

CADTH RAPID RESPONSE REPORT: REFERENCE LIST

Orthotic Bracing or Splinting of the Lower Extremities and Spine in Patients with Chronic, Non-Cancer Pain: Clinical Effectiveness and Guidelines

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Research Questions

1. What is the clinical effectiveness of orthotic bracing and splinting of the lower extremities or spine in patients with chronic, non-cancer pain?
2. What are the evidence-based guidelines regarding orthotic bracing or splinting for chronic, non-cancer pain?

Key Findings

Six systematic reviews (three with meta-analyses) and two randomized controlled trials were identified regarding the clinical effectiveness of orthotic bracing and splinting of the lower extremities in patients with chronic, non-cancer pain. Moreover, two non-randomized studies were identified regarding the clinical effectiveness of orthotic bracing and splinting of the spine in patients with chronic, non-cancer pain. Four evidence-based guidelines were identified regarding orthotic bracing or splinting of the lower extremities for chronic, non-cancer pain.

Methods

A limited literature search was conducted by an information specialist on key resources including PubMed, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were bracing or splinting to lower extremities and chronic pain. No filters were applied to limit the retrieval by study type. The search was also limited to English language documents published between January 1, 2015 and February 6, 2020. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Adults living with chronic non-cancer pain, excluding pregnant patients
Intervention	Q1: Orthotic braces and splinting of lower extremities (e.g., foot, ankle, knee, hip braces) and spine (i.e., neck and back) Q2: Orthotic bracing or splinting of any area
Comparator	Q1: Pharmacological interventions No treatment (no splinting) Usual care (if usual care is pharmacological interventions only) Q2: Not applicable
Outcomes	Q1: Clinical effectiveness (pain reduction, functional performance, quality of life, disability level, safety, global impression of recovery, adverse events) Q2: Recommendations
Study Designs	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, and evidence-based guidelines

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports and systematic reviews are presented first. These are followed by randomized controlled trials, non-randomized studies, and evidence-based guidelines.

Six systematic reviews¹⁻⁶ (three with meta-analyses) and two randomized controlled trials⁷⁻⁸ were identified regarding the clinical effectiveness of orthotic bracing and splinting of the lower extremities in patients with chronic, non-cancer pain. Additionally, two non-randomized studies⁹⁻¹⁰ were identified regarding the clinical effectiveness of orthotic bracing and splinting of the spine in patients with chronic, non-cancer pain. Four evidence-based guidelines¹¹⁻¹⁴ were identified regarding orthotic bracing or splinting of the lower extremities for chronic, non-cancer pain. No health technology assessments were identified regarding the clinical effectiveness of orthotic bracing and splinting of the lower extremities or spine in patients with chronic, non-cancer pain.

Additional references of potential interest are provided in the appendix.

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

Lower Extremities

1. Babatunde OO, Legha A, Littlewood C, et al. Comparative effectiveness of treatment options for plantar heel pain: a systematic review with network meta-analysis. *Br J Sports Med.* 2019 Feb;53(3):182-194.
[PubMed: PM29954828](#)
2. Rasenberg N, Riel H, Rathleff MS, Bierma-Zeinstra SMA, van Middelkoop M. Efficacy of foot orthoses for the treatment of plantar heel pain: a systematic review and meta-analysis. *Br J Sports Med.* 2018 Aug;52(16):1040-1046.
[PubMed: PM29555795](#)
3. Schiphof D, van den Driest JJ, Runhaar J. Osteoarthritis year in review 2017: rehabilitation and outcomes. *Osteoarthritis Cartilage.* 2018;26(3): 326-340.
[PubMed: PM29330103](#)
4. McDaid C, Fayer D, Booth A, et al. Systematic review of the evidence on orthotic devices for the management of knee instability related to neuromuscular and central nervous system disorders. *BMJ Open.* 2017 Sep 5;7(9):e015927.
[PubMed: PM28877943](#)

5. Salvioli S, Guidi M, Marcotulli G. The effectiveness of conservative, non-pharmacological treatment, of plantar heel pain: a systematic review with meta-analysis. *Foot*. 2017 Dec;33:57-67.
[PubMed: PM29126045](#)
6. Duivenvoorden T, Brouwer RW, van Raaij TM, et al. Braces and orthoses for treating osteoarthritis of the knee. *Cochrane Database Syst Rev*. 2015 Mar 16;(3):CD004020.
<https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD004020.pub3/full>
Accessed 2020 Feb 13.

Randomized Controlled Trials

Lower Extremities

7. Cambron JA, Dexheimer JM, Duarte M, Freels S. Shoe Orthotics for the Treatment of Chronic Low Back Pain: A Randomized Controlled Trial. *Arch Phys Med Rehabil*. 2017 Sep;98(9):1752-1762.
[PubMed: PM28465224](#)
8. Ostrander RV, Leddon CE, Hackel JG, O'Grady CP, Roth CA. Efficacy of Unloader Bracing in Reducing Symptoms of Knee Osteoarthritis. *Am J Orthop*. 2016 Jul-Aug;45(5):306-311.
[PubMed: PM27552455](#)

Non-Randomized Studies

Spine

9. Boutevillain L, Bonnin A, Chabaud A, et al. Short-term pain evolution in chronic low back pain with Modic type 1 changes treated by a lumbar rigid brace: a retrospective study. *Ann Phys Rehabil Med*. 2019 Jan;62(1):3-7.
[PubMed: PM30053630](#)
10. Zaina F, Poggio M, Donzelli S, Negrini S. Can bracing help adults with chronic back pain and scoliosis? Short-term results from a pilot study. *Prosthet Orthot Int*. 2018 Aug;42(4):410-414.
[PubMed: PM29446692](#)

Guidelines and Recommendations

Lower Extremities

11. Kolasinski SL, Neogi T, Hochberg MC, et al. 2019 American College of Rheumatology/Arthritis Foundation Guideline for the management of osteoarthritis of the hand, hip, and knee. *Arthritis Care Res*. 2020 Feb;72(2):149-162.
<https://www.ncbi.nlm.nih.gov/pubmed/31908149>
See: *RESULTS/RECOMMENDATIONS* (p.152-156)

12. American College of Occupational and Environmental Medicine. Ankle and foot disorders. Hegmann KT, Hughes MA, Eds. Westminster (CO): Reed Group; 2018 Jul: <https://www.dir.ca.gov/dwc/DWCPropRegs/MTUS-Evidence-Based-Update/Guidelines/ACOEM-Ankle-Foot-Guideline.pdf>
Accessed 2020 Feb 13.
See: Summary of Recommendations and Evidence (p.5-6)
13. Geenen R, Overman CL, Christensen R, et al. EULAR recommendations for the health professional's approach to pain management in inflammatory arthritis and osteoarthritis. *Ann Rheum Dis.* 2018 Jun;77(6):797-807.
[PubMed: PM29724726](https://pubmed.ncbi.nlm.nih.gov/3029724726/)
14. Martin RL, Chimenti R, Cuddeford T, et al. Achilles pain, stiffness, and muscle power deficits: midportion achilles tendinopathy revision 2018: clinical practice guidelines linked to the International Classification of Functioning, Disability and Health from the Orthopaedic section of the American Physical Therapy Association. *Orthop Sports Phys Ther.* 2018;48(5):A1-A38:
<https://www.jospt.org/doi/pdfplus/10.2519/jospt.2018.0302>
Accessed 2020 Feb 13.
See: Summary of Recommendations (p.A2)

Appendix — Further Information

Previous CADTH Reports

15. Hill S, Wright MD. Orthotic braces for idiopathic scoliosis: guidelines. (*CADTH rapid response report: summary of abstracts*). Ottawa (ON): CADTH; 2019 Aug. <https://www.cadth.ca/sites/default/files/pdf/htis/2019/RB1384%20Idiopathic%20scoliosis%20guidelines%20Final.pdf> Accessed 2020 Feb 13.
16. Wells C, Jones S, Felipe E. Orthotic walking boots for adults with fractures and ligament injuries: clinical and cost-effectiveness. (*CADTH rapid response report: summary of abstracts*). Ottawa (ON): 2017 Jun: <https://www.cadth.ca/sites/default/files/pdf/htis/2017/RB1108%20Orthotic%20Walking%20Boots%20Final.pdf> Accessed 2020 Feb 13.

Systematic Reviews and Meta-analyses

Alternative Intervention (Therapeutic Taping)

17. George CE, Heales LJ, Stanton R, Wintour SA, Kean CO. Sticking to the facts: A systematic review of the effects of therapeutic tape in lateral epicondylalgia. *Phys Ther Sport*. 2019 Nov;40:117-127. [PubMed: PM31518778](#)
18. Nelson NL. Kinesio taping for chronic low back pain: a systematic review. *J Bodyw Mov Ther*. 2016 Jul;20(3):672-681. [PubMed: PM27634093](#)

Alternative Comparator

19. Gohal C, Shanmugaraj A, Tate P, et al. Effectiveness of Valgus Offloading Knee Braces in the Treatment of Medial Compartment Knee Osteoarthritis: A Systematic review. *Sports Health*. 2018 Nov/Dec;10(6):500-514. [PubMed: PM29543576](#)
20. Whittaker GA, Munteanu SE, Menz HB, Tan JM, Rabusin CL, Landorf KB. Foot orthoses for plantar heel pain: a systematic review and meta-analysis. *Br J Sports Med*. 2018 Mar;52(5):322-328. [PubMed: PM28935689](#)

Unclear Comparator

21. Gijon-Nogueron G, Ramos-Petersen L, Ortega-Avila AB, Morales-Asencio JM, Garcia-Mayor S. Effectiveness of foot orthoses in patients with rheumatoid arthritis related to disability and pain: a systematic review and meta-analysis. *Qual Life Res*. 2018 Dec;27(12):3059-3069. [PubMed: PM29922913](#)

22. Paniagua-Collado M, Cauli O. Non-pharmacological interventions in patients with spinal cord compression: a systematic review. *J Neurooncol.* 2018 Feb;136(3):423-434.
[PubMed: PM29159776](#)
23. Barratt PA, Brookes N, Newson A. Conservative treatments for greater trochanteric pain syndrome: a systematic review. *Br J Sports Med.* 2017 Jan;51(2):97-104.
[PubMed: PM27834675](#)
24. RAND Southern California Evidence-based Practice Center, Newberry SJ, FitzGerald J, SooHoo NF, et al. Treatment of osteoarthritis of the knee: an update review. (*Comparative Effectiveness Review No. 190*). Rockville (MD): Agency for Healthcare Research and Quality; 2017 May
<https://www.effectivehealthcare.ahrq.gov/ehc/products/633/2441/osteoarthritis-knee-update-report-170505.pdf> Accessed 2020 Feb 13.
25. Cherian JJ, Jauregui JJ, Leichter AK, Elmallah RK, Bhave A, Mont MA. The effects of various physical non-operative modalities on the pain in osteoarthritis of the knee. *Bone Joint J.* 2016 Jan;98-b(1 Suppl A):89-94.
[PubMed: PM26733650](#)
26. Agyekum EK, Ma K. Heel pain: a systematic review. *Chin J Traumatol.* 2015;18(3):164-169.
[PubMed: PM26643244](#)
27. Conceicao CS, Gomes Neto M, Mendes SM, Sa KN, Baptista AF. Systematic review and meta-analysis of effects of foot orthoses on pain and disability in rheumatoid arthritis patients. *Disabil Rehabil.* 2015;37(14):1209-1213.
[PubMed: PM25249238](#)

Randomized Controlled Trials – Alternative Comparator

28. Xu R, Wang Z, Ma T, Ren Z, Jin H. Effect of 3D Printing Individualized Ankle-Foot Orthosis on Plantar Biomechanics and Pain in Patients with Plantar Fasciitis: A Randomized Controlled Trial. *Med Sci Monit.* 2019 Feb 21;25:1392-1400.
[PubMed: PM30789873](#)
29. Bishop C, Thewlis D, Hillier S. Custom foot orthoses improve first-step pain in individuals with unilateral plantar fasciopathy: a pragmatic randomised controlled trial. *BMC Musculoskelet Disord.* 2018 Jul 18;19(1):222.
[PubMed: PM30021556](#)
30. Thoumie P, Marty M, Avouac B, et al. Effect of unloading brace treatment on pain and function in patients with symptomatic knee osteoarthritis: the ROTOR randomized clinical trial. *Sci Rep.* 2018 Jul 12;8(1):10519.
[PubMed: PM30002395](#)

31. Menz HB, Auhl M, Tan JM, Levinger P, Roddy E, Munteanu SE. Effectiveness of Foot Orthoses Versus Rocker-Sole Footwear for First Metatarsophalangeal Joint Osteoarthritis: Randomized Trial. *Arthritis Care Res.* 2016 May;68(5):581-589.
[PubMed: PM26638878](#)
32. Moustafa IM, Diab AA, Taha S, Harrison DE. Addition of a Sagittal Cervical Posture Corrective Orthotic Device to a Multimodal Rehabilitation Program Improves Short- and Long-Term Outcomes in Patients with Discogenic Cervical Radiculopathy. *Arch Phys Med Rehabil.* 2016 Dec;97(12):2034-2044.
[PubMed: PM27576192](#)
33. Wrobel JS, Fleischer AE, Crews RT, Jarrett B, Najafi B. A randomized controlled trial of custom foot orthoses for the treatment of plantar heel pain. *J Am Podiatr Med Assoc.* 2015 Jul;105(4):281-294.
[PubMed: PM25941995](#)

Clinical Practice Guidelines

34. Federal Bureau of Prisons. Durable medical equipment: clinical guidance. Washington (DC): Federal Bureau of Prisons; 2018 Jun:.
https://www.bop.gov/resources/pdfs/durable_medical_equipment_cpg.pdf
Accessed 2020 Feb 13.
35. Leggit, JC, McLeod G. MSK injury? Make splinting choices based on the evidence. *J Fam Pract.* 2018 Nov;67(11):678-683. <https://www.ncbi.nlm.nih.gov/pubmed/30481246>

Additional References

36. Jones BQ, Covey CJ, Sineath MH, Jr. Nonsurgical Management of Knee Pain in Adults. *Am Fam Physician.* 2015 Nov 15;92(10):875-883.
[PubMed: PM26554281](#)