Conservative Care Options for Work-Related Epicondylitis / Epicondylosis

Contents

Purpose and Intended Use

This document updates a 2014 resource developed by the Industrial Insurance Chiropractic Advisory Committee (IICAC) of the Washington State Department of Labor and Industries. It provides concise summaries of published clinical and scientific literature regarding utility and effectiveness of commonly used conservative approaches for work-related epicondylosis; history, examination and special studies, recommendations for supportive, manual, and rehabilitative care including practical clinical resources (useable without licensing/charge in practice for non-commercial use). It is intended to inform care options and shared decision-making. It is not a standard of care, claim management standard, or a substitute for clinical judgment in an individual case. This practice resource does not change L&I coverage or payment.

A comprehensive search of available scientific literature on conservative assessment and intervention procedures for lateral epicondylosis was conducted by the Policy, Practice, and Quality (PPQ) Subcommittee of the IICAC and department staff during Fall 2022. Literature was reviewed, assessed for relevance and quality, and summaries were drafted by consensus of the subcommittee with expert content input from consultants and reviewers, including the Industrial Insurance Medical Committee and selected relevant professional societies in July 2023. The updated resource was posted for public comment and revision, and is expected to be voted on for approval for distribution by the IICAC in October 2023. This resource is expected to be updated periodically by the IICAC. Interested parties may submit new published scientific report for consideration for future revisions.

This and other practice resources are available for download at the State of Washington Department of Labor & Industries website. Contact information for public input and submission of studies for future revisions is available there.

http://www.lni.wa.gov/treatmentresources

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Practical Application Points

- Epicondylitis is a historical term not supported by current understandings of the disease process, since most cases of lateral elbow pain do not have inflammatory properties. Epicondylosis will be the preferred term for this resource.

- Several conservative interventions provide rapid relief of pain and improved pain-free grip including: eccentric extension exercise, elbow manipulation, soft tissue procedures (e.g. trigger point pressure in extensor or flexor muscles), and corticosteroid injections

- Set outcome goals for sustainable self-management (exercise, massage, activity modification) to maintain pain reduction and improved function.

- One elbow specific questionnaire and two more general upper arm function questionnaires have been shown to be sensitive to measure functional change in epicondylosis.

Work-Related Epicondylosis (formerly epicondylitis)

Epicondylopathy is characterized by medial or lateral elbow pain that worsens when muscles originating from the condyles are contracted, placing stress on the attachments. Epicondylopathy is an umbrella term that covers any disease process occurring at the tendon and is the best general term without knowing history and presentation. Epicondylitis signifies an acute inflammatory reaction, which is often not present histologically in clinical cases, thus leading to a change in terminology away from epicondylitis. Epicondylosis refers to a chronic process of degeneration with no inflammatory markers and accounts for most cases of elbow pain, medial or lateral. Lateral epicondylosis (LE) is often associated with an overuse injury using tools but may be due to direct trauma to the lateral elbow. Although referred to often as "tennis elbow", tennis accounts for only 5% of all LE. Similarly, medial epicondylosis (ME) is often referred to as "Golfer's elbow" but is probably better termed common flexor tendinopathy.[1] The most common age of onset is between 40 and 60 years of age with higher prevalence in women. Although originally thought to be a tendinitis, it is now believed to be a chronic irritation leading to fibroblastic changes specifically in the extensor carpi radialis brevis (LE) and flexor carpi radialis (ME). Approximately 25-61% of LE is related to work. Estimates of ME work-relatedness are lower and establishing work-relatedness requires good documentation of exposures. Repetitive work does not appear to be a risk factor; although there may be a relationship between combined factors such as grip force, awkward posture, trauma, and repetition. Diagnosis is clinical; no studies on diagnostic accuracy or reliability of clinical examination were found. Pain is related to degenerative change more so than inflammation. The condition is frequently self-limiting within 6-24 months.

Case Definition

- Work-related lateral epicondylosis (LE) is lateral elbow pain subsequent to a documented workplace exposure that usually combines grip force, repetition, awkward postures, or trauma. It is worsened by gripping and resisted wrist extension on exam. It occurs in approximately 1-1.5% of the general population.
- Work-related medial epicondylosis (ME) is a medial elbow pain subsequent to a documented workplace exposure that usually combines grip force, repetitions, awkward postures, or trauma. It is worsened by gripping and resisted wrist flexion on exam. It occurs in approximately 0.3-1% of the general population.

Evaluation Summary

- Rule out non-mechanical causes (typically by assessing for red flags for trauma/fracture, tumor, etc.)
- Pain over the epicondyles provoked by resisted flexor or extensor contraction (e.g. griping, twisting motions) is consistent with LE/ME.
- Orthopedic evaluation relies on provocation with stretching (e.g. Mill's Maneuver) or contraction (e.g. Cozen's). However, there are no diagnostic studies for the evaluation of epicondylitis that has demonstrated either reliability or validity.[2]
- History-taking is critical to establish work-related exposures of combined gripping and repetition and/or direct trauma to the area, since these are common conditions outside of work.

Intervention Summary

- Most acute/sub-acute cases self-resolve within weeks to months. Rapid resolution has been reported with slow stretching, eccentric resisted contraction exercise, and soft tissue work.
- Manual therapy and eccentric strength training are the physiotherapeutic treatment methods with the most beneficial effects.[3-5]
- Evidence for manipulation of the elbow is limited and usual HVLA approaches are not well studied. Mobilization using what are such as the Mulligan Technique approaches have shown no benefit or have only measured grip strength after a single session of treatment. Mobilization utilizing motion and the manipulation using Mill's technique show some benefit in the short-term.[6]
- Extension bracing and/or activity modification may be helpful.
- Benefit has been reported in lesser quality studies with iontophoresis and phonophoresis applied NSAIDs. Ultrasound does not appear to provide any advantage over placebo in the long run but may have short term benefit similar to shock wave therapy.[7]
- Short-term relief for corticosteroid injection may be outweighed by worse one-year outcomes compared to physiotherapy or natural history.

Improvement Progress

- Although typical self-resolution occurs in a 6-month to 2-year period, it is important to initiate management approaches early on to bring the worker back to activity in a shorter period of time. Improvement of acute epicondylosis under treatment should occur within weeks rather than months, as shown in the chart below. Achieving and monitoring functional progress is central to effective care of epicondylosis. The best overall long-term outcomes are believed to be associated with consistent, incremental increases in functional ability (e.g. pain-free grip strength, improving mobility, return to usual activities including work)
- Refractory cases warrant consideration for additional diagnostics to assess for tendon rupture or muscle tear.

Typical Interventions and Response Thresholds

1-2 wks	3-6 wks	7-8 wks	Beyond 8 wks
• Ice and avoidance of provoking activities. 30-45˚ wrist extension splint or a counterforce brace (ET Ref. - # 4) may be helpful.[8] • Rapid improvement is reported with eccentric flexor/extensor contraction exercise, mobilization, and soft tissue work. Utility of iontophoresis and phonophoresis is mixed. • Steroid injections are associated with poorer long-term outcomes.	• Improvement is best assessed by increasing functional gains, including ability to return to work. • Sustained functional gains should be tracked using a questionnaire specific to elbow pain or the upper extremity function. • Myofascial release and mobilization of elbow structures are effective. Rapid transition to self-management using eccentric resistance contraction exercise and massage should be encouraged.	• Good Improvement: Condition should be mostly resolved or primarily self-managed • Inadequate improvement: Persistent, recurrent pain on wrist activity may point to need for more attention to activity modification and if that does not address the problem, it may warrant consideration of additional diagnostics (e.g. imaging to assess for muscle or tendon tears/ruptures).	

Epicondylosis Progress Checklist

Voluntary educational / practice aid. This is not an L&I documentation requirement

Assessment / Intervention / Progress

Baseline	1-2 wks	3-6 wks	7-8 wks	Beyond 8 wks
Baseline Function Score: _____ from standard survey (e.g. PRTEE, UEFI, ULFI, QuickDASH) Pain Interference: 'In past week, how much has pain interferred with your daily activities?' 0 1 2 3 4 5 6 7 8 9 10 *None* — *Unable to do any activities* Self-control of pain: 'In past week, how much have you been able to control/help/reduce your elbow pain on your own?' 0 1 2 3 4 5 6 7 8 9 10 *Complete control of pain* — *No control of pain on activity* Work Status □ Full Duty □ Modified □ None	**Discuss Recovery** • Most recover rapidly with resisted contraction and stretching exercise, myofascial work and manipulation. Splinting and making modifications to proving activities are also helpful. • Address concerns with work activity. **Assess Functional Recovery** • Recheck function score, pain interference, and ability to control pain. These scores are sensitive to overall change/improvement. according to magnitudes descibed on the questionnaires (and/or scoring sections of Epicondylosis Terminology section). **Incrementally Increase Activity** • Goal to maintain normal activities & routines (including work). • Consider activity, ergonomic modifications, bracing, etc. when tasks continue to provoke pain.	**Assess Functional Recovery** • Functional score/pain interference. • Should approach pre-episode capacities. • Poor/worsening self control scores may reflect underlying psychosocial concern to screen for (anxiety, depression, fear avoidance), or may warrant further diagnostics to rule out underlying pathology.	**Continue to Increase Activity** • Consider additional diagnostic assessment for muscle and tendon damage if improvement does not meet expectation out to 6 months.

Epicondylosis Clinical Assessment Evidence Summary

Occupational Epicondylosis Case Definition

Epicondylosis is characterized by medial or lateral elbow pain that worsens when muscles originating from the condyles are contracted, placing stress on the attachments. The term epicondylitis is a commonly used term for this condition, however, current histological evidence suggests that inflammatory processes implied by that term are unlikely to occur, particularly when not related to acute trauma. Epicondylosis, along with terms like tendinosis or tendinopathy, better characterizes hypertrophic changes found at the musculotendinous attachments associate with these conditions.[9, 10]

Clinical presentation of lateral epicondylosis (LE)

- Lateral elbow pain worsened by gripping and resisted wrist extension.[2]
- Symptoms may be associated with degenerative change more so than acute inflammation.
- Frequently self-limiting within 6-12 months.
- Studies have shown that Mills test has excellent diagnostic value for ruling in LE and grip strength differences of 5-10% between flexion and extension may be predictive of LE.[2, 11]

Clinical presentation of medial epicondylosis (ME)

- Medial elbow pain worsened by gripping and resisted wrist /forearm flexion
- Symptoms may be associated with degenerative change more so than acute inflammation.
- Frequently self-limiting within 6-12 months.
- No studies on diagnostic accuracy or reliability of physical examination for ME. Tests like Reverse Cozen and grip testing may have similar diagnostic abilities as in LE.[12]

Work place exposure to LE/ME inducing activity

- Evidence for relationship between combined risk factors (e.g. force, repetition, and posture).[13, 14]
- Poor association with repetitive work by itself.
- Onset following blunt elbow trauma at work indicates occupational causation.
- Combined physical exertion and elbow movements as provocative.[15, 16]
- Important to differentiate work-related and non-work provocative activities

Diagnostic/Severity Indicators

Persistent elbow pain that is aggravated by resisted contraction, gripping, arm and/or hand use. Lateral epicondylosis (LE) is most common and is known as tennis elbow due to prevalence in tennis players, especially amateurs with poor backhand technique.[17] Frequently attributed to repetitive work activity, but may be that certain work activities increase symptoms of a chronic tendinosis that originated with a strain of extensor carpi radialis brevis (ECRB), extensor digitorum communis (EDC), and/or extensor carpi radialis longus (ECRL) origin tendons.

Medial epicondylosis is four to ten times less common in work injuries, but has similar risk factors where strains are originated in the flexor carpi radialis (FCR) and pronator teres and other muscles of the flexor pronator mass (FPM).[18]

Outcome Assessment Tools

Administer at baseline, then every 2-4 weeks. Scores should reduce over time.

Symptom Questionnaire

- **Visual Analog Pain Scale (VAS) -** Anchored pain scales are commonly used for musculoskeletal pain, including arm pain. Typically a component of functional questionnaires and typically more useful and reliable within the context of a functional instrument.[19]
- **Pain Interference Scale –** Pain interference (PI) scales may provide a more practical assessment of pain status as it relates to function rather than pure pain intensity. PI is not a replacement for measuring improvement in physical function, particularly for chronic pain.[20]

Function Questionnaires

Appendix A in this resource contains free versions of these questionnaires. For more information on outcome assessment tools and tracking function across many domains, refer to the Documenting Functional Improvement Resource

Disability of Arm, Shoulder, and Hand (DASH) Scale - assesses the entire upper limb function including elbow and hand. DASH has the best clinometric properties for upper extremity and contains a work component. Reliability and reproducibility have been demonstrated in several studies.[21]

QuickDASH - is quicker to use than the full DASH but measures different content with optional modules, including work. It has been reported to underestimate symptoms and overestimate disabilities.[22] The QuickDASH can be recommended as a quick assessment of arm symptoms and function based on the score to save time. QuickDASH is a validated measure of arm function but is reported to be less specific than the DASH in the subdomains, especially in symptoms. The Quick DASH is available for use with registration and may be obtained online without charge at https://dash.iwh.on.ca/about-quickdash

Patient-Rated Tennis Elbow Evaluation (PRTEE) – has been validated specifically for lateral epicondylosis and is a straightforward, one-page questionnaire easily administered in clinical settings.[23]

Patient-Rated Tennis Elbow Upper Extremity Functional Index (UEFI) – is a validated, one-page form that addresses general arm function with specific incorporation of activities that involve the elbow and wrist extensors and flexors.[24] Clinically meaningful changes have been reported to be 6 points on the UEFI.

Upper Limb Functional Index (ULFI) – is a validated, one-page form that has been compared to the UEFI as well as the DASH questionnaires and is considered by the developers to be particularly practical in clinical settings because of it's simplicity and assessment of the patient's perception of their condition.[25] The mean detectable change is about 10%.

Prognostic Indicators

Risk Factors for Prolonged Disability

- Age over 40 years.
- Repetitive keyboarding jobs and cervical joint dysfunction in women are associated with higher final VAS and DASH scores.
- Concurrent nerve symptoms are associated with poorer outcomes from physiotherapy.[26, 27]
- Delayed recovery beyond 6 months.[28]
- Repeated exposure to forces that stress extensor or flexor tendons.
- Risk factors for medial and lateral epicondylosis are different; medial epicondylosis is more frequently associated with other work-related upper limb disorders and has a stronger correlation with forceful work.[29]

Clinical Examination

Clinical examination is an important aspect of confirming the suspicion of medial or lateral epicondylosis. Particularly in palpation of the medial wrist flexor insertions or lateral wrist extensor insertion points, as well as the muscle belly. Eliciting pain or radiation patterns from palpation that reproduce a chief complaint are a helpful corroboration with physical exam procedures. The main categories are:

- **Functional deficits** such as reduced grip strength or limited ranges of motion.
- **Tenderness** locally at myotendinous insertions, or radiating patterns on palpation.
- **Provocative or relieg maneuvers** that increase or reduce chief complaint pains

Physical Exam

Functional Deficit

- **Grip strength** – Ideally measured using a dynamometer, may be weaker in the affected arm and in flexion versus extension, with differences of 5-10% having good diagnostic value.[2]
- **Range of Motion –** Slight decrease in extension range of motion and joint play at the radiocapitellar joint has been speculated to exist with epicondylosis. Literature evaluating sensitivity, specificity, or predictive value is lacking.

Provocation & Relief Maneuvers

- **Radiation Pattern -** Eliciting for myotendinous radiation patterns that reproduce the epicondylar pain may help assess this. Several other conditions may mimic epicondylosis symptoms including supinator syndrome and other upper arm and shoulder muscle trigger points, such as supraspinatus and biceps trigger points, that radiate to the epicondylar regions. In ME, this radiation pattern can be elicited in the 4th or 5th digits.[30]
- **Tenderness –** Typically elicited at the lateral epicondyle especially a few millimeters distal and anterior to the lateral condyle at the origin of ECRB, or a few millimeters distal and anterior to the medial epicondyle insertions.
- **Resisted Contraction –** Wrist extension, particularly against resistance, provokes pain.
- **Cozen's Forearm Extensor Muscle Test (Extensor Grip Test)(LE) –** Wrist is extended against resistance with elbow in flexed and extended positions in an attempt to recruit and stress muscle and tendon of the ECRB. Pain at the extensor insertion at the lateral epicondyles is considered positive. Literature evaluating sensitivity, specificity, or predictive value is lacking, however one cohort study comparing outcomes of extension bracing alone, physical therapy (ultrasound, friction massage and strengthening-stretching exercise) and combination of brace and physical therapy reported that a positive extensor grip test was predictive of a good outcome with bracing alone.[31]
- **Reverse Cozen's Flexor Muscle Test (ME)** As above, this procedure is repeated in reverse for ME, flexing the wrist against resistance and adding pronation.[30]
- **Mill's Maneuver –** Wrist is passively flexed with elbow in extended position aimed at recruiting and stressing ECRB muscle and tendon. Pain at the extensor insertion at the lateral epicondyles is considered positive. Literature shows this to have the highest predictive value for ruling in LE when it is positive.[11]
- **Book or Chair Test –** Patient attempts to pick up a book or chair by its back with elbow extended and forearm pronated. Inability to do so due to pain at the lateral epicondyle is considered positive. Literature evaluating sensitivity, specificity, or predictive value is lacking.
- **Middle Finger Extension Test -** Resisted contraction of the middle finger or ring finger recruits and stresses the EDC muscle and tendon. Pain at the lateral epicondyles is considered positive. Literature evaluating sensitivity, specificity, or predictive value is lacking.

Imaging Studies

Plain film radiography

- Less than a quarter of LE and ME patients demonstrate calcific infiltration in the extensor or flexor tendons; however, imaging does not clarify diagnosis nor inform conservative or arthroscopic management decisions. Radiography is not initially indicated.

Special imaging

- MRI, CT, or diagnostic ultrasound may be helpful in determining differential diagnoses (e.g. ligament and tendon tear) in refractory cases from 8 weeks out to 6 months.[32, 33]

Diagnostic Ultrasonography (US)

Diagnostic ultrasound has been shown to differentiate thickening of the extensor tendon in symptomatic LE and ME subjects compared to asymptomatic individuals and the ability to detect enthesopathic sites of inflammation.[18, 34] It is not clear that additional diagnostic accuracy would have any impact (therapeutic yield) on care.

- Presence of larger ligament tears on diagnostic ultrasound correlated to poorer 6 month outcomes (PRTEE scores) in 62 lateral epicondylosis patients.[33]
- A meta-analysis evaluated diagnostic accuracy of ultrasound for LE and noted substantial variability in sensitivity and specificity. A review of ultrasound for ME found roughly 90% sensitivity and specificity.[18] Accuracy was still dependent on operator experience, degree of pathology, and type of equipment used. Caution was urged in clinical application.[35]

Conservative Interventions Summary

When reviewing the literature on the effectiveness of different treatment modalities for LE, it is important to recognize that the results are often inconclusive or insufficient to support recommendations, especially in systematic reviews. However, this is dependent on comparison to long-term outcomes, which generally are favorable regardless of the therapy or even natural history. However, short-term results for many non-surgical approaches are clinically meaningful. For that reason, when they are compared it is often stated that there is no difference among them, but patients improve with many of these treatments. This results in the best evidence encouraging the following treatment methods for LE and ME:[3, 4, 36]

- eccentric exercise
- various forms of attended physiotherapy modalities to increase circulation
- taping or bracing
- mobilization

Coverage decisions on specific therapies by L&I can be found at:
https://www.lni.wa.gov/patient-care/treating-patients/conditions-and-treatments

Physiotherapy Modalities

Ice & Avoidance of Provoking Activity

- Frequently considered useful in an acute episode for pain control. Specific high-quality studies for most physiotherapeutic modalities on epicondylosis are lacking.[17, 27]

Ultrasound

- Lower quality studies find conflicting results for the short-term benefit of ultrasound or phonophoresis, [37, 38] [39] There also appears to be no difference between phonophoresis and iontophoresis using Naproxin gel; both may reduce acute symptoms.[40] After 6 weeks, pulsed low-intensity ultrasound appears to be no more effective than placebo. [41] A more recent study indicated that when compared to laser therapy and phonophoresis, iontophoresis has better effects for pain and function.[42]

Laser Therapy

- A systematic review and meta-analysis concluded that low-level laser therapy (LLLT class 3b lasers), offers short-term pain relief and less disability, both alone and likely with better outcomes for pain and function when used in conjunction with exercise.[43-45] Additionally, laser therapy appears to be more effective in improving grip strength than bracing or ultrasound.[46]

Pulsed Electromagnetic Field Therapy

- No difference was identified in 30 subjects with chronic LE comparing pulsed electromagnetic field therapy to placebo.[47] This is considered experimental and not covered at the time of writing.

Shockwave Therapy

- There is a general lack of evidence for determining long-term benefit for shockwave therapy in epicondylosis.[26]
- Two systematic reviews compared EWST to sham, US, or corticosteroid injection and found that it was not superior.[7, 48, 49]
- Refer to L&I's coverage decision for updates on coverage. Not covered at the time of writing.

Splinting, Taping, & Bracing

Upper Forearm Compression braces – Various designs range from Velcro straps applied to the upper forearm or flexible sleeves that fit over the elbow, to more sophisticated devices that localize pressure to particular muscles or tendons in the upper forearm.[8]

Wrist Motion Limiting braces (e.g. wrist extension) – Fixed splints typically hold the wrist in a flexed, neutral, or extended position. These are applied during daytime exposure during provoking activities over several weeks to limit excessive motion. Wrist extension splints appear to be more effective for lateral epicondylosis pain reduction over a 6-week period.[50]

Kinesiotaping – Several small studies demonstrate short-term (two weeks) clinical effects for kinesiotaping in acute cases, but no significant effects in chronic LE. Kinesiotaping outcomes appear comparable to other physiotherapeutic modalities.[51-55]

Manipulation & Mobilization

Mobilization only:

- **Cervical spine**: Lateral glide cervical mobilization showed immediate positive effect for VAS pain scale and pressure-elicited pain, but lacked positive effects for pain-free grip strength (PFGS).[56] However, there was no long-term follow-up, only post treatment assessment.
- **Upper Extremity:** In a small group of LE patients treated with Manipulation with Movement (MWM), 92% were able to perform previously painful movements without pain and had improved grip strength immediately after treatment. PFGS improved more than maximum grip strength, but both were significantly increased.[57]

Mobilization with Movement:

- **Upper Extremity**: Evidence in a systematic review and meta-analysis concluded that Mulligan mobilization and exercise showed short-term benefits and warranted further research into longer-term effects.[26] Local elbow mobilization of affected LE elbow showed positive immediate effect on PFGS and pressure-pain threshold, but was only measured post-treatment with no assessment after that. It is important to note that these are not traditional chiropractic HVLA adjustments of the radial head, but rather mobilization approaches (e.g. Mulligan Technique).[58, 59]

Manipulation only:

- **Cervical Spine**: C-spine manipulation had a greater hypoalgesic effect when compared to thoracic spine manipulation, increasing Pain Pressure Threshold scores (35.1% vs. 0.8%). There were also small improvements in PFGS scores in the cervical spine manipulation group compared to the thoracic spine manipulation group (24.7% vs. 19.8%).Treatment groups were small (n=18) and effects were measured directly after one treatment, limiting applicability over time.[60]
- **Upper Extremity**: Wrist manipulation in a small sample with LE reported that up to 9 sessions over 6 weeks was more effective than ultrasound, friction massage, and strengthening/stretching exercise. This resulted in three times more patients reporting complete recovery or much improved after 3 weeks, and improvement in VAS scores at 6-week follow-ups.[61]

Manipulation combined with DTFM:

- **Upper Extremity:** Deep Tissue Friction Massage combined with Mills manipulation was less effective than corticosteroid injection in improving pain, function, grip strength, and global assessment however, the within group improvements for mobilization with movement and the Mill's manipulation had a moderate effect.[6, 62] DTFM plus Mills manipulation was also less effective than a supervised exercise program in a small cohort, although both groups showed improvement.[63]

Soft Tissue Techniques

Massage, trigger point, passive stretch, IASTM,etc.

Deep Tissue Friction Massage (DTFM) only:

- Deep transverse friction massage for lateral epicondylosis showed that 9-12 sessions of DTFM combined with concurrent physiotherapeutic modalities over 3-5 weeks offered little to no benefit over modalities combined with exercise or alone in reported pain relief, grip strength, or functional status scores.[64, 65]
- Cyriax physiotherapy (12 treatments, 3x/4 weeks) was superior to phonophoresis in improving pain, PFGS, and functional status in 2-8 weeks.[66]

Instrument Assisted Soft Tissue Mobilization:

- There is moderate evidence across several studies that IASTM may be helpful in improving pain and patient-reported function in some patients, although it does not appear to enhance strength. Evidence is still limited and groups are small. Protocols used a short period of tissue work over 8-10 sessions.[67]

Effleurage/Myofascial Release only:

- In 52 healthy subjects with fatigued power grip (from 3 minutes maximal isometric exercise consistently leading to 60% of baseline strength), 5 minutes of forearm/hand muscle massage (friction and effleurage) had greater effect in increasing grip performance than a 5 minute rest period or 5 minutes of passive elbow and shoulder motion.[68] This may have limited applicability to workers with injuries.

Exercise

A systematic review of studies examining efficacy (in overall improvement, pain, and grip strength) of manual methods found that manipulation with exercise and exercise with stretching have a short-term effect, with the latter also having a long-term beneficial effect.[69]

Stretching – Systematic approaches involving extremes of wrist and elbow position aimed at stretching wrist extensors or flexors.
Resisted Contraction –Typically isometric approached involving holding the hand/fist of the affected arm with the opposite hand and contracting the affected muscles intermittently and/or through various degrees of wrist flexion and extension
Strengthening – various approaches used to strength forearm and upper arm using isometrics or weights with wrist and/or elbow motion (e.g. wrist, biceps curls).
Self-administered Myofascial Work – Patient applies massage and pressure of variable duration and force to forearm muscles especially in the upper and mid forearm region, especially ones that exhibit tightness and tenderness.

Strengthening

- In a prospective randomized study (n=29), a forearm support band (used throughout the day but not at night for at least 3 months), strengthening exercises, or a combination of both were not effective in improving pain or grip strength at 6 weeks, 3 months or 1 year.[70]
- In an RCT (n=92), an eccentric training program (non-strengthening rehabilitation including ice, analgesic, TENS, US, deep friction massage and stretching, 3x/week for 9 weeks plus isokinetic eccentric training) significantly reduced pain intensity and prevented forearm supinator and wrist extensor strength deficits compared to a program that did not include isokinetic eccentric training.[71]

Eccentric Training Specifically

- A systematic review and meta-analysis demonstrated that a treatment program using eccentric strengthening of adequate intensity and duration seemed to be most effective for treating lateral elbow tendinopathy.[72] All groups inclusive of eccentric exercise reported decreased pain and improved function and grip strength compared to baseline scores.[73] Therapy aids like rubber bars have shown to be easy implementations of eccentric exercise.[74]

Injections and compounds

Corticosteroids
Corticosteroid injections are commonly used to alleviate pain in LE patients, but should be used with caution and not as a stand-alone therapy. Injections are effective in treating LE only in the short term (2-6 weeks), but show no long-term benefit and may be harmful to recovery in the intermediate timeframe.[75-78] Recurrence of LE after injection is higher than after other treatment modalities.[79]

Botox
Botulinum toxin A has demonstrated some limited benefit in the treatment of LE. This possible alternative is less invasive, can be performed in an outpatient setting, and does not impair a patient's ability to work. Further studies are needed to evaluate the effect on LE. **[80-82]**

Autologous Blood Injections and Platelet Rich Plasma

Autologous blood injections have preliminary reports showing improved pain and function in patients with LE similar or slightly worse outcomes compared to corticosteroid in the short term (1-4 weeks), but superior outcomes past 8-12 weeks and even up to a year later in some trials.[83-89] These therapies may enhance tendon healing and could serve as an effective non-operative alternative, but are currently experimental. Refer to coverage decisions. Further studies of better quality and longer follow-up evaluation are needed to assess the effect on LE and whether there is an advantage when combined with physical rehabilitation.

Topical Nitric Oxide

Nitric oxide administered by 24 hour topical patch over the affected tendons has had mixed result in a RCT study.[90] Although short term benefit may be possible, a long term (5 year) prospective study reported no advantages over a rehabilitation program.[91]

Acupuncture

A 2008 Cochrane Review, including 4 small randomized controlled trials, concluded that there is insufficient evidence to support or refute the use of acupuncture (needle or laser) in the treatment of LE. Further studies of better quality are needed to evaluate the effect of acupuncture on LE.[92]

Workers' Compensation and Management Issues

Causation & Work Relatedness

Epicondylosis is typically believed to be a chronic tendinosis that may be related to or aggravated by excessive repeated force to wrist flexor or extensor muscles and forearm rotation, particularly when combined with higher strain.[93] Occupations such as meat cutter, plumbers, and weavers include activities that may exemplify such exposure. Repetitive work by itself (e.g. keyboarding) does not appear to be a causative factor. Overall prevalence for epicondylosis ranged between 4-30% depending on the type of work.[17, 94]

Work-related causes of epicondylosis account for somewhere between one third and two thirds of all cases.[95, 96] A prospective study of Washington State workers detailed health history, symptoms, and physical examination with detailed exposure assessment of 611 workers over a 3.5-year follow up period.[14] Combined effects were significant predictors of dominant side LE [97] :

- forearm pronation >45°;
- >40% time engaged in forceful exertion;
- And lifting >3% of time and duty cycle with >10% forceful exertion

Neither awkward position nor forceful exertion alone were good predictors of LE onset. Lateral epicondylosis may account for an average of 12 weeks of time loss in approximately one third of affected workers.[98]

Ergonomic Interventions

Avoidance and/or modification of activities that place stress on the upper arm muscles originating from the humoral epicondyles is generally considered a first-line intervention for epicondylosis.[17] Specific studies of physical factors that increase risk, suggest reducing strain associated with the work and reducing overall forearm rotation during a task.[93] No specific studies of ergonomic and activity modification programs in work-related epicondylosis patients were found. General reports suggesting utility for ergonomic programs for reducing exposure risk for upper extremity problems for workers such as computer users were found.[99]
Practical approaches include avoidance of outstretched arm in with the wrist bent into heavy flexion or extension. Work task and station adjustments may be easy ways to alter these positions. Additionally modifying tasks with forceful grasping combined with the outstretched and bent wrist is standard practice.[100]

Evidence and Methodology

Literature Retrieval and Review

1. **Initial systematic searches** of electronic databases (e.g. PubMed). Search terms used typically included MeSH terms for tests and interventions with conditions being addressed. Follow-up searches also included population attributes (e.g., workers compensation, occupational).
2. **Abstract screening** for relevance.
3. **Original paper retrieval** with review for relevance, quality, outcome meaningfulness, and effect magnitude.
4. **Additional studies identified** through clinical summaries (e.g., reviews, texts), citation tracking, and feedback from public.

About Evidence for Physical Examination and Conservative Interventions

Conservative musculoskeletal care is typically care of first resort based on long standing practices. Typically 'low tech,' low cost, with minimal and rare side effects, it is frequently delivered in portal of entry settings, and by various health providers. The rigor and quality expected of high cost, higher risk, emerging, and tertiary interventions is less common for many routine physical examination procedures and conservative interventions. Much of the evidence summarized here would be considered Class "C" or "III" in ratings systems. Thus, the committee has not presented explicit *recommendations*, rather, *evidence summaries* guided by expert consensus to assist in formulating care options. Further, significant emphasis is made regarding tracking and documenting meaningful functional improvement with patients. Study attributes most likely to strengthen or limit confidence are characterized in the evidence descriptions.

Assessing Study Methodologic Quality

Attributes of study methodology quality vary according to the clinical procedure (e.g., diagnostic, therapeutic intervention) looked at, and specific research questions being studied. The American Academy of Neurology's Clinical Practice Guideline Process Manual [101] offers a comprehensive guide to systematic evidence review, quality attributes and consensus process that generally serves as the approach taken by IICAC.

General attributes identified when extracting evidence from studies include identification of population, the intervention and co-interventions and outcomes being addressed in each study. The clinical questions addressed such as diagnostic accuracy, therapeutic effectiveness, or causation are determined. Studies are extracted into evidence tables including quality attributes and/or ratings which are reviewed both by department staff and committee members (usually 2 per study).

Specific quality attributes include: Diagnostic Accuracy – design, spectrum of patients, validity and relevance of outcome metric; Therapeutic Interventions – comparison groups (no treatment, placebo, comparative intervention), treatment allocation, blinding/masking (method and degree: single, double, independent), follow-up (period and completion), and analysis (statistical power, intent-to-treat). Specific attention is paid to several factors including reporting of outcomes (primary vs. secondary), relevance of outcome (e.g., function versus pain), and meaningfulness (clinically important change versus minimally detectable change).

Synthesizing Evidence

Consideration of study quality (class), significance (statistical precision), consistency across studies, magnitude of effect, and relevance to populations and procedures were taken into account in preparing evidence summaries. Special attention was given to clarifying conclusions related to the clinical questions of interest. Evidence, particularly with low tech and highly diffused examination and conservative procedures addressed here, is rarely truly "definitive," even when multiple studies exist. Inconsistent conclusions typically reflect error (systematic, random) and/or bias in studies. Data pooling via meta-analysis is useful to reduce random error when studies are of sufficient power and methodologic strength. Larger meaningful effect size may increases confidence in findings.

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Appendix A: Functional Outcome Measures

Below are one page handouts that can be printed off for use in the clinic. Citation of the original article and format of the surveys are included.

Patient-Rated Tennis Elbow Evaluation (PRTEE)

Voluntary educational / practice aid. This is not an L&I documentation requirement

Name _____ Date _____ Affected Arm ☐ Left ☐ Right

*Describe your **average** arm symptoms **over the past week** on a scale 0-10. Please provide an answer for all questions. If you did not perform an activity because of pain or because you were unable, circle a "10". If you are unsure, please estimate to the best of your ability. If you never perform that activity, please draw a line completely through the question.*

1. PAIN in your affected arm

*Rate the average **amount of pain** in your arm over the past week by circling the number that best describes your pain on a scale from 0-10. A **zero (0)** means that you **did not have any pain** and a **ten (10)** means that you had **the worst pain imaginable.***

RATE YOUR PAIN:

	No Pain										Worst Imaginable
When you are at rest	0	1	2	3	4	5	6	7	8	9	10
When doing a task with repeated arm movement	0	1	2	3	4	5	6	7	8	9	10
When carrying a plastic bag of groceries	0	1	2	3	4	5	6	7	8	9	10
When your pain was at its least	0	1	2	3	4	5	6	7	8	9	10
When your pain was at its worst	0	1	2	3	4	5	6	7	8	9	10

2A. FUNCTIONAL ABILITY - SPECIFIC ACTIVITIES

*Rate the **amount of difficulty** you experienced performing each of the tasks listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. A **zero (0)** means you did not experience any difficulty and a **ten (10)** means it was **so difficult you were unable to do it at all**.*

RATE DIFFICULTY OF EACH ACTIVITY:

	Unable to do										No Difficulty
Turn a doorknob or key	0	1	2	3	4	5	6	7	8	9	10
Carry a grocery bag or briefcase by the handle	0	1	2	3	4	5	6	7	8	9	10
Lift a full coffee cup or glass of milk to your mouth	0	1	2	3	4	5	6	7	8	9	10
Open a jar	0	1	2	3	4	5	6	7	8	9	10
Pull up pants	0	1	2	3	4	5	6	7	8	9	10
Wring out a washcloth or wet towel	0	1	2	3	4	5	6	7	8	9	10

2B. FUNCTIONAL ABILITY - USUAL ACTIVITIES

*Rate the **amount of difficulty** you experienced performing your **usual** activities in each of the areas listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. By "usual activities", we mean the activities that you performed **before** you started having a problem with your arm. A **zero** (0) means you did not experience any difficulty and a **ten** (10) means it was so difficulty you were unable to do any of your usual activities.*

RATE DIFFICULTY OF EACH ACTIVITY:

Unable to Do											No Difficulty
Personal activities (dressing, washing)	0	1	2	3	4	5	6	7	8	9	10
Household work (cleaning, maintenance)	0	1	2	3	4	5	6	7	8	9	10
Work (your job or everyday work)	0	1	2	3	4	5	6	7	8	9	10
Recreational or sporting activities	0	1	2	3	4	5	6	7	8	9	10

COMMENTS:

Complete scoring instructions can be found in the ***Epicondylosis Terminology*** section.

Macdermid J. Update: The Patient-Rated Forearm Evaluation Questionnaire is now the Patient-Rated Tennis Elbow Evaluation. J Hand Ther 2005;18(4):407-10.

Upper Extremity Functional Index (UEFI)

Voluntary educational / practice aid. This is not an L&I documentation requirement

Name _____ Date _____ Affected Arm ☐ Left ☐ Right

Please indicate if are having any difficulty at all with the activities listed below because of your upper limb problem for which you are currently seeking attention. Please check (√) an answer for **each** activity.

Today, do you or would you have any difficulty at all with:

Activities	Extreme Difficulty or Unable to Perform	Quite a Bit of Difficulty	Moderate Difficulty	A Little Bit Of Difficulty	No Difficulty
1) Any of your usual work, household, or school activities	0	1	2	3	4
2) Your usual hobbies, recreational or sporting activities	0	1	2	3	4
3) Lifting a bag of groceries to waist level	0	1	2	3	4
4) Lifting a bag of groceries above your head	0	1	2	3	4
5) Grooming your hair	0	1	2	3	4
6) Pushing up on your hands (e.g. from bathtub or chair)	0	1	2	3	4
7) Preparing food (e.g. peeling, cutting)	0	1	2	3	4
8) Driving	0	1	2	3	4
9) Vacuuming, sweeping, or raking	0	1	2	3	4
10) Dressing	0	1	2	3	4
11) Doing up buttons	0	1	2	3	4
12) Using tools or appliances	0	1	2	3	4
13) Opening doors	0	1	2	3	4
14) Cleaning	0	1	2	3	4
15) Tying or lacing shoes	0	1	2	3	4
16) Sleeping	0	1	2	3	4
17) Laundering clothes (e.g. washing, ironing, folding)	0	1	2	3	4
18) Opening a jar	0	1	2	3	4
19) Throwing a ball	0	1	2	3	4
20) Carrying a small suitcase with your affected limb	0	1	2	3	4
Total circled numbers in each column:					

Score (add all circled numbers) _____/80 MDC (minimum detectable change) = 9 pts /15% Error +/- 5 scale points

Complete scoring instructions can be found in the ***Epicondylosis Terminology*** section.

Stratford PW, Binkley JM, Stratford DM. Development and initial validation of the upper extremity functional index. Physiotherapy Canada Fall 2001;259-266.

Upper Limb Functional Index (ULFI)

Voluntary educational / practice aid. This is not an L&I documentation requirement

Name _____ Date _____ Affected Arm ☐ Left ☐ Right

Your upper limb (arm) may make it difficult to do some of the things you normally do. This list contains sentences people often use to describe themselves when they have such problems.

Think of yourself over the last few days. **If an item describes you, mark the box. If not, leave the box blank. DUE TO MY ARM:**

☐ 1. I stay at home most of the time.

☐ 2. I change position frequently for comfort.

☐ 3. I avoid heavy jobs e.g. cleaning, lifting more than 5kg or 10lbs, gardening etc.

☐ 4. I rest more often.

☐ 5. I get others to do things for me.

☐ 6. I have pain almost all the time.

☐ 7. I have difficulty lifting and carrying (e.g. bags, shopping up to 5kg or 10lbs).

☐ 8. My appetite is now different.

☐ 9. My walking or normal recreational activity is affected.

☐ 10. I have difficulty with normal home or family duties and chores.

☐ 11. I sleep less well.

☐ 12 .I need assistance with personal care (e.g. washing and hygiene).

☐ 13. My regular daily activities (work, social contact) are affected.

☐ 14. I am more irritable and / or bad tempered.

☐ 15. I feel weaker and / or stiffer.

☐ 16. My transport independence is affected (driving, public transport).

☐ 17. I have difficulty putting my arm into a shirt sleeves or need assistance dressing.

☐ 18. I have difficulty writing or using a key board and / or "mouse".

☐ 19. I am unable to do things at or above shoulder height.

☐ 20. I have difficulty eating and /or using utensils (e.g. knife, fork, spoon, chop sticks).

☐ 21. I have difficulty holding and moving dense objects (e.g. mugs, jars, cans).

☐ 22. I tend to drop things and/or have minor accidents more frequently.

☐ 23. I use the other arm more often.

☐ 24. I have difficulty with buttons, keys, coins, taps/faucets, containers, or screw-top lids.

☐ 25. I have difficulty opening, holding, pushing or pressing (e.g. triggers, lever, heavy doors).

ULFI Score: Add the checked boxes _____ % Score (x 4) = _____ %

Patient Specific Index (PSI): List 5 activities that are important to you and affected by your arm problem. If you cannot think of 5, choose from the ones you have marked at the left.

Score each activity on a scale of 0-5 with 0 being best (never affected/can do activity normally) and 5 being WORST (Always affected/can't do activity at all). You may use Half (½) marks if you wish

ACTIVITY	***Score***
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

PSI Total = _____ % Score (x 4) = _____

Think of yourself **over the last few days. Due to your arm,** assess your **Overall Status** compared to your normal or pre-injury level on the following scale

0 1 2 3 4 5 6 7 8 9 10

Pre-Injury or Normal — Worst Possible

Minimum Detectable Change (MDC, 90% Confidence): 10.5 % or 2.6 ULFI points. Change less than the MDC may be due to error. Complete scoring instructions can be found in the ***Epicondylosis Terminology*** section.

Gable CP, Michener LA, Burket B, Neller A. The Upper Limb Function Index: Development and determination of reliability, validity, and responsiveness. J Hand Therap 2006; 19:328-49.