

RULE 17, EXHIBIT 5

**Cumulative Trauma Conditions
Medical Treatment Guidelines**

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**Department of Labor and Employment
DIVISION OF WORKERS' COMPENSATION**



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DEPARTMENT OF LABOR AND EMPLOYMENT

Division of Workers' Compensation

CCR 1101-3
Rule 17, EXHIBIT 5

CUMULATIVE TRAUMA CONDITIONS MEDICAL TREATMENT GUIDELINES

A. INTRODUCTION

This document has been prepared by the Colorado Department of Labor and Employment, Division of Workers' Compensation (Division) and should be interpreted within the context of guidelines for physicians/providers treating individuals qualifying under Colorado's Workers' Compensation Act as injured workers with cumulative trauma conditions.

Although the primary purpose of this document is advisory and educational, these guidelines are enforceable under the Workers' Compensation Rules of Procedure, 7 CCR 1101-3. The Division recognizes that acceptable medical practice may include deviations from these guidelines, as individual cases dictate. Therefore, these guidelines are not relevant as evidence of a provider's legal standard of professional care.

To properly utilize this document, the reader should not skip nor overlook any sections.

B. GENERAL GUIDELINES PRINCIPLES

The principles summarized in this section are key to the intended implementation of all Division of Workers' Compensation guidelines and critical to the reader's application of the guidelines in this document.

1. **APPLICATION OF THE GUIDELINES** The Division provides procedures to implement medical treatment guidelines and to foster communication to resolve disputes among the provider, payer and patient through the Worker's Compensation Rules of Procedure. In lieu of more costly litigation, parties may wish to seek administrative dispute resolution services through the Division or the office of administrative courts.
2. **EDUCATION** of the patient and family, as well as the employer, insurer, policy makers and the community should be the primary emphasis in the treatment of CTCs and disabilities. Currently, practitioners often think of education last, after medications, manual therapy, and surgery. Practitioners must develop and implement an effective strategy and skills to educate patients, employers, insurance systems, policy makers and the community as a whole. An education based paradigm should always start with inexpensive communication providing reassuring information to the patient. More in-depth education currently exists within a treatment regime employing functional restorative and innovative programs of prevention and rehabilitation. 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.
3. **TREATMENT PARAMETER DURATION** Time frames for specific interventions commence once treatments have been initiated, not on the date of injury. Obviously, duration will be impacted by 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.
4. **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 interventions are viewed as a means to facilitate progress in an active rehabilitation program with concomitant attainment of objective functional gains.
5. **ACTIVE THERAPEUTIC EXERCISE PROGRAM** goals should incorporate patient strength, endurance, flexibility, coordination, and education. This includes functional application in vocational or community settings.
6. **POSITIVE PATIENT RESPONSE** 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 (ROM), strength and 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. Anatomic correlation must be based on objective findings.
7. **RE-EVALUATE TREATMENT EVERY 3 TO 4 WEEKS** If a given treatment or modality is not producing positive results within 3 to 4 weeks, the treatment should be either modified or discontinued. Reconsideration of diagnosis should also occur in the event of poor response to a seemingly rational intervention.

8. **SURGICAL INTERVENTIONS** should be contemplated within the context of expected functional outcome and not purely for the purpose of pain relief. 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 diagnostic tests. A comprehensive assimilation of these factors must lead to a specific diagnosis with positive identification of pathologic condition(s).
9. **SIX-MONTH TIME FRAME** 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. It is important to note that time frames may not be pertinent to injuries that do not involve work-time loss or are not occupationally related.
10. **RETURN-TO-WORK** is therapeutic, assuming the work is not likely to aggravate the basic problem or increase long-term pain. The practitioner must provide specific physical limitations and the patient should never be released to “sedentary” or “light duty.” The following physical limitations should be considered and modified as recommended: lifting, pushing, pulling, crouching, walking, using stairs, bending at the waist, awkward and/or sustained postures, tolerance for sitting or standing, hot and cold environments, data entry and other repetitive motion tasks, sustained grip, tool usage and vibration factors. Even if there is residual chronic pain, return-to-work is not necessarily contraindicated.

The practitioner should understand all of the physical demands of the patient's job position before returning the patient to full duty and should request clarification of the patient's job duties. Clarification should be obtained from the employer or if necessary, including, but not limited to a health care professional with experience in ergonomics, vocational rehabilitation specialist, or an industrial hygienist.

11. **DELAYED RECOVERY** Strongly consider a psychological evaluation, if not previously provided, as well as initiating interdisciplinary rehabilitation treatment and vocational goal setting, for those patients who are failing to make expected progress 6 to 12 weeks after an injury. The Division recognizes that 3 to 10% of all industrially injured patients will not recover within the timelines outlined in this document despite optimal care. Such individuals may require treatments beyond the limits discussed within this document, but such treatment will require clear documentation by the authorized treating practitioner focusing on objective functional gains afforded by further treatment and impact upon prognosis.
12. **GUIDELINE RECOMMENDATIONS AND INCLUSION OF MEDICAL EVIDENCE** are recommendations based on available evidence and/or consensus recommendations. When possible, guideline recommendations will note the level of evidence supporting the treatment recommendation. When interpreting medical evidence statements in the guideline, the following apply:

Consensus means the opinion of experienced professionals based on general medical principles. Consensus recommendations are designated in the guideline as “generally well accepted,” “generally accepted,” “acceptable/accepted,” or “well-established.”

“Some” means the recommendation considered at least one adequate scientific study, which reported that a treatment was effective.

“Good” means the recommendation considered the availability of multiple adequate scientific studies or at least one relevant high-quality scientific study, which reported that a treatment was effective.

“Strong” means the recommendation considered the availability of multiple relevant and high quality scientific studies, which arrived at similar conclusions about the effectiveness of a treatment.

All recommendations in these guidelines are considered to represent reasonable care in appropriately selected cases, regardless of the level of evidence or consensus statement attached to it. Those procedures considered inappropriate, unreasonable, or unnecessary are designated in the guideline as being “not recommended.”

13. **CARE BEYOND MAXIMUM MEDICAL IMPROVEMENT (MMI)** should be declared when a patient’s condition has plateaued to the point where the authorized treating physician no longer believes further medical intervention is likely to result in improved function. However, some patients may require treatment after MMI has been declared in order to maintain their functional state. The recommendations in this guideline are for pre-MMI care and are not intended to limit post-MMI treatment.

The remainder of this document should be interpreted within the parameters of these guidelines principles that may lead to more optimal medical and functional outcomes for injured workers.

C. DEFINITIONS AND MECHANISMS OF INJURY

Cumulative trauma related conditions of the upper extremity comprise a heterogeneous group of diagnoses which include numerous specific clinical entities including disorders of the muscles, tendons and tendon sheaths, nerves, joints and neurovascular structures.

The terms “cumulative trauma disorder”, “repetitive motion syndrome”, “repetitive strain injury”, “myofascial pain” and other similar nomenclatures are umbrella terms that are not acceptable, specific diagnoses. The health care provider must provide specific diagnoses in order to appropriately educate, evaluate, and treat the patient. Examples include: de Quervain’s disease, cubital tunnel syndrome, and lateral/medial epicondylitis (epicondylalgia). Many patients present with more than one diagnosis, which requires a thorough upper extremity and cervical evaluation by the health care provider. Furthermore, there must be a causal relationship between work activities and the diagnosis (See Initial Diagnostic Procedures). The mere presence of a diagnosis that may be associated with cumulative trauma does not presume work-relatedness unless the appropriate work exposure is present.

Mechanisms of injury for the development of cumulative trauma related conditions have been controversial. However, repetitive awkward posture, force, vibration, cold exposure, and combinations thereof are generally accepted as occupational risk factors for the development of cumulative trauma related conditions.

Evaluation of cumulative trauma related conditions require an integrated approach that incorporates ergonomics assessment clinical assessment, past medical history and psychosocial evaluation on a case-by-case basis.

The normal working age population may often have non-specific pain complaints that require minimum treatment and may be considered part of the normal aging process. When pain continues or a complete history indicates a potential for other diagnoses, a medical workup is necessary to screen for other diseases. However, in cases where there is no specific diagnosis and corresponding work related etiology, the work-up should generally be performed outside of the workers compensation system.

D. INITIAL DIAGNOSTIC PROCEDURES

The Division recommends the following diagnostic procedures be considered, at least initially, the responsibility of the workers' compensation carrier to ensure that an accurate diagnosis and treatment plan can be established. Standard procedures that should be utilized when initially diagnosing a work-related upper extremity complaint are listed below.

1. **HISTORY TAKING AND PHYSICAL EXAMINATION (Hx & PE)** are generally accepted, well-established and widely used procedures that establish the foundation/basis for and dictates subsequent stages of diagnostic and therapeutic procedures. When findings of clinical evaluations and those of other diagnostic procedures are not complementing each other, the objective clinical findings should have preference. The medical records should reasonably document the following:

- a. **History of Present Injury:**

- i. Age, hand dominance, gender should be documented.
- ii. Onset: date of onset, triggering event (if present) versus gradual onset. Activity at/or before onset of symptoms.
- iii. Nature of symptoms: pain, numbness, tingling, weakness, swelling, stiffness, temperature change, moisture change, color change.
- iv. 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, especially during the first 2 weeks following injury to assure that all work related symptoms are addressed.

Use comprehensive pain diagrams as it is important to solicit the reporting of more proximal symptoms.

Evaluate the patient's overall pain behavior. The behavior should be consistent with the current pain levels reported by the patient.

- v. Provocative and alleviating factors (occupational and non-occupational): identify the specific physical factors that are aggravating or alleviating the problem.
- vi. Sleep disturbances.
- vii. Other associated signs and symptoms noted by the injured worker.
- viii. Ability to perform activities of daily living (ADLs). ADLs include: such activities as self-care and personal hygiene, communication, ambulation, attaining all normal living postures, travel, non-specialized hand activities, sexual function, sleep, and social and recreational activities. Specific movements in this category include: pinching or grasping keys/pens/other small objects (brushing teeth, doing laundry), grasping telephone receivers or cups or other similar-sized objects, and opening jars. The quality of these activities is judged by the independence, appropriateness, and effectiveness, with which they are completed.

Assess not simply the number of restricted activities, but the overall degree of restriction or combination of restrictions.

- ix. Prior occupational and non-occupational injuries to the same area including specific prior treatment and any prior supportive devices.
- x. Discussion of any symptoms present in the uninjured extremity.

b. Relationship to Work and Other Activity:

Assess the individual's ability to perform job duties: this may include a jobsite evaluation as well as the patient's description of the job duties.

Job title alone is not sufficient information. The clinician is responsible for documenting specific information regarding repetition, force, other risk factors and duration of employment. Refer to risk factors as listed in the tables entitled 'Primary Risk Factor Definitions and Diagnosis Based Risk Factors.' A formal jobsite evaluation may be required.

Information must be obtained regarding other employment, sports, recreational, and avocational activities that might contribute to, or be impacted by CTC development. Activities such as hand operated video games, crocheting/needlepoint; baseball/softball playing musical instruments, home computer operation, golf, tennis, and gardening are included in this category. Duration of these activities should be documented.

c. Past History:

- i. Demographics.
- ii. Past injury/symptoms involving the upper extremities, trunk and cervical spine.
- iii. Past work-related injury or occupational disease.
- iv. Past personal injury or disease that resulted in temporary or permanent job limitation.
- v. Medical conditions associated with cumulative trauma: The following are examples of medical conditions which have been commonly seen in association with cumulative trauma conditions. These require treatment and may impact the recovery of the work comp injury.
 - A) Amyloidosis;
 - B) Arthropathies including connective tissue disorders, rheumatoid arthritis, systemic lupus erythematosus, gout, osteoarthritis and spondyloarthropathy;
 - C) Cancer;
 - D) Diabetes mellitus, including family history or gestational diabetes;
 - E) Hypothyroidism, especially in older females;

- F) Obesity;
- G) Pregnancy.
- vi. History of smoking and alcohol use; history of substance abuse;
- vii. Medication history including, birth control pills, corticosteroid use, and other prescription and non-prescription medication; and
- viii. Psychosocial history.

- d. **Physical Examination:** The evaluation of any upper extremity complaint 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), body type (e.g. mesomorph, ectomorph, etc.), and anthropometric measurements, (e.g. body mass index [BMI]) should be documented. Behavioral adaptations to symptoms should be documented. Additional physical exam components may be necessary based on past medical history.

A neurological examination typically includes bilateral assessments of pinprick, 2 point sensation as applicable, motor strength and reflexes. Similar assessments of the upper extremities including a vascular assessment may be performed as this will provide information regarding polyneuropathic processes such as diabetic neuropathy. Vibratory sense and Achilles reflexes are frequently lost in diabetic neuropathy. Decreased response to cold temperature or pain response to cold temperature has been related to radicular findings in the spine as discriminated from axial pain.

To confirm a reported hypoalgesic area, some examiners may choose to complete multiple tests that may be done with the patient's eyes closed: 1) having the patient say yes or no whenever they think a stimulus has been applied; 2) repeatedly redefining the affected area.

Refer to the Physical Examination and Findings Reference Table for details.

SEE NEXT PAGE

Physical Examination Findings Reference Table

Section F.		Specific Musculoskeletal Diagnosis
DIAGNOSIS	SYMPTOMS	SIGNS (Required Findings)
Aggravated Osteoarthritis of the Wrist.	Pain usually in the carpal-metacarpal joints; or in metacarpal-phalangeal joints.	<p><u>At least one of the following:</u></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><u>At least one of the following:</u></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.
Epicondylitis-Medial (Epicondylalgia)	Elbow pain over the medial epicondyle.	<p>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:</p> <ul style="list-style-type: none"> • Active or resisted wrist flexion; • Active or resisted pronation.
Extensor Tendon	Pain localized to the affected tendon(s) worsened by wrist or finger extension.	Pain and/or tenderness with active or resisted wrist/digit extension, specific to

Section F.	Specific Musculoskeletal Diagnosis	
Disorders of the Wrist		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 Tear (TFCC)	Symptoms mainly on ulnar side of the wrist.	<p>Tenderness over the TFCC complex and localized pain, clicking, or findings of abnormal motion with one of the following movements:</p> <ul style="list-style-type: none"> • Forced supination and pronation with axial pressure on an ulnar deviated wrist; • The patient pushes up from a seating 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.	<p>One of the following:</p> <ul style="list-style-type: none"> • Tenderness at the A-1 pulley with finger flexion; • Triggering of the digit; • Difficulty flexing and extending the finger with a palpable nodule.

Physical Exam Findings Reference (continued):

Section G	Specific Peripheral Nerve Diagnosis	
DIAGNOSIS	SYMPTOMS	SIGNS (Required Findings)
Carpal Tunnel Syndrome	<ul style="list-style-type: none"> • Specific paresthesias in 2 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 closed fist test; • Positive compression test; • Thenar atrophy may be present later in course; • Weakness of abductor pollicis brevis; • Sensory loss to pinprick, light touch, two-point discrimination or Semmes-Weinstein monofilament tests in a median nerve distribution.
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 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; • Positive elbow flexion/ulnar compression test; • Later stages manifested by: intrinsic atrophy and ulnar innervated intrinsic weakness; Wartenberg's sign; Froment's sign.
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;

Section G	Specific Peripheral Nerve Diagnosis	
		<ul style="list-style-type: none"> • 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;
Pronator Syndrome	Pain/paresthesias in the median nerve distribution distal to the elbow.	Paresthesias in the median nerve distribution and at least one of the following reproduces median nerve symptoms: <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.
Radial Tunnel Syndrome	Pain over the lateral posterior forearm. May occur in conjunction with and must be distinguished from lateral epicondylitis. May include paresthesias over the dorsal radial hand and wrist.	The following two elements are required: <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.

2. **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, arthritis, and related inflammatory diseases. The presence of concurrent disease does not refute work-relatedness of any specific case. This frequently requires laboratory testing. In one study of patients with cumulative trauma conditions other than carpal tunnel syndrome, seen by specialists, 3% of patients were diagnosed with diabetes, 6% with hypothyroidism, and 9% with chronic inflammatory disease including spondyloarthritis, arthritis, and systemic lupus erythematosus. Up to two thirds of the patients were not aware of their concurrent disease. When a patient's history and physical examination suggest infection, metabolic or endocrinologic disorders, tumorous conditions, systemic musculoskeletal disorders (e.g., rheumatoid arthritis or ankylosing spondylitis), or problems potentially related to medication (e.g., renal disease and non-steroidal anti-inflammatory medications), then laboratory tests, including, but not limited to the following can provide useful diagnostic information:

- a. Serum rheumatoid factor, antinuclear antigen (ANA), human leukocyte antigen (HLA)-B27 titre for rheumatoid work-up;
- b. Thyroid stimulating hormone (TSH) for hypothyroidism;

- c. Diabetic screening - recommended for men and women with a BMI over 30, patients with a history of family diabetes, those from high risk ethnic groups, and with a previous history of impaired glucose tolerance. A fasting blood-glucose greater than 125mg/dl is diagnostic for diabetes. Urine dipstick is a specific but not sensitive screening test for testing glucose level. Quantitative urine glucose is sensitive and specific in high-risk populations. There is some evidence that diabetic patients with upper extremity disorders are more likely to be under poor diabetic control. Therefore, it is appropriate to order a hemoglobin A1c for any diabetic patients with a CTC.
- d. Serum protein electrophoresis;
- e. Sedimentation rate and C-reactive protein (CRP) are nonspecific, but elevated in infection, neoplastic conditions and rheumatoid arthritis;
- f. Serum calcium, phosphorus, uric acid, alkaline and acid phosphatase for metabolic, endocrine and neo-plastic conditions;
- g. Complete blood count (CBC), liver and kidney function profiles for metabolic or endocrine disorders, or for adverse effects of various medications;
- h. Bacteriological (microorganism) work-up for wound, blood and tissue;
- i. Serum B6 – routine screening is not recommended due to the fact that Vitamin B6 supplementation has not been proven to affect the course of carpal tunnel syndrome. However, it may be appropriate for patients on medications that interfere with the effects of Vitamin B6, or for those with significant nutritional problems.

The Division recommends that lab diagnostic procedures be initially considered the responsibility of the workers' compensation carrier to ensure that an accurate diagnosis and treatment plan can be established. Laboratory testing may be required periodically to monitor patients on chronic medications.

3. MEDICAL CAUSATION ASSESSMENT FOR CUMULATIVE TRAUMA CONDITIONS

General Principles of Causation Assessment

The clinician must determine if it is medically probable (greater than 50% likely or more likely than not) that the need for treatment in a case is due to a work-related exposure or injury. Treatment for a work-related condition is covered when: 1) the work exposure causes a new condition; or 2) the work exposure causes the activation of a previously asymptomatic or latent medical condition; or 3) the work exposure combines with, accelerates, or aggravates a pre-existing symptomatic condition. In legal terms, the question that should be answered is: "Is it medically probable that the patient would need the treatment that the clinician is recommending if the work exposure had not taken place?" If the answer is "yes," then the condition is not work-related. If the answer is "no," then the condition is most likely work-related. In some cases, the clinician may need to order diagnostic testing or jobsite evaluations to make a judgment on medical probability. The following steps should be used to evaluate causality in CTC cases:

Step 1: Make a specific and supportable diagnosis. Remember that cumulative trauma, repetitive strain and repetitive motion are not diagnoses. Examples of appropriate

diagnoses include: specific tendonopathies, strains, sprains, and mono-neuropathies. Refer to Sections F (Specific Musculoskeletal Disorders) and G (Specific Peripheral Nerve Disorders) for the specific findings of common CTCs.

- Step 2:** Determine whether the disorder is known to be or is plausibly associated with work. The identification of work-related risk factors is largely based on comparison of risk factors (as described in Section D.3. a. & b. Foundations for Evidence of Occupational Relationships and Using Risk Factors to Determine Causation) with the patient's work tasks.
- Step 3:** Interview the patient to find out whether risk factors are present in sufficient degree and duration to cause or aggravate the condition. Consider any recent change in the frequency or intensity of occupational or non-occupational tasks. In some cases, a formal jobsite evaluation may be necessary to quantify the actual ergonomic risks. Refer to the Jobsite Evaluation Section E.6.c.
- Step 4:** Complete the required match between the risk factors identified on the Risk Factor Table and the established diagnosis using the system described in Section D. 3. b.
- Step 5:** Determine whether a temporal association exists between the workplace risk factors and the onset or aggravation of symptoms.
- Step 6:** Identify non-occupational diagnoses, such as rheumatoid arthritis, obesity, diabetes, as well as avocational activities, such as golf and tennis. This information infrequently affects the work-related causation decision. It may be applicable when exposure levels are low and the case does not meet evidence-based criteria.

- a. **Foundations for Evidence of Occupational Relationships:** All results described in this section are a result of a thorough review of the epidemiologic literature available at the time of this guideline. The studies most heavily relied upon healthy worker populations with a variety of exposures, not all of which were well-described quantitatively. No single epidemiologic study fulfills all criteria for causality. The clinician must recognize that currently available epidemiologic data is based on population results. Individual variability lies outside the scope of these studies and must be addressed by the physician on a case-by-case basis. The clinician is responsible for documenting specific information regarding the force, posture, repetition, and other risk factors as listed in the table entitled "Risk Factors Definitions." Job title alone is not sufficient to determine the risk factors. A jobsite evaluation is usually necessary.

Many studies have been completed in industrial settings focusing on cumulative trauma conditions or upper extremity complaints in relationship to work exposures. The studies vary in several ways that directly affect the interpretation of their results. Studies with 1) an accepted clinical exam confirming the diagnosis and 2) work exposures validated by direct observation, or questionnaires that were correlated with direct observation, provide the strongest evidence. Well-done, prospective, longitudinal studies (cohort studies) are preferred; however for uncommon disorders, these studies may not be able to identify the causal factors. We considered other large prevalence and incidence studies when minimum quality criteria had been met and the self-reported exposure uses reliable questionnaires.

Many studies report symptoms rather than disease conditions. These studies are useful for ergonomic research or as pilot studies but do not directly affect the

evidence level for causation. They are mentioned, when useful, as indirect evidence. If multiple well-done symptom studies show no increase in symptomatology with specific activities, it follows that there is very little chance that the studied exposure causes disease.

In addition, there are a few studies which address less common musculoskeletal diagnoses or peripheral nerve conditions other than carpal tunnel syndrome, such as posterior interosseus nerve entrapment and pronator syndrome. In these cases, we rely upon studies which report the risks for related conditions.

Many of the original studies identifying diagnosable cumulative trauma conditions were performed in manufacturing industries and meat, fish and poultry processing companies. In these industries most workers are exposed to highly repetitive mono-task jobs which frequently involve a forceful grip, awkward postures, vibration, and cold environments. The evidence for increased disorders when these multiple risk factors are present is compelling. Research attempting to define clear, threshold exposure limits for increased risk from isolated tasks and/or intermittent exposures has less consistent results.

The quality of keyboarding studies is highly variable. Most of the studies rely on self report. Self report appears to approximately double the actual time spent using the keyboard. Some studies show distortion highest in the medium range of use. There appears to be less inflation for self reported mouse use. Fortunately a few studies have provided more objective keyboard use data.

The group of studies now available provides good evidence that keyboarding in a reasonable ergonomic posture (wrist with 30 degrees or less of extension and 15 degrees or less of radial deviation) up to 7 hours per day under usual conditions is very unlikely to cause carpal tunnel syndrome or other upper extremity disorders. This is based on studies of carpal tunnel pressure under a variety of typing and wrist positions as well as a number of studies of workers who keyboard on a regular basis. Clinicians may determine in a particular case that there is a relationship based on the ergonomic conditions or on excessive typing, such as more than 7 hours per day of essentially uninterrupted keyboard use per day or full-day court reporting.

There is some evidence that mouse use appears to be associated with carpal tunnel syndrome and related symptoms with 4 hours or greater per day of continuous use. Studies of pressure within the carpal tunnel indicated that pressures may rise to levels which could affect the median nerve when the mouse is being dragged or clicked. Again the actual ergonomics of the work place should be considered for each individual patient before making a final causation decision.

There was a large variety in assessment strategies for lower quality studies. Examples included: symptom only reports; dichotomous choices for exposures, e.g. 1 hour or less per week repetitive activities versus more than 1 hour per week; self report data that does not follow basic pathophysiology, e.g. mouse use between 2.5 & 5 hours per week causing wrist pain; and bias introduced due to prior knowledge of the participants regarding expected work & symptom correlations. In order to reasonably integrate the volume of disparate data, interpretation of lower quality studies took into account reasonable pathophysiology and exposure limits. Dose response relationships were also examined to look for trends in exposure which resulted in increased disease or symptoms.

Most studies were unable to truly assess repetition alone, unassociated with other risk factors. Indirect evidence from a number of studies supports the conclusion that task repetition up to 6 hours per day unaccompanied by other risk factors is not causally associated with cumulative trauma conditions. Risk factors that are likely to be associated with specific CTC diagnostic categories include: extreme wrist or elbow postures; force including regular work with hand tools greater than 1 kg or tasks requiring greater than 50% of an individual's voluntary maximal strength; work with vibratory tools at least 2 hours per day; or cold environments.

The variability in study design presented a challenge for creating physiologically reasonable hour limits for the specific primary and secondary risk factors. We chose the strongest studies for the specific risks involved and extrapolated the measures utilizing the number of quartiles in the working day the person was exposed, or the exposure groups themselves. For example, $\frac{3}{4}$ of a day exposure was translated to a 6 hour exposure and exposure groups working on assembly lines or in similar employment were also assumed to be performing the same tasks for at least 6 hours per day. This cut-off corresponds the best to studies which found positive diagnoses in workers performing repetitive jobs with at least one other risk factor. These constitute our primary risk factor definitions. For the secondary risk factor definitions one study provided direct evidence of 4 hours for the most common risks. We also found indirect evidence from other studies, such as one assessing upper extremity functional impairment and another determining the presence of upper extremity symptoms that 4 hours was a reasonable cut off point for determining physiologically acceptable secondary risks.

No studies examined the relationship between the development of ganglion cysts and work activities; however, work activities, such as bending or twisting of the wrist repetitively, may cause an aggravation of existing ganglion cysts that interferes with function.

Aggravation of a pre-existing medically established diagnosis must be determined on an individual case basis. A comparison of the worker's specific job duties with usual activities of daily living and the occupational risk factors should contribute to the discussion.

Non-occupational exposures

Most studies demonstrate an association of cumulative trauma conditions with older age; high BMI; the presence of other upper extremity musculoskeletal diagnoses; related diseases such as auto-immune conditions, diabetes, hypothyroidism and rheumatologic diseases; and psychosocial issues including relationships with supervisors. The influence of these non-occupational risk factors varies according to the specific diagnoses involved. While the presence of any of these additional factors may be viewed as contributing to the disorder in question, that does not refute the actual evidence from the defined risk factors supporting a specific work related condition.

Use the Risk Factor Definition and Diagnosis Based Risk Factors tables with the following direction to formulate the causation of diagnoses established as cumulative trauma conditions.

b. Using Risk Factors to Determine Causation (Directions):

The physician should perform the following:

Step 1. Determine the diagnosis.

Using the history, physical examination and supporting studies, a medical diagnosis must be established. Refer to Section F (Specific Musculoskeletal Disorders and G (Specific Peripheral Nerve Disorders).

Step 2. Clearly define the job duties of the worker.

Do not rely solely on the employer's description of job duties. The worker's description of how they actually perform the duties is extremely important. Jobsite evaluations are always appropriate, but are sometimes unnecessary when the physician can identify the job duty which appears to be causing the symptoms and provide a method for ergonomically correcting the activity.

Step 3. Compare the worker's duties with the Primary Risk Factor Definition Table.

Hours are calculated by adding the total number of hours per day during which the worker is exposed to the defined risk. Breaks, time performing other activities and inactive time are not included in the total time. When the employee meets the definition for a sole Primary Risk Factor and the risk factor is physiologically related to the diagnosis, it is likely that the worker will meet causation for the cumulative trauma condition. When the Primary Risk Factor identified is not physiologically related to the diagnosis, causation will not be established at this point and Step 4 needs to be considered.

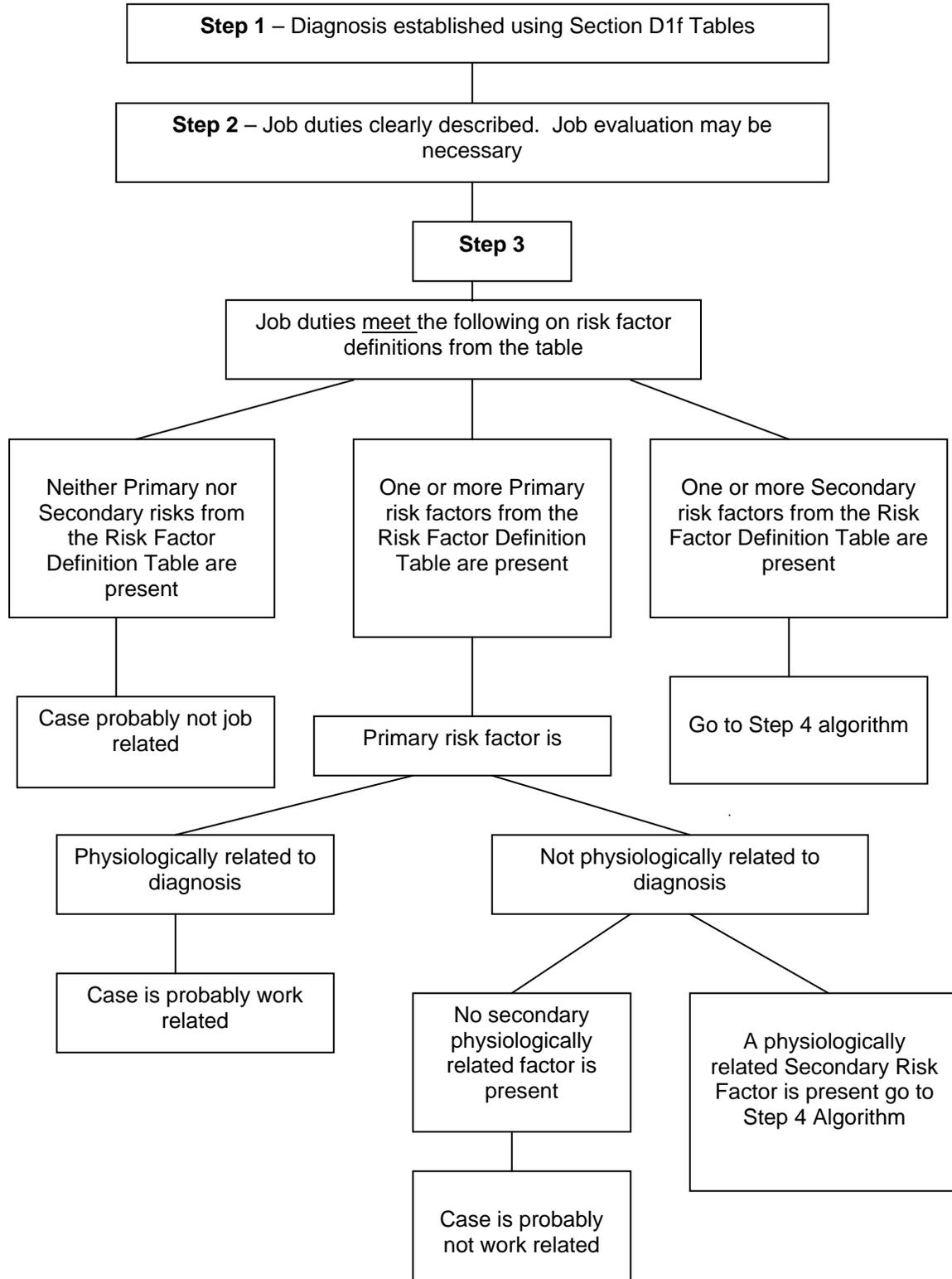
Step 4. Compare the worker's risk factors identified in Step 2 with the Secondary Risk Factor definitions on the Risk Factor Definition Table. If secondary risk factors are identified proceed to the Diagnosis Based Risk Factor Table.

When no Primary Risk Factors are present but one or more Secondary Risk Factors are found on the Risk Factor Definitions Table proceed to the Diagnosis Based Risk Factor Table. Elements in this table are listed under the strength of evidence headings. This includes a category for strength of evidence for risks that have been demonstrated not to be related to the diagnosis. Consult the diagnostic category pertaining to the worker. For a number of less common diagnoses, little direct research has been done that meets our quality standards. Therefore, the risk factors for these diagnoses use the risk factors from physiologically related, better researched diagnostic titles. Initially, check the evidence statements for or against causation based on the secondary risks identified previously. If the Diagnosis Based Risk Factor table establishes a match between the Secondary Risk Factor(s) and other job duties, using the evidence based columns for the established diagnosis, the case is likely work-related based on evidence. If none of the evidence categories matches the worker, causation based solely on evidence from research has not been established.

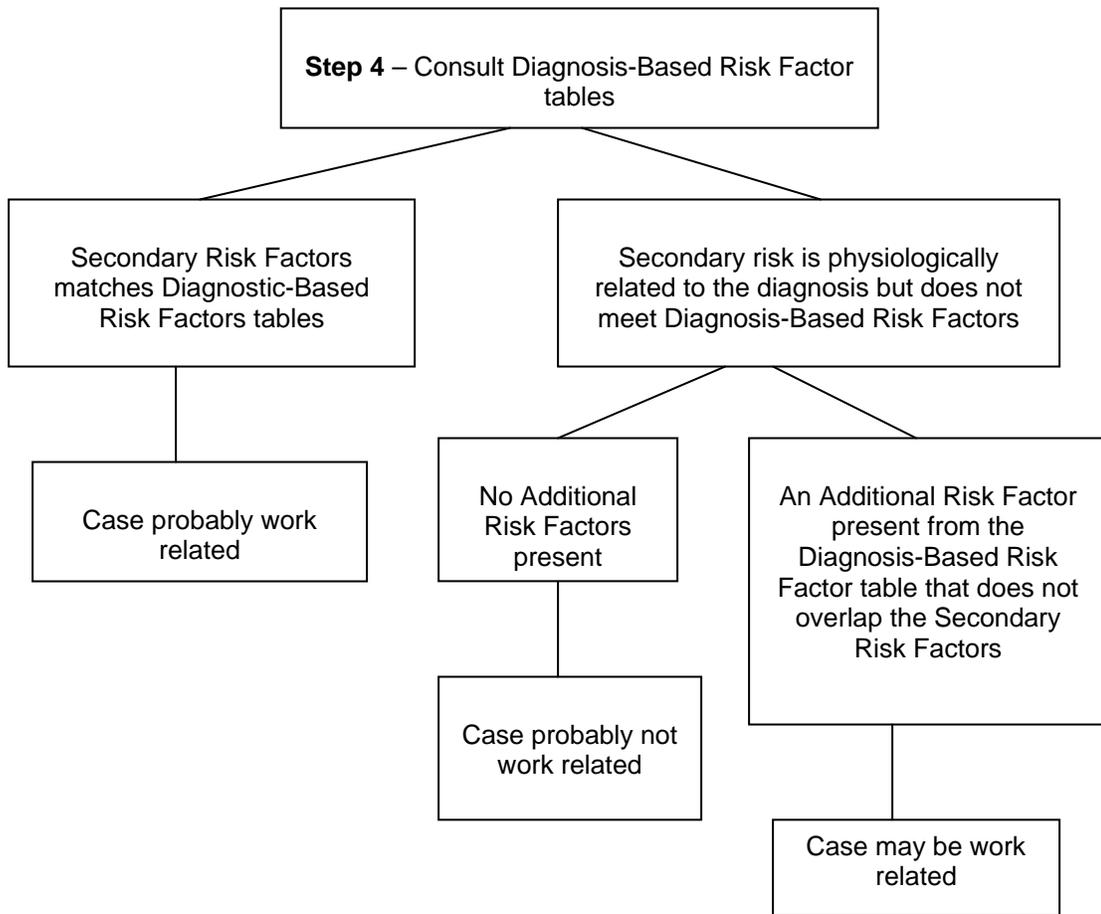
Step 5.

If an evidence based causation relationship, based on Steps 1-4, has not been established and the worker has one Secondary Risk Factor from the Risk Definition table, the physician may consult the last column of the Diagnosis Based Risk Factor table entitled "Additional Risk Factors." This category describes medically accepted physiologic risk factors for the diagnosis and risk factors which demonstrated an association with the diagnosis in lower quality studies that did not meet our standards of evidence. Some of the additional risk factors have less clear definitions due to lack of definition in the lower quality studies. These risk factors were added only when the medical consensus of the multi-disciplinary group agreed they were physiologically plausible. When a Secondary Risk Factor has been identified that does not meet the evidence based definitions in the Diagnosis Based Risk Factor Tables, physicians may use the other "Additional Risk Factors", as appropriate, to establish the presence of combined risk factors and establish causation. The worker must have met at least one of the Secondary Risk Factor definitions from the Risk Factor Definition table and that risk factor must be physiologically related to the diagnosis, in order to use the "Additional Risk Factors" in the Diagnosis Based Risk Factor table. Additional Risk factors that duplicate the conditions in the Secondary Risk Factor identified for the case may not be used. Any conclusions using this methodology are not strictly evidence-based and therefore the physician should include a discussion of why the Additional Risk Factors are pertinent in the particular case.

Algorithmic Steps for Causation Assessment



Algorithmic Steps for Causation Assessment



RISK FACTOR DEFINITIONS

CAUSATION MAY BE ESTABLISHED BY THE PRESENCE OF 1) A DIAGNOSIS-RELATED SOLE PRIMARY RISK FACTOR WHICH IS PHYSIOLOGICALLY RELATED TO THE DIAGNOSIS OR; 2) AT LEAST ONE SECONDARY RISK FACTOR THAT MEETS THE REQUIREMENTS FROM THE DIAGNOSIS-BASED RISK FACTOR TABLE

NOTE: Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included.

Category	As a Primary Risk Factor	Secondary Risk Factor
<u>Force and Repetition/Duration</u>	6 hrs. of: > 50% of individual maximum force with task cycles 30 seconds or less or force is used for at least 50% of a task cycle-maximum force for most individuals is 3-5 kg of force.	4 hrs. of: > 50% of individual maximum force with task cycles 30 seconds or less or force is used for at least 50% of a task cycle-maximum force for most individuals is 3-5 kg of force.
	6 hrs. of: lifting 10 lbs > 60x per hour.	4 hrs. of: lifting 10 lbs > 60x per hour. *
	6 hrs. of: use of hand held tools weighing 2 lbs or greater.	4 hrs. of: use of hand held tools weighing 2 lbs or greater.
<u>Awkward Posture and Repetition/Duration</u>	4 hrs. of: Wrist flexion > 45 degrees, extension > 30 degrees, or ulnar deviation > 20 degrees.	
	6 hrs. of: Elbow - flexion > 90 degrees.	4 hrs. of: Elbow - flexion > 90 degrees.
	6 hrs. of: Supination/pronation with task cycles 30 seconds or less or posture is used for at least 50% of a task cycle.	4 hrs. of: Supination/pronation with task cycles 30 seconds or less or posture is used for at least 50% of a task cycle.*

RISK FACTOR DEFINITIONS

CAUSATION MAY BE ESTABLISHED BY THE PRESENCE OF 1) A DIAGNOSIS-RELATED SOLE PRIMARY RISK FACTOR WHICH IS PHYSIOLOGICALLY RELATED TO THE DIAGNOSIS OR; 2) AT LEAST ONE SECONDARY RISK FACTOR THAT MEETS THE REQUIREMENTS FROM THE DIAGNOSIS-BASED RISK FACTOR TABLE

NOTE: Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included.

Category	As a Primary Risk Factor	Secondary Risk Factor
<u>Computer Work</u>	<p>Note: Up to 7 hours per day at an ergonomically correct workstation is not a risk factor.</p> <p>> 4 hrs. of: Mouse use.</p>	
<u>Use of handheld vibratory power tools and Duration</u>	6 hrs. for more common types of vibration exposure.	2 hrs. When accompanied by other risks.
<u>Cold Working Environment</u>		Ambient temperature of 45F or less for 4 Hrs. or more, such as handling frozen foods that are 10 degrees.

* Referencing related studies, which established 4 hours as a cut off for symptoms of cumulative trauma conditions and which found 4 hours of exposure to be related to functional problems of the upper extremity, as well as reasonable inferences from physiological knowledge, 4 hours is considered the most reasonable cut off.

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Secondary Risk Factor Definitions from the Risk Factor Definition Table

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>Aggravated Osteoarthritis of the Wrist</u>	No Quality Evidence Available				Awkward Posture (depending on the joint involved)
					Repetition of activities affecting the joint involved for 4 hrs.
					Prior Injury.
<u>Carpal Tunnel Syndrome</u>		Combination of force, repetition, and vibration.	Wrist bending or awkward posture for 4 hrs.	Good evidence - Keyboarding less than or equal to 7 hrs. in good ergonomic position is NOT RELATED.	High repetition defined as task cycle times of less than 30 seconds or performing the same task for more than 50% of the total cycle time.
		Combination of repetition and force for 6 hours.			
		Combination repetition and forceful tool use with	Mouse use more than 4 hours.	Good evidence- Repetition alone less than or	Tasks using a hand grip.

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Secondary Risk Factor Definitions from the Risk Factor Definition Table

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>Carpal Tunnel Syndrome (continued)</u>		awkward posture for 6 hours – Deboning study.		equal to 6 hrs. is NOT RELATED.	
		Combination force, repetition, and awkward posture.	Combination cold and forceful repetition for 6 hours - Frozen food handling.		Extreme wrist radial/ulnar positions or elbows in awkward postures.
<u>Cubital Tunnel Syndrome</u>			Combination forceful tool use, repetition and probably posture for 6 hours - Holding a tool in position with repetition.		Wrist bending and/or full elbow flexion/extension, repetition for 4 hours, vibration.
					Repetitive pronation of forearm. ³
					Sustained pressure at the cubital tunnel.
<u>DeQuervain's Disease</u>		Combination force, repetition, & posture.			Wrist in ulnar deviation. ³
					Repetitive thumb abduction and extension. ³
					Wrist bending in extreme postures.

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Secondary Risk Factor Definitions from the Risk Factor Definition Table

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>DeQuervain's (cont)</u>					<p>Precise hand motions e.g. dental hygienists.</p> <p>Repetitive hitting.</p>
<u>Epicondylitis Lateral -</u>		<p>Combination – awkward posture (forearm supination past 45 degrees) and forceful lifting.</p> <p>Combination force and possible awkward posture – study used repetition and turning and screwing.</p> <p>Combination – force & repetition, force and wrist and hand repetition.</p>		Some evidence keyboard use is NOT RELATED.	Wrist posture in extension and repetitive supination of the forearm and/or elbow extension. ³

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Secondary Risk Factor Definitions from the Risk Factor Definition Table

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>Epicondylitis Lateral (cont)</u>			Combination repetition and awkward posture including static posture.		
<u>Epicondylitis Medial</u>		Combination - force & repetition, force and wrist and hand repetition.		Some evidence keyboard use is NOT RELATED.	Wrist posture in flex and repetitive pronation and/or elbow extension. ³
		Combination - forceful exertion and repetition 6 hours.			

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Risk Factor Definitions found in the Secondary Risk Factor column.

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>Extensor tendon disorders of the Wrist</u>		Combination force, repetition, & posture.			Sustained tool use.
					Awkward posture. ³
					No relationship to keyboard use is expected in a good ergonomic workstation.
					Wrist bending in extreme postures.
					Repetitive hitting.

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Risk Factor Definitions found in the Secondary Risk Factor column.

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>Flexor tendon disorders of the Wrist</u>		Combination force, repetition, & posture.			Sustained tool use. Awkward posture. ³ No relationship to keyboard use is expected in a good ergonomic workstation. Wrist bending in extreme postures. Repetitive hitting.
<u>Guyon Canal</u>	No Quality Evidence Available.				Ulnar wrist posture and flexion. Direct pressure on the wrist.
<u>Posterior Interosseus Nerve Entrapment</u>	Refer to lateral epicondylitis section above for indirect evidence. No specific evidence available.				

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Risk Factor Definitions found in the Secondary Risk Factor column.

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
<u>Pronator Syndrome</u>	Refer to medial epicondylitis section above for indirect evidence. No specific evidence available.				
<u>Trigger Finger</u>			Hand tool use – 6 hours.		Repeated digital flexion.
<u>Radial Tunnel Syndrome</u>			Repetition and force - force of 1 kg with cycle time < 1 minute or awkward posture (static posture) elbow > 90 degrees.		Repetitive Supination. Extension of the elbow from 0 to 45 degrees.
<u>Triangular Fibrocartilage Compression</u>	No Quality Evidence Available.				Usually from traumatic hyperextension which may become symptomatic over time. Wrist posture in extension and

DIAGNOSIS - BASED RISK FACTORS

Hours are calculated by totaling the cumulative exposure time to the risk over an 8 hour day. Breaks or periods of inactivity or performing other types of work tasks are not included. Unless the hours are specifically stated below, "combination" of factors described below uses the Risk Factor Definitions found in the Secondary Risk Factor column.

Diagnosis	Evidence FOR Specific Risk Factors			Evidence AGAINST Specific Risk Factors	Non-Evidence-Based Additional Risk Factors to Consider. These factors must be present for at least 4 hours of the work day, and may not overlap evidence risk factors. ¹
	Strong Multiple high quality studies	Good One high quality study or multiple adequate studies	Some One adequate study		
					repetitive supination of the forearm and/or elbow extension. For occupational, usually unilateral with ulnar wrist pain while supinating and extending the wrist as part of the regular work duty.

¹ Physiological risk factors are those generally agreed upon by the medical community to cause the specific condition described. Other risk factors described are those identified in lower quality studies that are possibly related. These are consensus risk factors.

² Combined factors refer to the Secondary Risk Factor definitions found in the Risk Factor Definition Table.

³ **Caution:** These additional risk categories may not be used when awkward posture, using a similar definition, has been cited as a Secondary Risk Factor.

⁴ Evidence rated as strong by NIOSH 1997 criteria are placed in the "good" category because the NIOSH strong evidence definition matches the Colorado "good" level of evidence requiring multiple adequate studies.

⁵ Due to small case size and a definition of low force/high repetition jobs that likely included many jobs qualifying for a force risk from the "Risk Definitions" table, this study does not support repetition as a sole risk factor.

4. **STAGING** Cumulative trauma staging may be helpful to track the progress of cases and to rate permanent impairment of specific disorders when no other rating is available in the American Medical Association (AMA) Guides to the Evaluation of Permanent Impairment, 3rd Edition Revised. CTCs can be staged only after taking a thorough history and performing an appropriate physical examination (see History and Physical Examination). The CTC Staging Matrix may be used to help determine the need for further diagnostic tests and/or more extensive treatment. The factors included in the CTC Staging Matrix are:

A = History and Physical Examination.

B = Response to Modification of Specific Aggravating Factors.

C = Activities of Daily Living.

It is expected that objective signs on physical examination will correlate with subjective symptoms. The signs and symptoms are staged in the Cumulative Trauma Staging Matrix as:

Stage 1 = Minimal.

Stage 2 = Mild.

Stage 3 = Moderate.

Stage 4 = Severe.

At initial evaluation, some patients in Stages 1 or 2 for History and Physical Examination may qualify for higher stages in response to modification of specific aggravating factors or ADLs. With treatment, patients should show progress to a stage of lower severity. In the event of failure to progress or inconsistencies in staging, the provider should consider further diagnostic testing, a psychosocial evaluation, and/or a change in treatment plan.

Stages 3 and 4 frequently may be associated with other secondary symptoms of chronic pain such as sleep alteration, chronic generalized weakness, fatigue, or depression.

Cumulative Trauma Staging Matrix

	Stage 1 (Minimal)	Stage 2 (Mild)	Stage 3 (Moderate)	Stage 4 (Severe)
History and Physical Examination	1 to 2 symptoms with signs identified on history and supported by physical examination with consistency of subjective and objective findings	2 or more symptoms with signs identified and supported by physical examination with consistency of subjective and objective findings	3 or more symptoms with signs identified and supported by the physical examination with consistency of subjective and objective findings	3 or more symptoms with signs identified and supported by physical examination with consistency of subjective and objective findings
	AND	AND	AND	AND
Response to Modification of Specific Aggravating Factors	Symptoms and/or signs improve or resolve with modification of specific aggravating activity	Symptoms and/or signs may improve but will not resolve completely with modification of specific aggravating activity	Symptoms and/or signs do not improve with modification of the specific aggravating activity, but may improve with elimination of the specific aggravating	Symptoms and/or signs do not improve with modification or elimination of the specific aggravating activity

	activity			
	OR	OR	OR	OR
Activities of Daily Living (ADLs)	Minimal problems with ADLs	Noticeable aggravation by more difficult ADLs	Significant interference with most ADLs	Severe limitations of ADLs
Impairment Grades at MMI (See Note below to obtain Multiplier)	0-10%	11-20%	21-30%	31-40%

NOTE: When the Staging Matrix is used for impairment rating at maximum medical improvement (MMI), assignment of the patient to a stage should be based primarily on limitations in ADLs and history and physical examination findings. The response to modification of specific aggravating activities may be used to aid the rater in choosing a number within the available rating range. The staging number chosen from the "Impairment Grades at MMI" row is to be used as a multiplier in conjunction with the AMA Guides to the Evaluation of Permanent Impairment, 3rd Edition Revised, Chapter 3, and Table 17, to determine the impairment rating for each specific diagnosis. The primary presenting joint that corresponds to each specific established diagnosis should be rated. Descriptions of painful conditions without clear physiologic findings may not be rated using this chart. Examples include pain in the elbow or other upper extremity joint and myofascial pain disorder. The staging matrix is only used to rate a diagnosis when there is no impairment rating under range of motion and/or the specific diagnosis in the AMA Guides 3rd Edition Revised. All impairment ratings from this table are provided in upper extremity terms, and then converted to whole person. The table is not intended to distinguish between permanent partial disability as paid under 8-42-107 (2) and 8-42-107 (8).

E. FOLLOW-UP DIAGNOSTIC IMAGING AND TESTING PROCEDURES

One diagnostic imaging procedure may provide the same or distinctive information as does another procedure. Therefore, the prudent choice of a single diagnostic procedure, a complement of procedures or a sequence of procedures will optimize diagnostic accuracy; maximize cost effectiveness (by avoiding redundancy), and minimize potential adverse effects to patients.

All diagnostic imaging procedures have a significant percentage of specificity and sensitivity for various diagnoses. None is specifically characteristic of a certain diagnosis. Clinical information obtained by history-taking and physical examination should be the basis for selection and interpretation of imaging procedure results.

When a diagnostic procedure, in conjunction with clinical information, provides sufficient information to establish an accurate diagnosis, the second diagnostic procedure will become a redundant procedure. At the same time, a subsequent diagnostic procedure can be a complementary diagnostic procedure if the first or preceding procedures, in conjunction with clinical information, cannot provide an accurate diagnosis. Usually, preference of a procedure over others depends upon availability, a patient's tolerance, and/or the treating practitioner's familiarity with the procedure.

1. ELECTRODIAGNOSTIC (EDX) STUDIES This section does not include automated electrodiagnostic testing such as neurometers and portable automated electrodiagnostic devices. These testing devices are not adequate to determine peripheral neuropathies or unusual nerve compression syndromes and should not be used. Neurometers and portable electrodiagnostic testing devices may not be used to make a diagnosis and are not recommended in treatment settings. Refer also to Section E. 5 a. i. and ii. (Electroneurometer and Portable Automated Electrodiagnostic Devices).

- a.** Electrodiagnostic (EDX) studies are well-established and widely accepted for evaluation of patients suspected of having peripheral nerve pathology. Studies may confirm the diagnosis or direct the examiner to alternative disorders. Studies may require clinical correlation due to the occurrence of false positive and false negative results. Symptoms of peripheral nerve pathology may occur with normal EDX studies, especially early in the clinical course.

Because EDX studies may be falsely negative early in the clinical course, they are usually delayed until the patient has been symptomatic for 4 to 6 weeks. Refer to Sections F and G, on specific diagnoses for details.

When polyneuropathy is suspected it may be worthwhile to perform electrodiagnostic testing in the lower extremities.

- b.** To assure accurate testing, temperature should be maintained at 30 to 34C preferably recorded from the hand/digits. For temperature below 30C the hand should be warmed.
- c.** All studies must include normative values for their laboratories.

2. **IMAGING STUDIES**

- a. **Radiographic Imaging:** of the upper extremities is a generally accepted, well-established and widely used diagnostic procedure when specific indications based on history and/or physical examination is present. It should not be routinely performed for cumulative trauma injuries. It may be useful when clinical findings suggest a fracture, arthritis, avascular necrosis or ligament or cartilage injuries involving the carpals or pain persists after initial treatment. The mechanism of injury and specific indications for the radiograph should be listed on the request form to aid the radiologist and x-ray technician. For additional specific clinical indications, see Sections F and G "Specific Musculoskeletal/Peripheral Nerve Diagnosis, Testing and Treatment." Indications for initial imaging may include any of the following:
- b. **MRI:** May show increased T2-weighted signal intensity of the common extensor tendon in lateral epicondylitis, but this finding has commonly been found in the asymptomatic contralateral elbow and is not sufficiently specific to warrant the use of MRI as a diagnostic test for epicondylitis. MRI may be helpful to diagnoses triangular fibrocartilage complex tears and other suspected ligament or bone pathology when clinical findings suggest these diagnoses. Its routine use for CTCs are not recommended.
- c. **Computed Axial Tomography (CT):** is generally accepted and provides excellent visualization of bone. It is rarely needed for cumulative trauma conditions. When clinical findings suggest possible bone pathology it may be used to further evaluate bony masses and suspected fractures not clearly identified on radiographic window evaluation. Instrument scatter reduction software provides better resolution when metallic artifact is of concern.
- d. **Diagnostic Sonography:** is an accepted diagnostic procedure to rule out mass lesions. It is rarely appropriate for CTC diagnoses; however, may be used to rule out ganglions, other space occupying lesions and flexor tendon injuries. It should not be used to diagnosis carpal tunnel syndrome. The performance of sonography is operator dependent, and is best when done by a specialist in musculoskeletal radiology.

3. **JOINT ASPIRATION** is a generally accepted, well-established and widely used procedure when specifically indicated and performed by individuals properly trained in these techniques. It is rarely indicated for cumulative trauma conditions but may be needed when history and/or physical examination are of concern for a septic joint or bursitis and for some acute injuries. Persistent or unexplained effusions may be examined for evidence of infection, rheumatologic, or inflammatory processes. The presence of fat globules in the effusion strongly suggests occult fracture.

4. **PERSONALITY/PSYCHOLOGICAL/PSYCHOSOCIAL EVALUATIONS** are generally accepted and well-established diagnostic procedures with selective use in the CTC population, but have more widespread use in sub-acute and chronic pain populations.

Diagnostic testing procedures may be useful for patients with symptoms of depression, delayed recovery, chronic pain, recurrent painful conditions, disability problems, and for pre-operative evaluation as well as a possible predictive value for post-operative response. Psychological testing should provide differentiation between pre-existing depression versus injury caused depression, as well as post-traumatic stress disorder.

Formal psychological or psychosocial evaluation should be performed on patients not making expected progress within 6 to 12 weeks following injury and whose subjective

symptoms do not correlate with objective signs and tests. In addition to the customary initial exam, the evaluation of the injured worker should specifically address the following areas:

- Employment history;
- Interpersonal relationships — both social and work;
- Leisure activities;
- Current perception of the medical system;
- Results of current treatment;
- Perceived locus of control; and
- Childhood history, including abuse and family history of disability.

This information should provide clinicians with a better understanding of the patient, thus allowing for a more effective rehabilitation. The evaluation will determine the need for further psychosocial interventions, and in those cases, a Diagnostic Statistical Manual for Mental Disorders (DSM) diagnosis should be determined and documented. An individual with a PhD, PsyD, or Psychiatric MD/DO credentials should perform initial evaluations, which are generally completed within 1 to 2 hours. When issues of chronic pain are identified, the evaluation should be more extensive and follow testing procedures as outlined in the Division's Chronic Pain Disorder Medical Treatment Guidelines.

- ❖ Frequency: 1 time visit for evaluation. If psychometric testing is indicated as a portion of the initial evaluation, time for such testing should not exceed an additional 2 hours of professional time.

5. **ADJUNCTIVE TESTING** these tests are not used to establish a diagnosis. They may be used to follow the progress of the patient, depending on their diagnosis or to conduct research.

a. **Automated Electrodiagnostic Testing:**

- i. **Electroneurometer:** Not recommended as a diagnostic tool because it requires patient participation, cannot distinguish between proximal and distal lesions, and does not have well validated reference values.
- ii. **Portable Automated Electrodiagnostic Devices:** Measures distal median nerve motor latency and F-wave latency at the wrist and has been tested in research settings. It performed well in this setting following extensive calibration of the device. Motor nerve latency compared favorably with conventional electrodiagnostic testing, but F-wave latency added little to diagnostic accuracy. It remains an investigational instrument whose performance in a primary care setting is as yet not established, and is not recommended as a substitute for conventional electrodiagnostic testing in clinical decision making.

b. **Pinch and Grip Strength Measurements:** Not generally accepted as a diagnostic tool for CTC's. Strength is defined as the muscle force exerted by a muscle or group of muscles to overcome a resistance under a specific set of

circumstances. Pain, the perception of pain secondary to abnormal sensory feedback, and/or the presence of abnormal sensory feedback affecting the sensation of the power used in grip/pinch may cause a decrease in the force exerted and thereby not be a true indicator of strength. When a bell-shaped curve is present, these measures provide a method for quantifying strength that can be used to follow a patient's progress and to assess response to therapy. In the absence of a bell-shaped curve, clinical reassessment is indicated. These measurements may also be useful to determine an individual's fitness for duty or as a reassessment after therapy and/or surgery.

- c. **Quantitative Sensory Testing (QST):** May be used as an assessment tool to monitor the patient's progress throughout treatment. Results of tests and measurements of sensory integrity are integrated with the history and review of systems findings and the results of other tests and measures. QST tests the entire sensory pathway, limiting its ability to localize a deficit precisely. It depends on the patient's report of perception and may not be objective. Cutaneous conditions may alter sensory thresholds.

QST may be useful for peripheral polyneuropathy but not for isolated nerve injury or compression syndromes. Although it is not useful diagnostically, it may be used post-operatively for surgically treated mononeuropathies.

- i. Threshold tests measure topognosis, the ability to exactly localize a cutaneous sensation, and pallesthesia, the ability to detect mechanical sensation using vibration discrimination testing (quickly adapting fibers); and/or Semmes-Wienstein monofilament testing (slowly adapting fibers);
- ii. Density tests also measure topognosis and pallesthesia using static two-point discrimination (slowly adapting fibers); and/or moving two-point discrimination (quickly adapting fibers).

6. **SPECIAL TESTS** are generally well-accepted tests and are performed as part of a skilled assessment of the patients' capacity to return to work, his/her strength capacities, physical work demand classifications, and tolerance. The procedures in this subsection are listed in alphabetical order.

- a. **Computer-enhanced Evaluations:** may include isotonic, isometric, isokinetic and/or isoinertial measurement of movement, range of motion, endurance or strength. Values obtained can include degrees of motion, torque forces, pressures or resistance. Indications include determining validity of effort, and effectiveness of treatment. These evaluations should not be used as a major determinant of return-to-work restrictions. The added value of computer-enhanced evaluations is unclear. Targeted work tolerance screening or gradual return to work is preferred.

❖ Frequency: 1 time for evaluation. Can monitor improvements in strength every 3 to 4 weeks up to a total of 6 evaluations.

- b. **Functional Capacity Evaluation (FCE):** is a comprehensive or modified evaluation of the various aspects of function as they relate to the worker'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 and financial status, as well as psychosocial aspects of competitive employment may be evaluated. Components of this evaluation may include: (a) musculoskeletal screen; (b) cardiovascular profile/aerobic capacity; (c) coordination; (d) lifting/carrying analysis; (e) job-specific activity tolerance; (f)

maximum voluntary effort; (g) pain assessment/psychological screening; and (h) non-material and material handling activities.

When an FCE is being used to determine return to a specific jobsite, the provider is responsible for fully understanding the job duties. A jobsite evaluation is frequently necessary. FCEs cannot be used in isolation to determine work restrictions. The authorized treating physician must interpret the FCE in light of the individual patient's presentation and medical and personal perceptions. FCEs should not be used as the sole criteria to diagnose malingering. Full FCEs are rarely necessary. In many cases, a work tolerance screening will identify the ability to perform the necessary job tasks.

- ❖ Frequency: Can be used: 1) initially to determine baseline status; and 2) for case closure when patient is unable to return to the pre-injury position and further information is desired to determine permanent work restrictions. Prior authorization is required for FCEs performed during treatment.

- c. **Jobsite Evaluations and Alterations:** Ergonomic alterations must be done early to assure that appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite.

Jobsite evaluation and alteration should include input from a health care professional with experience in ergonomics or a certified ergonomist; the employee, and the employer. The employee must be observed performing all job functions in order for the jobsite evaluation to be a valid representation of a typical workday.

A formal jobsite evaluation is a comprehensive analysis of the physical, mental and sensory components of a specific job and may be important initially to determine causation. These components may include, but are not limited to: (a) postural tolerance (static and dynamic); (b) aerobic requirements; (c) range-of-motion; (d) torque/force; (e) lifting/carrying; (f) cognitive demands; (g) social interactions; (h) visual perceptual; (i) environmental requirements of a job; (j) repetitiveness; and (k) essential functions of a job.

Ergonomic changes that provide a therapeutic benefit or relieve the patient's ongoing symptoms are part of the required medical treatment for cumulative trauma conditions and therefore, it is assumed that the insurer will be responsible for paying for such jobsite alterations.

Job descriptions provided by the employer are helpful but should not be used as a substitute for direct observation.

A jobsite evaluation may include observation and instruction of how work is done, what material changes (desk, chair) should be made, and determination of readiness to return to work. Refer to Jobsite Alterations, Section H. 4, for specific ergonomic recommendations.

Requests for a jobsite evaluation should describe the expected goals for the evaluation. Goals may include, but are not limited to the following:

- i. To determine if there is potential contributing factors to the person's condition and/or for the physician to assess causality;
 - ii. To make recommendations for, and to assess the potential for ergonomic changes;
 - iii. To provide a detailed description of the physical and cognitive job requirements;
 - iv. To assist the patient in their return to work by educating them on how they may be able to do their job more safely in a bio-mechanically appropriate manner; and/or
 - v. To give detailed work/activity restrictions.
- ❖ Frequency: 1 time with additional visits as needed for follow-up per jobsite.

d. **Vocational Assessment:** Once an authorized practitioner has determined that a patient will not be able to return to his/her former employment and can prognosticate final restrictions, implementation of a timely vocational assessment can be performed. The vocational assessment should provide valuable guidance in the determination of future rehabilitation program goals. It should clarify rehabilitation goals, which optimize both patient motivation and utilization of rehabilitation resources. The effectiveness of vocational rehabilitation may be enhanced when performed in combination with work hardening or work conditioning. If prognosis for return to former occupation is determined to be poor, except in the most extenuating circumstances, vocational assessment should be implemented within 3 to 12 months post-injury. Declaration of MMI should not be delayed solely due to lack of attainment of a vocational assessment.

❖ Frequency: 1 time with additional visits as needed for follow-up.

e. **Work Tolerance Screening (Fitness for Duty):** is a determination of an individual's tolerance for performing a specific job as based on a job activity or task. It may include a test or procedure to specifically identify and quantify work-relevant cardiovascular demands, physical fitness, and postural tolerance. It may also address ergonomic issues affecting the patient's return-to-work potential. May be used when a full FCE is not indicated.

F. **SPECIFIC MUSCULOSKELETAL DIAGNOSIS, TESTING AND TREATMENT PROCEDURES**

Cumulative trauma related conditions (CTCs) comprise a number of specific diagnoses with specific diagnostic findings and treatment. Cumulative trauma disorder itself is not a diagnosis and cannot be treated or evaluated until the specific diagnosis is identified. Refer to Section C., Definitions and Mechanisms of Injury for details.

CTCs often involve several diagnoses and conservative treatment of all applicable diagnoses should be treated simultaneously. See Section G for peripheral neuropathies.

1. **AGGRAVATED OSTEOARTHRITIS OF THE WRIST**

- a. **Description/Definition:** Internal wrist joint pathology accompanied by cartilage loss. Pain usually in the carpal-metacarpal joints; or in metacarpal-phalangeal joints.
- b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. **Specific Physical Exam Findings:** the most common joint affected is the first carpal metacarpal (CMC) joint. The thumb metacarpal-phalangeal joint may also be involved. The “grind test” consists of applying an axial load to the first metacarpal and rotating it medially and laterally. A positive test results in pain and/or crepitus. Subluxation of the metacarpal may be induced in advanced cases. Swelling, reduced motion, and angular deformities may be present.

When a patient presents with pain at the base of the thumb, tests for de Quervain's, flexor carpi radialis tendonitis and scaphoid pathology should all be considered.

- d. **Diagnostic Testing Procedures:** X-ray, diagnostic injection and/or aspiration. Eaton and Littler developed a radiographic x-ray scheme to stage thumb carpal metacarpal arthritis described below.

Stage 1 - articular contours normal, joint space may be widened with less than 1/3 subluxation of articular surfaces on any view.

Stage 2 - slight narrowing of joint space with osteophytes measuring less than 2mm, articular contours are normal and there may be more than 1/3 subluxation on stress radiographs.

Stage 3 - CMC joint space narrowing with sclerotic or cystic changes and osteophytes greater than 2mm with scaphotrapezoidal-trapezoid joint intact.

Stage 4 – Pan-trapezoidal arthrosis with both CMC and scaphoid trapezoidal-trapezoid (STT) joints showing severe articular degeneration.

- e. **Non-operative Treatment Procedures:**
 - i. **Initial Treatment:** There is good evidence that custom splints used nocturnally for 1 year decrease pain and increase function. Historically, both hand-based and forearm-based splints have been used effectively

and the type of splint should probably be based on patient preference as this will also influence long-term compliance. Splinting may be used nocturnally and for protection during specific activities. It should maintain neutral wrist mechanics to avoid nerve stretch and/or ligamentous changes to the extensor or transverse carpal ligament. Self application of heat and ergonomic changes of the jobsite are recommended.

- ii. Medications such as analgesics (including NSAIDs) and over the counter medications for symptomatic relief may be helpful. Topical salicylates and nonsalicylates have been shown to be effective in relieving pain in acute and chronic musculoskeletal conditions. There is good evidence that diclofenac gel reduces pain and improves function in mild-to-moderate hand osteoarthritis. At the time of this guidelines writing, diclofenac gel has been FDA approved for acute pain due to minor strains, pains, and contusions; and for relief of pain due to osteoarthritis of the joints amenable to topical treatment, such as those of the knees and hands. There is some evidence that topical ketoprofen patches are more effective than placebo in reducing pain of upper extremity tendonitis; however, the need for continuous skin application may limit overall use. Use of ketoprofen topical patch for the disorders described in these guidelines has not been FDA approved at the time of this guideline writing. Liver enzymes should be monitored when using topical NSAIDs.

Non-prescription glucosamine and chondroitin are sold in the United States as dietary supplements. Their dosage, manufacture, and purity, are not regulated by the Food and Drug Administration. Effectiveness for mild disease is unknown.

When osteoarthritis is identified as a contributing factor to a work-related injury pharmaceutical grade glucosamine and chondroitin may be tried. Long-term coverage for these medications would fall under Workers' Compensation only when the arthritic condition is primarily related to the work injury.

S-adenosyl methionine (SAM-e), like glucosamine and chondroitin, is sold as a dietary supplement in the United States, with a similar lack of standard preparations of dose and manufacture. SAM-e is not currently recommended due to lack of availability of pharmaceutical quality, systemic effects, and loss of potency with storage.

Refer to medication discussions in Section H. 5, Medications and Medical Management for further details.

- iii. Patient education should include instruction in self-management techniques, ergonomics, and home therapy program. One study demonstrated a 70% reduction in the number of patients desiring surgery when they were provided with 3 sessions of hand therapy explaining the use of splints; accessories such as fitted scissors, book support, pen handles; and modification of their work environment.

It is strongly suggested that all patients receive hand therapy support before considering surgery, especially if the job requirements place a high demand on fine hand activities.

- iv. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure that appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- v. Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They include range of motion (ROM), active therapies, and a home exercise program. Active therapies include restoring normal joint mechanics and function of adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section H., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section H., Therapeutic Procedures, Non-operative.

- vi. 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.

Steroid injections may be useful in early stage osteoarthritis when used with a splint.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 4 to 8 weeks apart.
- ❖ Maximum Frequency: 6 per year in the presence of severe osteoarthritis.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- vii. Viscosupplementation injections. There is no convincing evidence that hyaluronate injections are superior to steroid injections for CMC thumb arthritis.

Viscosupplementation/Intracapsular acid salts involve the injection of hyaluronic acid and its derivatives into the joint space. Hyaluronic acid is secreted into the joint space by the healthy synovium and has functions of lubrication and cartilage protection.

There is some evidence that intra-articular injection of high-molecular weight hyaluronic acid is more effective than saline in improving function and pain at 6 months for osteoarthritis at the base of the thumb. There is no evidence that hyaluronate injections are superior to steroid injections for CMC thumb arthritis. They may be tried after 3 months of conservative therapy, including when steroid injections have failed. At the time of this guidelines writing, hylan G-F 20 has been FDA approved for the treatment of pain due to osteoarthritis of the knee in patients who have failed to respond adequately to conservative non-pharmacologic therapy and simple analgesic

- ❖ Time to Produce Effect: 1 injection.

- ❖ Optimum Frequency: 2 injections per year.

- viii. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return-to-Work.

- ix. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

- i. The patient may be a good surgical candidate when functional deficits interfere with activities of daily living and/or job duties after at least 3 months of active patient participation in non-operative therapy including jobsite changes, medication, injections and splints.

One study demonstrated a 70% reduction in the number of patients desiring surgery after 7 months when they were provided with 3 sessions of hand therapy explaining the use of splints; accessories such as fitted scissor, book support, pen handles; and modification of their work environment. It is strongly suggested that all patients receive hand therapy support and jobsite alterations before considering surgery.

- ii. Thumb carpal-metacarpal joint arthritis.

- A) The most common current procedures for thumb CMC arthritis are trapeziectomy with or without suspension procedures including ligament reconstruction and/or tendon interposition. There is good evidence that these procedures have similar outcomes at 1 year. Longer follow-up time is required to establish whether trapeziectomy alone is equivalent (in terms of functional outcomes) to trapeziectomy with a suspension procedure. Osteotomies may be additional procedures in some cases and fusions are occasionally performed, usually in younger active patients.

The ligament and tendon procedures are thought to protect the other carpal joints from earlier deterioration and allow greater stability for the thumb. Most patients have not been followed long enough to compare rates of subsequent arthritis and resulting functional deficits between those having a simple trapeziectomy and those with suspension procedures. There is good evidence that simple trapeziectomy is associated with fewer post-operative complications in the first year compared to ligament reconstruction and tendon interposition (LRTI) but the functional consequences of these complications are unclear, and many of them resolve as time passes. Due to the complexity of the wrist joint and the lack of clear superiority of any one procedure, the choice of the type of procedure for an individual patient must be made on a case-by-case basis by the surgeon and patient.

B) The use of implants or spacers remains highly controversial. Most long-term studies of these have shown unacceptable levels of subsidence, subluxation or breakage. Due to the lack of evidence, implant procedures should only be considered after a second opinion by a hand surgeon specializing in the techniques and thorough understanding of the patient regarding expectation from the procedure, recovery time and possible complications.

iii. Arthritis at other joints.

Scaphotrapezio-trapezoid joint arthritis resistant to conservative treatment is usually treated with fusion, although trapezoidectomy has also been used.

Fusion may be recommended for thumb metacarpal-phalangeal arthritis when surgery is necessary.

iv. Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure that the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

v. Because smokers have a higher risk of delayed bone healing and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g. **Operative Procedures:** Trapeziectomy with or without suspension procedures including ligament reconstruction and/or tendon transposition; trapezoidectomy; fusion; osteotomy, rarely implant.

h. Post-operative Treatment:

- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and the therapist is important to the timing of exercise progressions.
- ii. Hand therapy should be started early to prevent loss of motion of adjacent joints. Treatment may include the following: splinting, restricted activities and other active therapy with or without passive therapy. Exact treatment regimes are based on the surgeon's recommendation and may include other therapies from Section H., Therapeutic Procedures, Non-operative.
- iii. Continuous passive motion after metacarpal-phalangeal (MCP) joint arthroplasty is not supported by scientific evidence and therefore is not recommended.
- iv. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

2. DE QUERVAIN'S DISEASE

- a. **Description/Definition:** Pain and swelling in the over the first dorsal extensor compartment (anatomical snuffbox) and/or over the radial styloid; pain radiating into the hand and forearm; pain worsened by thumb abduction and/or extension.
- b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. **Specific Physical Exam Findings:** de Quervain's disease affects the first dorsal extensor compartment.
 - i. Required elements for diagnosis of de Quervain's disease are at least one of the following:
 - Pain worsened by resisted thumb abduction and/or extension with or without resistance;
 - Positive Finkelstein's. The Finkelstein test is positive when localized pain results from ulnar wrist deviation with the thumb adducted.
 - ii. Crepitus may be present and tenderness over the first dorsal compartment is common.
 - iii. Less common and examiner-dependent findings include thickening of the first dorsal tendon sheath, swelling in the same area.
- d. **Diagnostic Testing Procedures:** X-ray and other imaging may be performed to rule out other differential diagnoses or when there is an indication additional pathology, such as a space-occupying lesion, may be present.

e. Non-operative Treatment Procedures:

- i. Initial Treatment: Over-the-counter medications for symptomatic relief, thumb spica, ice, and restriction of activities.
- ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. 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 for patients under 30 years of age should be used with caution.

Observational studies suggest that steroid injections may be beneficial even when splints are not used. Injection into the abductor pollicis longus and extensor pollicis brevis compartments is more effective but sometimes inaccurately performed. These injections are best performed by a specialist.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 2 to 8 weeks apart injection.
- ❖ Maximum Frequency: 4 per year if injections result in functional benefit without local reactions or complications.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return to Work.

vi. Other therapies in Section H., Therapeutic Procedures, Non-operative may be employed in individual cases.

f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

First extensor compartment release is rarely necessary. Most cases resolve spontaneously over a number of months. Surgery may be performed to achieve functional gains for those with the required diagnostic exam findings who continue to have significant ongoing impaired activities of daily living after 8 weeks of treatment which include job modifications, injections, and other therapy.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g. **Operative Procedures:** First extensor compartment release.

h. **Post-operative Treatment:**

i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progression. Treatment may include the following: splinting and other active therapy with or without passive therapy.

ii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

3. **EPICONDYLITIS – LATERAL (EPICONDYLALGIA):**

a. **Description/Definition:** Lateral epicondylitis is also known as tennis elbow, lateral elbow pain, rowing elbow, tendonopathy of the common extensor origin, and peri-tendonopathy of the elbow. It is characterized by elbow pain and tenderness over the lateral epicondyle of the humerus. Patients describe tenderness to palpation slightly anterior and distal to the lateral epicondyle and/or over the bony prominence of the lateral epicondyle. Patients frequently complain of pain with grasping when the elbow is extended and pronated.

b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.

c. **Specific Physical Exam Findings:**

i. Required elements for the diagnosis of lateral epicondylitis are as follows:

- A) The patient must report tenderness to palpation at/near lateral epicondyle; and
- B) In addition, at least one of the following examiner maneuvers must result in pain over the lateral epicondyle and/or extensor mass of the forearm:
- Active or resisted wrist extension;
 - Active or resisted middle finger extension;
 - Active or resisted supination.
- ii. Pain may also increase with gripping. Swelling, erythema, and warmth are generally not seen in this condition.
- d. **Diagnostic Testing Procedures:** The clinical diagnosis of lateral epicondylitis is made by the combination of patient complaints and required objective physical findings. Additional studies such as plain radiographs, MRI, and sonogram examinations are not routinely ordered to establish the diagnosis of lateral epicondylitis, but may be used to rule out other conditions that may produce similar symptoms, including radial tunnel syndrome, cervical radiculopathy, osteochondral radiocarpal lesion, posterolateral elbow plica, and posterolateral elbow instability. X-rays may be normal or demonstrate spur formation over the involved epicondyle.
- e. **Non-operative Treatment Procedures:**
- i. Initial Treatment: Over-the-counter medications for symptomatic relief, ice, bracing, and restriction of activities. Topical NSAIDs may also be effective.
- Literature indicates that over 80% of cases improve with conservative therapy only. The natural history of epicondylitis supports an expectation of improvement within 3 months of using patient education and modified activities.
- ii. Patient education should include instruction in self-management techniques, ergonomics, and home therapy program.
- iii. Bracing: Rationale for braces is to rest the wrist extensor muscles while reducing tension at the extensor origin, allowing healing of the muscle and tendon.
- Brace types include proximal forearm band/sleeve, cock-up wrist splint, forearm/hand splint, and dynamic extensor brace.
- There is some evidence that certain braces may improve the short-term ability to perform daily activities.
- Braces may be used in patients who are able to tolerate wearing the brace during activity and do not experience worsening pain and/or additional symptoms due to brace, but should be discontinued in the event of adverse effects.

There is no evidence that one brace type is superior to other types. However, some brace types may be impractical for use in most workers. For example, surgical technicians and food handlers would be unable to use most braces involving the wrist due to incompatibility with occupational function. The forearm band brace type appears to be the least cumbersome brace option and may be the best tolerated.

Selecting the appropriate brace type is a decision that should be made by both patient and treating physician and should include appropriate patient education and follow-up. Braces which restrict range of motion should not be used continuously as this may result in permanent loss of motion. Compression straps should not be positioned in a manner which would irritate branches of the radial nerve. Braces should achieve maximum function and patient comfort.

- iv. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- v. Steroid injections may decrease inflammation, pain, and allow the therapist to progress with rehabilitation therapy. There is strong evidence that steroid injection decreases pain in the first few weeks but has a worse outcome at 52 weeks than PT or more conservative therapy including bracing, platelet-rich plasma injections, heat or cold therapy, and change in activities. The potential for negative long-term effects should be strongly considered.

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 for patients under 30 years of age should be used with caution.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 2 to 8 weeks apart injection.
- ❖ Maximum Frequency: 4 to 6 per year if injections result in functional benefit without local reactions or complications.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- vi. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return to Work.
- vii. Botulinum toxin injection: Rationale for botulinum toxin treatment is that it reversibly paralyzes the extensor muscles and thereby prevents repetitive micro-trauma of the tendonous fibers at their origin from the osseous lateral epicondyle. The unit dosage varies significantly depending on the brand used. Usage for lateral and medial epicondylitis is not FDA approved at the time of this guideline writing. There is good evidence that botulinum toxin A injection may provide short-term pain relief from pain due to chronic (3 months or longer) lateral epicondylitis. However, the long-term functional benefits are unknown. There is also good evidence that botulinum toxin A injections cause weakness in finger extension and/or digit paresis. Additional complications may include: allergic reaction to medications, increased risk of systemic effects in patients with motor neuropathy or disorders of the neuromuscular junction.

Botulinum toxin injection is known to cause short-term third (middle) finger strength deficits and possible digit paresis, which may persist for up to 3 to 4 months. Botulinum toxin injection should only be used in patients whose occupational performance will be unaffected by this side effect, and should not be used in patients with physically demanding job descriptions.

It should not be considered a first line of treatment. Other conservative measures should be tried first. A single botulinum toxin type A injection may provide pain reduction for up to 3 to 4 months in patients with chronic lateral epicondylitis which has persisted after 3 months of treatment.

Botulinum toxins are manufactured at different potencies, and units of the different manufacturers are not equivalent. Careful botulinum toxin dosing should be used to avoid complete paresis and allow maintained functionality and return to work.

The decision to use botulinum toxin for pain relief from chronic lateral epicondylitis symptoms should be made carefully by both patient and treating physician, with knowledge of the known side effects and consideration of the individual occupational demands of the patient.

Botulinum injection should only be performed by a physician or surgeon who has expertise in the anatomy of the upper extremity and who is experienced in the use of this agent. Prior authorization is required.

❖ Maximum: One injection episode

- viii. Other injections:
 - A) Prolotherapy and polidocanol have all been used in studies too small and/or inadequate to make any recommendations. Due to lack of evidence of their effectiveness and the cost involved, prolotherapy and polidocanol are not recommended.

B) Autologous Whole Blood Injections/Platelet-Rich Plasma Injections:

- 1) Autologous Whole Blood Injections: are inexpensive treatments and may be used in patients who have not made sufficient functional progress with initial therapy for lateral or medial epicondylitis after 10 to 12 weeks.

There is some evidence that for patients with symptoms lasting 6 months or more, autologous blood injections result in better pain and functional outcomes after 1 year than steroid injections.

- ❖ Optimum Frequency: 2 injections may be required.

- 2) Platelet-Rich Plasma Injections: There is good evidence that for patients with symptoms lasting 6 months or more, platelet-rich plasma injections result in better pain and functional outcomes after 1 year than steroid injections.

- ❖ Optimum Frequency: 2 injections may be required.

- ix. There is no clinical evidence or sound physiologic rationale for magnets or diathermy, therefore, they are not recommended.
- x. There is good evidence that low level laser is not more effective than placebo for lateral epicondylitis, and its use is not recommended.
- xi. Extracorporeal shock wave therapy (ESWT).

Large studies have not provided evidence that this intervention provides long-term benefit. The natural history of epicondylitis supports an expectation of improvement within 3 months using patient education and modified activities.

There is some evidence that highly motivated patients may show up to a 35% additional improvement over no other treatment, when administered low energy shock wave treatment without local anesthesia. There is some evidence that using the same treatment with local anesthetic is not effective and therefore no use of local anesthetic is recommended. There is some evidence that radial shock wave therapy may also be effective. There is some evidence that ESWT results in better long-term functional and pain outcomes than steroid injections, for patients who have failed after 6 months of other treatment. Patients who have experienced some positive response to other therapy but continue to have functional deficits after 10 to 12 weeks may be considered for this treatment. Peripheral vascular disease, upper extremity neuropathy and diabetes are all relative contraindications. Diagnostic testing may be needed to rule out these conditions. Some devices used in ESWT may not be FDA approved for the above-mentioned indications.

Refer to Section H.12, Therapeutic procedures, non-operative, for information on available evidence, time parameters, and other details.

- xii. There is some evidence to support the use of acupuncture.
- xiii. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.
 - Ultrasound, phonophoresis, and iontophoresis may be used occasionally to facilitate other therapy but there is no evidence that they alter long-term function.
 - Neither deep tissue massage nor manipulation alone, have sufficient evidence to support their routine isolated use. Both may be used in conjunction with a complete upper extremity therapy program when functional progress is demonstrated within the time to effect found in Section H., Therapeutic Procedures, Non-operative.

There is good evidence that physical therapy using manipulation, home exercise and supervised exercise reduced pain at 6 weeks but not at 52 weeks. This may be appropriate therapy to hasten return to work.

❖ Time to Produce Effect: 4 treatments.

❖ Optimum Frequency: 8 treatments over 6 weeks.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Lateral epicondyle release/debridement is generally accepted; however, over 80% of cases improve with conservative therapy only. Intermittent discomfort may recur over 6 months to 1 year after initial conservative treatment.

The patient may be a good surgical candidate when the diagnosis is confirmed on physical exam (Refer to Section D.1.d) and functional deficits interfere with activities of daily living and/or job duties after at least 3 months of active patient participation in non-operative therapy including worksite changes, medication, splints, and injections or other therapy noted above.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific

smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. Operative Procedures:** Lateral epicondyle release/debridement. There is no evidence to support radiofrequency microtenotomy and it is not recommended.
- h. Post-operative Treatment:**
 - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: bracing, and active therapy with or without passive therapy.
 - ii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

4. EPICONDYLITIS – MEDIAL (EPICONDYLALGIA):

- a. Description/Definition:** Pain emanating from the medial elbow; mild grip weakness; medial elbow pain exacerbated by repetitive wrist motions.
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. Specific Physical Exam Findings:**
 - i. Required elements for the diagnosis of medial epicondylitis are as follows:
 - A) The patient must report tenderness to palpation at/near medial epicondyle; and
 - B) In addition, at least one of the following examiner maneuvers must result in pain over the medial epicondyle and/or flexor mass of the forearm:
 - Active or resisted wrist flexion;
 - Active or resisted pronation.
 - ii. The exam may include elements for diagnosing cubital tunnel syndrome if appropriate.
- d. Diagnostic Testing Procedures:** X-ray, sonogram, and other imaging may be performed to rule out other differential diagnoses or when there is an indication additional pathology may be present. X-rays may be normal or demonstrate spur formation over the involved epicondyle.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Over the counter medications for symptomatic relief, ice, wrist bracing and restriction of activities. Braces which restrict range of motion should not be used continuously as this may result in permanent loss of motion. A forearm band may be used. Compression straps should not be positioned in a manner which would irritate the branches of the ulnar nerve.

Literature on lateral epicondylitis indicates that over 80% of cases improve with conservative therapy only. Literature on lateral epicondylitis indicates that the natural history of lateral epicondylitis supports an expectation of improvement within 3 months of using patient education and modified activities.

- ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. Steroid injections may decrease inflammation, pain and allow the therapist to progress with rehabilitation therapy. There is strong evidence in literature on lateral epicondylitis that steroid injection decreases pain in the first few weeks but has a worse outcome at 52 weeks than PT or more conservative therapy including bracing, platelet-rich plasma injections, heat or cold therapy, and change in activities. The potential for negative long-term effects should be strongly considered.

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 for patients under 30 years of age should be used with caution.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 2 to 8 weeks apart injection.
- ❖ Maximum Frequency: 4 to 6 per year if injections result in functional benefit without local reactions or complications.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return to Work.
- vi. Botulinum toxin injection: Rationale for botulinum toxin treatment is that it reversibly paralyzes the flexor muscles and thereby prevents repetitive microtrauma of the tendonous fibers at their origin from the osseous medial epicondyle. The unit dosage varies significantly depending on the brand used. Usage for lateral and medial epicondylitis is not FDA approved at the time of this guideline writing. There is good evidence in literature on lateral epicondylitis, that botulinum toxin A may provide short-term pain relief from pain due to chronic (3 months or longer) lateral epicondylitis. However, the long-term functional benefits are unknown. There is also good evidence in literature on lateral epicondylitis, that botulinum toxin A injections cause weakness in finger extension and/or digit paresis. Therefore, weakness could be anticipated for finger flexion with use at the medial epicondyle. Additional complications may include: allergic reaction to medications, increased risk of systemic effects in patients with motor neuropathy or disorders at the neuromuscular junction.

Botulinum toxin injection is known to cause short-term third (middle) finger strength deficits and possible digit paresis, which may persist for up to 3 to 4 months. Botulinum toxin injection should only be used in patients whose occupational performance will be unaffected by this side effect, and should not be used in patients with physically demanding job descriptions.

It should not be considered a first line of treatment. Other conservative measures should be tried first. A single botulinum toxin type A injection may provide pain reduction for up to 3 to 4 months in patients with chronic lateral epicondylitis which has persisted after 3 months of treatment.

Botulinum toxins are manufactured at different potencies, and units of the different manufacturers are not equivalent. Careful botulinum toxin dosing should be used to avoid complete paresis and allow maintained functionality and return to work.

The decision to use botulinum toxin for pain relief from chronic medial epicondylitis symptoms should be made carefully by both patient and treating physician, with knowledge of the known side effects and consideration of the individual occupational demands of the patient.

Botulinum injection should only be performed by a physician or surgeon who has expertise in the anatomy of the upper extremity and who is experienced in the use of this agent. Prior authorization is required.

❖ Maximum: One injection episode

- vii. Other injections:

A) Prolotherapy, polidocanol, and autologous whole blood, have all been used in studies too small and/or inadequate to make any recommendations. Due to lack of evidence of their effectiveness and the cost involved prolotherapy, and polidocanol are not recommended.

B) Autologous Whole Blood/Platelet-Rich Plasma Injections:

1) Autologous whole blood injections: are an inexpensive treatment and may be used in patients who have not made sufficient functional progress with initial therapy for lateral and medial epicondylitis after 10 to 12 weeks.

There is some evidence in literature on lateral epicondylitis, that for patients with symptoms lasting 6 months or more, autologous blood injections result in better pain and functional outcomes after 1 year than steroid injections.

❖ Optimum Frequency: 2 injections may be required.

2) Platelet-Rich Plasma Injections: There is good evidence in literature on lateral epicondylitis, that for patients with symptoms lasting 6 months or more, platelet-rich plasma injections result in better pain and functional outcomes after 1 year than steroid injections.

❖ Optimum Frequency: 2 injections may be required.

viii. There is no clinical evidence, nor sound physiologic rationale for magnets or diathermy, therefore, they are not recommended.

ix. There is good evidence that low level laser is not more effective than placebo for lateral epicondylitis; therefore, its use is not recommended for medial epicondylitis.

x. Extracorporeal Shock Wave Therapy (ESWT):

Studies on lateral epicondylitis have shown the following: Large studies have not provided evidence that this intervention provides long-term benefit. The natural history of epicondylitis supports an expectation of improvement within 3 months using patient education and modified activities.

Other studies on lateral epicondylitis have indicated the following: There is some evidence that highly motivated patients may show up to a 35% additional improvement over no other treatment, when administered low energy shock wave treatment without local anesthesia. There is some evidence that using the same treatment with local anesthetic is not effective and therefore no use of local anesthetic is recommended. There is some evidence that radial shock wave therapy may also be effective. There is some evidence that ESWT results in better long-term functional and pain outcomes than steroid injections, for patients who have failed

after 6 months of other treatment. Patients who have experienced some positive response to other therapy but continue to have functional deficits after 10 to 12 weeks may be considered for this treatment. Peripheral vascular disease, upper extremity neuropathy and diabetes are all relative contraindications. Diagnostic testing may be needed to rule out these conditions. Some devices used in ESWT may not be FDA approved for the above-mentioned indications.

Refer to Section H.12, Therapeutic Procedures, Non-operative, for information on available evidence, time parameters, and other details.

- xi. There is some evidence, in literature on lateral epicondylitis, to support the use of acupuncture
- xii. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.
 - A) Ultrasound, phonophoresis, and iontophoresis may be used occasionally to facilitate other therapy but there is no evidence, as indicated in studies on lateral epicondylitis, that they alter long-term function.
 - B) Studies from literature on lateral epicondylitis indicate that neither deep tissue massage, nor manipulation alone have sufficient evidence to support their routine isolated use. Both may be used in conjunction with a complete upper extremity therapy program when functional progress is demonstrated within the time to effect found in Section H, Therapeutic Procedures, Non-operative.

There is good evidence in literature on lateral epicondylitis that physical therapy using manipulation, home exercise and supervised exercise reduces pain at 6 weeks but not at 52 weeks. This may be appropriate therapy to hasten return to work.

❖ Time to Produce Effect: 4 treatments.

❖ Optimum Frequency: 8 treatments over 6 weeks.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Medial epicondyle release/debridement is generally accepted; however, the majority of cases improve with conservative therapy. Intermittent discomfort may recur over 6 months to 1 year after initial conservative treatment.

The patient may be a good surgical candidate when the diagnosis is confirmed on physical exam (Refer to Section D.1,d) and functional deficits interfere with activities of daily living and/or job duties after at least 3 months of active patient participation in non-operative therapy including worksite changes, medication, splints, and injections or other therapy noted above.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. Operative Procedures:** Medial epicondyle release/debridement.
- h. Post-operative Treatment:**
 - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-Operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: bracing, and active therapy with or without passive therapy.
 - ii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

5. EXTENSOR TENDON DISORDERS OF THE WRIST

- a. Description/Definition:** Pain localized to the affected tendon(s) pain worsened by active and/or resisted wrist or finger extension.
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. Specific Physical Exam Findings:**
 - i. Required elements for the diagnosis of extensor tendon disorders of the wrist are the following: pain and/or tenderness with active or resisted wrist/digit extension, specific to the extensor mechanism involved.
 - ii. Other common findings include creaking/crepitus with wrist extension and swelling along the dorsal aspects of the hand/wrist/forearm.
- d. Diagnostic Testing Procedures:** X-ray and other imaging may be performed to rule out other differential diagnoses or when there is an indication additional pathology may be present.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Over the counter medications for symptomatic relief; wrist splinting, and restriction of activities.
- ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. Steroid injections may decrease inflammation, pain, 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 for patients under 30 years of age should be used with caution.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 2 to 8 weeks apart.
- ❖ Maximum Frequency: 3 to 4 per year if injections result in functional benefit without local reactions or complications.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return to Work.
- vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Surgery is indicated when a tendon is ruptured.

Surgery may be performed to achieve functional gains for those with the required diagnostic exam findings who continue to have significant ongoing impaired activities of daily living after 8 weeks of treatment which included job modifications, injections and other therapy.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. Operative Procedures:** Tenosynovectomy, Repair, and/or reconstruction of the extensor tendon.
- h. Post-operative Treatment:**
 - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: splinting, and active therapy with or without passive therapy.
 - ii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

6. FLEXOR TENDON DISORDERS OF THE WRIST

- a. Description/Definition:** Pain and/or tenderness localized to the affected tendons; pain in the affected tendons associated with wrist/digit flexion and ulnar deviation, especially against resistance.
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. Specific Physical Exam Findings:**
 - i. Required elements for the diagnosis of general wrist flexion tendon disorders include the following:
 - A) Reproduction of pain with active or resisted wrist/digit flexion; or
 - B) Ulnar deviation specific to flexor mechanism involved.
 - ii. Crepitus with active motion of the flexor tendons may also be present.
- d. Diagnostic Testing Procedures:** X-ray and other imaging may be also performed to rule out other differential diagnoses or when there is an indication additional pathology may be present.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Over-the-counter medications for symptomatic relief, wrist splints for wrist flexors and splinting.
- ii. Patient education should include instruction in self-management techniques, ergonomics, home therapy program and intermittent splinting for contractures.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. Steroid Injections may decrease inflammation, pain, 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 for patients under 30 years of age should be used with caution.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 2 to 8 weeks apart.
- ❖ Maximum Frequency: 3 to 4 per year if injections result in functional benefit without local reactions or complications.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return to Work.
 - vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.
- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Surgery is rarely necessary. Any decision for surgical intervention should be based on a hand surgeon's evaluation of need and the existence of a clear functional deficit that can be corrected by surgical intervention.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. Operative Procedures:** The surgical procedures will depend on the specific deficit.
- h. Post-operative Treatment:**
 - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: splinting, and active therapy with or without passive therapy.
 - ii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

7. TRIANGULAR FIBROCARILAGE COMPLEX TEAR (TFCC)

- a. Description/Definition:** tear of the fibrocartilage between the radius and the ulna with symptoms mainly on the ulnar side of the wrist.
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. Specific Physical Exam Findings:**
 - i. Required elements for the diagnosis of TFCC are:
 - A) Tenderness over the TFCC complex; and
 - B) One other positive provocative test with localizing pain, clicking or findings of abnormal motion. Provocative tests include:
 - Forced supination and pronation with axial pressure on an ulnar deviated wrist;
 - The patient pushes up from a seating position using the hand; and/or
 - Ballottement of the distal ulna with the wrist supinated causes abnormal motion as compared to the asymptomatic side.

- ii. Crepitus is frequently present;
- iii. Extensor or flexor carpi ulnaris tendinitis may also be confused with TFCC.

d. **Diagnostic Testing Procedures:** X-ray and MRI or MRI arthrography. As with knee degenerative changes, many patients with TFCC tears are asymptomatic. In one study of patients with a history of TFCC and related falls, ligament disruptions were commonly found in the opposite asymptomatic hand over 50% of the time. It may be reasonable to also image the opposite wrist if it is asymptomatic. Those with a corresponding abnormality in the opposite wrist should have an especially rigorous diagnostic review before proceeding to a surgical intervention.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Rest, splinting, ice and later heat.
- ii. Medications such as analgesics and over-the-counter medications for symptomatic relief may be helpful. Refer to medication discussions in Section H. 5, Medications and Medical Management.
- iii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iv. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

v. Steroid injections may decrease inflammation, pain, and allow the therapist to progress with functional exercise and range of motion 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 for patients under 30 years of age should be used with caution.

- ❖ 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.
- ❖ Optimum Frequency: 3 injections in 1 year spaced at least 2 to 8 weeks apart injection.

- ❖ Maximum Frequency: 4 per year if injections result in functional benefit without local reactions or complications.
 - vi. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H. 9, Return to Work.
 - vii. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.
- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

A patient may be a surgical candidate if there are concomitant fractures, instability, or if symptoms continue to interfere with ADLs or job duties after non-surgical interventions for 2 to 3 months.

- i. Non-surgical interventions should include: rest from inciting factors, ergonomic job changes, and steroid injections. Pathology is usually identified on MRI and there should not be another diagnosis which better explains the patient's complaints.

Those with a corresponding abnormality in the opposite wrist should have an especially rigorous diagnostic review before proceeding to a surgical intervention.

- ii. Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

- iii. For surgery involving soft tissue only: smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

For both non-union and soft-tissue: because smokers have a higher risk of non-union and post-operative costs, if a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels.

The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. **Operative Procedures:** Numerous procedures including arthroscopy debridement and/or repair, ulna shortening and wafer procedure when there is a carpal detachment or detachment off of the radius.

- h. Post-operative Treatment:**
- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions.
 - ii. Wrist splints are usually required for 6 weeks and power grip and axial loading are discouraged. Range of motion is usually begun at 2 weeks.
 - iii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon. Usually light activity only is recommended for 3 months.

8. TRIGGER FINGER

- a. Description/Definition:** Difficulty extending and flexing the digit which may be accompanied by a history of the finger “catching” or “triggering.”
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.

- c. Specific Physical Exam Findings:** required elements for the diagnosis of trigger digits include one of the following:

- Tenderness at the A1 pulley with finger motion;
- Triggering of the digit;
- A history of difficulty flexing and extending the digit with a palpable nodule.

Active range of motion deficit, usually only in severe cases.

- d. Diagnostic Testing Procedures:** X-ray and other imaging may be performed to rule out other differential diagnoses or when there is an indication additional pathology may be present.

- e. Non-operative Treatment Procedures:**

- i. Initial Treatment: Over the counter medications for symptomatic relief, splinting at night.
- ii. Patient education should include instruction in self-management techniques, ergonomics, home therapy program and intermittent splinting for contractures.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. Steroid injections for trigger finger may provide decreased symptoms for up to one year.

Steroid injections may decrease inflammation, pain, 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 for patients under 30 years of age should be used with caution.

- ❖ 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.
- ❖ Optimum Frequency: 3 to 5 injections in 1 year spaced at least 2 to 8 weeks apart.
- ❖ Maximum Duration: if additional injections are being considered referral to a hand specialist should be considered.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9, Return to Work.
- vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Trigger finger/thumb release open or percutaneous may be indicated when: 1) diagnosis has been verified; and 2) symptoms persist after conservative management including steroid injections over at least 4 weeks. Surgery should be performed to achieve functional gains on those with significant ongoing impaired activities of daily living or work-related functions.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the

insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g. Operative Procedures: Trigger finger/thumb release.

h. Post-operative Treatment:

- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: splinting, and active therapy with or without passive therapy.
- ii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

G. SPECIFIC PERIPHERAL NERVE DIAGNOSIS, TESTING AND TREATMENT PROCEDURES

1. CARPAL TUNNEL SYNDROME

- a. **Description/Definition:** The median nerve is vulnerable to compression and injury in the region of the wrist and palm. In this area, the nerve is bound by the wrist bones and the transverse carpal ligament. The most common site of compression is at the proximal edge of the flexor retinaculum (an area near the crease of the wrist). Stenosing tenosynovitis may occur proximal and distal to carpal tunnel area. There is often a myofascial component in the patient's presentation. This should be considered when proceeding with the diagnostic workup and therapeutic intervention.

The following elements are commonly associated with carpal tunnel syndrome.

- i. The diagnosis is most frequently made from the patient's history of numbness, tingling, pain, and/or burning of the hand involving the distal median nerve distribution; however, distribution of the sensory symptoms may vary considerably between individuals.

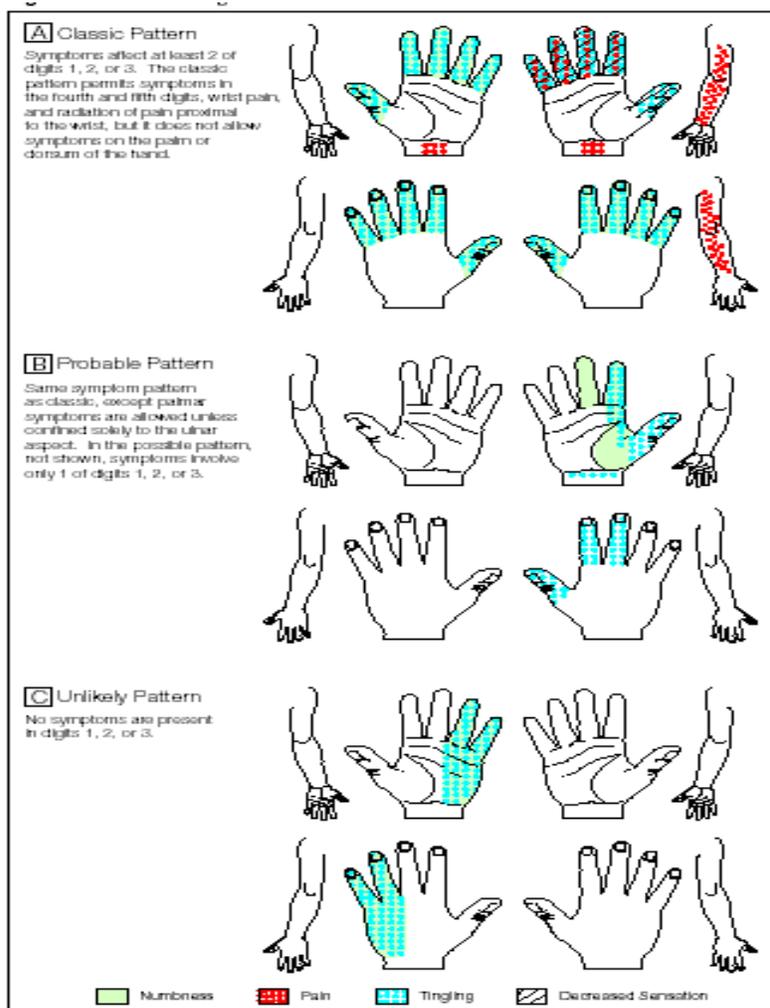
Although the classic median nerve distribution is to the palmar aspect of the thumb, the index finger, the middle finger and radial half of the ring finger, patients may report symptoms in any or all of the fingers.

The Katz Hand diagram may be useful in documenting the distribution of symptoms.

- ii. Nocturnal symptoms often disrupt sleep and consist of paresthesias and/or pain in the hand and/or arm.
- iii. The "flick sign" or shaking the symptomatic hand to relieve symptoms is frequently reported.
- iv. Pain in the wrist occurs frequently and may even occur in the forearm, elbow or shoulder.
- v. While proximal pain is not uncommon, its presence warrants evaluation for other pathology in the cervical spine, shoulder and upper extremity.
- vi. There may be some difficulty performing specific job duties and activities of daily living. Clumsiness of the hand or dropping objects is often reported, but may not be present early in the course. There may be weakness with pinching or grasping keys/pens/other small objects, grasping telephone receivers or cups or other similar sized objects, and opening jars.
- vii. The following areas should also be addressed in the history.

- a. Exacerbating and alleviating factors of the reported symptoms. The physician should explore and report on non-work related, as well as work-related activities.
- b. Prior occupational and non-occupational injuries to the same area including specific prior treatment and any prior bracing devices.
- c. Discussion of any symptoms present in the unexposed extremity.

Katz Hand Diagram:



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b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.

c. **Specific Physical Exam Findings:** No one test is predictive of carpal tunnel syndrome. Multiple tests should be recorded with the patient's exact response. Final diagnosis is dependent on a correlation of symptoms, physical exam findings and NCV testing as any of these alone can be false positive or false negative. Phalen's and Tinel's appear to have similar predictive values as the flick test between 73 and 87% for the positive predictive value and negative predictive values between 35 and 40%.

i. The clinical diagnosis is confirmed by a 1) patient's history of paresthesia in two 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.
- Tinel's sign over the carpal tunnel.
- Closed fist test – holding fist closed for 60 seconds reproducing median nerve paresthesia.
- Compression test – applying compression over the median nerve for 30 to 60 seconds reproducing symptoms.
- Thenar atrophy may be present, usually late in the course.
- Weakness of the abductor pollicis brevis.
- Sensory loss to pinprick, light touch, two-point discrimination or Semmes Weinstein monofilament tests in a median nerve distribution.

ii. Physicians should be aware that both NCV-diagnosed CTS and physician-diagnosed CTS fluctuate over time in both directions for individual cases.

iii. Evaluation of the contralateral wrist is recommended due to the frequency of bilateral involvement.

iv. Evaluation of the proximal upper extremity and cervical spine for other conditions cervical radiculopathy, thoracic outlet syndrome, other peripheral neuropathies, and other musculoskeletal conditions.

v. Assessment for signs of underlying medical disorders associated with CTS (e.g., diabetes mellitus, arthropathy, and hypothyroidism).

- vi. Myofascial findings requiring treatment may present in additional soft tissue areas these should be identified and treated in accordance with medical treatment guidelines.

d. Diagnostic Testing Procedures:

- i. **Diagnostic Steroid injections:** Classic findings of CTS include subjective numbness or dysesthesias confined to the median nerve distribution, worsening of symptoms at night, and positive exam findings. When the diagnosis is in question, steroid injection into the carpal tunnel is a strongly supportive test if it is followed by significant relief of symptoms. A negative diagnostic steroid injection does not eliminate the diagnosis of CTS.
- ii. **Electrodiagnostic (EDX) Testing:** 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. When polyneuropathy is suspected, it may be worthwhile to perform electrodiagnostic testing in the lower extremities. Studies require clinical correlation 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.

EDX studies are imperfect indicators of the outcome of treatment of CTS, since they may be only weakly correlated with functional scores. However, they may provide useful information when symptomatic and functional recovery after treatment has not occurred.

EDX findings in CTS reflect slowing of median motor and sensory conduction across the carpal tunnel region due to demyelination. Axonal loss, when present, is demonstrated by needle electromyography in median nerve supplied thenar muscles.

- A) Needle electromyography of a sample of muscles innervated by the C5 to T1 spinal roots, including a thenar muscle innervated by the median nerve of the symptomatic limb, is frequently required.
- B) The following EDX studies are not recommended to confirm a clinical diagnosis of CTS.
 - 1) Due to low sensitivity and specificity compared to other EDX studies, multiple median F wave parameters, median motor nerve residual latency, and sympathetic skin response are not recommended.
 - 2) Investigational studies: Evaluation of the effect on median nerve conduction with limb ischemia, dynamic hand exercises, and brief or sustained wrist positioning are not recommended.

- 3) Electroneurometer: This is not recommended as a diagnostic tool because it requires patient participation, cannot distinguish between proximal and distal lesions, and does not have well-validated reference values.
 - 4) Portable Automated Electrodiagnostic Device: Measures distal median nerve motor latency and F-wave latency. It remains an investigational instrument whose performance in a primary care setting is as yet not established, and is not recommended as a substitute for conventional electrodiagnostic testing in clinical decision making. Refer to Follow-up Diagnostic Procedures section for details.
- C) To assure accurate testing, temperature should be maintained at 30 to 34C preferably recorded from the hand/digits. For temperature below 30C the hand should be warmed.
- D) Positive Findings – Any of these nerve conduction study findings must be accompanied by median nerve symptoms to establish the diagnosis.
- 1) Slowing of median distal sensory and/or motor conduction through the carpal tunnel region.
 - 2) Electromyographic changes in the median thenar muscles in the absence of proximal abnormalities.
 - 3) Suggested guidelines for the upper limits of normal latencies:
 - a) Median distal motor latency (DML) - 4.5msec/8cm
 - b) Median distal sensory peak latency (DSL) - 3.6msec/14cm.
 - c) Median intrapalmar peak latency (palm/wrist) - 2.2msec/8cm
 - d) Median-ulnar palmar sensory latency difference greater than - 0.3msec.
 - e) The Combined Sensory Index (also known as Robinson's index) may be useful when any of the above specific studies are not diagnostic. It is the sum of the differences between the median peak latency minus the ulnar or radial peak latency for the ring finger, the thumb and the palm. A normal finding is 0.9ms or less.

- 4) Because laboratories establish their own norms, a degree of variability from the suggested guideline values [as described in 3 above] is acceptable.
- E) In all cases, normative values are to be provided with the neuro-diagnostic evaluation.
- F) Suggested grading scheme by electrodiagnostic criteria for writing a consultation or report may be:
- 1) Mild CTS - prolonged (relative or absolute) median sensory or mixed action potential distal latency (orthodromic, antidromic, or palmar).
 - 2) Moderate CTS - abnormal median sensory latencies as above and prolongation (relative or absolute) of median motor distal latency.
 - 3) Severe CTS - prolonged median motor and sensory distal latencies, with either absent sensory or palmar potential, or low amplitude or absent thenar motor action potential. Needle examination reveals evidence of acute or chronic denervation with axonal loss.
- G) 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 carpal tunnel syndrome over a 3 to 4 week period.
 - b) Patients in whom the diagnosis is in question.
 - c) Patients for whom surgery is contemplated.
 - d) To rule out other nerve entrapments, or alternative radiculopathy.
 - 2) Repeated studies 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 improvement with non-surgical treatment.
 - c) Post-operative 3 to 6 months for persistent or recurrent symptoms following carpal tunnel

release, unless an earlier evaluation is required by the surgeon.

- iii. **Laboratory Tests:** In one study of carpal tunnel patients seen by specialists, 9% of patients were diagnosed with diabetes, 7% with hypothyroidism, and 15% with chronic inflammatory disease including spondyloarthropathy, arthritis, and systemic lupus erythematosus. Up to two thirds of the patients were not aware of their concurrent disease. Estimates of the prevalence of hypothyroidism in the general population vary widely, but data collected from the Colorado Thyroid Disease Prevalence Study revealed subclinical hypothyroidism in 8.5% of participants not taking thyroid medication. The prevalence of chronic joint symptoms in the Behavioral Risk Factor Surveillance System (BRFSS) from the Centers for Disease Control (CDC) was 12.3%. If initial history suggests concomitant disease or after 2 to 3 weeks the patient is not improving, the physician should strongly consider the following laboratory studies: thyroid function panels, rheumatoid screens, chemical panels, and others if clinically indicated. There is some evidence that diabetic patients with upper extremity disorders are more likely to be under poor diabetic control. Therefore, it is appropriate to order a hemoglobin A1c for any diabetic patients with a CTC.

Laboratory testing for cumulative trauma conditions may be required periodically to monitor patients on chronic medications.

- iv. **Other Tests:**
 - A) Imaging, MRI, and sonography are not recommended unless a space occupying lesion is suspected.
 - B) Electroneurometer and other portable automated electro-diagnostic devices are not recommended. Refer to Section E. Follow-up Diagnostic Imaging and Testing Procedures.

e. Non-operative Treatment Procedures:

- i. **Initial Treatment:** Medications such as analgesics and over the counter medications for symptomatic relief; wrist splint at night, and restriction of activities such as forceful gripping, awkward wrist posture, and repetitive wrist motion.

A number of studies have followed patients with mild clinical carpal tunnel symptoms. Approximately 40 to 50% of patients improved over time, most of whom receive conservative treatment. However, patients with positive Phalen's at 30 seconds, symptoms lasting 10 months, over 50 years of age, or bilateral symptoms were less likely to improve.

- ii. Patient education should include instruction in self-management techniques including sleeping postures which avoid excessive wrist flexion; ergonomics; and a home therapy program.

- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure that appropriate changes are accomplished early in the treatment program. In a 2007 published study it was noted that 73% of mild cases referred for carpal tunnel surgery received splints, 23% steroid injections and only 15% modification in activities recommendations. This emphasizes the need for basic initial care including jobsite modification for all patients, especially in milder cases that may not require surgery.

Whenever a case is identified as a work related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite.

Suggested ergonomic changes are usually applicable also to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H. 4. Jobsite Alteration.

- iv. Medications and Medical Treatment: Use of medications in the treatment of carpal tunnel syndrome is appropriate for controlling acute and chronic pain and inflammation. All drugs should be used according to patient 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.

Use of non-steroidal anti-inflammatory medications (NSAIDs), oral steroids, and diuretics, have not been shown to have significant long-term beneficial effect in treating carpal tunnel syndrome. Although NSAIDs are not curative, they and other analgesics may provide symptomatic relief.

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. However, it may be appropriate for patients on medications that interfere with the effects of Vitamin B6, or for those with significant nutritional problems.

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 them for patients with severe CTS symptoms who refuse injections and who have no risk factors for adverse effects. Refer to Section H.5 for other medications.

- v. 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 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. Although off-the-shelf splints are usually sufficient, custom thermoplastic splints may provide a better fit for certain patients.

Splints may be effective when worn at night 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 minimize daytime splint use in order avoid detrimental effects such as stiffness and dependency over time.

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 2 to 4 weeks. It is more likely to have some long-term benefit in patients who have less severe paresthesias at night (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: Nightly. 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.

- vi. 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. One case series showed up to 16 month improvement in mild CTS cases with nerve conduction changes after an injection. However, it is not clear that this is a better long-term option for patients with moderate or severe neuro-conduction changes since improvement in nerve conduction may be minimal or later deteriorate.

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.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- ❖ 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.

- vii. Nerve Gliding: exercises consist of ROM 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.

- viii. Manual Therapy Techniques: 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. Refer to Section H., Therapeutic Procedures Non-operative.

- 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. It is suggested that treatment be limited to 12 sessions over 6 weeks.

- x. Low Level Laser: There is no evidence that low level laser therapy alone is beneficial in changing the outcome for patients with carpal tunnel syndrome and therefore it is not recommended.
 - xi. Yoga: There is some evidence that Hatha yoga instruction may reduce pain, improve grip strength, and decrease response to Phalen's maneuver for motivated patients, as compared to patients receiving only wrist splints. This, as other complementary/alternative exercise, should be done with oversight of a physician or other appropriate healthcare professional.
 - ❖ Time to Produce Effect: 2 to 6 treatments.
 - ❖ Frequency: 2 times per week.
 - ❖ Optimum and Maximum Duration: 4 to 8 weeks.
 - xii. Ionotophoresis: has not yet been shown to be effective for CTS but may be an appropriate option for patients refusing surgery and injections.
 - ❖ Optimum and Maximum Frequency: 6 to 9 sessions over 5 weeks.
 - xiii. There is no evidence for the use of magnets, laser acupuncture, or chiropractic. Therefore, these interventions are not recommended.
 - xiv. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9 Return to Work.
 - xv. Other therapies in Section H may be used for myofascial symptoms accompanying carpal tunnel syndrome.
- f. **Surgical Indications/Considerations**: Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Overall it is probably reasonable to expect that 40 to 50% of patients with mild exam findings may improve or remain stable overtime.

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 5 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 post-operative scores. However, their post-operative scores were higher than the post-operative scores of those with more severe symptoms.

- i. Surgery should be considered as an initial therapy in situations where clinical evidence of carpal tunnel syndrome is present based on the criteria below.
 - A) Median nerve trauma has occurred; “acute carpal tunnel syndrome”, or
 - B) Thenar atrophy is present and due to median nerve compression; or
 - C) Electrodiagnostic evidence of moderate to severe neuropathy 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.
- ii. For cases with positive EDX findings and with a motor latency less than 5.0ms, 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.
- iii. Surgery may be considered in cases where electrodiagnostic testing is normal and initial non-operative therapy has failed. A second opinion from a hand surgeon is strongly recommended. The following criteria should be considered in deciding whether to proceed with surgery:
 - A) The patient's signs and symptoms are specific for carpal tunnel syndrome;AND
 - B) The patient experiences significant temporary relief following steroid injection into the carpal tunnel.
- iv. Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will

make the final determination as to whether smoking cessation is required prior to surgery.

g. Operative Procedures:

i. **Open and endoscopic carpal tunnel release 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.

ii. **Small incision technique with lighted blade:** A minimal access technique using a battery operated trans-illuminating light source through a small proximal or distal incision is an additional surgical option for CTS.

There is some evidence that this procedure results in less scar tenderness than traditional open procedures. There is good evidence that the procedure has similar functional and symptomatic outcomes as an open procedure.

iii. **Complications:** Serious complications are rare and include permanent nerve damage and infection. Pillar pain may persist for 20 months; a burning sensation and scar tenderness are also common, up to 18% of cases. Reoccurrence is possible although reoperation usually occurs in less than 5% of the population.

iv. **Neurolysis:** has not been proven advantageous for carpal tunnel syndrome. Internal neurolysis should never be done. Very few indications exist for external neurolysis.

v. **Tenosynovectomy:** For routine cases of CTS, tenosynovectomy has not proven to be of benefit in carpal tunnel syndrome. Although achy pain in the wrist and forearm commonly may accompany CTS, paresthasias tend to be the predominant complaint. In occasional cases, pain may be the predominant complaint. If a patient with documented CTS experiences pain along the volar wrist, hand, and/or distal forearm as the predominant symptom, clearly overshadowing the paresthasias, there may be a significant component of tenosynovitis. Tenosynovectomy should be considered in these unusual cases at the time of carpal tunnel release.

h. Post-operative Treatment:

i. Patients should 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, allowing pain to guide their activities.

ii. 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 splinting post-operatively should be left to the discretion of the treating physician based upon the surgical technique used and the specific conditions of the patient.

- iii. An individualized rehabilitation program may be helpful in patients who do not show functional improvements post-operatively or in patients with heavy or repetitive job activities. There is good evidence that routine use of hand therapy after surgery does not improve pain, function, or return to work in carpal tunnel syndrome uncomplicated by endocrine disease, arthritis, or advanced median nerve disease. However, workers compensation patients may have slower return to work and therefore at least 2 visits with the therapist are recommended to insure appropriate scar management and return to function.

The rehabilitation program should be based upon communication between the surgeon and the therapist and using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions.

- iv. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

Suggested parameters for return-to-work are:

Time Frame	Activity Level
2 Days	Return to work with restrictions on utilizing the affected extremity
2 to 3 Weeks	Sedentary and non-repetitive work
4 to 6 Weeks	Case-by-case basis
6 to 12 Weeks	Heavy labor, forceful and repetitive

Note: All return-to-work decisions are based upon clinical outcome.

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 improve initially and then recur, but are unresponsive to non-operative therapy. (See section H, Therapeutic Procedures, Non-operative) consider the following:

- Recurrent synovitis;
- Repetitive work activities may be causing “dynamic” 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 carpal tunnel syndrome vary widely depending on the etiology of recurrent symptoms.

2. **CUBITAL TUNNEL SYNDROME**

- a. **Description/Definition:** The following are typical symptoms of cubital tunnel syndrome:
- Activity related pain/paresthesias involving the 4th and 5th fingers coupled with discomfort near the medial aspect of the elbow;
 - Pain/paresthesias worse at night;
 - Decreased sensation of the 5th finger and ulnar half of the ring finger (including dorsum 5th finger);
 - Progressive inability to separate fingers;
 - Loss of power grip and dexterity.
- b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. **Specific Physical Exam Findings:** Required elements for the diagnosis include paresthesias or dull, aching in the 4th and 5th digits and at least one of the following exam findings:
- 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;
 - Positive elbow flexion/ulnar compression test. The combination flexion pressure test can be performed by fully flexing the elbow in supination and applying pressure to the ulnar nerve proximal to the cubital tunnel for 60 seconds. Reproduction of symptoms is a positive test;

- Later stages manifested by intrinsic atrophy and ulnar innervated intrinsic weakness. Specific physical signs include clawing of the ulnar 2 digits (Benediction posture), ulnar drift of the 5th finger (Wartenberg's sign), or flexion at the thumb IP joint during pinch (Froment's sign).

- d. **Diagnostic Testing Procedures:** Electrodiagnostic (EDX) studies are well-established and widely accepted for evaluation of patients suspected of having peripheral nerve pathology. Studies may confirm the diagnosis or direct the examiner to alternative disorders. When polyneuropathy is suspected, it may be worthwhile to perform electrodiagnostic testing in the lower extremities. Studies require clinical correlation due to the occurrence of false positive and false negative results. Symptoms of peripheral nerve pathology may occur with normal EDX studies, especially early in the clinical course.

To assure accurate testing, temperature should be maintained at 30 to 34C preferably recorded from the hand/digits. For temperature below 30C the hand should be warmed.

All studies must include normative values for their laboratories.

During the study the elbow should be maintained in moderate flexion usually 70-90 degrees. Positive findings in this position include:

- i. Absolute motor nerve conduction velocity from above elbow to below elbow less than 50m/s
- ii. Above to below elbow segment more than 10m/s slower than the below elbow to wrist segment.
- iii. Decrease in compound muscle action potential (CMAP) negative peak amplitude from below the elbow to above the elbow of 20%.
- iv. Significant change in CMAP configuration at the above elbow site compared to below elbow.
- v. Nerve action potential recoding can sometimes be useful; however, there are technical issues with interpretation.
- vi. When results are inconclusive from the above, other techniques may be used, including an inching study which explores multiple locations.
- vii. Indications for testing
 - A) Initial testing:
 - 1) Patients with clinically significant cubital tunnel findings who do not improve symptomatically or functionally with conservative measures, including jobsite alteration over a 3 to 4 week period.
 - 2) Patients in whom the diagnosis is in question.

- 3) Patients for whom surgery is contemplated.
 - 4) To rule out other nerve entrapments, or alternative radiculopathy.
- B) Other studies may be performed:
- 1) At 3 months or longer when the initial studies were normal and cubital tunnel syndrome is still suspected.
 - 2) At 8 to 12 weeks for inadequate improvement with non-surgical treatment.
 - 3) Post-operative 3 to 6 months for persistent or recurrent symptoms following ulnar nerve surgery, unless an earlier evaluation is required by the surgeon.

e. Non-operative Treatment Procedures:

- i. Initial Treatment: Medications such as analgesics and over the counter medications for symptomatic relief; elbow pad anteriorly at 30 to 60 degrees or towel around elbow at night, optional posterior pad for daywear, and restriction of activities.
- ii. Patient education should include instruction in self-management techniques including avoidance of excessive or repetitive elbow flexion, ergonomics: and a home therapy program. There is some evidence to support the effectiveness of education, regarding nerve anatomy and how to avoid pronation, as first line therapy.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Workers should avoid repetitive full flexion or extension or posterior pressure on the elbow. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. 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.

- ❖ Time to Produce Effect: 1 injection.
- ❖ Maximum Frequency: 3 injections in 1 year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9 Return to Work.
- vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Surgery may be considered when 1) findings on history and objective evidence correlate specifically with the diagnosis; 2) jobsite alteration and other conservative measures have not alleviated the symptoms; and 3) functional deficits persist after 6 to 8 weeks. Subjective complaints should be localized and appropriate to the diagnosis, neurologic complaints should be consistent with the nerve distribution in question, and physical exam findings should correlate with the history. Objective evidence should be present and include: positive physical exam findings as described in section 2 c.; positive electrodiagnostic (EDX) studies; diagnostic peripheral nerve block which eradicates the majority of the patient's symptoms; or a motor deficit commensurate with the suspected neurologic lesion. In general, patients with minimal symptoms or without objective findings of weakness tend to respond better to conservative treatment.

Surgery may be considered as an initial therapy in situations where there is clinical and electrodiagnostic evidence of severe or progressive neuropathy.

Smoking may affect nerve healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

A second opinion by a hand surgeon and repeat nerve conduction studies are required if repeat surgery is contemplated.

- g. **Operative Procedures:** simple decompression or transposition with or without, medial epicondylectomy, anterior subcutaneous transfer, and submuscular or intramuscular transfer.

The complications and complexity of these procedures varies. Patients should understand the risks of each procedure, expected recovery, and need for follow-up therapy before consenting to the procedure.

Approximately 80% of patients will experience decreased symptoms post-operatively and around 35% will have some residual symptoms at the site. Simple decompression appears to be effective even in patients with more severe disease and it has fewer complications. There may be a subset of patients not yet identified by the current literature who would benefit more from a transposition. There is strong evidence that both anterior transposition and simple decompression are similarly effective for cubital tunnel.

- h. Post-operative Treatment:** An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: splinting, scar management, nerve gliding, and active therapy with or without passive therapy.

Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

3. GUYON CANAL (TUNNEL) SYNDROME

- a. Description/Definition:** Paresthesias in the ulnar nerve distribution (ring and small fingers) distal to the wrist and/or weakness digital adductors and abductors or lumbricals, without proximal ulnar complaints, are typical symptoms/findings of Guyon's canal syndrome.
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. Specific Physical Exam Findings:** Required elements for the diagnosis must include at least one of the following exam findings:

- Positive Tinel's at hook of hamate.
- Numbness or paresthesias of the palmar surface of the ring and small fingers without proximal ulnar complaints.
- Later stages or types may affect ulnar innervated intrinsic muscle strength.

Five types have been described that present with differing neurological signs. Testing should include strength of the adductor pollicis, abductor digiti minimi, and lumbricals. Testing the ability of the long finger to cross the index finger is useful.

- d. **Diagnostic Testing Procedures:** Nerve conduction velocity studies of both sides for comparison to normal side. EMGs may be needed to rule out radiculopathy or more proximal ulnar nerve compression. When polyneuropathy is suspected it may be worthwhile to perform electrodiagnostic testing in the lower extremities. Several sites of ulnar nerve entrapment at the wrist may be documented with electrodiagnostic testing.

MRI or sonogram may be used to rule out space occupying lesions.

Diagnostic injections may be done to confirm the diagnosis.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Medications such as analgesics and over the counter medications for symptomatic relief, wrist bracing, splints, restriction of activities and ergonomic changes.
- ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. 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.

❖ Time to Produce Effect: 1 injection.

❖ Maximum Frequency: 3 injections in 1 year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9 Return to Work.

vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involves several areas in an upper extremity surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Surgery may be considered when: 1) findings on history and objective evidence correlate specifically with the diagnosis; 2) jobsite alteration and other conservative measures have not alleviated the symptoms; and 3) functional deficits persist after 6 to 8 weeks. Subjective complaints should be localized and appropriate to the diagnosis, neurologic complaints should be consistent with the nerve distribution in question, and physical exam findings should correlate with the history. Objective evidence should be present and includes: positive physical exam findings as described in section 3 c; positive electrodiagnostic (EDX) studies, diagnostic peripheral nerve block which eradicates the majority of the patient's symptoms, or a motor deficit commensurate with the suspected neurologic lesion.

Surgery may be considered as an initial therapy in situations where there is clinical and electrodiagnostic evidence of severe or progressive neuropathy. Smoking may affect nerve healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. **Operative Procedures:** Ulnar nerve decompression at the wrist (ulnar tunnel release or Guyon's Canal release).
- h. **Post-operative Treatment:** An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: bracing, scar management, and active therapy with or without passive therapy.

Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

4. **POSTERIOR INTEROSSEOUS NERVE ENTRAPMENT (PIN)**

- a. **Description/Definition:** weakness of finger and thumb extension. Complaints of pain not usually present.
- b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.

c. **Specific Physical Exam Findings:** Required exam findings include:

- Weakness or inability to extend fingers or thumb.

Radial deviation occurs with wrist extension. Weakness of thumb abduction usually occurs. If paresthesias in the radial nerve distribution or significant weakness of the wrist, suspect other diagnoses. Testing the ability of the long finger to cross the index finger is useful.

d. **Diagnostic Testing Procedures:** Nerve conduction velocity studies of both sides for comparison to normal side. EMGs may be needed to rule out radiculopathy. When polyneuropathy is suspected, it may be worthwhile to perform electrodiagnostic testing in the lower extremities. MRI can be done if space occupying lesions are suspected.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Medications such as analgesics and over the counter medications for symptomatic relief, splints, restriction of activities, ergonomic changes, stretching and exercise.
- ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. 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.

- ❖ Time to Produce Effect: 1 injection.

- ❖ Maximum Frequency: 3 injections in 1 year spaced at least 4 to 8 weeks apart

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9 Return to Work.
- vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Surgery may be considered when 1) findings on history and objective evidence correlate specifically with the diagnosis; 2) jobsite alteration and other conservative measures have not alleviated the symptoms; and 3) functional deficits persist after 8 to 10 weeks. Subjective complaints should be localized and appropriate to the diagnosis, neurologic complaints should be consistent with the nerve distribution in question, and physical exam findings of weakness should correlate with the history. Objective evidence should be present and may include: positive physical exam findings as described in section 6.c; positive electrodiagnostic (EDX) studies; or a motor deficit commensurate with the suspected neurologic lesion.

Surgery may be considered as an initial therapy in situations where there is clinical and electrodiagnostic evidence of severe or progressive neuropathy.

Smoking may affect nerve healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. **Operative Procedures:** Nerve Decompression.
- h. **Post-operative Treatment:** An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: bracing, scar management and active therapy with or without passive therapy.

Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

5. **PRONATOR SYNDROME**

- a. **Description/Definition:** Pain/paresthesias in median nerve distribution distal to elbow.
- b. **Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. **Specific Physical Exam Findings:** Required elements for the diagnosis include paresthesias in the median nerve distribution and at least one of the following related exam findings:
- Tingling in median nerve distribution on resisted pronation with elbow flexed at 90 degrees or elbow extended. When symptoms are reproduced with resisted elbow flexion in supination the lacertus fibrosis may be responsible. The flexor digitorum superficialis may be responsible if symptoms are reproduced with resisted flexion of the proximal interphalangeal joint of the long finger.
 - Positive Tinel's at the proximal edge of the pronator teres muscle over the median nerve.

There may be sensation loss over the palm and over the thenar eminence which is not present with carpal tunnel syndrome.

- d. **Diagnostic Testing Procedures:** X-rays of the elbow may be useful to rule out other conditions. Nerve conduction velocity tests of both extremities for comparison to normal; however, findings are frequently negative. EMG should always be included to test median nerve innervated muscles below and above the wrist to rule out carpal tunnel syndrome. When polyneuropathy is suspected, it may be worthwhile to perform electrodiagnostic testing in the lower extremities.
- e. **Non-operative Treatment Procedures:**
- i. **Initial Treatment:** Medications such as analgesics and over the counter medications for symptomatic relief; posterior elbow splint, wrist splint, and restriction of activities such as forceful gripping, and repetitive elbow flexion or forearm pronation.
 - ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
 - iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the

same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. 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.

- ❖ Time to Produce Effect: 1 injection.

- ❖ Maximum Frequency: 3 injections in 1 yearspaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9 Return to Work.
- vi. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

- f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Most patients with this condition recover with conservative therapy. Surgery may be considered when: 1) findings on history and objective evidence correlate specifically with the diagnosis; and 2) jobsite alteration and other conservative measures have not alleviated the symptoms; and 3) functional deficits persist after 8 to 10 weeks. Subjective complaints should be localized and appropriate to the diagnosis, neurologic complaints should be consistent with the nerve distribution in question, and physical exam findings should correlate with the history. Objective evidence should be present and includes: positive physical exam findings as described in section 4c; positive electrodiagnostic (EDX) studies; or a diagnostic peripheral nerve block which eradicates the majority of the patient's symptoms. Surgery may be considered as an initial therapy in situations where there is clinical and electrodiagnostic evidence of severe or progressive neuropathy.

When no objective evidence is present and the patient continues to have signs and symptoms consistent with the diagnosis after 6 months of conservative treatment including a psychological evaluation, a second opinion should be obtained before operative treatment is considered.

Electrodiagnostic (EDX) studies may show delayed median nerve conduction in the forearm. If nerve conduction velocity is normal with suggestive clinical

findings, the study may be repeated after a 3 to 6 month period of continued conservative treatment. If the study is still normal, the decision on treatment is made on the consistency of clinical findings and the factors noted above.

Smoking may affect nerve healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

- g. Operative Procedures:** Median nerve decompression in the forearm (pronator teres or flexor digitorum superficialis release).
- h. Post-operative Treatment:** An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. Some motion is usually allowed 1 week after surgery. In all cases, communication between the physician and therapist is important to the timing of exercise progressions. Treatment may include the following: bracing, scar management, and active therapy with or without passive therapy.

Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

6. RADIAL TUNNEL SYNDROME

- a. Description/Definition:** Pain over the lateral posterior forearm. May occur in conjunction with and must be distinguished from lateral epicondylitis. May include paresthesias over the dorsal radial hand and wrist.
- b. Occupational Relationship:** Refer to Section D. 3, Medical Causation Assessment for Cumulative Trauma Conditions. To perform a proper causation assessment, the reader must comply with all sections.
- c. Specific Physical Exam Findings:** The following two elements are required for the clinical diagnosis:
 - i. Tenderness over the radial nerve near the proximal edge of the supinator muscle. This may be tested by applying pressure along the radial nerve at points corresponding to the diameter of a half dollar beginning just distal to the elbow. At the third pressure point no symptoms should be reproducible. There may be subtle weakness of finger extension but weakness of wrist extension suggests nerve compression proximal to the radial tunnel as do sensation changes.
 - ii. Resisted supination or resisted middle finger extension with the forearm pronated and extended reproduces symptoms.

d. **Diagnostic Testing Procedures:** Nerve conduction velocity studies of both sides for comparison to normal side. EMGs may be needed to rule out radiculopathy. When polyneuropathy is suspected it may be worthwhile to perform electrodiagnostic testing in the lower extremities. Electrodiagnostic (EDX) studies are helpful when positive, but negative studies do not exclude the diagnosis.

- i. MRI may be done if space occupying lesions are suspected.
- ii. X-rays may be normal or demonstrate spur formation over the involved epicondyle.

Diagnostic lidocaine injections may be used to confirm the diagnosis if surgery is being considered, as EMGs are frequently normal in this condition.

e. **Non-operative Treatment Procedures:**

- i. **Initial Treatment:** Medications such as analgesics and over the counter medications for symptomatic relief; restriction of activities and ergonomic changes. Most cases should respond to conservative treatment.
- ii. Patient education should include instruction in self-management techniques, ergonomics, and a home therapy program.
- iii. Jobsite evaluations and alterations. Ergonomic alterations must be done early to assure the appropriate changes are accomplished early in the treatment program.

Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of: 1) instructing the worker how specific duties might be performed to meet ergonomic standards; 2) actual job worksite or duty changes; and/or 3) a formal jobsite evaluation at the worksite. Suggested ergonomic changes are usually applicable to uninjured workers in the same job position. Refer to Section E.6.c., Jobsite Evaluation and H.4., Jobsite Alteration.

- iv. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section H.9 Return to Work.
- v. Other therapies in Section H. Therapeutic Procedures, Non-operative may be employed in individual cases.

f. **Surgical Indications/Considerations:** Since cumulative trauma conditions often involve several areas in an upper extremity, surgical treatment of one problem should be performed in conjunction with conservative treatment of other problems in the upper extremity.

Surgery may be considered when: 1) findings on history and objective evidence correlate specifically with the diagnosis; 2) jobsite alteration and other conservative measures have not alleviated the symptoms; and 3) functional

deficits persist after 8 to 10 weeks. Subjective complaints should be localized and appropriate to the diagnosis, neurologic complaints should be consistent with the nerve distribution in question, and physical exam findings should correlate with the history. Objective evidence should be present and includes: positive physical exam findings as described in section 5.c.; positive electrodiagnostic (EDX) studies, or diagnostic peripheral nerve block which eradicates the majority of the patient's symptoms.

When no objective evidence is present and the patient continues to have signs and symptoms consistent with the diagnosis after 6 months of conservative treatment including a psychological evaluation, a second opinion should be obtained before operative treatment is considered.

Most cases improve with conservative treatment. Surgery should only be performed to achieve functional gains on those with significant ongoing impaired activities of daily living.

Radial nerve decompression is reported to have good success; however, approximately 30% of cases may have residual pain and others may suffer wrist and finger extension weakness due to damage to the posterior interosseous nerve.

Smoking may affect nerve healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g. Operative Procedures: Radial nerve decompression.

h. Post-operative Treatment:

- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section H, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of exercise progressions.
- ii. Treatment may include the following: bracing, scar management and active therapy with or without passive therapy. Stretching is usually started early and strengthening may be begun between the 3 to 6 weeks. Longest recovery would be expected to be 4 months.
- iii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

H. **THERAPEUTIC PROCEDURES – NON-OPERATIVE**

Treating providers as well as employers and insurers are highly encouraged to reference the General Guidelines Principles (Section B) prior to initiation of any therapeutic procedure. All treatment plans should include frequency, duration with specific treatment milestones that are expected that would support ongoing use of the intervention for the specific duration. Before initiation of any therapeutic procedure, the authorized treating provider, employer and insurer must consider these important issues in the care of the injured worker.

First, patients undergoing therapeutic procedure(s) should be released or returned to modified- or restricted-duty during their rehabilitation at the earliest appropriate time. Refer to “Return-to-Work” in this section for detailed information.

Second, cessation and/or review of treatment modalities should be undertaken when no further significant subjective or objective improvement in the patient’s condition is noted. If patients are not responding within the recommended duration periods, alternative treatment interventions, further diagnostic studies or consultations should be pursued.

Third, providers should provide and document education 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.

Lastly, formal psychological or psychosocial evaluation should be performed on patients not making expected progress within 6 to 12 weeks following injury and whose subjective symptoms do not correlate with objective signs and tests.

In cases where a patient is unable to attend an outpatient center, home therapy may be necessary. Home therapy may include active and passive therapeutic procedures as well as other modalities to assist in alleviating pain, swelling, and abnormal muscle tone. Home therapy is usually of short duration and continues until the patient is able to tolerate coming to an outpatient center.

The following procedures are listed in alphabetical order.

1. **ACUPUNCTURE** is an accepted and widely used procedure for the relief of pain and inflammation in cumulative trauma conditions. There is some evidence to support its use for lateral epicondylitis. The exact mode of action is only partially understood. Western medicine studies suggest that acupuncture stimulates the nervous system at the level of the brain, promotes deep relaxation, and affects the release of neurotransmitters. Acupuncture is commonly used as an alternative or in addition to traditional Western pharmaceuticals. While it is commonly used when pain medication is reduced or not tolerated, it may be used as an adjunct to physical rehabilitation and/or surgical intervention to hasten the return of functional activity. Acupuncture should be performed by licensed practitioners.
 - a. **Acupuncture:** is the insertion and removal of filiform needles to stimulate acupoints (acupuncture points). Needles may be inserted, manipulated and retained for a period of time. Acupuncture can be used to reduce pain and inflammation, increase blood flow, increase range-of-motion, decrease the side

effects of medication-induced nausea, promote relaxation in an anxious patient, and reduce muscle spasm.

Indications include joint pain, joint stiffness, soft tissue pain and inflammation, paresthesia, post-surgical pain relief, muscle spasm, and scar tissue pain.

- b. **Acupuncture with Electrical Stimulation:** is the use of electrical current (micro-amperage or milli-amperage) on the needles at the acupuncture site. It is used to increase effectiveness of the needles by continuous stimulation of the acupoint. Physiological effects (depending on location and settings) can include endorphin release for pain relief, reduction of inflammation, increased blood circulation, analgesia through interruption of pain stimulus, and muscle relaxation.

It is indicated to treat chronic pain conditions, radiating pain along a nerve pathway, muscle spasm, inflammation, scar tissue pain, and pain located in multiple sites.

- c. **Total Time Frames for Acupuncture and Acupuncture with Electrical Stimulation:** Time frames are not meant to be applied to each of the above sections separately. The time frames are to be applied to all acupuncture treatments regardless of the type or combination of therapies being provided.

- ❖ Time to Produce Effect: 3 to 6 treatments.
- ❖ Frequency: 1 to 3 times per week.
- ❖ Optimum Duration: 1 to 2 months.
- ❖ Maximum Duration: 14 treatments.

Any of the above acupuncture treatments may extend longer if objective functional gains can be documented or when symptomatic benefits facilitate progression in the patient's treatment program. Treatment beyond 14 treatments must be documented with respect to need and ability to facilitate positive symptomatic or functional gains. Such care should be re-evaluated and documented with each series of treatments.

- d. **Other Acupuncture Modalities:** Acupuncture treatment is based on individual patient needs and therefore treatment may include a combination of procedures to enhance treatment effect. Other procedures may include the use of heat, soft tissue manipulation/massage, and exercise. Refer to sections H.11 Active Therapy and H.12 Passive Therapy (Massage and Superficial Heat and Cold Therapy) for a description of these adjunctive acupuncture modalities and time frames.

2. **BIOFEEDBACK** is a form of behavioral medicine that helps patients learn self-awareness and self-regulation skills for the purpose of gaining greater control of their physiology, such as muscle activity, brain waves, and measures of autonomic nervous system activity. It is an accepted treatment. Electronic instrumentation is used to monitor the targeted physiology and then displayed or fed back to the patient visually,

auditorially, or tactilely, with coaching by a biofeedback specialist. Biofeedback is provided by clinicians certified in biofeedback and/or who have documented specialized education, advanced training, direct or supervised experience qualifying them to provide the specialized treatment needed (e.g., surface EMG, EEG, or other).

Treatment is individualized to the patient's work-related diagnosis and needs. Home practice of skills is required for mastery and may be facilitated by the use of home training tapes. The ultimate goal in biofeedback treatment is normalizing the physiology to the pre-injury status to the extent possible and involves transfer of learned skills to the workplace and daily life. Candidates for biofeedback therapy or training must be motivated to learn and practice biofeedback and self-regulation techniques.

Indications for biofeedback include individuals who are suffering from musculoskeletal injury in which muscle dysfunction or other physiological indicators of excessive or prolonged stress response affects and/or delays recovery. Other applications include training to improve self-management of emotional stress/pain responses such as anxiety, depression, anger, sleep disturbance, and other central and autonomic nervous system imbalances. Biofeedback is often utilized along with other treatment modalities.

- ❖ Time to Produce Effect: 3 to 4 sessions.
- ❖ Frequency: 1 to 2 times per week.
- ❖ Optimum Duration: 5 to 6 sessions.
- ❖ Maximum Duration: 10 to 12 sessions. Treatment beyond 12 sessions must be documented with respect to need, expectation, and ability to facilitate positive symptomatic or functional gains.

3. **INJECTIONS – THERAPEUTIC** are generally accepted, well-established procedures that may play a significant role in the treatment of patients with upper extremity pain or pathology. Therapeutic injections involve the delivery of anesthetic and/or anti-inflammatory medications to the painful structure. Therapeutic injections have many potential benefits. Ideally, a therapeutic injection will: (a) reduce inflammation in a specific target area; (b) relieve secondary muscle spasm; and (c) diminish pain and support therapy directed to functional recovery. Diagnostic and therapeutic injections should be used early and selectively to establish a diagnosis and support rehabilitation. If injections are overused or used outside the context of a monitored rehabilitation program, they may be of significantly less value.

Indications — Diagnostic injections are procedures which may be used to identify pain generators or pathology. For additional specific clinical indications, see Sections F. and G., Specific Musculoskeletal and Specific Peripheral Nerve Diagnosis, Testing and Treatment.

Special Considerations — The use of injections has become progressively sophisticated. Each procedure considered has an inherent risk, and risk versus benefit should be evaluated when considering injection therapy. In addition, all injections must include sterile technique.

Contraindications — General contraindications include local or systemic infection, bleeding disorders, allergy to medications used, and patient refusal. Specific contraindications may apply to individual injections.

a. Autologous Whole Blood Injections/Platelet-Rich Plasma Injections:

- i. Autologous Whole Blood Injections: Autologous whole blood injections are an inexpensive treatment and may be used in patients who have not made sufficient functional progress with initial therapy for lateral or medial epicondylitis after 10 to 12 weeks. Refer to Sections F. 3. e. and F. 4. e.

There is some evidence in literature on lateral epicondylitis, that for patients with symptoms lasting 6 months or more, autologous blood injections result in better pain and functional outcomes after 1 year than steroid injections.

- ❖ Optimum Duration/Frequency: 2 injections may be required.

- ii. Platelet-Rich Plasma Injections: There is good evidence, in literature on lateral epicondylitis, that for patients with symptoms lasting 6 months or more, platelet-rich plasma injections result in better pain and functional outcomes after 1 year than steroid injections.

- ❖ Optimum Duration/Frequency: 1 injection.

- b. Botulinum Toxin Injections:** Rationale for botulinum toxin as a treatment for lateral and medial epicondylitis is that it reversibly paralyzes the extensor muscles and thereby prevents repetitive micro-trauma of the tendonous fibers at their origin from the osseous lateral/medial epicondyle. The unit dosage varies significantly depending on the brand used. Usage for lateral and medial epicondylitis is not FDA approved at the time of this guideline writing. There is good evidence that botulinum toxin A injection may provide short-term pain relief from pain due to chronic (3 months or longer) lateral epicondylitis. However, the long-term functional benefits are unknown. There is also good evidence that botulinum toxin A injections cause weakness in finger extension and/or digit paresis. Additional complications may include: allergic reaction to medications, increased risk of systemic effects in patients with motor neuropathy or disorders of the neuromuscular junction.

It should not be considered a first line of treatment. Other conservative measures should be tried first. Careful botulinum toxin dosing should be used to avoid complete paresis and maintain function and return to work.

Botulinum toxin injections are listed in this guideline as a treatment option for lateral and medial epicondylitis. Prior authorization is required. For more specific details, the reader must refer to Sections F. 3. e. and F. 4. e.

- ❖ Maximum: 1 injection episode

c. **Steroid Injections:** including joint, bursa and peri-tendonous insertions are well-established procedures with varying degrees of evidence depending on the diagnosis. Peri-tendonous injections under significant pressure should be avoided as the needle may be inadvertently penetrating the tendon. Injection into the tendon can cause tendon degeneration, tendon breakdown, or rupture. Injections should be used with caution for patients under 30 years of age. When performing peri-tendonous injections, the risk of tendon rupture should be discussed with the patient and the need for temporary restricted-duty emphasized.

- ❖ Time to Produce Effect: Immediate with local anesthesia, or within 3 days if no anesthesia.
- ❖ Optimum Duration: Usually 1 to 2 injections is adequate.
- ❖ Maximum Frequency: Not more than 3 to 4 times annually.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood-glucose level at least twice daily for 2 weeks post-injections.

There is strong evidence in literature on lateral epicondylitis that steroid injection decreases pain in the first few weeks but has a worse outcome at 52 weeks than PT or more conservative therapy including bracing, platelet-rich plasma injections, heat or cold therapy, and change in activities. The potential for negative long-term effects should be strongly considered. A program of physical rehabilitation in combination with judicious use of analgesic medications should be the core treatment for epicondylitis.

d. **Trigger Point Injections:** although generally accepted, have only rare indications in the treatment of upper extremity disorders. Therefore, the Division does not recommend their routine use in the treatment of upper extremity injuries.

Description - Trigger point treatment can consist of dry needling or injection of local anesthetic with or without corticosteroid into highly localized, extremely sensitive bands of skeletal muscle fibers that produce local and referred pain when activated. Medication is injected in a four-quadrant manner in the area of maximum tenderness. Injection efficacy can be enhanced if injections are immediately followed by myofascial therapeutic interventions, such as vapo-coolant spray and stretch, ischemic pressure massage (myotherapy), specific soft tissue mobilization and physical modalities. A truly blinded study comparing dry needle treatment of trigger points is not feasible.

There is no indication for conscious sedation for patients receiving trigger point injections. The patient must be alert to help identify the site of the injection.

Indications - Trigger point injections may be used to relieve myofascial pain and facilitate active therapy and stretching of the affected areas. They are to be used as an adjunctive treatment in combination with other treatment modalities such as functional restoration programs. Trigger point injections should be utilized

primarily for the purpose of facilitating functional progress. Patients should continue with a therapeutic exercise program as tolerated throughout the time period they are undergoing intensive myofascial interventions. Myofascial pain is often associated with other underlying structural problems, and any abnormalities need to be ruled out prior to injection.

Trigger point injections are indicated in those patients where well-circumscribed trigger points have been consistently observed, characteristic radiation of pain pattern and local autonomic reaction, such as persistent hyperemia following palpation. Generally, these injections are not necessary unless consistently observed trigger points are not responding to specific, noninvasive, myofascial interventions within approximately a 6 week time frame.

Complications — Potential but rare complications of trigger point injections include infection, anaphylaxis, neurapraxia, and neuropathy. If corticosteroids are injected in addition to local anesthetic, there is a risk of developing local myopathy. Severe pain on injection suggests the possibility of an intraneural injection, and the needle should be immediately repositioned.

- ❖ Time to Produce Effect: Local anesthetic 30 minutes; no anesthesia 24 to 48 hours.
- ❖ Frequency: Weekly, suggest no more than 4 injection sites per session per week to avoid significant post-injection soreness.
- ❖ Optimum Duration: 4 Weeks.
- ❖ Maximum Duration: 8 weeks. Occasional patients may require 2 to 4 repetitions of trigger point injection series over a 1 to 2 year period.

- e. **Prolotherapy:** (also known as sclerotherapy) consists of peri-articular injections of hypertonic dextrose with or without phenol with the goal of inducing an inflammatory response that will recruit cytokine growth factors involved in the proliferation of connective tissue. Advocates of prolotherapy propose that these injections will alleviate complaints related to joint laxity by promoting the growth of connective tissue and stabilizing the involved joint.

Laboratory studies may lend some biological plausibility to claims of connective tissue growth, but high quality published clinical studies are lacking. The dependence of the therapeutic effect on the inflammatory response is poorly defined, raising concerns about the use of conventional anti-inflammatory drugs when proliferate injections are given. The evidence in support of prolotherapy is insufficient and therefore, its use is not recommended in upper extremity injuries.

- f. **Viscosupplementation/Intracapsular Acid Salts:** involves the injection of hyaluronic acid and its derivatives into the joint space. Hyaluronic acid is normally secreted by the healthy synovium into the joint space and functions to lubricate the joint and protect the cartilage. These injections may only be used for osteoarthritis.

There is some evidence that intra-articular injection of high molecular weight hyaluronic acid is more effective than saline in improving function and pain at 6 months for osteoarthritis at the base of the thumb. There is no evidence that hyaluronate injections are superior to steroid injections for CTC thumb arthritis. They may be tried after 3 months of conservative therapy, including steroid injections has failed. At the time of this guidelines writing, hylan G-F 20 has been FDA approved for the treatment of pain due to osteoarthritis of the knee in patients who have failed to respond adequately to conservative non-pharmacologic therapy and simple analgesics.

- ❖ Time to Produce Effect/Frequency: 1 injection.
- ❖ Optimum Duration/Frequency: 2 injections per year.

4. **JOBSITE ALTERATION** Early evaluation and training of body mechanics and other ergonomic factors are essential for every injured worker and should be done by a qualified individual. Whenever a case is identified as a work-related cumulative trauma condition, job alterations are an expected treatment. These may be in the form of instructing the worker how specific duties might be performed to meet the ergonomic suggestions in the jobsite alteration section or in actual job worksite or duty changes. Studies of symptomatic workers show that those who report symptoms of pain or aching are more likely to progress to increased pain or aching or actual categories of a CTC when they have ergonomic risks at work, and are more likely to experience a decrease in work production. There is some evidence that early workplace intervention may prevent loss of work productivity, particularly when handling high physical loads. Therefore, employees presenting with pain or aching associated with ergonomic risks would benefit from having their work stations properly evaluated and adjusted as appropriate even when no workers compensation claim is accepted. In many cases, this requires a jobsite evaluation.

There is no single factor or combination of factors that is proven to prevent or ameliorate CTC, but a combination of ergonomic and psychosocial factors are generally considered to be important. Ergonomic factors that may be considered include use of force, repetition, awkward positions, upper extremity vibration, cold environment, and contact pressure on the nerve. Psychosocial factors to be considered include pacing, degree of control over job duties, perception of job stress, and supervisory support.

Job evaluation and modification should include input from a health care professional with experience in ergonomics or a certified ergonomist; the employee; and the employer. The employee must be observed performing all job functions in order for the jobsite evaluation to be a valid representation of a typical workday. Periodic follow-up is recommended to assess the effectiveness of the intervention and need for additional ergonomic changes.

Because ergonomic changes are a required medical treatment for cumulative trauma conditions and the person performing the evaluations is a health care professional, it is assumed that the insurer will be responsible for paying for the jobsite evaluation.

- a. **Interventions:** There are no conclusive studies with convincing evidence of standard ergonomic changes that will accommodate all workers. Individual characteristics, such as height or strength, affect the ideal organization of the workstation. The worksite should be adjusted to support neutral, yet natural,

positions. In addition, workers should be counseled to vary tasks throughout the day whenever possible. OSHA suggests that workers who perform repetitive tasks, including keyboarding, change activities over a 5-minute interval every hour. Mini-breaks should include stretching exercises. The following should be considered: engineering controls, e.g., mechanizing the task, and changing the tool used, or adjusting the jobsite; or administrative controls, e.g., adjusting the time an individual performs the task.

- b. **Seating Description:** The following description may aid in evaluating seated work positions: The head should be in a neutral position, and if a monitor is used, there should be 18 to 24 inches of viewing distance with no glare. Arms should rest naturally, with the elbow at the side and flexed to 90 degrees or slightly extended. Some individuals may prefer a wrist pad to reduce wrist extension. Wrists should be straight or minimally extended. It is generally preferable to avoid dependence on arm rests. The back must be properly supported by a chair with the back upright or leaning backwards slightly, allowing change in position with backrest adjustment. There should be good knee and legroom, with the feet resting comfortably on the floor or footrest. Tools should be within easy reach, and twisting or bending should be avoided.
- c. **Job Hazard Checklist:** The following table entitled, 'Identifying Job Duties which may pose Ergonomic Hazards,' is adopted with modification from Washington State's job hazard checklist, and may be used as a generally accepted guide for identifying job duties which may pose ergonomic hazards. The fact that an ergonomic hazard exists at a specific job, or is suggested in the table, does not establish a causal relationship between the job and the individual with a musculoskeletal injury. However, when an individual has a work-related injury and ergonomic hazards exist that affect the injury, appropriate job modifications should be made. Proper correction of hazards may prevent future injuries to others, as well as aid in the recovery of the injured worker.
- d. **Tools:** The tools should be assessed for the individual and not used universally. It is important to select the right tool for the task. In general, the person should work in the most neutral position possible and use the least force possible. For force tools, the grip should not span more than 3.5 inches, and the handle diameter should not be greater than 2 inches. Precision tools may require a smaller diameter. If possible, continual forearm tasks requiring supination/pronation should be avoided by using automatic tools.

SEE NEXT PAGE FOR JOB HAZARDS TABLE

Identifying Job Duties Which May Pose Ergonomic Hazards*

Type of Job Duty	Hours per Day
Pinching an unsupported object(s) weighing 2 lbs or more per hand, or pinching with a force of 4 lbs or more per hand (comparable to pinching a half-ream of paper):	
1. Highly repetitive motion.	More than 3 hours total/day
2. Wrist palmar flexion greater than 45 degrees, wrist extension greater than 30 degrees, ulnar deviation greater than 20 degrees, or radial deviation greater than 20 degrees.	
3. Most of the work cycle performed with the elbow flexed equal to or greater than 90 degrees.	
4. No other risk factors.	More than 4 hours total/day
Gripping (an) unsupported object(s) weighing 10 lbs or more/hand, or gripping with a force of 10 lbs or more/hand (comparable to clamping light duty automotive jumper cables onto a batter): *Handles should be rounded and soft, with at least 1.25"-2.0" in diameter grips at least 5" long. Preferably, a power grip should be used.	
1. Highly repetitive motion.	More than 3 hours total/day
2. Wrist palmar flexion greater than 45 degrees, wrist extension greater than 30 degrees, ulnar deviation greater than 20 degrees, or radial deviation greater than 20 degrees.	
3. Most of the work cycle performed with the elbow flexed equal to or greater than 90 degrees.	
4. No other risk factors.	More than 4 hours total/day
Repetitive Motion (using the same motion with little or no variation) with a cycle time 30 seconds or less or greater than 50% of cycle time performing the same task:	
1. High, forceful exertions with the hands, with wrist palmar flexion greater than 45 degrees, wrist extension greater than 30 degrees, ulnar deviation greater than 20 degrees, or radial deviation greater than 20 degrees.	More than 2 hours total/day
2. Most of the work cycle performed with the elbow flexed equal to or greater than 90 degrees.	
3. No other risk factors.	More than 6 hours total/day
<u>Intensive Keying:</u>	
1. Wrist palmar flexion greater than 45 degrees, wrist extension greater than 30 degrees, ulnar deviation greater than 20 degrees, or radial deviation greater than 20 degrees.	

Type of Job Duty	Hours per Day
<u>Intensive Keying</u> (continued) 2. Most of the work cycle performed with the elbow flexed equal to or greater than 90 degrees.	More than 4 hours total/day
3. No other risk factors.	More than 7 hours total/day
<u>Repeated Impact:</u>	
1. Using the hand (heel/base of palm) as a hammer more than once/minute.	More than 2 hours total/day
<u>Vibration:</u>	
Two determinants of the tolerability of segmental vibration of the hand are the frequency and the acceleration of the motion of the vibrating tool, with lower frequencies being more poorly tolerated at a given level of imposed acceleration, expressed below in multiples of the acceleration due to gravity.	
1. Frequency range 8-15 Hz and acceleration 6 g	More than 30 minutes at a time
2. Frequency range 80 Hz and acceleration 40 g	
3. Frequency range 250 Hz and acceleration 250 g	
4. Frequency range 8-15 Hz and acceleration 1.5 g	More than 4 hours at a time
5. Frequency range 80 Hz and acceleration 6 g	
6. Frequency range 250 Hz and acceleration 20 g	

* This table may not be used to establish causation. Refer to Section D. 3. Medical Causation for Cumulative Trauma Conditions. Recommendations for ergonomic changes to make the workplace more comfortable and efficient for the worker are not identical to risk factors which may cause an identified CTC.

5. **MEDICATIONS AND MEDICAL MANAGEMENT** use in the treatment of cumulative trauma related conditions is generally accepted for controlling acute pain and inflammation. Use of medications will vary widely due to the spectrum of injuries from simple strains to post-surgical analgesia. 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. Treatment for pain control is initially accomplished with acetaminophen and/or NSAIDs. The patient should be educated regarding the interaction with prescription and over the counter medications as well as the contents of over the counter herbal products.

Oral non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen are useful in treating conditions associated with degenerative joint disease and/or inflammation. Topical medications may also be useful in controlling pain.

a. **Acetaminophen:** is an effective analgesic with antipyretic but not anti-inflammatory activity. Acetaminophen is generally well tolerated, causes little gastrointestinal irritation but may be associated with stomach bleeding in at risk patients. Acetaminophen has been associated with liver toxicity in overdose situations or in chronic alcohol use. Patients may not realize that many over the counter preparations may contain acetaminophen. The total daily dose of acetaminophen is recommended not to exceed 4 grams per 24-hour period, from all sources, including narcotic acetaminophen combination preparations.

- ❖ Optimal Duration: 7 to 10 days.

- ❖ Maximum Duration: Chronic use as indicated on a case-by-case basis. Use of this substance long-term for 3 days per week or greater may be associated with rebound pain upon cessation.

b. **Minor Tranquilizer/Muscle Relaxants:** may be appropriate for muscle spasm, mild pain, and sleep disorders; however, are rarely necessary to treat CTC. When prescribing these agents, physicians must seriously consider side effects of drowsiness or dizziness and the fact that benzodiazepines and some other muscle relaxants may be habit forming.

- ❖ Optimal Duration: 1 week.

- ❖ Maximum Duration: 4 weeks.

c. **Narcotics:** should be primarily reserved for the treatment of severe upper extremity pain. There are circumstances where prolonged use of narcotics is justified based upon specific diagnosis, and in these cases, it should be documented and justified. In mild-to-moderate cases of upper extremity pain, narcotic medication should be used cautiously on a case-by-case basis. Adverse effects include respiratory depression, the development of physical and psychological dependence, and impaired alertness.

Narcotic medications should be prescribed with strict time, quantity, and duration guidelines, and with definitive cessation parameters. Pain is subjective in nature and should be evaluated using a pain scale and assessment of function to rate effectiveness of the narcotic prescribed. Any use beyond the maximum duration should be documented and justified based on the diagnosis and/or invasive procedures.

- ❖ Optimal Duration: 3 to 7 days.

- ❖ Maximum Duration: 2 weeks. Use beyond two weeks is acceptable in appropriate cases. Refer to the Chronic Pain Guidelines which gives a detailed discussion regarding medication use in chronic pain management. When prescribing beyond the maximum duration, it is recommended physicians access the Colorado Prescription Drug Monitoring Program (PDMP). This system allows the prescribing physician to see all controlled substances prescribed by other physicians for an individual patient.

- d. **Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):** are useful for pain and inflammation. In mild cases, they may be the only drugs required for analgesia. There are several classes of NSAIDs, and the response of the individual injured worker to a specific medication is unpredictable. For this reason, a range of NSAIDs may be tried in each case with the most effective preparation being continued. Patients should be closely monitored for adverse reactions. The US Food and Drug Administration advise that many NSAIDs may cause an increased risk of serious cardiovascular thrombotic events, myocardial infarction, and stroke, which can be fatal. Naproxen sodium does not appear to be associated with increased risk of vascular events. Administration of proton pump inhibitors, histamine 2 blockers or prostaglandin analog misoprostol along with these NSAIDs may reduce the risk of duodenal and gastric ulceration but do not impact possible cardiovascular complications. Due to the cross-reactivity between aspirin and NSAIDs, NSAIDs should not be used in aspirin-sensitive patients, and should be used with caution in all asthma patients. NSAIDs are associated with abnormal renal function, including renal failure, as well as abnormal liver function. Certain NSAIDs may have interactions with various other medications. Individuals may have adverse events not listed above. Intervals for metabolic screening are dependent upon the patient's age, general health status and should be within parameters listed for each specific medication. Complete blood count (CBC) and liver and renal function should be monitored at least every six months in patients on chronic NSAIDs and initially when indicated.

NSAIDs may be used for pain management after joint replacement. They have also been used to reduce heterotopic ossification after arthroplasty. NSAIDs do reduce the radiographically documented heterotopic ossification in this setting, but there is some evidence in lower extremity cases that they do not improve functional outcomes and they may increase the risk of bleeding events in the post-operative period. Their routine use for prevention of heterotopic bone formation is not recommended.

i. Non-selective Nonsteroidal Anti-Inflammatory Drugs:

Includes NSAIDs and acetylsalicylic acid (aspirin). Serious GI toxicity, such as bleeding, perforation, and ulceration can occur at any time, with or without warning symptoms in patients treated with traditional NSAIDs. Physicians should inform patients about the signs and/or symptoms of serious gastrointestinal toxicity and what steps to take if they occur. Anaphylactoid reactions may occur in patients taking NSAIDs. NSAIDs may interfere with platelet-function. Fluid retention and edema have been observed in some patients taking NSAIDs.

❖ Optimal Duration: 1 week.

❖ Maximum Duration: 1 year. Use of these substances long-term (3 days per week or greater) is associated with rebound pain upon cessation.

ii. Selective Cyclo-oxygenase-2 (COX-2) Inhibitors:

COX-2 inhibitors are more recent NSAIDs and differ in adverse side effect profiles from the traditional NSAIDs. The major advantages of selective COX-2 inhibitors over traditional NSAIDs are that they have less gastrointestinal toxicity and no platelet-effects. COX-2 inhibitors can worsen renal function in patients with renal insufficiency, thus renal function may need monitoring.

COX-2 inhibitors should not be first-line for low risk patients who will be using NSAIDs short-term but are indicated in select patients for whom traditional NSAIDs are not tolerated. Serious upper GI adverse events can occur even in asymptomatic patients. Patients at high risk for GI bleed include those who use alcohol, smoke, are older than 65, take corticosteroids or anti-coagulants, or have a longer duration of therapy. Celecoxib is contraindicated in sulfonamide-allergic patients.

- ❖ Optimal Duration: 7 to 10 days.
- ❖ Maximum Duration: Chronic use is appropriate in individual cases. Use of these substances long-term (3 days per week or greater) is associated with rebound pain upon cessation.

e. Oral Steroids:

Oral steroids have limited use but are accepted in cases requiring potent anti-inflammatory drug effect in carefully selected patients. A one-week regime of steroids may be considered in the treatment of patients who have arthritic flare-ups with significant inflammation of the joint.

For carpal tunnel syndrome, 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 for carpal tunnel syndrome. It may occasionally be appropriate to use them for patients with severe CTS symptoms who refuse injections and who have no risk factors for adverse effects.

The physician must be fully aware of potential contraindications for the use of all steroids such as hypertension, diabetes, glaucoma, peptic ulcer disease, etc., which should be discussed with the patient.

- ❖ Optimal Duration: 3 to 7 days.
- ❖ Maximum Duration: 7 days.

- f. Psychotropic/Anti-anxiety/Hypnotic Agents:** may be useful for treatment of mild and chronic pain, dysesthesias, sleep disorders, and depression. Post-operative patients may receive medication to assure normal sleep cycles. Antidepressant medications, such as tricyclics and Selective Serotonin Reuptake Inhibitors (SSRIs), are useful for affective disorder and chronic pain management. Tricyclic anti-depressant agents, in low dose, are useful for chronic pain but have more frequent side effects.

Anti-anxiety medications are best used for short-term treatment (i.e., less than 6 months). Accompanying sleep disorders are best treated with sedating antidepressants prior to bedtime. Frequently, combinations of the above agents are useful. As a general rule, physicians should assess the patient's prior history of substance abuse or depression prior to prescribing any of these agents.

Due to the habit-forming potential of the benzodiazepines and other drugs found in this class, they are not routinely recommended. Refer to the Chronic Pain Guidelines which give a detailed discussion regarding medication use in chronic pain management.

- ❖ Optimal Duration: 1 to 6 months.
- ❖ Maximum Duration: 6 to 12 months, with monitoring.

- g. Topical Drug Delivery:** Creams and patches may be an alternative treatment of localized musculoskeletal disorders. They should only be considered for patients who cannot tolerate oral NSAIDs.

It is necessary that all topical agents be used with strict instructions for application as well as the maximum number of applications per day to obtain the desired benefit and avoid potential toxicity. As with all medications, patient selection must be rigorous to select those patients with the highest probability of compliance. Refer to "Iontophoresis" in Passive Therapy of this section for information regarding topical iontophoretic agents.

- i. Topical Salicylates and Nonsalicylates: have been shown to be effective in relieving pain in acute and chronic musculoskeletal conditions. Topical salicylate and nonsalicylates achieve tissue levels that are potentially therapeutic, at least with regard to COX inhibition.

There is good evidence that diclofenac gel reduces pain and improves function in mild-to-moderate hand osteoarthritis. There is some evidence that topical ketoprofen patches are more effective than placebo in reducing pain of upper extremity tendonitis; however, the need for continuous skin application may limit overall use. Use of ketoprofen topical patch for the disorders described in these guidelines has not been FDA approved at the time of this guideline writing.

Other than local skin reactions, the side effects of therapy are minimal, although not non-existent and the usual contraindications to use of these compounds needs to be considered. Local skin reactions are rare and systemic effects were even less common. Their use in patients receiving warfarin therapy may result in alterations in bleeding time. Overall, the low level of systemic absorption can be advantageous; allowing the topical use of these medications when systemic administration is relatively contraindicated such as is the case in patients with hypertension, cardiac failure, or renal insufficiency. Hepatic changes have been documented with topical NSAID use and therefore monitoring of liver enzymes is recommended.

There is no evidence that topical agents are more or less effective than oral medications.

- ❖ Optimal Duration: 1 week.
- ❖ Maximal Duration: 2 weeks per episode.

ii. Capsaicin: is another medication option for topical drug use in upper extremity injury. Capsaicin offers a safe and effective alternative to systemic NSAID therapy. Although it is quite safe, effective use of capsaicin is limited by the local stinging or burning sensation that typically dissipates with regular use, usually after the first 7 to 10 days of treatment. Patients should be advised to apply the cream on the affected area with a plastic glove or cotton applicator and to avoid inadvertent contact with eyes and mucous membranes. At the time of these guidelines writing, neuropathic pain associated with post-herpetic neuralgia is the only FDA approved use of prescription topical capsaicin.

- ❖ Optimal Duration: 1 week.
- ❖ Maximal Duration: 2 weeks per episode.

iii. Iontophoretic Agents: Refer to "Iontophoresis," under Passive Therapy of this section.

iv. Topical Glyceryl Trinitrate: There is some evidence that topical glyceryl trinitrate is not effective for epicondylitis therefore it is not recommended.

v. Topical Lidocaine: There is no evidence that lidocaine patches have a functional benefit over other well-accepted treatment for carpal tunnel. At the time of these guidelines writing, post-herpetic neuralgia is the only medical condition for which topical lidocaine patch is FDA approved. The patches are not generally recommended, although may be used when the primary complaint of the patient is pain and the patient refuses a steroid injection.

h. Vitamin B6: Randomized trials on non-surgical treatment for carpal tunnel syndrome 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.

6. OCCUPATIONAL REHABILITATION PROGRAMS

a. Non-Interdisciplinary: These generally-accepted programs are work-related, outcome focused, individualized treatment programs. Objectives of the program include, but are not limited to, improvement of cardiopulmonary and neuromusculoskeletal functions (strength, endurance, movement, flexibility, stability, and motor control functions), patient education, and symptom relief. The goal is for patients to gain full- or optimal-function and return to work. The service may include the time limited use of passive modalities with progression to achieve treatment and/or simulated/real work.

- i. Work conditioning: is usually initiated once re-conditioning has been completed but may be offered at any time throughout the recovery phase. It should be initiated when imminent return of a patient to modified- or full-duty is not an option, but the prognosis for returning the patient to work at completion of the program is at least fair to good.
 - ❖ Length of Visit: 1 to 2 hours per day.
 - ❖ Frequency: 2 to 5 visits per week.
 - ❖ Optimum Duration: 2 to 4 weeks.
 - ❖ Maximum Duration: 6 weeks. Participation in a program beyond 6 weeks must be documented with respect to need and the ability to facilitate positive symptomatic or functional gains.

- ii. Work simulation: is a program where an individual completes specific work-related tasks for a particular job and return-to-work. Use of this program is appropriate when modified duty can only be partially accommodated in the work place, when modified duty in the work place is unavailable, or when the patient requires more structured supervision. The need for work place simulation should be based upon the results of a Functional Capacity Evaluation (FCE) and/or Jobsite Evaluation.
 - ❖ Length of Visit: 2 to 6 hours per day.
 - ❖ Frequency: 2 to 5 visits per week.
 - ❖ Optimum Duration: 2 to 4 weeks.
 - ❖ Maximum Duration: 6 weeks. Participation in a program beyond 6 weeks must be documented with respect to need and the ability to facilitate positive symptomatic or functional gains.

- b. **Interdisciplinary**: These generally-accepted programs are characterized by a variety of disciplines that participate in the assessment, planning, and/or implementation of an injured worker's program with the goal of the patient gaining full- or optimal-function and returning to work. There should be close interaction and integration among the disciplines to ensure that all members of the team interact to achieve team goals. These programs are for patients with greater levels of perceived disability, dysfunction, de-conditioning and psychological involvement. For patients with chronic pain, refer to the Division's Chronic Pain Disorder Medical Treatment Guidelines.
 - i. Work Hardening is an interdisciplinary program addressing a patient's employability and return-to-work. It includes a progressive increase in the number of hours per day that a patient completes work simulation tasks until the patient can tolerate a full workday. This is accomplished by addressing the medical, psychological, behavioral, physical, functional, and vocational components of employability and return-to-work.

This can include a highly structured program involving a team approach or can involve any of the components thereof. The interdisciplinary team should, at a minimum, be comprised of a qualified medical director who is board certified with documented training in occupational rehabilitation, physicians having experience in occupational rehabilitation, occupational therapist, physical therapist, case manager, and psychologist. As appropriate, the team may also include: chiropractor, RN, vocational specialist, or certified biofeedback therapist.

- ❖ Length of Visit: Up to 8 hours/day.
- ❖ Frequency: 2 to 5 visits per week.
- ❖ Optimum Duration: 2 to 4 weeks.
- ❖ Maximum Duration: 6 weeks. Participation in a program beyond 6 weeks must be documented with respect to need and the ability to facilitate positive symptomatic or functional gains.

7. **PATIENT EDUCATION** No treatment plan is complete without addressing issues of individual patient and/or group education as a means of prolonging the beneficial effects of treatment, as well as facilitating self-management of symptoms and injury prevention. Patient education is widely used, well-established, and generally well-accepted. The patient should take an active role in the establishment of functional outcome goals. They should be educated on his or her specific injury, assessment findings, and plan of treatment. Education and instruction in proper body mechanics, posture, positions to avoid task/tool adaptation, self care for exacerbation of symptoms, and home exercise/task adaptation should also be addressed.

- ❖ Time to Produce Effect: Varies with individual patient.
- ❖ Frequency: Should occur at every visit.

8. **PERSONALITY/PSYCHOLOGICAL/PSYCHOSOCIAL INTERVENTION** is generally accepted, widely used, and well-established. This group of therapeutic and diagnostic modalities includes, but is not limited to, individual counseling, group therapy, stress management, psychosocial crises intervention, hypnosis, and meditation. Any screening or diagnostic workup should clarify and distinguish between pre-existing versus aggravated versus purely causative psychological conditions. Psychosocial intervention is recommended as an important component in the total management program that should be implemented as soon as the problem is identified. This can be used alone or in conjunction with other treatment modalities. Providers treating patients with chronic pain should refer to the Division's Chronic Pain Disorder Medical Treatment Guidelines.

- ❖ Time to Produce Effect: 2 to 4 weeks.
- ❖ Frequency: 1 to 3 times weekly for the first 4 weeks (excluding hospitalization, if required), decreasing to 1 to 2 times per week for the second month. Thereafter, 2 to 4 times monthly.
- ❖ Optimum Duration: 6 weeks to 3 months.

- ❖ **Maximum Duration:** 3 to 12 months. Counseling is not intended to delay but to enhance functional recovery. For select patients, longer supervised treatment may be required, and if further counseling beyond 3 months is indicated, documentation addressing which pertinent issues are pre-existing versus aggravated versus causative, as well as projecting a realistic functional prognosis, should be provided by the authorized treating provider every 4 to 6 weeks during treatment.

9. **RETURN-TO-WORK** Early return-to-work generally accepted and should be a prime goal in treating occupational injuries given the poor return-to-work prognosis for an injured worker who has been out of work for more than 6 months. It is imperative that the patient be educated regarding the benefits of return-to-work, work restrictions, and follow-up if problems arise. When attempting to return a patient to work after a specific injury, clear objective restrictions of activity level should be made. An accurate job description with detailed physical duty restrictions is often necessary to assist the physician in making return-to-work recommendations. This may require a formal jobsite evaluation.

Employers should be prepared to offer transitional work. This may consist of temporary work in a less demanding position, return to the regular job with restrictions, or gradual return to the regular job. Company policies which encourage return-to-work with positive communication are most likely to have decreased worker disability.

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. Due to the large spectrum of injuries of varying severity and varying physical demands in the work place, it is not possible to make specific return-to-work guidelines for each injury. Therefore, the Division recommends the following:

- a. **Establishment of a Return-to-Work Status:** Ascertaining a return-to-work status is part of medical care, should be included in the treatment and rehabilitation plan, and addressed at every visit. A description of daily activity limitations is part of any treatment plan and should be the basis for restriction of work activities. In most non-surgical cases, the patient should be able to return to work in some capacity or in an alternate position consistent with medical treatment within several days unless there are extenuating circumstances. Injuries requiring more than 2 weeks off work should be thoroughly documented. Refer to Specific Diagnoses in Sections F. and G., Post-operative Return to Work Subsections.
- b. **Establishment of Activity Level Restrictions:** Communication is essential between the patient, employer and provider to determine appropriate restrictions and return-to-work dates. It is the responsibility of the physician to provide clear concise restrictions, and it the employer's responsibility to determine if temporary duties can be provided within the restrictions. Refer to Section E. 6.c. Jobsite Evaluation and Section H. 4, Jobsite Alteration.
- c. **Compliance with Activity Level Restrictions:** In most CTC cases, compliance with restriction of activity levels will require a complete jobsite evaluation. A functional capacity evaluation (FCE) or other special testing may be occasionally necessary. Refer to the "Special Tests" section of these guidelines.

10. **SLEEP DISTURBANCES** are a common secondary symptom of CTCs. Although primary insomnia may accompany pain as an independent co-morbid condition, it more commonly occurs, secondary to the pain condition itself. Exacerbations of pain often are accompanied by exacerbations of insomnia; the reverse can also occur. Sleep laboratory studies have shown disturbances of sleep architecture in pain patients. Loss of deep slow-wave sleep and increase in light sleep occur and sleep efficiency, the proportion of time in bed spent asleep, is decreased. These changes are associated with patient reports of non-restorative sleep.

Many affected patients develop behavioral habits that exacerbate and maintain sleep disturbances. Excessive time in bed, irregular sleep routine, napping, low activity, and worrying in bed are all maladaptive responses that can arise in the absence of any psychopathology. Behavioral modifications are accepted interventions, easily implemented and can include:

- a. Maintaining a regular sleep schedule, retiring and rising at approximately the same time on weekdays and weekends.
- b. Avoiding daytime napping.
- c. Avoiding caffeinated beverages after lunchtime.
- d. Making the bedroom quiet and comfortable, eliminating disruptive lights, sounds, television sets, and keeping a bedroom temperature of about 65 degrees Fahrenheit.
- e. Avoiding alcohol or nicotine within 2 hours of bedtime.
- f. Avoiding large meals within 2 hours of bedtime.
- g. Exercising vigorously during the day, but not within 2 hours of bedtime, since this may raise core temperature and activate the nervous system.
- h. Associating the bed with sleep and sexual activity only, using other parts of the home for television, reading, and talking on the telephone.
- i. Leaving the bedroom when unable to sleep for more than 20 minutes, returning to the bedroom when ready to sleep again.

These modifications should be undertaken before sleeping medication is prescribed for long-term use.

11. **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. Frequency times and duration of treatment apply only to diagnoses not previously covered in Sections F. and G.

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

- a. **Activities of Daily Living (ADL):** are well-established interventions which 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.

- b. **Functional Activities:** are generally well-accepted interventions which 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.

- c. **Nerve Gliding:** exercises are generally accepted and consist of a series of flexion and extension movements of the hand, wrist, elbow, shoulder, 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. Biomechanical principles have been more thoroughly studied than clinical outcomes.
 - ❖ 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.

d. **Neuromuscular Re-education:** is an accepted treatment that involves 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. **Proper Work Techniques:** Please refer to the “Jobsite Evaluation and Alteration’ sections (Sections E and H.4) of these guidelines.

f. **Therapeutic Exercise:** is generally well-accepted and widely used. It is done with or without mechanical assistance or resistance may include isoinertial, isotonic, isometric and isokinetic types of exercises. Indications include the need for cardiovascular fitness, reduced edema, improved muscle strength, improved connective tissue strength and integrity, increased bone density, promotion of circulation to enhance soft tissue healing, improvement of muscle recruitment, increased range of motion, and are used to 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.

12. **THERAPY-PASSIVE** Most of the following passive therapies and modalities are generally well-accepted methods of care for a variety of work-related injuries. This includes those 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, swelling, and 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.

- a. **Electrical Stimulation (Unattended):** is an accepted treatment. 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. TENS therapy or PENS are not indicated for diagnoses in this guidelines. Refer to Exhibit 9, Chronic Pain Medical Treatment Guidelines for usage.

- ❖ 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.

- b. **Extracorporeal Shock Wave Therapy (ESWT):**

Low energy ESWT is an accepted treatment for lateral and medial epicondylitis. The mechanism of action in the use of ESWT for decreasing symptoms is not well understood. ESWT uses acoustic impulses with duration in microseconds focused on the target tissue. Low energy ESWT does not require anesthetics. It is given in a series of treatments, generally 3 sessions.

Large studies on lateral epicondylitis have not provided evidence that this intervention provides long-term benefit. The natural history of epicondylitis supports an expectation of improvement within 3 months of using patient education and modified activities.

Other studies on lateral epicondylitis have indicated the following: There is some evidence that highly motivated patients may show up to a 35% additional improvement over no other treatment, when administering low energy shock wave treatment without local anesthesia. There is some evidence that using the same treatment with local anesthetic is not effective and therefore no use of local anesthetic is recommended. There is some evidence that radial shock wave therapy may also be effective for lateral epicondylitis. There is some evidence that ESWT results in better long-term functional and pain outcomes than steroid injections, for patients who have failed 6 months of other treatment.

ESWT treatments are generally reserved for patients who have experienced some positive response to other therapy but continue to have functional deficits after 10 to 12 weeks.

It is not considered a first line of treatment. It may be considered after other treatments such as NSAIDs, ice, braces, jobsite changes and steroid injections have been tried. These patients should meet the indications for surgery found in specific diagnosis, epicondylitis. Peripheral vascular disease, upper extremity neuropathy and diabetes are all relative contraindications. Diagnostic testing may be needed to rule out these conditions. Some devices used in ESWT may not be FDA approved for the above-mentioned indications.

- ❖ Time to Produce Effect: 2 sessions.
- ❖ Optimum Duration: 3 sessions, 1 week or more apart.
- ❖ Maximum Duration: Treatment may be continued for up to 5 total sessions if functional improvement has been demonstrated after 3 treatment sessions. Functional improvement is preferably demonstrated using functional scales validated in clinical research settings or direct testing.

c. **Iontophoresis:** Is an accepted treatment. It is the transfer of medication, including, but not limited to, steroidal anti-inflammatories and anesthetics, through the use of electrical stimulation. Indications include pain (lidocaine), inflammation (hydrocortisone, salicylate), edema (mecholyly, hyaluronidase, and salicylate), ischemia (magnesium, mecholyly, and iodine), muscle spasm (magnesium, calcium) calcific deposits (acetate), scars and keloids (chlorine, iodine, acetate). Refer to the specific diagnosis for use with cumulative trauma.

- ❖ Time to Produce Effect: 1 to 4 treatments.
- ❖ Frequency: 2 to 3 times per week with at least 48 hours between treatments.
- ❖ Optimum Duration: 6 to 9 treatments.
- ❖ Maximum Duration: 9 treatments.

d. **Low Level Laser Therapy:** There is no evidence that low level laser therapy alone is beneficial for changing the outcome of patients with carpal tunnel syndrome. Additionally, there is good evidence that low level laser is not more effective than placebo for lateral epicondylitis. Therefore, it is not recommended for lateral and medial epicondylitis or for carpal tunnel syndrome.

e. **Manipulation:** is a generally accepted, well-established and widely used therapeutic intervention for upper extremity injuries. Manipulative treatment (not therapy) is defined as the therapeutic application of manually guided forces by an operator to improve physiologic function and/or support homeostasis that has been altered by the injury or occupational disease, and has associated clinical significance.

High velocity, low amplitude (HVLA) technique, chiropractic manipulation, osteopathic manipulation, muscle energy techniques, counter strain, and non-force techniques are all types of manipulative treatment. This may be applied by

osteopathic physicians (D.O.), chiropractors (D.C.), properly trained physical therapists (P.T.), properly trained occupational therapists (O.T.), or properly trained medical physicians. Under these different types of manipulation exist many subsets of different techniques that can be described as a) direct a forceful engagement of a restrictive/pathologic barrier, b) indirect a gentle/non-forceful disengagement of a restrictive/pathologic barrier, c) the patient actively assists in the treatment and d) the patient relaxing, allowing the practitioner to move the body tissues. When the proper diagnosis is made and coupled with the appropriate technique, manipulation has no contraindications and can be applied to all tissues of the body. Pre-treatment assessment should be performed as part of each manipulative treatment visit to ensure that the correct diagnosis and correct treatment is employed. Refer to the specific diagnosis for use with cumulative trauma conditions.

- ❖ Time to Produce Effect (for all types of manipulative treatment): 1 to 6 treatments.
- ❖ Frequency: Up to 3 times per week for the first 3 weeks as indicated by the severity of involvement and the desired effect.
- ❖ Optimum Duration: 10 treatments.
- ❖ Maximum Duration: 12 treatments. Additional visits may be necessary in cases of re-injury, interrupted continuity of care, exacerbation of symptoms, and in those patients with co-morbidities. Functional gains including increased ROM must be demonstrated to justify continuing treatment.

f. **Manual Therapy Techniques:** are passive interventions in which the provider uses his/her hands to administer skilled movements designed to modulate pain; increase joint range of motion; reduce/eliminate soft tissue swelling, inflammation or restriction; induce relaxation; and improve contractile and non-contractile tissue extensibility. These generally accepted techniques are applied only after a thorough examination is performed to identify those for whom manual therapy would be contraindicated or for whom manual therapy must be applied with caution.

i. Mobilization (Joint)/Manipulation. Mobilization is passive movement involving oscillatory motions to the involved joints. The passive mobility is performed in a graded manner (I, II, III, IV, or V), which depicts the speed of the maneuver. It may include skilled manual joint tissue stretching. Indications include the need to improve joint play, improve intracapsular arthrokinematics, or reduce pain associated with tissue impingement. Contraindications include joint instability, fractures, severe osteoporosis, infection, metastatic cancer, active inflammatory arthritides, and signs of progressive neurologic deficits.

- ❖ Time to Produce Effect: 4 to 6 treatments.
- ❖ Frequency: 2 to 3 times per week.

- ❖ Optimum Duration: 4 to 6 weeks.
 - ❖ Maximum Duration: 6 weeks.
- ii. Mobilization (Soft Tissue). Mobilization of soft tissue is the skilled application of manual techniques designed to normalize movement patterns through the reduction of soft tissue pain and restrictions. Indications include muscle spasm around a joint, trigger points, adhesions, and neural compression.
- ❖ Time to Produce Effect: 4 to 6 treatments.
 - ❖ Frequency: 2 to 3 times per week.
 - ❖ Optimum Duration: 4 to 6 weeks.
 - ❖ Maximum Duration: 6 weeks.
- g. **Massage Manual or Mechanical:** Massage is manipulation of soft tissue with broad ranging relaxation and circulatory benefits. It is an accepted treatment. This may include stimulation of acupuncture points and acupuncture channels (acupressure), application of suction cups 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.
- h. **Orthotics/Immobilization with Splinting and Bracing:** is a generally accepted, well-established and widely used therapeutic procedure. Depending on the specifics of the condition, the treatment plan, and the daily activities, splints may be effective when worn at night or during portions of the day. Splints should be loose and soft enough to maintain comfort while supporting the involved joint in a relatively neutral position. Splint comfort is critical and may affect compliance. Although off-the-shelf splints are usually sufficient, custom thermoplastic splints may provide better fit for certain patients.
- Splint use is rarely mandatory. Providers should be aware that over usage is counterproductive, and counsel patients to minimize daytime splint use in order avoid detrimental effects, such as, stiffness and dependency over time.
- ❖ Time to Produce Effect: 1 to 4 weeks.

- ❖ Frequency: Daytime intermittent or night use, 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 further diagnostic studies or to other treatment options.

i. **Paraffin Bath:** is a superficial heating modality that uses melted paraffin (candle wax) 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.

j. **Superficial Heat and Cold Therapy:** is an accepted intervention. Thermal agents are applied in various manners that lowers or raises 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 and hemorrhage, 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.

k. **Ultrasound (Including phonophoresis):** is an accepted treatment. It uses sonic generators to deliver acoustic energy for therapeutic thermal and/or non-thermal soft tissue effects. Refer to Specific Diagnosis sections for use. Indications include scar tissue, adhesions, collagen fiber and muscle spasm, and to improve muscle tissue extensibility and soft tissue healing. Ultrasound with electrical stimulation is concurrent delivery of electrical energy that involves dispersive electrode placement. Indications include: muscle spasm, scar tissue,

pain modulation, and muscle facilitation. Phonophoresis is the transfer of medication to the target tissue to control inflammation and pain through the use of sonic generators. These topical medications include, but are not limited to, steroidal anti-inflammatory and anesthetics.

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

13. **RESTRICTION OF ACTIVITIES** Continuation of normal daily activities is an accepted and well-established recommendation for CTCs with or without neurologic symptoms. Complete work cessation should be avoided if possible, since it often further aggravates the pain presentation. Modified return-to-work is almost always more efficacious and rarely contraindicated in the vast majority of injured workers with CTCs.

14. **VOCATIONAL REHABILITATION** is a generally accepted intervention, but Colorado limits its use as a result of Senate Bill 87-79. Initiation of vocational rehabilitation requires adequate evaluation of patients for quantification of highest functional level, motivation, and achievement of maximum medical improvement (MMI). Vocational rehabilitation may be as simple as returning to the original job or as complicated as being retrained for a new occupation. The effectiveness of vocational rehabilitation may be enhanced when performed in combination with work hardening and work conditioning.

It may also be beneficial for full vocational rehabilitation to be started before MMI if it is evident that the injured worker will be unable to return to his/her previous occupation. A positive goal and direction may aid the patient in decreasing stress and depression, and promote optimum rehabilitation.