duration: 1 month. If beneficial, provide with home unit or purchase if effective.

E.4.f.viii

Superficial Heat and Cold Therapy: Thermal agents are applied in various manners that lower or raise the body tissue temperature for the reduction of pain, inflammation, and/or effusion resulting from injury or induced by exercise. Includes application of heat just above the surface of the skin at acupuncture points. Indications include acute pain, edema, need to increase pain threshold, reduce muscle spasm and promote stretching/flexibility. Cold and heat packs can be used at home as an extension of therapy in the clinic setting.

- Time to Produce Effect: Immediate.
- Frequency: 2 to 5 times per week (clinic). Home treatment as needed.
- Optimum Duration: 3 weeks as primary or intermittently as an adjunct to other therapeutic procedures up to 2 months.
- Maximum Duration: 2 months. If symptoms persist, consideration should be given to further diagnostic studies or other treatment options.

E.4.f.ix **Ultrasound:** There is some evidence that ultrasound may be effective in symptom relief and in improving nerve conduction in mild-to-moderate cases of CTS. No studies have demonstrated long-term functional benefit. This treatment may be used in conjunction with an active therapy program for non-surgical patients who do not improve with splinting and activity modification. It is not known if there are any long-term deleterious neurological effects from ultrasound.

- Time to Produce Effect: Immediate.
- Frequency: 1 to 2 times per week.
- Optimum Duration: 6 weeks.
- Maximum Duration:
- Ultrasound treatments may extend longer if objective functional gains can be documented or when benefits facilitate progression in the patient's treatment program.

Treatment beyond 12 sessions must be documented with respect to the need and ability to facilitate positive functional gains.

E.4.g. Ongoing Maintenance Care

A maintenance program of PT or OT may be indicated in certain situations, after the determination of MMI, when tied to maintenance of functional status.

- Although the current body of scientific evidence as reviewed does not support the routine use of this intervention, maintenance therapy modalities may be indicated in certain situations in order to maintain functional status, without which an objective deterioration of function has been previously observed and documented in the medical record.
- Specific objective goals should be identified and measured in order to support the need for ongoing maintenance care.
- Progressively longer trials of therapeutic withdrawal are to be attempted to ascertain whether therapeutic goals can be maintained in the absence of clinical interventions.

- Within a year and annually thereafter, a trial without maintenance treatment should be instituted.
- The care of chronic CTS symptoms should include an ongoing patient self-management program performed by the patient regularly and a self-directed pain management program initiated as indicated:
 - An ongoing clinically appropriate self-management program, typically independent, home-based, and self-directed, developed jointly by the provider and patient, should be implemented to encourage physical activity and/or work activities despite residual pain, with the goal of preserving function.
 - In addition to the self-management program, a self-directed pain management plan should be developed, which can be initiated by the patient in the event that symptoms worsen and function decreases.
- If deterioration of ability to maintain function is documented, reinstatement of ongoing maintenance may be acceptable.

Frequency: Maximum up to 10 visits/year, after the determination of MMI, according to objectively documented maintenance of functional status. No variance from the maximum frequency is permitted.

F SURGERY

F.1. SURGICAL INDICATIONS/CONSIDERATIONS

Surgical management of CTS should not preclude the treatment of other upper extremity conditions as indicated. Overall it is probably reasonable to expect that 40 to 50% of patients with mild exam findings may improve or remain stable over time without surgery.

There is strong evidence that surgery is more effective than splinting or injections in producing long-term symptom relief and normalization of median nerve conduction velocity for those patients with clinically significant CTS with positive NCV findings. There is also a positive cost utility for surgery over conservative care for patients with positive nerve conduction studies. There is good evidence that surgery improves symptoms more effectively than steroid injection for up to five months.

In one prospective study, duration of symptoms prior to surgery, up to five years, did not affect the ability to achieve symptom or functional outcome

success with surgery. Patients with more severe symptoms and longer duration of symptoms showed significant improvement with surgery. Patients with thenar atrophy, weakness of the abductor pollicis brevis, and fixed sensory deficits may still improve with surgery. Patients with mild symptoms and functional deficits demonstrated the smallest changes from pre- to postoperative scores. However, their postoperative scores were higher than the postoperative scores of those with more severe symptoms.

F.1.a. Surgery as Initial Therapy

Surgery should be considered an initial therapy in situations where clinical evidence of CTS is present based on the criteria below.

1. Median nerve trauma has occurred: “acute carpal tunnel syndrome,”
or
2. Thenar atrophy is present and due to median nerve compression,
or
3. Electrodiagnostic evidence of moderate to severe compressive neuropathy of the median nerve is present. EMG findings showing evidence of acute or chronic motor denervation suggest the possibility that irreversible damage may be occurring. There is good evidence that surgery is more beneficial than non-surgical treatment for patients with a motor latency of more than 5.0 ms.

For cases with positive EDX findings (see D.3.a.ii) and with a motor latency less than 5.0 ms, non-surgical treatment may be beneficial in some cases; therefore, conservative management, including job alterations, should be tried over 4 to 6 weeks before surgery is considered.

F.1.b. EDX Studies

A clinical impression of moderate to severe CTS with normal EDX studies is very rare and generally indicates a mistaken diagnosis.

- Surgery is generally not recommended in these cases.
- Surgery may be considered in cases where a clinical impression of moderate-to-severe CTS exists, electrodiagnostic testing is normal, and initial non-operative therapy as recommended by these guidelines has failed. The following criteria must be met in deciding whether to proceed to surgery in these cases:

1. The patient's medical history, including symptoms and physical examination findings are specific for clinically-significant CTS (moderate-to-severe).

and

2. There has been no benefit from previous non-operative treatment as described in the current guidelines.

and

3. The patient experiences a significant temporary relief following steroid injection into the carpal tunnel.

F.2 OPERATIVE PROCEDURES

F.2.a. Techniques

Endoscopic and open carpal tunnel release have low rates of serious complications. The most commonly seen serious complications are incomplete transection of the transverse carpal ligament and inadvertent nerve or vessel injuries. Choice of technique should be left to the discretion of the surgeon.

F.2.a.i Neurolysis: Has not been proven advantageous for CTS. Internal neurolysis should never be done. Very few indications exist for external neurolysis.

F.2.a.ii Tenosynovectomy:

- For routine cases of CTS, tenosynovectomy has not proven to be of benefit, and is not recommended.
- Tenosynovectomy may be considered at the time of carpal tunnel release in the unusual case in which CTS is accompanied by rheumatoid arthritis.

F.3 POSTOPERATIVE TREATMENT

F.3.a. Home Therapy

Patients may receive a home therapy protocol involving stretching, ROM, scar management and resistive exercises. Patients should be encouraged to use the hand as much as possible for daily activities, but warned not to overuse their hands in the performance of daily activities. Patients should be encouraged to allow the presence of pain to guide their activities.

F.3.b. Mobilization

There is some evidence showing that immediate mobilization of the wrist following surgery is associated with less scar pain, and faster return to work. Final decisions regarding the need for postoperative splinting should be left to the discretion of the treating physician based upon the surgical technique used and the specific conditions of the patient.

F.3.c. Rehabilitation

An individualized rehabilitation program may be helpful in patients who do not show functional postoperative improvements or in patients with heavy or repetitive job activities. Two postoperative visits are recommended to ensure appropriate scar management and two additional visits, at intervals of four to six weeks afterwards, are recommended to ensure appropriate return to function.

The postoperative rehabilitation program should be based upon communication between the treating physician and the therapist. In all cases, communication between the physician and therapist is important to the timing of exercise progression.

- Time to Produce Effect: Immediate.
- Frequency: 2 to 3 times a week.
- Optimum duration: 6 weeks.
- Maximum duration: 12 weeks.

Communication is essential between the patient, employer and physician to determine appropriate restrictions and return-to-work dates. It is the responsibility of the physician to provide clear and concise restrictions, and it is the employer's responsibility to determine if temporary duties can be provided within the restrictions.

F.3.d. Considerations for Repeat Surgery

The single most important factor in predicting symptomatic improvement following carpal tunnel release is the severity of preoperative neuropathy. Patients with moderate electrodiagnostic abnormalities have better results than those with either very severe and/or mild findings. Incomplete cutting of the transverse carpal ligament or iatrogenic injury to the median nerve are rare.

If median nerve symptoms do not improve following initial surgery, or symptoms recur after initially improvement, but are unresponsive to non-operative therapy, consider the following:

- Repetitive work activities may be causing recurrent CTS.
- Scarring.
- Work-up for systemic diseases.

A second opinion by a hand surgeon and repeat nerve conduction studies are required if repeat surgery is contemplated. The decision to undertake repeat surgery must factor in all of the above possibilities. Results of surgery for recurrent CTS vary widely depending on the etiology of recurrent symptoms. A repeat surgery is subject to the existing regulations (12 NYCRR 324.2(d)(3)) regarding the pre-authorization requirement.

APPENDIX

TABLE A. Differential Diagnosis of Upper Extremity Musculoskeletal and Peripheral Nerve Conditions

Diagnosis	Symptoms	Signs - Common Findings
Aggravated Osteoarthritis of the Wrist	Pain usually in the carpal-metacarpal joints, or in metacarpal-phalangeal joints	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Positive grind test resulting in pain; crepitus; • Subluxation of the metacarpal may be induced in advanced cases; • Swelling; • Reduced motion; • Angular deformities; • Tenderness with palpation of thumb phalangeal-metacarpal or carpal-metacarpal joint.
de Quervain's Disease	Tenderness over the first dorsal extensor compartment (anatomical snuff box)	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Pain worsened by resisted thumb abduction and/or extension with or without resistance; • Positive Finkelstein's test.
Epicondylitis-Lateral Epicondylalgia	Elbow pain over the lateral epicondyle increased with gripping	<p>Tenderness to palpation at/near lateral epicondyle and pain over the lateral epicondyle and/or extensor mass of the forearm with one of the following maneuvers:</p> <ul style="list-style-type: none"> • Active or resisted wrist extension; • Active or resisted middle finger extension; • Active or resisted supination.

Diagnosis	Symptoms	Signs - Common Findings
Epicondylitis-Medial Epicondylalgia	Elbow pain over the medial epicondyle	Tenderness to palpation at/near medial epicondyle and pain over the medial epicondyle and/or flexor mass of the forearm with one of the following maneuvers: <ul style="list-style-type: none"> • Active or resisted wrist flexion; • Active or resisted pronation.
Extensor Tendon Disorders of the Wrist	Pain localized to the affected tendons(s) worsened by wrist or finger extension	Pain and/or tenderness with active or resisted wrist/digit extension, specific to the extensor mechanism involved.
Flexor Tendon Disorders of the Wrist	Pain/tenderness localized to affected tendons	Reproduction of pain with active or resisted wrist/digit flexion or ulnar deviation specific to the flexor mechanism involved.
Triangular Fibrocartilage Complex Test (TFCC)	Symptoms mainly on ulnar side of the wrist	Tenderness over the TFCC complex and localized pain, clicking, or findings of abnormal motion with one of the following movements: <ul style="list-style-type: none"> • Forced supination and pronation with axial pressure on an ulnar deviated wrist; • The patient pushes up from a sitting position using the hand, and/or • Ballotment of the distal ulna with the wrist supinated causes abnormal motion as compared to the asymptomatic side.
Trigger Finger	Difficulty flexing the finger with a catching or triggering sensation	One of the following: <ul style="list-style-type: none"> • Tenderness of the A-1 pulley with finger flexion; • Triggering of the digit; • Difficulty flexing and extending the finger with a palpable nodule.

TABLE B. Specific Peripheral Nerve Diagnoses

Diagnosis	Symptoms	Signs - Common Findings
Carpal Tunnel Syndrome	<ul style="list-style-type: none"> • Specific paresthesias in two of the following digits: thumb, index, and middle finger • Shaking of the hand (to relieve symptoms) and nocturnal symptoms are common 	<p>At least one of the following:</p> <ul style="list-style-type: none"> • Positive Phalen’s sign; • Positive Tinel’s sign over the carpal tunnel; • Positive compression test; • Thenar atrophy may be present later in course; • Weakness of abductor pollicis brevis;
Cubital Tunnel Syndrome	Paresthesias or dull, aching sensations in the 4 th and 5 th digits (ring and small fingers) and discomfort near the medial aspect of the elbow	<p>Paresthesias or dull aching sensations in the 4th and 5th digits and at least one of the following exam findings:</p> <ul style="list-style-type: none"> • Diminished sensation of the fifth and ulnar half of the ring fingers, which may sometimes include sensory loss to pinprick, light touch, two-point discrimination or Semmes-Weinstein monofilament tests in an ulnar nerve distribution.
Guyon Canal (Tunnel) Syndrome	Paresthesias in the 4 th and 5 th digits (ring and small fingers) without proximal ulnar complaints	<p>At least one of the following exam findings:</p> <ul style="list-style-type: none"> • Positive Tinel’s at hook of hamate; • Numbness or paresthesias of the palmar surface of the ring and small fingers; • Decreased strength of the adductor pollicis, abductor digiti minimi, and/or lumbricals.
Posterior Interosseous Nerve Entrapment (PIN)	Weakness of finger and thumb extension	Weakness or inability to extend fingers or thumb.

Diagnosis	Symptoms	Signs - Common Findings
<p>Pronator Syndrome</p>	<p>Pain/paresthesias in the median nerve distribution distal to the elbow</p>	<p>Paresthesias in the median nerve distribution and at least one of the following reproduces median nerve symptoms:</p> <ul style="list-style-type: none"> • Resisted pronation with elbow flexed at 90 degrees or elbow extended; • Positive Tinel’s at the proximal edge of the pronator teres muscle over the median nerve.
<p>Radial Tunnel Syndrome</p>	<p>Pain over the lateral posterior forearm. May occur in conjunction with and must be distinguished from lateral epicondylitis.</p> <p>May include paresthesias over the dorsal radial hand and wrist.</p>	<p>The following two elements are required:</p> <ul style="list-style-type: none"> • Tenderness over the radial nerve near the proximal edge of the supinator muscle; • Resisted supination or resisted middle finger extension with the forearm pronated and extended reproduces symptoms.

INDEX

- Active Interventions, 3
- Active Therapeutic Exercise Program, 3
- Activities of Daily Living, 20
- Acupuncture, 22
- Continuation Activities, 17
- Delayed Recovery, 2
- Diagnosis, 3, 12
- Diagnostic Imaging And Testing
 - Procedures, 3
- Diagnostic Testing, 13
- Diagnostic Time Frames, 2
- Differential Diagnosis, 31
- Education, 2, 3, 17
- Electrical Stimulation, 22
- Electrodiagnostic Testing, 13
- Experimental Treatment, 7
- FCE, 5
- Functional Activities, 20
- Functional Capacity Evaluation. See FCE
- General Guideline Principles, 1
- Guideline Recommendations And
 - Medical Evidence, 6
- Heat and Cold Therapy, 24
- History, 8, 9
- History Taking, 3
- Home Therapy, 28
- Injured Workers As Patients, 7
- Iontophoresis, 23
- Job Site Evaluation, 6
- Laboratory Testing, 10
- Laser Acupuncture, 23
- Low Level Laser, 23
- Magnets, 23
- Manual Therapy Techniques, 23
- Massage, 23
- Medical Care, 1, 5
- Medications, 17
- Mobilization, 29
- Nerve Gliding, 21
- Neuromuscular Re-education, 21
- Ongoing Maintenance Care, 25
- Operative Procedures, 28
- Orthotics, 18
- Paraffin Bath, 24
- Personality/Psychological/Psychosocial
 - Evaluations, 4
- Personality/Psychological/Psychosocial
 - Intervention, 5
- Physical Examination, 3, 10, 12
- Positive Patient Response, 1
- Postoperative, 28
- Radiographic tests, 16
- Re-evaluate Treatment, 1
- Rehabilitation, 29
- Repeat Surgery, 29
- Return To Work, 5
- Scope of Practice, 7

Signs and Symptoms, 12
Six-Month Time Frame, 2
Splinting, 18
Steroids, Injections, 19
Steroids, Oral, 18
Surgery, 26
Surgical Interventions, 3
Therapeutic Exercise, 3

Therapy, Active, 19
Therapy, Passive, 22
Treatment, 17, 28
Treatment Time Frames, 2
Ultrasound, 25
Vitamin B6, 18
Work Relatedness, 10

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