### Supplemental Table 1. Interventions for Elbow

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Study Objectives</th>
<th>Level/Design/Participants</th>
<th>Intervention and Outcome Measures</th>
<th>Results</th>
<th>Study Limitations</th>
<th>Implications for Occupational Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisset et al. (2005)</td>
<td>To determine the effectiveness of physical interventions on clinically relevant outcomes for LE</td>
<td>Level I Design Systematic review of studies of patients diagnosed with LE with randomization of participants, comparison between ≥2 groups with 1 intervention being the physical intervention, and the use of at least 1 clinically relevant outcome measure (such as pain, grip strength, or global improvement)</td>
<td>Intervention Studies that met the initial criteria of randomization, comparison between ≥2 groups and ≥1 clinically relevant outcome measure were included. Studies comparing a physical intervention with corticosteroid injections or NSAIDs were included, but those involving surgery were not. Studies that used the same physical intervention for both groups were eliminated. Outcome Measures Pain scores (using a visual analog scale or an ordinal point system), grip strength (reported as either maximum grip strength or pain-free grip strength), dichotomous rating of success through a global improvement or patient satisfaction scale</td>
<td>28 studies scored above the a priori minimum quality score of 50%. 5 studies looked at effects immediately after the intervention, 24 studies included a short-term outcome assessment (&lt;6 wk), and 8 included long-term follow-up (&gt;6 mo).</td>
<td>Only 1 reviewer identified and screened all articles for inclusion. Conclusions drawn were dependent on the reviewer’s views of clinical relevancy of results, the quality of assessment schema used, and the 50% acceptable quality level.</td>
<td>Evidence to establish whether nonelectrotherapeutic interventions or electrotherapeutic interventions should be used for the treatment of LE is insufficient. Although ultrasound and ionization have shown some short-term benefit, none of the interventions reviewed have demonstrated any long-term benefits. On the basis of the limited evidence and the cost of treatment, further research should focus on whether the perceived temporary relief of symptoms outweighs the cost of treatment.</td>
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Supplemental Table 1. Interventions for Elbow (cont.)

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<tr>
<td>Borkholder et al. (2004)</td>
<td>To confirm or refute the efficacy of using splints in the treatment of LE</td>
<td>Level I Design</td>
<td>Intervention: On the basis of the American Society of Hand Therapists Splint Classification System</td>
<td>Of the 11 studies included, 1 was rated as Sackett's Level 1b and 10 were rated as Level 2b.</td>
<td>None of the included studies had follow-up times &gt;4 wk. Many of the studies lacked sample and power analyses.</td>
<td>The use of splints in the treatment of LE has some support; however, the support is not conclusive. Future studies are needed.</td>
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- **Electromagnetic field and ionization:** Contradictions in results and the heterogeneity of interventions in the 9 studies included for this intervention provide insufficient support for or against its use in treating LE.

- **Ultrasound and phonophoresis:** The pooled data from 5 studies of ultrasound provided insufficient evidence to either support or refute the use of ultrasound as a unimodal treatment of LE.

- **Combined physical interventions (deep friction massage, ultrasound, and exercise):** 1 study showed evidence of a marginal advantage over the long term in using a combined physical approach in treatment of LE when compared with corticosteroid injection but not compared with a wait-and-see (no-treatment) condition.

**Conclusions**

Little consensus exists on the management of LE. Ultrasound and ionization have shown some evidence of short-term benefits (≤3 mo), but no evidence of long-term effects, raising cost–benefit issues. No studies have elucidated long-term beneficial effects of any of the commonly prescribed interventions for LE.
Systematic review of RCTs, with or without blinded outcome measures, involving splinting of patients diagnosed with LE or splinting of normal participants to address appropriate associated issues.

Source of Studies
Medline, CINAHL, Embase, PEDro, and Cochrane databases; hand searches of article references obtained from the electronic database searches to ensure that pertinent articles were not omitted.

Method
4 independent reviewers with no conflict of interest in the subject matter conducted the database searches and reverse look-up searches of article references. 58 published articles were identified by a minimum of 1 of the 3 main reviewers through their titles, abstracts, or both. Blinded copies of 22 articles that met the minimum criterion were reviewed by the 3 primary reviewers. Disagreements were resolved by consensus but, if unresolved, would have been resolved by consulting a 4th independent reviewer. As a result, 11 articles were included in review.

Outcomes
Strength, reduction of load on epicondyle, pain.

- Elbow flexion, forearm-neutral, wrist-neutral immobilization splint, Type 0 (3): 1 RCT of 128 patients documented the positive effects of immobilization and rest in treating patients with LE. No other studies of this particular category of splint were found.
- Elbow-flexion restriction splint, Type 0(1): Reduction of load on the epicondyle by elbow-flexion restriction splints was greater than the no-splint situation and the nonarticular proximal forearm splints, but not as much as the nonarticular forearm splints with forearm pads. The immediate effects of an elastic elbow restriction splint on pain was non-significant.
- Nonarticular proximal forearm splint: inelastic: Three RCTs demonstrated increases in grip strength, wrist strength, or both using this category of splints. Some evidence exists that, although this type of splint may not provide any immediate pain relief, it may provide some relief over time.
- Nonarticular proximal forearm splint: elastic: No statistically significant difference was found in grip strength or wrist strength using an elastic nonarticular proximal forearm splint. No difference in load on the epicondyle was evident when comparisons were made between splint and no-splint situations. No statistically significant.

Often, sample size was not defined. Only 3 of the studies included addressed reliability and validity of outcome measurement instruments. Data could not be pooled because of inconsistency of randomization techniques, control groups, measurement tools, and statistical analyses.

Research needs to focus on more accurately defining physical characteristics of splints and the outcome measures as well as the use of clean research designs and control groups.
<table>
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<td>Brosseau et al. (2002)</td>
<td>To assess the efficacy of DTFM for treating tendinitis</td>
<td>Level I</td>
<td>Intervention: DTFM compared with other physiotherapy interventions</td>
<td>Of the 19 potential studies identified, only 2 met the inclusion criteria. Only 1 of those studies examined DTFM for ECRT. In this study, no statistically significant difference was found in pain intensity, grip strength, and functional status after 9 consecutive sessions of DTFM combined with other modalities.</td>
<td>Only 2 studies met inclusion criteria, and only 1 examined the efficacy of DTFM to treat ECRT. High-quality randomized trials using validated outcome measures and high-quality reporting methods were lacking.</td>
<td>No evidence of clinically important benefits of using DTFM for treating tendinitis exists.</td>
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<td>Outcome Measures: Pain relief, grip strength, and functional status measures</td>
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**Intervention and Outcome Measures**

- Difference in pain relief was found when comparing manipulation with a combination of interventions including splinting and manipulation.
- **Nonarticular forearm splint**: These splints provided statistically significant reduction in load at the lateral epicondyle when compared with other splints in 2 classifications and with no-splint conditions.
- **Wrist immobilization splint, Type 0(1)**: Evidence from 1 study suggested that wearing these types of splints decreases grip strength and may reduce muscle activity of the wrist extensors. Extensor muscle activity was significantly greater for dorsal splints than for volar splints.

**Conclusions**
The 11 studies reviewed offer early positive, but not conclusive, support for the effectiveness of splinting for LE.
and Related Therapies up to the end of June 2002.
- The reference list of trials and key experts in the area were consulted for additional studies.

**Method**

2 reviewers determined the studies to be included on the basis of inclusion and exclusion criteria. The 2 reviewers used a validated checklist to independently assess the methodological quality of the RCTs and CCTs. The data were cross-checked by a 3rd reviewer. Final data values were based on consensus of the reviewers.

**Derebery et al. (2005)**

To evaluate the effects of splinting on outcomes for injured workers with epicondylitis

**Level II**

**Design**

Retrospective cohort study using propensity score methodology to statistically control for all observed pretreatment differences between patients with and without splints

**Participants**

All injured workers (N = 4,614) receiving primary care for lateral or medial epicondylitis

**Method**

Splinting was identified from electronic records of patient visits. Patients were counted as receiving a splint if they received any restraint to the elbow, forearm, or wrist, including braces, splints, straps, and wrap bandages.

**Intervention**

Splinting

**Outcome Measures**

Physician-prescribed rates of duty restrictions and lost time, treatment duration, specialist referrals, and medical and physical therapy visits and charges

Patients with splints had higher rates of limited duty (p < .001), more medical visits and charges (p < .001), higher total charges (p < .001), and longer treatment durations (p < .01) than patients without splints. Patients who received therapy had higher rates of limited duty (p < .05), medical visits (p < .01), and medical charges (p < .01).

**Conclusion**

The use of splints does not necessarily lead to better outcomes and may have adverse effects in treating epicondylitis. The retrospective design restricts certainty about the causal relationship between splinting and outcomes. The differences among the types of splints were not addressed, and the wearing schedule, length of time worn, or extent of restricted motion were not considered.

This study does not provide support for the use of splints to treat epicondylitis and suggests adverse effects; however, the lack of specificity in defining splints, the wearing schedules, length of time worn, or the amount of motion restriction raises questions about the validity of the results.

**Martinez-Silvestrini et al. (2005)**

To evaluate the effectiveness of eccentric strengthening in the treatment of LE

**Level I**

**Design**

All groups received instruction on icing, stretching, and

**Intervention**

None of the baseline measures of the outcome variables were statistically different

Exercise programs were not supervised, so noncompliance or poor exercise technique

Stretching alone, or in combination with eccentric or concentric strengthening, may reduce symptoms compared with control groups.

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<tr>
<td>Smidt et al. (2003)</td>
<td>To evaluate the available evidence of effectiveness of physiotherapy for LE of the elbow</td>
<td>Level I</td>
<td>Systematic review of RCTs evaluating the effects of physiotherapy for LE</td>
<td>Pain-free grip strength, Patient-Rated Forearm Evaluation Questionnaire, DASH, SF–36, and visual analog pain scale. At 6 wk, participants were asked, “How satisfied are you with the results of the treatment you have received for your elbow pain?”</td>
<td>Twenty-three RCTs were included in the review. Twenty-three RCTs were included in the review.</td>
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- **Intervention**
  - Physiotherapy interventions including laser therapy, ultrasound treatment, electrotherapy, and exercise and mobilization techniques

- **Outcome Measures**
  - Pain, global improvement

Smidt et al. (2003) | To evaluate the available evidence of effectiveness of physiotherapy for LE of the elbow | Level I | Systematic review of RCTs evaluating the effects of physiotherapy for LE | Pain-free grip strength, Patient-Rated Forearm Evaluation Questionnaire, DASH, SF–36, and visual analog pain scale. At 6 wk, participants were asked, “How satisfied are you with the results of the treatment you have received for your elbow pain?” | Twenty-three RCTs were included in the review. Twenty-three RCTs were included in the review. |

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- **Intervention**
  - Physiotherapy interventions including laser therapy, ultrasound treatment, electrotherapy, and exercise and mobilization techniques

- **Outcome Measures**
  - Pain, global improvement
databases using the highly sensitive Cochrane Collaboration search strategy. Two reviewers independently assessed methodological quality on blinded articles. The Amsterdam–Maastricht consensus list was used for methodological quality assessment. Initial disagreements were evaluated and resolved by consensus. Best-evidence synthesis was conducted by weighting the studies with respect to their internal validity, statistical significance, clinical relevance, and statistical power.

**Exercise and mobilization techniques**: The best-evidence synthesis of the 5 studies considered provided insufficient evidence for exercise and mobilization techniques because of low power, poor validity, and large heterogeneity regarding interventions and outcomes.

**Conclusions**
Evidence for most physiotherapy interventions for LE is insufficient because of contradictory results, insufficient power, and the lower number of studies per intervention. Only weak evidence for efficacy was found for ultrasound.

**LLLT**

- **To determine the effectiveness of LLLT in the management of LET**
- **Level I**
- **Design**
  Systematic review of RCTs that included LLLT, patients with LET, and ≥1 of the clinically relevant outcome measures
- **Source of Studies**
  - More citations were retrieved from reference sections of retrieved articles and from the
- **Intervention**
  - LLLT
- **Outcome Measures**
  - Pain and function
- **9 RCTs** were included in the review. Although included studies had satisfactory methodology, the results provided neither evidence of benefits nor lack of effects of LLLT for treatment of LET.

**Conclusion**
Little evidence exists to support the use of LLLT as sole treatment of LET.

Although the quality of studies included was satisfactory overall, methodological shortcomings limited pooling of data and drawing of conclusions. LLLT should not be used as a sole treatment of LET until the optimal treatment dose can be defined.
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<tr>
<td>Struijs et al. (2002)</td>
<td>To assess the effectiveness of orthotic devices for the treatment of tennis elbow (LE)</td>
<td>Level I</td>
<td>Intervention: Orthotic device in the form of a brace, splint, cast, band, or strap. Outcome Measures: Pain, global measure of improvement, elbow-specific functional status, maximum grip strength, pain-free grip strength, generic functional status, pressure pain on the lateral epicondyle.</td>
<td>The heterogeneity among trials and the limited number of RCTS available made it difficult to draw clear conclusions on the effectiveness of orthotic devices. Orthotic devices vs. other conservative treatment: Of the 4 studies considered, none provided conclusive evidence to support that orthotic devices were any more beneficial or lacked effects than other treatments to which they were compared. Orthotic device as an additional treatment: 3 studies addressed the additive use of an orthotic device. None demonstrated significant differences in pain perception or grip strength. Orthotic devices vs. another orthotic device: Only study compared 2 types of orthotic devices. No significant differences on global measure of improvement—pain-free grip strength—were demonstrated over the short term, intermediate term, and long term.</td>
<td>The heterogeneity of the included studies did not permit pooling of data. The number of studies included was small, and each had limitations in study design.</td>
<td>Orthotic devices are used as common treatments for LE; however, evidence does not support application of splint for this diagnosis.</td>
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</table>

Method
The titles and abstracts of all studies were assessed by 1 reviewer for eligibility. The reviewer then determined the quality of the articles using the Chalmers technique.

Source of Studies
MEDLINE, Embase, CINAHL, the Cochrane Controlled Trial Register, current contents up to May 1999, and reference lists from all retrieved articles. Experts on the subjects were approached for additional trials.

Method
2 reviewers independently assessed the validity of the included trials and extracted data on relevant outcome measures. Dichotomous outcomes were expressed as relative risks and continuous outcomes as standardized mean differences.
Conclusions
No definitive conclusions can be drawn concerning effectiveness of orthotic devices for LE.

Trudel et al. (2004)  
To determine the effectiveness of conservative treatments for LE

Level I

Design
Systematic review of RCTs and quasi-RCTs

Source of Studies
Medline, CINAHL, Embase, PEDro, and the Cochrane database from January 1983 through March 2003

Method
5 independent reviewers examined titles and abstracts of studies identified in the search to select trials that met inclusion criteria. 2 blinded independent evaluators appraised the 38 articles identified using the MacDermid appraisal form. If consensus could not be reached between the 2 evaluators, then a 3rd independent evaluator was consulted to resolve the disagreement.

Interventions
Ultrasound, exercise, ionization, pulsed electromagnetic field, mobilization and manipulations, laser

Outcome Measures
Pain, function

31 trials were included in this review.

- Ultrasound: 6 studies examined the use of ultrasound in the treatment of LE. 4 studies found that ultrasound alone or in combination with other treatments could decrease pain. In these 4 studies—the ones in which ultrasound was used in combination with other treatments—no 1 treatment was found to be superior to another. In 2 additional studies, progressive exercise therapy was found to be more beneficial than ultrasound in acute and chronic LE.

- Wait and see: 1 study revealed that ultrasound, friction massage, and exercise were the best option for long-term improvement, followed by a wait-and-see treatment.

- Exercise: 4 studies examined the effects of exercise in the treatment of LE. All 4 studies found that progressive strengthening and stretching programs had significantly greater reductions in pain than alternative treatments. 1 of the 4 studies found a statistically significant increase in grip strength in clients who participated in strengthening and stretching programs.

No limitations were noted. Evidence, although not the strongest, supported the conservative management of LE with a variety of commonly used physiotherapy approaches including ultrasound, exercise, ionization, electromagnetic field, mobilization, and manipulations.
Supplemental Table 1. Interventions for Elbow (cont.)

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<td><strong>Ionization:</strong> 2 studies were examined. These studies compared ionization with diclofenac with other treatments. Both concluded that ionization with diclofenac significantly reduced pain compared with the other treatments.</td>
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<td><strong>Pulsed electromagnetic field:</strong> Only 1 study could be identified. It compared the effects of electromagnetic field therapy with a placebo. No significant differences were found related to pain and grip strength.</td>
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<td><strong>Mobilization:</strong> 2 studies that addressed mobilization were included. 1 study found that mobilization of the radial head and neural tension technique was superior to standard treatments (ultrasound, stretching, strengthening, friction). The 2nd study demonstrated a hypoanalggesic effect of mobilization during and after treatment.</td>
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<td><strong>Manipulation:</strong> 2 studies examined the effects of manipulation for the treatment of LE. The 1st study found that manipulation alone was as effective as manipulation combined with a forearm strap and the use of anti-inflammatory cream. The 2nd study found that corticosteroid injections were more effective than DTFM and Mills manipulation for short-term pain relief.</td>
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<td><strong>Laser:</strong> 6 studies examined the effects of laser therapy vs. placebo laser therapy in</td>
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the treatment of LE. The findings of all 6 studies were that laser is not significantly better than placebo laser for any outcomes in the treatment of LE.

**Conclusions**

Many good-quality studies on therapeutic interventions for LE demonstrated a variety of effective treatment options that enable conservative management of LE. However, the evidence is incomplete and does not permit strong conclusions to be drawn.

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<tr>
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<th>Aim</th>
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<tr>
<td>van de Streek et al. (2004)</td>
<td>To compare the effect of a Thamert forearm–hand splint with the elbow band for treatment of LE</td>
<td>Level I</td>
<td>43 patients with tennis elbow who had symptoms for ≥3 wk and no other medical conditions</td>
<td>Participants were randomly assigned to 1 of the 2 treatment groups. Group 1 received the elbow band worn under the lateral epicondyle; Group 2 received a Thamert orthoflex splint to keep the wrist in slight dorsiflexion. Participants were instructed to wear their orthotics as often as possible for 6 wk.</td>
<td>Maximal grip strength with pain score; Patient-Rated Forearm Evaluation Questionnaire to evaluate functional limitations and symptom relapse</td>
<td>The Thamert splint was not more effective than the simple elbow band as a treatment of LE. The Thamert brace was more cumbersome and may have affected wearing time (5 patients wore it &lt;4 wk compared with 1 in the simple band group). Job characteristics may have influenced the results.</td>
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<td>Warwick &amp; Seradge (1995)</td>
<td>To evaluate the effects of early vs. late range-of-motion exercises after cubital tunnel release and medial epicondylectomy</td>
<td>Level I</td>
<td>57 consecutive cases over a 2-yr period</td>
<td>Both Group 1 and Group 2 received therapy consisting of active, active assisted, and passive range-of-motion exercises. The sling was discontinued when therapy began. Modalities were used</td>
<td>52% of Group 1 did not achieve full active extension compared with 4% of patients in Group 2. No statistically significant difference was detected between the 2 groups in grip strength. The average time for return to work was 4 wk.</td>
<td>The simple elbow band is as effective as the Thamert splint that is more cumbersome.</td>
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<tr>
<td><strong>Method</strong></td>
<td>Patients were randomly divided into 2 groups. Group 1 participants were instructed to wear their slings and to move their elbows to only a comfortable point postoperatively. They started physical therapy 14 days postoperatively. Group 2 participants started active range of motion on the day of surgery and physical therapy was started 3 days postoperatively.</td>
<td>as needed before exercise. Progressive resistive exercises were initiated, if tolerated, to increase strength. For Group 1, treatment was initiated 14 days postoperatively; for Group 2, treatment was initiated 3 days postoperatively.</td>
<td>Change in active range of motion, change in grip strength, length of time to return to work with empirical light duty</td>
<td>mo for Group 1 compared with an average of 2.2 mo for Group 2.</td>
<td>Conclusions The sooner the therapy was initiated after surgery, the sooner the patient recovered and achieved full range of motion. The use of modalities may have given temporary relief of symptoms but did not affect the outcome of range of motion.</td>
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**Note.** CCTs = controlled clinical trials; DASH = Disabilities of the Arm, Shoulder questionnaire; DTFM = deep transverse friction massage; ECRT = extensor carpi radialis tendonitis; ESWT = extracorporeal shock wave therapy; LE = lateral epicondylitis; LET = lateral elbow tendinopathy; LLLT = low-level laser therapy; NSAIDs = nonsteroidal anti-inflammatory drugs; PEDro = Physiotherapy Evidence Database; RCTs = randomized controlled trials.

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