Work-Related Ulnar Neuropathy at the Elbow (UNE) Diagnosis and Treatment*

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**This guideline does not apply to severe or acute traumatic injury to the upper extremities*

I. ULNAR NEUROPATHY AT THE ELBOW SURGICAL CRITERIA

SURGICAL TREATMENT	AND if the diagnosis is supported by these clinical findings			CONSERVATIVE TREATMENT
	SUBJECTIVE	OBJECTIVE	DIAGNOSTIC	
	AND	**AND**	**AND**	
Simple decompression Surgery should include exploration of the ulnar nerve throughout its course around the elbow, and release of all compressive structures. Complete release may require nerve decompression at multiple sites and may also require Z-lengthening of the flexor pronator origin.	Pain or dysesthesias in the ring and small fingers (4^{th} or 5^{th} digits) often coupled with pain in the proximal medial aspect of the elbow. Note: Pain or paresthesias may worsen at night.	Diminished sensation of ring and little fingers and medial aspect of the hand **OR** Progressive muscle weakness with inability to separate fingers, loss of power grip and poor dexterity **OR** Atrophy of ulnar intrinsic muscles of hand **OR** Clawing contracture of ring and little fingers **OR** Froment's sign	Electrodiagnostic studies are required to objectively confirm the diagnosis of UNE. <u>Electrodiagnostic criteria are as follows (at least two of the criteria should be met)</u>: **1.** Slowing of above elbow (AE) to below elbow (BE) nerve conduction velocity to less than 50 m/s in either ADM or FDI. **2.** Focal slowing on inching studies of the ulnar nerve across the elbow, defined as a latency difference exceeding 0.7 msec across a 2-cm segment (or 0.4 msec across a 1-cm segment). **3.** Compound muscle action potential (CMAP) amplitude decrease of >20% between AE and BE waveforms† **4.** CMAP duration increase of >30% between AE and BE waveforms* *For electromyographers: for findings 3 and 4, and particularly when there is amplitude drop between wrist and BE, the presence of Martin-Gruber anastamosis must be excluded as a cause of these findings.	At least 6 weeks* of conservative care such as: • Modified activities and avoiding leaning on elbows • Splinting to limit flexion at elbow • Padding to limit pressure on elbow *In the case of clear motor deficit, the 6 weeks conservative care is not required.

***** In unusual circumstances, a patient may have appropriate symptoms and abnormal EDS without objective physical findings.

Work-Related Ulnar Neuropathy at the Elbow (UNE)

Diagnosis and Treatment

The medical treatment guidelines are written from a clinical perspective, to guide clinical care. Providers should consult the Medical Aid Rules and Fee Schedule (MARFS) for documentation and coding requirements.

II. INTRODUCTION

This guideline is to be used by physicians, Labor and Industries claim managers, occupational nurses, and utilization review staff. The emphasis is on accurate diagnosis and treatment that is curative or rehabilitative (see WAC 296-20-01002 for definitions). An electrodiagnostic worksheet and guideline summary are appended to the end of this document.

This guideline was developed in 2009 and updated in January 2015 by Washington State's Labor and Industries' Industrial Insurance Medical Advisory Committee (IIMAC) and its subcommittee on Upper Extremity Entrapment Neuropathies. The subcommittee presented its work to the full IIMAC, and the IIMAC made an advisory recommendation to the Department to adopt the guideline. This guideline was based on the weight of the best available clinical and scientific evidence from a systematic review of the literature and on a consensus of expert opinion. One of the Committee's primary goals is to provide standards that ensure a uniformly high quality of care for injured workers in Washington State.

Ulnar nerve entrapment (UNE) occurs most commonly at the elbow due to mechanical forces that produce traction or ischemia to the ulnar nerve. A differential diagnosis for UNE includes cervical radiculopathy, brachial plexopathy and compression of the ulnar nerve at the wrist[1]. Entrapment may also occur from soft-tissue structures such as tumors or ganglions, bony abnormalities such as cubitus valgus or bone spurs, or subluxation of the ulnar nerve over the medial epicondyle with elbow flexion[3]. A tardy ulnar nerve palsy may be seen in association deformities of the elbow secondary to a supracondylar fracture of the humerus. This may occur when the ulnar nerve becomes entrapped by scar tissue. This may produce anterior displacement of the nerve with elbow flexion, which may then spontaneously reduce back into the ulnar nerve groove with elbow extension.

Potential sites of UNE include Osborne's ligament at the cubital tunnel, the arcade of Struthers, the medial intermuscular septum, the medial epicondyle, the flexor-pronator aponeurosis, and rarely an accessory muscle, the anconeus epitrochlearis[2].

In general, work-relatedness and appropriate symptoms and objective signs must be present for Labor and Industries to accept UNE on a claim. Electrodiagnostic studies (EDS), including nerve conduction velocity studies (NCVs) and needle electromyography (EMG), should be scheduled immediately to corroborate the clinical diagnosis. If time loss extends beyond two weeks or if surgery is requested, completion of EDS is required and does not require prior authorization.

III. ESTABLISHING WORK-RELATEDNESS

Work related activities may also cause or contribute to the development of UNE. Establishing work-relatedness requires all of the following:

1. Exposure: Workplace activities that contribute to or cause UNE, and
2. Outcome: A diagnosis of UNE that meets the diagnostic criteria under Section III, and
3. Relationship: Generally accepted scientific evidence, which establishes on a more probable than not basis (greater than 50%) that the workplace activities (exposure) in an individual case contributed to the development or worsening of the condition (outcome).

Although the exact incidence and prevalence are uncertain, UNE is second only to carpal tunnel syndrome as the most common peripheral nerve entrapment. From 1995-2000, approximately 2800 claims for work-related UNE were reported to the Department of Labor and Industries (L&I)[4]. A quarter of these patients received surgical treatment while the remainder was treated conservatively. Time loss payments were paid to 93% of the surgery group and 61% of the conservatively treated group.

Certain work-related activities have been associated with UNE. Activities requiring repetitive or sudden elbow flexion or extension, intensive use of hand tools, or repeated trauma or pressure to the elbow[5-7]. Jobs where these activities occur may include but are not limited to the following:

Lifting	Leaning on elbow(s) at desk or work bench
Working in tight places	Shoveling
Digging	Hammering
Using hand saws or large power machinery	Operating boring and punching machines

Several occupations have been associated with UNE. This is not an exhaustive list and is meant only as a guide in the consideration of work-relatedness.[3, 5]

Carpenter	Painter
Glass cutter	Musician
Seamstress	Packaging worker
Assembly line worker	Shoe and clothing industry worker
Food industry worker	

IV. MAKING THE DIAGNOSIS

A. SYMPTOMS AND SIGNS

A case definition of confirmed UNE includes appropriate symptoms, objective physical findings ("signs"), and abnormal electrodiagnostic studies. A provisional diagnosis of UNE may be made based upon appropriate symptoms and objective signs, but confirmation of the diagnosis requires abnormal EDS.

The primary symptom associated with UNE is diminished sensation or abnormal unpleasant sensation (dysesthesias) in the ring and small fingers (4^{th} or 5^{th} digits), often coupled with pain in the proximal medial aspect of the elbow[7]. Motor symptoms may include progressive weakness,

with inability to separate fingers, loss of power grip, and poor dexterity. Non-specific symptoms, (e.g., pain without sensory loss; "dropping things") by themselves are not diagnostic of UNE. Symptoms of UNE may worsen at night. Symptom provocation has been described with Tinel's sign (tapping over the cubital tunnel), or by sustained (sixty seconds) elbow flexion with or without manual compression of the ulnar nerve at or proximal to the cubital tunnel[8]. Alone, these findings are neither sensitive nor specific for the diagnosis of UNE.

Objective findings on physical examination should be localized to muscles supplied by the ulnar nerve (Table 1) or sensory impairment in an ulnar distribution. Motor deficits include weakness of intrinsic hand muscles, which can be demonstrated with Froment's sign (activation of flexor pollicis longus to compensate for weak adductor pollicis). To perform this test, the patient is asked to pinch a piece of paper between the tip (not pad) of the thumb and the tip (not pad) of the index finger. The tester pulls the paper out from between the fingers, asking the patient not to let go. Weakness of the ulnar innervated adductor pollicis muscle (or positive Froment's sign) is present if the patient cannot maintain a tip-to-tip pinch and instead resorts to a pad-to-pad pinch. In more advanced cases, intrinsic muscle atrophy becomes visibly evident (e.g. 1st dorsal interosseous). In severe cases, hand opening will reveal a characteristic "ulnar claw" posture, with hyperextension of the metacaropophalangeal joints and flexion of the interphalangeal joints[2]. (This should not be confused with the median neuropathy "benediction" sign seen with hand closing.) Ulnar sensory impairment can be demonstrated using Semmes-Weinstein monofilaments and should be localized to the ring and small finger and ulnar aspect of the hand.

There appears to be a high frequency of diagnostic imprecision for cases handled within the workers' compensation system. In the general population, UNE typically occurs as an isolated mononeuropathy, with co-incidence of UNE and carpal tunnel syndrome being relatively uncommon. However, the experience of L&I shows that approximately 60% of UNE surgery patients had a concomitant diagnosis of carpal tunnel syndrome, usually made prior to a diagnosis of UNE[4]. Every effort should be made to objectively verify the diagnosis of UNE before considering surgery.

Table 1. Muscles Innervated by the Ulnar Nerve

In the forearm, via the muscular branch of the ulnar nerve • *Flexor carpi ulnaris* • *Flexor digitorum profundus (medial half)*
In the hand, via the deep branch of the ulnar nerve • *hypothenar muscles* *-Opponens digiti minimi* *-Abductor digiti minimi* *-Flexor digiti minimi brevis* • *Adductor pollicis* • *Flexor pollicis brevis deep head* • *3rd and 4th lumbrical muscles* • *Dorsal interossei* • *Palmar interossei*
In the hand, via the superficial branch of the ulnar nerve • *Palmaris brevis*

B. ELECTRODIAGNOSTIC STUDIES (EDS)

i. Nerve Conduction Velocity

Electrodiagnostic studies can help to objectively locate, confirm, and quantify the severity of ulnar nerve compression. Nerve conduction velocities (NCV) are measured across the elbow with the ulnar-innervated hand intrinsic musculature (abductor digiti minimus or first dorsal interosseus muscles) used for motor velocity determination. Parameters for accurate testing include moderate flexion of the elbow (70°- 90°) and a consistent and documented distance across the elbow (at least 5-6 cm with digital storage oscilloscope or 10 cm with older electrodiagnostic equipment)[9-11].

There must be evidence of ulnar nerve demyelination with or without axon loss to confirm a diagnosis of UNE and should include at least two of the following motor nerve conduction abnormalities:

1. Slowing of above elbow (AE) to below elbow (BE) nerve conduction velocity to less than 50 m/s in either the abductor digiti minimi (ADM) or first dorsal interosseous (FDI).

2. Focal slowing on inching studies of the ulnar nerve across the elbow, defined as a latency difference exceeding 0.7 msec across a 2-cm segment (or 0.4 msec across a 1-cm segment)

3. Compound muscle action potential (CMAP) amplitude decrease of >20% between AE and BE waveforms*

4. CMAP duration increase of >30% between AE and BE waveforms*

   *For electromyographers: for findings 3 and 4, and particularly when there is an amplitude drop between wrist and BE, the presence of Martin-Gruber anastamosis must be excluded as a cause of the findings.

To exclude the presence of polyneuropathy as a cause of the abnormalities described above, evaluation of another motor nerve must be normal.

Ulnar sensory electrodiagnostic abnormalities alone are considered to be nonspecific and nonlocalizing and hence cannot alone be used to confirm a diagnosis of UNE. Amplitude of the sensory response is non-localizing and velocity is subject to errors. There is not sufficient reference data at this point to support using sensory studies to confirm the diagnosis of UNE.

One recent study[12] found with 95% specificity, the sensitivities of across-elbow MNCV were considerably better than looking at the MNCV difference between elbow and forearm segments (80% at ADM, 77% at FDI). The sensitivity of the study may be further increased by recording from both the FDI and ADM muscles.

In all cases, and particularly in cases with borderline NCV results, control for skin temperature should be documented. In general, the above referenced values will hold for skin temperature in the range of 30-34o C. Lower temperatures will be associated with falsely slowed NCV results.

ii. Needle Electromyography

EMG studies are usually normal if the nerve conduction studies are entirely normal and there are no atypical or unexplained signs or symptoms. Isolated needle EMG findings in the setting of normal nerve conduction studies are typically not seen in UNE and could be indicative of another diagnosis. Needle EMG study is not considered sufficient to establish a diagnosis of ulnar neuropathy in the absence of nerve conduction changes. If performed, the most helpful needle EMG findings in ulnar neuropathy is abnormal rest activity in the form of fibrillation potentials and positive sharp waves in ulnar-innervated muscles in the hand and forearm, which could suggest ongoing axonal injury. However, if there are clinical findings suggesting a diagnosis other than or in addition to UNE, needle EMG may be appropriate, for example, to evaluate:

a. Possible median neuropathy, demonstrated by clinical weakness or atrophy of the thenar muscles, or abnormal median nerve conduction study.
b. Possible peripheral polyneuropathy, such as from diabetes.
c. Possible traumatic nerve injury following acute trauma to the distal upper extremity.
d. Possible radiculopathy, with neck stiffness and radiating pain.

C. OTHER DIAGNOSTIC TESTS

Some studies have demonstrated that Magnetic Resonance Imaging (MRI) neurography and ultrasound have promise in the diagnosis of UNE. However, these services will not be authorized for this condition because the clinical utility of these tests has not yet been proven. While the Committee recognizes that these tests may be useful in unusual circumstances where NCV results are normal but there are appropriate clinical symptoms, the Committee believes that at this time the use of these tests is investigational and should be used only in a research setting.

V. TREATMENT

Non-surgical therapy may be considered in cases in which a provisional diagnosis has been made (i.e. it has not been confirmed by EDS testing). Surgical treatment should be provided only in cases where the diagnosis of UNE has been confirmed by abnormal EDS, as the potential benefits of UNE surgery outweigh the risks of surgery only when the diagnosis of UNE has been confirmed by abnormal EDS.

A. CONSERVATIVE TREATMENT

Conservative treatment is reasonable for patients presenting with early or mild symptoms, e.g. intermittent dysesthesias, minimal motor findings, and normal EDS. The goals of conservative treatment are to reduce the frequency and severity of symptoms and to prevent further progression of the condition[3, 13].

Management should include modification of activities that exacerbate symptoms, night-time splinting, or padding the elbow to prevent direct compression. Splinting has been reported to provide improvement within one month for some patients[14, 15]. However, there is no consensus on the duration of conservative treatment and the recommended length of time varies between one month and one year. Patients do not usually need time off from work activities prior to surgery unless they present with objective weakness in the distribution of the ulnar nerve that compromises workplace safety or limits work activities.

B. SURGICAL TREATMENT

Surgical treatment should be considered if:

1. The condition does not improve despite conservative treatment, and
2. The condition interferes with work or activities of daily living, and
3. The patient has met the diagnostic criteria under Section III.

Unless the patient meets criterion #3, surgery is not indicated and will not be authorized.

Surgery should include exploration of the ulnar nerve throughout its course around the elbow, and release of all compressive structures. Complete release may require nerve decompression at multiple sites and may also require Z-lengthening of the flexor pronator origin.

VI. RETURN TO WORK (RTW)

A. EARLY ASSESSMENT

Timeliness of the diagnosis can be a critical factor influencing RTW. Among workers with upper extremity disorders, 7% of workers account for 75% of the long-term disability.[16] A large prospective study in the Washington State workers' compensation system identified several important predictors of long-term disability: low expectations of return to work (RTW), no offer of a job accommodation, and high physical demands on the job.[17] Identifying and attending to these risk factors when patients have not returned to work within 2-3 weeks of the initial clinical presentation may improve their chances of RTW.

Washington State workers diagnosed accurately and early were far more likely to RTW than workers whose conditions were diagnosed weeks or months later. Early coordination of care with improved timeliness and effective communication with the workplace is also likely to help prevent long-term disability. A recent quality improvement project in Washington State (COHE) has demonstrated that organized delivery of occupational health best practices similar to those listed in Table 2 can substantially prevent long-term disability.

See next page for Table 2

Table 2. Occupational Health Quality Indicators for Ulnar Neuropathy at the Elbow (UNE)

Clinical care action	**Time-frame***
1. Identify physical stressors from both work and non-work activities; 2. Screen for presence of UNE 3. Determine work-relatedness 4. Recommend ergonomic improvements	1st health care visit
Communicate with employer regarding RTW using 1. Activity Prescription Form (or comparable RTW form) and/or 2. Phone call to employer	Each visit while work restrictions exist
1. Assess impediments for RTW 2. Request specialist consultation	If > 2 weeks of time-loss occurs or if there is no clinical improvement within 6 weeks
Specialist consultation	Performed ASAP, within 3 weeks of request
Electrodiagnostic studies	If the diagnosis of UNE is being considered, schedule studies immediately. These tests are required if time-loss extends beyond 2 weeks, or if surgery is requested.
Surgical decompression	Performed ASAP, within 4-6 weeks of determining need for surgery

*"Time-frame" is anchored in time from 1st provider visit related to UNE complaints.

B. RETURNING TO WORK FOLLOWING SURGERY

How soon a patient can return to work depends on the type of surgery performed and when rehabilitation begins. Most patients requiring a UNE release alone can return to light duty work within 3 weeks. Recommendations for rehabilitation vary.

VII. ELECTRODIAGNOSTIC WORKSHEET

PURPOSE AND INSTRUCTIONS

The purpose of this worksheet is to help the department's medical and nursing staff interpret electrodiagnostic studies (EDS) that are done for L&I patients. The worksheet should be used only when the main purpose of the study is to evaluate a patient for UNE. It should accompany but not replace the detailed report normally submitted to the department. We encourage you to use the electrodiagnostic worksheet below to report EDS results, but the department will accept the results on a report generated by your office system.

Worksheet for Ulnar Neuropathy at the Elbow Electrodiagnostic Testing

A positive UNE diagnosis can be made if <u>at least two</u> of the following criteria are met:	**Abnormal**
1. Slowing of above elbow (AE) to below elbow (BE) nerve conduction velocity to less than 50 m/s in either ADM or FDI.	
2. Focal slowing on inching studies of the ulnar nerve across the elbow, defined as a latency difference exceeding 0.7 msec across a 2-cm segment (or 0.4 msec across a 1-cm segment)	
3. Compound muscle action potential (CMAP) amplitude decrease of >20% between AE and BE waveforms*	
4. CMAP duration increase of >30% between AE and BE waveforms*	

*For electromyographers: for findings 3 and 4, and particularly when there is an amplitude drop between wrist and BE, the presence of Martin-Gruber anastamosis must be excluded as a cause of these findings.

Claim Number: _____

Claimant Name: _____

Additional Comments:

_____

_____

_____

_____ _____

Signed Date

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IIMAC Committee Members	Subcommittee Clinical Experts	Consultants:
Gregory T. Carter MD MS	Christopher H. Allan MD	Terrell Kjerulf MD
Dianna Chamblin MD – Chair	Lawrence R. Robinson MD	Ken O'Bara MD
G.A. DeAndrea MD MBA	Thomas E. Trumble MD	
Jordan Firestone, MD PhD MPH	Nicholas B. Vedder MD	
Andrew Friedman MD	Michael D. Weiss MD	

Department staff who helped develop and prepare this guideline include:

Gary M. Franklin MD, MPH, Medical Director
Lee Glass MD, JD, Associate Medical Director
Simone P. Javaher BSN, MPA, Occupational Nurse Consultant
Reshma N. Kearney MPH, Epidemiologist
Bintu Marong MS, Epidemiologist