RESUMEN DE LA EVIDENCIA CIENTÍFICA EN QUIROPRÁCTICA

Abril 2026

AEQ
Asociación Española de
QUIROPRÁCTICA

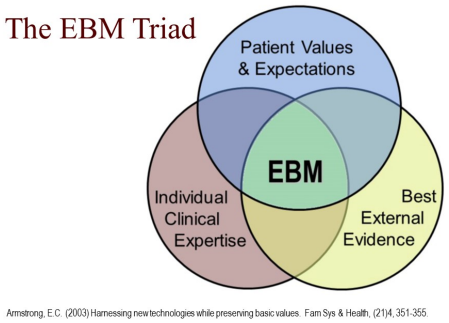
ELABORADO POR LA ASOCIACIÓN ESPAÑOLA DE QUIROPRÁCTICA

RESUMEN DE LA EVIDENCIA CIENTÍFICA EN QUIROPRÁCTICA

Este dossier es una breve recopilación de publicaciones científicas, para la cual se han seleccionado exclusivamente publicaciones del más alto nivel de calidad de evidencia científica publicadas en revistas de alto impacto en los últimos 15 años. Para una selección más extensa de títulos, remitimos a la última sección de esta publicación (*Bibliografía complementaria pág.67*).

La Organización Mundial de la Salud (OMS) define la Quiropráctica como la Profesión Sanitaria "que se ocupa del diagnóstico, el tratamiento y la prevención de los trastornos del sistema neuromusculoesquelético y de los efectos de dichos trastornos sobre la salud en general"[1]. La mayoría de países del entorno de España, tanto en la UE como fuera de ella también reconocen que la Quiropráctica es una profesión sanitaria. Tenemos ejemplos cercanos como Francia[2], Portugal[3] o Italia[4], pero también Bélgica[5], Alemania[6], Reino Unido[7] y todos los países Nórdicos, en la mayoría incorporada a los servicios ofrecidos por la sanidad pública[8,9,10,11,12].

Como toda profesión sanitaria, la Quiropráctica ha desarrollado un cuerpo de conocimientos propio, centrado en el estudio de la columna vertebral, sus trastornos, el efecto de los mismos sobre el sistema nervioso, y su abordaje. La intención de este dossier es el de recopilar y resumir el cuerpo de conocimientos en los siguientes artículos científicos. Como describe la OMS, la Quiropráctica "concede una particular importancia a las técnicas manuales, como la manipulación o el ajuste de las articulaciones"[1]. Por este motivo, los estudios seleccionados se centran en la intervención más utilizada por los Quiroprácticos, a pesar de no ser la única. Como bien se define en esta investigación reciente, en la práctica clínica se emplean a menudo intervenciones como la educación al paciente[13], con amplia evidencia a su favor (a menudo muy superior a intervenciones farmacológicas) para el abordaje de trastornos del aparato locomotor incluyendo los de la columna vertebral[14].



Armstrong, E.C. (2003) Harnessing new technologies while preserving basic values. Fam Sys & Health, (21)4, 351-355.

Según la definición revisada por Sackett y colaboradores, la Medicina Basada en la Evidencia supone la integración de la mejor evidencia disponible con la experiencia clínica y los valores y expectativas de los pacientes[15]. En este sentido, la actualización del presente dossier incorpora no solo evidencia sobre eficacia clínica, sino también sobre mecanismos de acción, seguridad, coste-efectividad y experiencia del paciente, en línea con un enfoque contemporáneo de la práctica clínica basada en la evidencia 16,[17,18.]

Los artículos que se presentan, publicados todos en revistas indexadas, revistas médicas de alto impacto en el sector (JAMA, Spine, The Spine Journal, The European Spine Journal, revisiones Cochrane), son en su mayoría revisiones sistemáticas y/o metaanálisis, por tanto del **más alto nivel de calidad de evidencia publicada en los últimos años**. Asimismo, se han incorporado estudios recientes que incluyen ensayos clínicos aleatorizados, metaanálisis con datos individuales de participantes (IPD), estudios de coste-efectividad y estudios poblacionales, lo que permite una visión más amplia y aplicada a la práctica clínica real [19,20,21.]

El único artículo no indexado es un informe elaborado por Mercer Health & Benefits, rama de la consultoría en recursos humanos más grande del mundo[22] y publicado por la prestigiosa Universidad de Harvard. A lo largo del documento se especifican el nivel de evidencia y el grado de recomendación de cada estudio, según la clasificación establecida por Sackett.[23]

Otro de los pilares a tener en cuenta son los valores y expectativas de los pacientes, a lo que a menudo se refiere como “preferencias del paciente”. Por este motivo, hemos incluido apartados específicos que abordan no solo el coste y la relación coste-efectividad de la atención quiropráctica, sino también la experiencia del paciente y la alianza terapéutica, factores reconocidos como elementos relevantes en los resultados clínicos [16,17.]

La seguridad de las intervenciones constituye otro pilar fundamental en la evaluación de cualquier práctica sanitaria. En este dossier se incluye evidencia reciente que analiza tanto la incidencia de eventos adversos como la calidad de su reporte en la literatura científica, mostrando que los eventos adversos graves asociados a la manipulación vertebral son poco frecuentes, aunque es necesario mejorar los sistemas de vigilancia y notificación para una evaluación más precisa de la seguridad[24,25,26,27.]

Por último, la pericia de los profesionales, depende en gran parte de la formación recibida. En las directrices elaboradas por la OMS, se establece que la seguridad y calidad de los servicios prestados depende directamente de la calidad de la formación. Según las mismas, un Quiropráctico es un profesional con una formación universitaria mínima de 4.800 horas1. Los países que reconocen el carácter sanitario de la profesión también determinan los criterios mínimos formativos, que son en todo el mundo de carácter universitario de segundo ciclo. Esto en Europa implica una formación de Grado y Máster, en países como Canadá o EE.UU. Bachelor y Doctor en Quiropráctica, mientras que en otros como México es de Licenciado en Quiropráctica. Según la normativa de educación superior

en cada país, la duración de los estudios oscila entre 5 y 7 años, en Europa equivalente a 300 puntos ECTS, como se detalla específicamente en la normativa francesa del 2018, por citar un ejemplo reciente28.

No se citan en este dossier, pero cabe mencionar que paneles compuestos por expertos en muchas otras disciplinas recomiendan la atención Quiropráctica mediante guías de práctica clínica basadas en la evidencia. Muchas de estas vienen dictadas por los Colegios de Médicos, como en Canadá29 o EE.UU[30]., mientras que otras son elaboradas por la Comisión Europea[31] o sus países miembros como es el ejemplo de Bélgica[32], Reino Unido[33], Dinamarca[34] o por sociedades científicas35. Una muy reciente serie de estudios sobre lumbalgia del prestigioso The Lancet36 confirma estas recomendaciones. En general las recomendaciones apoyan el abordaje Quiropráctico para trastornos de la columna vertebral. Precisamente, son los problemas de columna y en particular la lumbalgia, la primera causa de discapacidad a nivel global, según los datos extraídos del enorme esfuerzo realizado en el estudio de "Carga mundial de morbilidad 2016"[37], y el quiropráctico, unos de los profesionales mejor preparados para afrontar esta carga, según modelos basados en la evidencia propuestos desde EE.UU.[38]

Referencias

1. OMS (2005). Directrices sobre formación básica e inocuidad en quiropráctica. Ginebra, Organización Mundial de la Salud. Disponible online

2. en: http://apps.who.int/medicinedocs/documents/s14104s/s14104s.pdf.

3. WLoi n° 2002-303, du 4 mars 2002 relative aux droits des malades et à la qualité du système de santé- Article 75. Journal Officiel de la République Française, 15 avril 2011 au 29 novembre 2015. Disponible online en: https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JOR FTEXT000000227015.

4. Lei n. ° 71, de 2 de setembro 2013, Regulamenta a Lei nº 45/2003, de 22 de agosto, relativamente ao exercício profissional das atividades de aplicação de terapêuticas não convencionais. Diário da República, 2 de setembro de 2013, pp. 5439 a 5439. Disponible online en: http:// www.imt.pt/BO/uploadDOCS/Lei/lei712013.pdf.

5. Legge n° 244 Articolo 2 comma 355, 24 dicembre 2007, "Disposizioni per la formazione del bilancio annuale e pluriennale dello Stato (legge finanziaria 2008)"pubblicata nella Gazzetta Ufficiale n. 300 del 28 dicembre 2007 - Supplemento ordinario n. 285, pp. 140. Disponible online en: http://www.parlamento.it/parlam/leggi/07244l.pdf.

6. Loi du 29 avril 1999 relative aux pratiques non conventionnelles dans les domaines de l'art médical, de l'art pharmaceutique, de la kinésithérapie, de l'art infirmier et des professions. médicales. Moniteur Belge, 24 June 1999, 169. Belgium. Disponible online en: http:// www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=1999042968&table_ name=loi.

7. Heilpraktikergesetz in der im Bundesgesetzblatt Teil III, Gliederungsnummer 2122-2, veröffentlichten bereinigten Fassung, das zuletzt durch Artikel 17e des Gesetzes vom 23. Dezember 2016 (BGBl. I S. 3191) geändert worden ist. Disponible online en: https://www.gesetze-im- internet.de/heilprg/BJNR002510939.html.

8. The Chiropractors Act 1994. London: HMSO, 1994. Disponible online en: http://www.legislation.gov.uk/ukpga/1994/17/pdfs/ ukpga19940017en.pdf.

9. LBK nr. 877, af 04 august 2011, Kapitel 12 Kiropraktorer, Lov om autorisation af sundhedspersoner og om sundhedsfaglig virksomhed. Sundheds- og Ældreministeriets. Disponible online en: https://www.retsinformation.dk/Forms/R0710.aspx?id=121913#Kap12.

10. Act of 2 July 1999 No. 64 relating to health personnel etc (the health personnel Act), Ot.prp. nr. 13 (1998-99). Disponible online en: https:// www.regjeringen.no/no/dokumenter/act-of-2-july-1999-no-64-relating-to-hea/id107079/.

11. Motion till riksdagen 1989/90:Ub530-537, Stockholm den 22 januari 1990. Disponible online en: https://www.riksdagen.se/sv/dokument-lagar/dokument/motion/kiropraktorutbildningen_GD02Ub530.

12. Laki terveysalan ammattilaisista (559/1994) 2 §: n 1 momentin 2 kohta. Disponible online en: http://finlex.fi/fi/laki/ajantasa/1994/19940564

13. Íslensk lög 1. janúar 2018. Útgáfa 148a. Lög um heilbrigðisstarfsmenn, 2012 nr. 34 15. Maí. Disponible online en: http://www.althingi.is/ lagas/nuna/2012034.html.

14. Beliveau PJH, Wong JJ, Sutton DA, Simon NB, Bussières AE, Mior SA and French SD. The chiropractic profession: a scoping review of utilization rates, reasons for seeking care, patient profiles, and care provided. Chiropr Man Therap. 2017 Nov 22;25:35.

15. Babatunde OO, Jordan JL, Van der Windt DA, Hill JC, Foster NE, Protheroe J. Effective treatment options for musculoskeletal pain in primary care: a systematic overview of current evidence. PLoS One. 2017;12(6):e0178621.

16. Sackett DL, Richardson WS, Rosenberg W, and Hayne RB. Evidence-based medicine: how to practice and teach EBM. London: Churchill- Livingstone, 2000.

17. Newell D, Holmes MM. Patient Experience and Satisfaction With Chiropractic Care: A Systematic Review. J Patient Exp. 2024;11:23743735241302992. doi:10.1177/23743735241302992.

18. vanova D, Bishop FL, Newell D, Field J, Walsh M. Mixed methods systematic review of the literature base exploring working alliance in the chiropractic profession. Chiropr Man Therap. 2022;30:35. doi:10.1186/s12998-022-00452-6.

19. Leung B, Treleaven J, Dinsdale A, Marsh L, Thomas L. Serious adverse events associated with conservative physical procedures directed towards the cervical spine: A systematic review. J Bodyw Mov Ther. 2025;41:56-77. doi:10.1016/j.jbmt.2024.10.023.

20. Jenks A, de Zoete A, van Tulder M, Rubinstein SM; International IPD-SMT group. Spinal manipulative therapy in older adults with chronic low back pain: an individual participant data meta-analysis. Eur Spine J. 2022;31(7):1821-1845.

21. Leininger BD, Kuntz KM, Hodges JS, Evans R, Enns E, Johnson PJ, Bronfort G. Cost-effectiveness of spinal manipulation, exercise, and self-management for spinal pain. Chiropr Man Therap. 2025;33(1):36.

22. Wong JJ, Lu M, Côté P, Watson T, Rosella LC. Effects of chiropractic use on medical healthcare utilization and costs in adults with back pain in Ontario, Canada from 2003 to 2018: a population-based cohort study. BMC Health Serv Res. 2023;23(1):793.

23. Dawson J, (2004). Acquisition by Mercer to give new energy to high-flying Synhrgy. Houston Business Journal. Disponible online en: https://www.bizjournals.com/houston/stories/2004/01/19/story8.html.

24. Ball C, Sackett D, Phillips B, Haynes B, Straus S. Levels of evidence and grades of recommendations. In: EBM (Web site of the Oxford Centre for Evidence-Based Medicine). Disponible en: www.cebm.net/levels_of_evidence.asp

25. Leung B, Treleaven J, Dinsdale A, Marsh L, Thomas L. Serious adverse events associated with conservative physical procedures directed towards the cervical spine: A systematic review. J Bodyw Mov Ther. 2025;41:56-77. doi:10.1016/j.jbmt.2024.10.023.

26. Chu ECP, Trager RJ, Lee LYK, Niazi IK. A retrospective analysis of the incidence of severe adverse events among recipients of chiropractic spinal manipulative therapy. Sci Rep. 2023;13(1):1254. doi:10.1038/s41598-023-28520-4.

27. Thomas M, Swait G, Finch R. Ten years of online incident reporting and learning using CPiRLS: implications for improved patient safety. Chiropr Man Therap. 2023;31(1):9.

28. Gorrell LM, Brown BT, Engel R, Lystad RP. Reporting of adverse events associated with spinal manipulation in randomised clinical trials: an updated systematic review. BMJ Open. 2023;13(5):e067526.

29. JORF no0037, du 14 février 2018, Ministère Des Solidarités Et De La Santé. Relatif à la formation en chiropraxie, 13 février 2018. Disponible online en: http://solidarites-sante.gouv.fr/fichiers/bo/2018/18-02/ste_20180002_0000_0099.pdf.

30. Busse JW, Craigie S, Juurlink DN, Buckley DN, Wang L, Couban RJ, et al. Guideline for opioid therapy and chronic noncancer pain. CMAJ 2017; 189(18):E659–6.

31. Qaseem A, MD, PhD, MHA; Wilt TJ, MD, MPH; McLean RM, MD; Forciea MA, MD. Clinical Guidelines Committee of the American College of Physicians. Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. Ann Intern Med. 2017 Apr 4;166(7):514-530.

32. M. Aebi, COST Action B13: European Guidelines for the Management of Low Back Pain, European Spine Journal. 2006. Vol. 15, Suppl. 2 La original pone ON LINE.

33. Wambeke PV, Desomer A, Ailiet L, Berquin A, Dumoulin C, Depreitere B, Dewachter J, Dolphens M, Forget P, Fraselle V, et al. (2017) Belgian Health Care Knowledge Centre (KCE) Report. 287.

34. National Institute for Health and Care Excellence (NICE). Low back pain and sciatica in over 16s: assessment and Management (NG59). November 2016.

35. Stochkendahl et al. (2017) Stochkendahl MJ, Kjaer P, Hartvigsen J, Kongsted A, Aaboe J, Andersen M, Andersen MØ, Fournier G, Højgaard B, Jensen MB. National clinical guidelines for non-surgical treatment of patients with recent onset low back pain or lumbar radiculopathy. European Spine Journal. 2017;27:60–75.

36. North American Spine Society Diagnosis and Treatment of Low-Back Pain Evidence-Based Guideline 2016- Currently Under Development Guideline. Inclusion/Exclusion Criteria

Clinical Question List. NASS Diagnosis and Treatment of Low-Back Pain Guideline—Clinical Question Protocol.

37. Foster, N et al. Prevention and treatment of low back pain: evidence, challenges, and promising directions. The Lancet. Published Online

38. .2018 Mar 21. Disponible en: http://www.thelancet.com/series/low-back-pain.

39. Vos, T et al. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet, Volume 390, Issue 10100,1211 – 1259.

40. Murphy DR, Justice BD, Paskowski IC, Perle SM, Schneider MJ. The establishment of a primary spine care practitioner and its benefits to health care reform in the United States. Chiropr Man Therap. 2011 Jul 21;19(1):17.

ÍNDICE

- Nim C, Aspinall SL, Cook CE, Corrêa LA, Donaldson M, Downie AS, Harsted S, Hansen S, Jenkins HJ, McNaughton D, Nyirö L, Perle SM, Roseen EJ, Young JJ, Young A, Zhao GH, Hartvigsen J, Juhl CB. The Effectiveness of Spinal Manipulative Therapy in Treating Spinal Pain Does Not Depend on the Application Procedures: A Systematic Review and Network Meta-analysis. J Orthop Sports Phys Ther. 2025 Feb;55(2):109-122.
- Diao Y, Liu Y, Pan J, Chen J, Pan J, Liao M, Liu H, Liao L. Efficacy and safety of spinal manipulative therapy in the management of acute neck pain: a systematic review and meta-analysis. Syst Rev. 2025 May 1;14(1):97.
- Gevers-Montoro C, Romero-Santiago B, Medina-García I, Larranaga-Arzamendi B, Álvarez-Gálovich L, Ortega-De Mues A, Piché M. Reduction of Chronic Primary Low Back Pain by Spinal Manipulative Therapy is Accompanied by Decreases in Segmental Mechanical Hyperalgesia and Pain Catastrophizing: A Randomized Placebo-controlled Dual-blind Mixed Experimental Trial. J Pain. 2024 Aug;25(8):104500.
- Sørensen PW, Nim CG, Poulsen E, Juhl CB. Spinal Manipulative Therapy for Nonspecific Low Back Pain: Does Targeting a Specific Vertebral Level Make a Difference?: A Systematic Review With Meta-analysis. J Orthop Sports Phys Ther. 2023 Sep;53(9):529-539.
- Jenks A, de Zoete A, van Tulder M, Rubinstein SM; International IPD-SMT group. Spinal manipulative therapy in older adults with chronic low back pain: an individual participant data meta-analysis. Eur Spine J. 2022 Jul;31(7):1821-1845.
- Chaibi A, Stavem K, Russell MB. Spinal Manipulative Therapy for Acute Neck Pain: A Systematic Review and Meta-Analysis of Randomised Controlled Trials. J Clin Med. 2021 Oct 28;10(21):5011.

COSTE-EFECTIVIDAD DEL TRATAMIENTO QUIROPRÁCTICO

- Leininger BD, McDonough CM, Evans R, Tosteson ANA, Goertz C, Long CR, et al. Cost-effectiveness of spinal manipulation, exercise, and self-management for spinal pain. Chiropr Man Therap. 2025.
- Gedin F, Skeppholm M, Sparring V, Zethraeus N. Effectiveness and cost-effectiveness of chiropractic and physiotherapy for chronic low back pain: a multicenter RCT in Sweden. BMC Musculoskelet Disord. 2025 Feb 25;26(1):190.
- Farabaugh R, Hawk C, Taylor D, Daniels C, Noll C, Schneider M, McGowan J, Whalen W, Wilcox R, Sarnat R, Suiter L, Whedon J. Cost of chiropractic versus medical management of adults with spine-related musculoskeletal pain: a systematic review. Chiropr Man Therap. 2024 Mar 6;32(1):8.
- Wong JJ, Côté P, et al. Effects of chiropractic use on medical healthcare utilization and costs in adults with back pain in Ontario, Canada from 2003 to 2018: a population-based cohort study. BMC Health Serv Res. 2023 Jul 25;23(1):793.
- Harwood KJ, Pines JM, Andrilla CHA, Frogner BK. Where to start? A two stage residual

inclusion approach to estimating influence of the initial provider on health care utilization and costs for low back pain in the US. BMC Health Serv Res. 2022 May 23;22(1):694.

- Whedon JM, et al. Long-Term Medicare Costs Associated With Opioid Analgesic Therapy vs Spinal Manipulative Therapy for Chronic Low Back Pain in a Cohort of Older Adults. J Manipulative Physiol Ther. 2021 Sep;44(7):519-526.

SATISFACCIÓN DE LOS USUARIOS DE QUIROPRÁCTICA

- Newell D, Holmes MM. Patient Experience and Satisfaction With Chiropractic Care: A Systematic Review. J Patient Exp. 2024 Dec 25;11:23743735241302992.
- Ivanova D, Bishop FL, Newell D, et al. Mixed methods systematic review of the literature base exploring working alliance in the chiropractic profession. *Chiropr Man Therap.* 2022;30:35.

SEGURIDAD DEL EJERCICIO DE LA QUIROPRÁCTICA

- Leung B, Treleaven J, et al. Serious adverse events associated with conservative physical procedures directed towards the cervical spine: a systematic review. *J Bodyw Mov Ther.* 2025;41:56–77.
- Diao Y, Liu Y, Pan J, Chen J, Pan J, Liao M, Liu H, Liao L. Efficacy and safety of spinal manipulative therapy in the management of acute neck pain: a systematic review and meta-analysis. Syst Rev. 2025 May 1;14(1):97.
- Thomas M, Swait G, Finch R. Ten years of online incident reporting and learning using CPiRLS: implications for improved patient safety. *Chiropr Man Therap.* 2023;31:9.
- Gorrell LM, Brown BT, Engel R, Lystad RP. Reporting of adverse events associated with spinal manipulation in randomised clinical trials: an updated systematic review. *BMJ Open.* 2023;13(5):e067526.
- Chu ECP, Trager RJ, Lee LYK, Niazi IK. A retrospective analysis of the incidence of severe adverse events among recipients of chiropractic spinal manipulative therapy. *Sci Rep.* 2023;13:28520.

CAPÍTULO 1
MECANISMOS DE ACCIÓN Y EFECTOS BIOLÓGICOS SUBYACENTES A LAS TÉCNICAS DE MANIPULACIÓN QUIROPRÁCTICA

Este capítulo tiene como objetivo presentar un resumen de la evidencia científica existente sobre los mecanismos a través de los cuales los ajustes (técnicas de manipulación) quiroprácticos actúan sobre el organismo.

Debido a la existencia de diferentes efectos clínicos observados tras la realización de los ajustes vertebrales y la complejidad de los mismos, podemos penasr en diferentes mecanismos involucrados en la producción de dichos efectos. Por este motivo, se ha realizado una selección de artículos centrados por un lado en el estudio de diferentes mecanismos involucrados, biomecánicos y fisiológicos (incluidos los neurológicos) y, por otro, en los efectos asociados tales como la inhibición del dolor, observados tanto en modelos animales como en humanos.

Podemos apreciar una creciente producción científica que apoya cómo los efectos de los ajustes vertebrales se basan en alteraciones biomecánicas o fisiológicas (incluidas las neurológicas). Aún así, futuros estudios podrán aportar más información sobre estos mecanismos y podrán ser comprendidos en mayor profundidad.

Neuromuscular Response to High-Velocity, Low-Amplitude Spinal Manipulation-An Overwiew.

Alanazi MS, Degenhardt B, Kelley-Franklin G, Cox JM, Lipke L, Reed WR.

Medicina (Kaunas). 2025 Jan 22;61(2):187.

ABSTRACT

The clinical use of spinal manipulation to treat musculoskeletal conditions has nearly tripled in the United States since 1980, and it is currently recommended by most global clinical guidelines as a conservative treatment for musculoskeletal pain, despite a lack of knowledge concerning its mechanisms of action. This overview highlights evidence of direct neuromuscular responses to high-velocity, low-amplitude spinal manipulation (HVLA-SM) as delivered by chiropractic, osteopathic, and physical therapy clinicians, with an intent to foster greater interprofessional dialogue and collaborative research to better address current gaps in mechanistic knowledge of the neuromuscular response to HVLA-SM. Three databases (PubMed, CINAHL Ultimate (EBSCO), EMBASE (Elsevier)) were searched from 2000 to December 2024 with specific search terms related to thrust HVLA-SM and the neuromuscular response. To focus strictly on neuromuscular responses related to HVLA-SM, this literature overview excluded articles using non-HVLA-SM manual therapy techniques (i.e., massage, non-thrust joint mobilization, and/or combined HVLA-SM with other forms of treatment such as exercise or non-thrust joint mobilization) and studies in which patient-centered outcomes (i.e., pain scores) were the primary outcomes of the HVLA-SM interventions. Pediatric studies, animal studies, and studies in languages other than English were also excluded. One-hundred and thirty six articles were identified and included in this overview. Neuromuscular findings related to HVLA-SM in the areas of electromyography (EMG), muscle thickness, muscle strength, reflexes, electroencephalogram (EEG), and evoked potential were often mixed; however, evidence is beginning to accumulate either in favor of or opposed to particular neuromuscular responses to HVLA-SM as larger and more scientifically rigorous studies are being performed. Recurrent limitations of many HVLA-SM-related studies are small sample sizes, leading to a lack of generalizability, and the non-standardization of HVLA-SM delivery, which has prevented researchers from arriving at definitive conclusions regarding neuromuscular responses to HVLA-SM. Discussions of future neuromuscular research needs related to HVLA-SM are included for clinicians and researchers inside and outside of the field of manual therapy, to advance this field.

Keywords: electromyography; high-velocity, low-amplitude spinal manipulation; manual therapy; neuromuscular; spinal manipulation.

RESUMEN DEL TEXTO

Este trabajo revisa la evidencia sobre la respuesta neuromuscular a la manipulación vertebral de alta velocidad y baja amplitud (HVLA).

Los resultados muestran que la **manipulación puede inducir respuestas neuromusculares medibles, incluyendo cambios en la actividad electromiográfica, reflejos, fuerza muscular y actividad cerebral**.

Sin embargo, los hallazgos son variables entre estudios y **no permiten establecer conclusiones consistentes.**

Los autores destacan que la evidencia está limitada por tamaños muestrales pequeños y falta de estandarización en la aplicación de la técnica, concluyendo que, aunque existen indicios de efectos neuromusculares, **se necesitan estudios más rigurosos para clarificar estos mecanismos.**

Nivel de evidencia: 1A
Grado de recomendación: A

Mechanisms of manipulation: a systematic review of the literature on immediate anatomical structural or positional changes in response to manually delivered high-velocity, low-amplitude spinal manipulation.

Young KJ, Leboeuf-Yde C, Gorrell L, Bergström C, Evans DW, Axén I, Chance-Larsen K, Gagey O, Georgopoulos V, Goncalves G, Harris C, Harsted S, Kerry R, Lee E, McCarthy C, Nim C, Nyirö L, Schweinhardt P, Vogel S.

Chiropr Man Therap. 2024 Sep 11;32(1):28.

ABSTRACT

Background: Spinal manipulation (SM) has been claimed to change anatomy, either in structure or position, and that these changes may be the cause of clinical improvements. The aim of this systematic review was to evaluate and synthesise the peer-reviewed literature on the current evidence of anatomical changes in response to SM.

Methods: The review was registered with PROSPERO (CRD42022304971) and reporting was guided by the standards of the PRISMA Statement. We searched Medline, Embase, CINAHL, AMED, Cochrane Library all databases, PEDro, and the Index to Chiropractic Literature from inception to 11 March 2022 and updated on 06 June 2023. Search terms included manipulation, adjustment, chiropractic, osteopathy, spine and spine-related structures. We included primary research studies that compared outcomes with and without SM regardless of study design. Manipulation was defined as high-velocity, low-amplitude thrust delivered by hand to the spine or directly related joints. Included studies objectively measured a potential change in an anatomical structure or in position. We developed a novel list of methodological quality items in addition to a short, customized list of risk of bias (RoB) items. We used quality and RoB items together to determine whether an article was credible or not credible. We sought differences in outcomes between SM and control groups for randomised controlled trials and crossover studies, and between pre- and post-SM outcomes for other study designs. We reported, in narrative form, whether there was a change or not.

Results: The search retrieved 19,572 articles and 20 of those were included for review. Study topics included vertebral position (n = 3) facet joint space (n = 5), spinal stiffness (n = 3), resting muscle thickness (n = 6), intervertebral disc pressure (n = 1), myofascial hysteresis (n = 1), and further damage to already damaged arteries (n = 1). Eight articles were considered credible. The credible articles indicated that lumbar facet joint space increased and spinal stiffness decreased but that the resting muscle thickness did not change.

Conclusion: We found few studies on this topic. However, there are two promising areas for future study: facet joint space and spinal stiffness. A research strategy should be developed with funding for high quality research centres.

Keywords: Chiropractic; Mechanism; Osteopathy; Physiotherapy; Spinal manipulation; Systematic review.

RESUMEN DEL TEXTO

Esta revisión analiza si la manipulación vertebral produce cambios estructurales inmediatos medibles. Los resultados muestran evidencia limitada y heterogénea. Algunos estudios observan aumento del espacio articular facetario lumbar y disminución de la rigidez espinal, pero no cambios consistentes en otros parámetros estructurales.

Se concluye que no existe evidencia suficiente para sostener explicaciones estructurales amplias como principal mecanismo de acción.

Nivel de evidencia: 1A
Grado de recomendación: A

Changes in biochemical markers following a spinal manipulation - a systematic review update

Kovanur Sampath K, Treffel L, P Thomson O, Rodi JD, Fleischmann M, Tumilty S. Changes in biochemical markers following a spinal manipulation - a systematic review update.

J Man Manip Ther. 2024 Feb;32(1):28-50.

ABSTRACT

Objective: The aim of this systematic review was to update the current level of evidence for spinal manipulation in influencing various biochemical markers in healthy and/or symptomatic population. **Methods:** This is a systematic review update. Various databases were searched (inception till May 2023) and fifteen trials (737 participants) that met the inclusion criteria were included in the review. Two authors independently screened, extracted and assessed the risk of bias in included studies. Outcome measure data were synthesized using standard mean differences and meta-analysis for the primary outcome (biochemical markers). The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) was used for assessing the quality of the body of evidence for each outcome of interest. **Results:** There was low-quality evidence that spinal manipulation influenced various biochemical markers (not pooled). There was low-quality evidence of significant difference that spinal manipulation is better (SMD -0.42, 95% CI - 0.74 to -0.1) than control in eliciting changes in cortisol levels immediately after intervention. Low-quality evidence further indicated (not pooled) that spinal manipulation can influence inflammatory markers such as interleukins levels post-intervention. There was also very low-quality evidence that spinal manipulation does not influence substance-P, neurotensin, oxytocin, orexin-A, testosterone and epinephrine/nor-epinephrine. **Conclusion:** Spinal manipulation may influence inflammatory and cortisol post-intervention. However, the wider prediction intervals in most outcome measures point to the need for future research to clarify and establish the clinical relevance of these changes.

Keywords: Biochemical Markers; Cortisol; Inflammatory Markers; Pain Markers; Spinal Manipulation.

RESUMEN DEL TEXTO

Se actualiza la evidencia sobre los efectos de la manipulación vertebral en marcadores bioquímicos. Los resultados muestran evidencia de baja calidad de cambios en cortisol e interleucinas, mientras que otros marcadores presentan resultados inconsistentes o de muy baja calidad.

Estos hallazgos sugieren **la existencia de respuestas biológicas tras la manipulación**, aunque su relevancia clínica aún no está claramente establecida.

Nivel de evidencia: 1A
Grado de recomendación: A

No Sufficient Evidence for an Immediate Hypoalgesic Effect of Spinal Manual Therapy on Pressure Pain Thresholds in Asymptomatic and Chronic Pain Populations: A Systematic Review and Meta-Analysis.

Jung A, Adamczyk WM, Ahmed A, van der Schalk L, Poesl M, Luedtke K, Szikszay TM.
Phys Ther. 2023 Mar 3;103(3): pzad003.

ABSTRACT

Objective: Spinal manual therapy (SMT) is often used to treat patients with spinal disorders; however, the underlying mechanisms of SMT are not fully understood. This systematic review and meta-analysis investigates the effect of SMT compared with sham treatment or no intervention on local or remote (segmental or non-segmental) pressure pain thresholds (PPTs) in patients with chronic musculoskeletal conditions and people who are pain free. **Methods:** A systematic search was conducted in the PubMed, Cochrane Library, Web of Science, and CINAHL databases. Randomized controlled trials investigating the effect of SMT on PPTs in patients with chronic musculoskeletal conditions and in people who were pain free were included. Quality assessment and evidence synthesis were performed according to Cochrane Handbook recommendations. A meta-analysis was performed using standardized mean difference and 95% CIs. **Results:** Twenty-two reports were included in the present review. There were no significant results for an immediate effect of SMT on local (low certainty of evidence), remote (segmental) (low certainty of evidence), and remote (non-segmental) (low certainty of evidence) PPTs in patients with chronic pain as well as on local (moderate certainty of evidence) and remote (segmental) (low certainty of evidence) PPTs in people who were pain free. A small but significant effect (standardized mean difference = 0.26; 95% CI = 0.01 to 0.51; low certainty of evidence) was observed on remote (non-segmental) PPTs in people who were pain free, which was not considered a meaningful effect size. **Conclusion:** No immediate, consistent, or meaningful hypoalgetic effect of SMT was shown on PPTs on various body areas. Involvement of spinal or supraspinal underlying mechanisms were, therefore, not confirmed via PPTs but should still be investigated using methods designed to assess central nervous pain processing. **Impact:** No consistent and meaningful hypoalgesic effects of spinal manual therapy were demonstrated on PPTs in participants who were pain free and in patients with chronic musculoskeletal disorders.

Keywords: Hypoalgesia; Manual Therapy; Pressure Pain Threshold; Spinal Manipulative Therapy; Widespread

RESUMEN DEL TEXTO

Esta revisión sistemática con metaanálisis evalúa el efecto inmediato de la terapia manual espinal sobre los umbrales de dolor a la presión en sujetos sanos y en pacientes con dolor musculoesquelético crónico.

Los resultados no muestran un efecto hipoalgésico inmediato consistente ni clínicamente relevante, tanto a nivel local como remoto. Aunque se observa un pequeño efecto en sujetos sanos en zonas no segmentarias, este no se considera significativo desde el punto de vista clínico.

Se concluye que **los umbrales de dolor a la presión no permiten confirmar los mecanismos analgésicos de la manipulación vertebral**, y que son necesarios otros métodos para evaluar el procesamiento central del dolor.

Nivel de evidencia: 1A
Grado de recomendación: A

The contemporary model of vertebral column joint dysfunction and impact of high-velocity, low-amplitude controlled vertebral thrusts on neuromuscular function.

Haavik H, Kumari N, Holt K, Niazi IK, Amjad I, Pujari AN, Türker KS, Murphy B.

Eur J Appl Physiol. 2021 Oct;121(10):2675-2720.

ABTRACT

Purpose: There is growing evidence that vertebral column function and dysfunction play a vital role in neuromuscular control. This invited review summarises the evidence about how vertebral column dysfunction, known as a central segmental motor control (CSMC) problem, alters neuromuscular function and how spinal adjustments (high-velocity, low-amplitude or HVLA thrusts directed at a CSMC problem) and spinal manipulation (HVLA thrusts directed at segments of the vertebral column that may not have clinical indicators of a CSMC problem) alters neuromuscular function. **Methods:** The current review elucidates the peripheral mechanisms by which CSMC problems, the spinal adjustment or spinal manipulation alter the afferent input from the paravertebral tissues. It summarises the contemporary model that provides a biologically plausible explanation for CSMC problems, the manipulable spinal lesion. This review also summarises the contemporary, biologically plausible understanding about how spinal adjustments enable more efficient production of muscular force. The evidence showing how spinal dysfunction, spinal manipulation and spinal adjustments alter central multimodal integration and motor control centres will be covered in a second invited review. **Results:** Many studies have shown spinal adjustments increase voluntary force and prevent fatigue, which mainly occurs due to altered supraspinal excitability and multimodal integration. The literature suggests physical injury, pain, inflammation, and acute or chronic physiological or psychological stress can alter the vertebral column's central neural motor control, leading to a CSMC problem. The many gaps in the literature have been identified, along with suggestions for future studies. **Conclusion:** Spinal adjustments of CSMC problems impact motor control in a variety of ways. These include increasing muscle force and preventing fatigue. These changes in neuromuscular function most likely occur due to changes in supraspinal excitability. The current contemporary model of the CSMC problem, and our understanding of the mechanisms of spinal adjustments, provide a biologically plausible explanation for how the vertebral column's central neural motor control can dysfunction, can lead to a self-perpetuating central segmental motor control problem, and how HVLA spinal adjustments can improve neuromuscular function.

Keywords: Chiropractic; Muscle strength; Neuromuscular function; Spinal manipulation.

RESUMEN DEL TEXTO

Esta revisión propone un modelo contemporáneo en el que la disfunción vertebral se entiende como una alteración del control motor mediada por el sistema nervioso central, más que como un problema estructural.

La manipulación vertebral podría modificar la información aferente propioceptiva y, con ello, influir en la integración sensoriomotora y en la excitabilidad del sistema nervioso central. Algunos estudios sugieren efectos sobre la fuerza muscular y la fatiga, aunque la evidencia sigue siendo limitada.

Los autores concluyen que los **efectos de la manipulación** podrían explicarse por **mecanismos neurofisiológicos centrales**, pero se necesitan estudios de mayor calidad para confirmarlo.

Nivel de evidencia: 5
Grado de recomendación: D

Neurophysiological mechanisms of chiropractic spinal manipulation for spine pain

Gevers-Montoro C, Provencher B, Descarreaux M, Ortega de Mues A, Piché M.

European Journal of Pain. 2021 Aug;25(7):1429-1448.

ABSTRACT

Together, neck pain and back pain are the first cause of disability worldwide, ac- counting for more than 10% of the total years lived with disability. In this context, chiropractic care provides a safe and effective option for the management of a large proportion of these patients. Chiropractic is a healthcare profession mainly focused on the spine and the treatment of spinal disorders, including spine pain. Basic studies have examined the influence of chiropractic spinal manipulation (SM) on a variety of peripheral, spinal and supraspinal mechanisms involved in spine pain. While spinal cord mechanisms of pain inhibition contribute at least partly to the pain-relieving effects of chiropractic treatments, the evidence is weaker regarding peripheral and supraspinal mechanisms, which are important components of acute and chronic pain. This narrative review highlights the most relevant mechanisms of pain relief by SM and provides a perspective for future research on SM and spine pain, including the validation of placebo interventions that control for placebo effects and other non- specific effects that may be induced by SM.

Significance: Spinal manipulation inhibits back and neck pain partly through spinal segmental mechanisms and potentially through peripheral mechanisms regulating inflammatory responses. Other mechanisms remain to be clarified. Controls and pla- cebo interventions need to be improved in order to clarify the contribution of specific and non-specific effects to pain relief by spinal manipulative therapy.

RESUMEN DEL TEXTO

Esta **revisión bibliográfica** tiene como objetivo evaluar los mecanismos a través de los cuales la manipulación vertebral (SM) consigue aliviar el dolor derivado de alteraciones de la columna vertebral. En ella se valoran diferentes mecanismos de inhibición del dolor que pueden clasificarse en mecanismos periféricos, medulares y supramedulares. Hay fuertes indicios de que **la SM consigue aliviar el dolor de espalda y dolor cervical a través de mecanismos medulares segmentales principalmente**. También pueden intervenir mecanismos periféricos de modulación de la respuesta inflamatoria. Sin embargo, la evidencia referente a otros mecanismos es débil todavía. Por último, en esta revisión se acentúa la importancia de mejorar los diseños de estudios futuros para conseguir un mejor control sobre los efectos de la SM y el efecto placebo.

Nivel de evidencia: 1A
Grado de recomendación: A

Spinal manipulative therapy effects in autonomic regulation and exercise performance in recreational healthy athletes: a randomized controlled trial

Valenzuela PL, Pancorbo S, Lucia A, Germain F.

Spine. 2018 Oct

ABSTRACT

Study design: Randomized, double blind, parallel groups, sham-controlled trial. **Objective:** To analyse the acute effects of spinal manipulative therapy (SMT) on performance and autonomic modulation. **Summary of Background Data:** The use of SMT is progressively spreading from the clinical to the sporting context owing to its purported ergogenic effects. However, its effects remain unclear. **Methods:** 37 male recreational athletes (aged 37±9 years) who had never received SMT were assigned to a sham (n=19) or actual SMT group (n=18). Study endpoints included autonomic modulation (heart rate variability), handgrip strength, jumping ability and cycling performance (8-minute time trial [TT]). Differences in custom effects between interventions were determined using magnitude-based inferences. **Results:** A significant and very likely lower value of a marker of sympathetic modulation, the stress score, was observed in response to actual compared to sham SMT (p=0.007; effect size [ES]=-0.97). A trend towards a significant and likely lower sympathetic:parasympathetic ratio (p=0.055; ES=-0.96) and a likely higher natural logarithm of the root-mean-square differences of successive heartbeat intervals ([LnRMSSD], p=0.12; ES=0.36) was also found with actual SMT. Moreover, a significantly lower mean power output was observed during the TT with actual compared with sham SMT (p=0.035; ES=-0.28). Non-significant (p>0.05) and unclear or likely trivial differences (ES<0.2) were found for the rest of endpoints, including handgrip strength, heart rate during the TT, and jump loss thereafter. **Conclusion:** A single pre-exercise SMT session induced an acute shift towards parasympathetic dominance and slightly impaired performance in recreational healthy athletes.

RESUMEN DEL TEXTO

Este **ensayo clínico controlado y aleatorizado de doble ciego** tiene como objetivo analizar los efectos que provoca la terapia de **manipulación vertebral** (SM) sobre el **sistema nervioso autónomo** y el rendimiento de triatletas. Se midieron variables de modulación autónoma (variabilidad de la frecuencia cardíaca), el rendimiento en bicicleta estática y una tarea de salto, así como la fuerza manual de los participantes antes y después de una única sesión de SM o terapia placebo, según el grupo al que fueran asignados. Se observó un **aumento de la actividad parasimpática** sobre la simpática tras la SM en los atletas que recibieron el tratamiento en comparación con el grupo control. No se vieron diferencias significativas en cuanto a la fuerza de empuñadura ni en la tarea de salto y se observó un menor rendimiento en la bicicleta estática en el grupo SM en comparación con el grupo control, hallazgo que se relaciona con una influencia hacia la **dominancia de la rama parasimpática provocada por la SM**.

Nivel de evidencia: 1B
Grado de recomendación: A

CAPÍTULO 2
EFICACIA Y EFECTIVIDAD DE LAS TÉCNICAS DE MANIPULACIÓN QUIROPRÁCTICA

Los estudios más recientes y las guías de práctica clínica basadas en la evidencia de muchos países de nuestro entorno, sitúan a la profesión quiropráctica y en particular al tratamiento basado en la manipulación vertebral realizada por quiroprácticos (Spinal Manipulation Treatment) como uno de los abordajes más eficaces y efectivos de estos trastornos musculoesqueléticos.

Si bien podría afirmarse que sus efectos son igual de beneficiosos que otras prácticas, incluida las empleadas por la medicina convencional, los mejores efectos clínicos sobre los pacientes se obtienen mediante la combinación de tratamientos en base a la práctica basada en la evidencia dentro de la que se contempla la Quiropráctica.

A continuación se muestran algunos de los estudios más relevantes que apoyan la eficacia del tratamiento quiropráctico.

The effect of spinal manipulative therapy on pain relief and function in patients with chronic low back pain: An individual participant data meta-analysis

de Zoete A, Rubinstein SM, de Boer MR, Ostelo R, Underwood M, Hayden JA, Buffart LM, van Tulder MW; International IPD-SMT group.

Physiotherapy. 2021 Sep;112:121-134.

ABSTRACT

Background: A 2019 review concluded that spinal manipulative therapy (SMT) results in similar benefit compared to other interventions for chronic low back pain (LBP). Compared to traditional aggregate analyses individual participant data (IPD) meta-analyses allows for a more precise estimate of the treatment effect. **Purpose:** To assess the effect of SMT on pain and function for chronic LBP in a IPD meta-analysis. **Data Sources:** Electronic databases from 2000 until April 2016, and reference lists of eligible trials and related reviews. **Study selection:** Randomized controlled trials (RCT) examining the effect of SMT in adults with chronic LBP compared to any comparator. **Data extraction and data synthesis:** We contacted authors from eligible trials. Two review authors independently conducted the study selection and risk of bias. We used GRADE to assess the quality of the evidence. A one-stage mixed model analysis was conducted. Negative point estimates of the mean difference (MD) or standardized mean difference (SMD) favors SMT. **Results:** Of the 42 RCTs fulfilling the inclusion criteria, we obtained IPD from 21 (n=4223). Most trials (s=12, n=2249) compared SMT to recommended interventions. There is moderate quality evidence that SMT vs recommended interventions resulted in similar outcomes on pain (MD -3.0, 95%CI: -6.9 to 0.9, 10 trials, 1922 participants) and functional status at one month (SMD: -0.2, 95% CI -0.4 to 0.0, 10 trials, 1939 participants). Effects at other follow-up measurements were similar. Results for other comparisons (SMT versus non-recommended interventions; SMT as adjuvant therapy; mobilization versus manipulation) showed similar findings. SMT versus sham SMT analysis was not performed, because we only had data from one study. Sensitivity analyses confirmed these findings. **Limitations:** Only 50% of the eligible trials were included. **Conclusions:** Sufficient evidence suggest that SMT provides similar outcomes to recommended interventions, for pain relief and improvement of functional status. SMT would appear to be a good option for the treatment of chronic LBP.

RESUMEN DEL TEXTO

Esta revisión sistemática y metaanálisis con datos de participantes individuales tiene como objetivo evaluar el **efecto de la terapia de manipulación espinal (SMT) sobre la reducción del dolor y mejora de la función del dolor lumbar crónico** en adultos no atribuido a patología específica. Consta de 43 ensayos controlados aleatorizados que examinan el efecto de la SMT en 4223 adultos con dolor lumbar crónico en comparación con otras terapias conservadoras. La SMT se comparó con otras

recomendadas, incluido el tratamiento farmacológico; con no recomendadas; con placebo (simulado); solo SMT; y con movilización. La conclusión final del estudio afirma que existe suficiente evidencia para sugerir que **la SMT proporciona resultados similares a las intervenciones recomendadas, para el alivio del dolor y la mejora del estado funcional.**

Nivel de evidencia: 1B
Grado de recomendación: A

The Effectiveness of Spinal Manipulative Therapy in Treating Spinal Pain Does Not Depend on the Application Procedures: A Systematic Review and Network Meta-analysis.

Nim C, Aspinall SL, Cook CE, Corrêa LA, Donaldson M, Downie AS, Harsted S, Hansen S, Jenkins HJ, McNaughton D, Nyirö L, Perle SM, Roseen EJ, Young JJ, Young A, Zhao GH, Hartvigsen J, Juhl CB

J Orthop Sports Phys Ther. 2025 Feb;55(2):109-122.

ABSTRACT

OBJECTIVE: To assess whether spinal manipulative therapy (SMT) application procedures (ie, target, thrust, and region) impacted changes in pain and disability for adults with spine pain. **DESIGN:** Systematic review with network meta-analysis. **LITERATURE SEARCH:** We searched PubMed and Epistemonikos for systematic reviews indexed up to February 2022 and conducted a systematic search of 5 databases (MEDLINE, EMBASE, CENTRAL [Cochrane Central Register of Controlled Trials], PEDro [Physiotherapy Evidence Database], and Index to Chiropractic Literature) from January 1, 2018, to September 12, 2023. We included randomized controlled trials (RCTs) from recent systematic reviews and newly identified RCTs published during the review process and employed artificial intelligence to identify potentially relevant articles not retrieved through our electronic database searches. **STUDY SELECTION CRITERIA:** We included RCTs of the effects of high-velocity, low-amplitude SMT, compared to other SMT approaches, interventions, or controls, in adults with spine pain. **DATA SYNTHESIS:** The outcomes were spinal pain intensity and disability measured at short-term (end of treatment) and long-term (closest to 12 months) follow-ups. Risk of bias (RoB) was assessed using version 2 of the Cochrane RoB tool. Results were presented as network plots, evidence rankings, and league tables. **RESULTS:** We included 161 RCTs (11 849 participants). Most SMT procedures were equal to clinical guideline interventions and were slightly more effective than other treatments. When comparing inter-SMT procedures, effects were small and not clinically relevant. A general and nonspecific rather than a specific and targeted SMT approach had the highest probability of achieving the largest effects. Results were based on very low- to low-certainty evidence, mainly downgraded owing to large within-study heterogeneity, high RoB, and an absence of direct comparisons. **CONCLUSION:** There was low-certainty evidence that clinicians could apply SMT according to their preferences and the patients' preferences and comfort. Differences between SMT approaches appear small and likely not clinically relevant

RESUMEN DEL TEXTO

Este metaanálisis en red analiza si diferentes formas de aplicar la manipulación vertebral (segmento tratado, tipo de thrust o región) influyen en los resultados clínicos en pacientes con dolor espinal.

El estudio muestra **que la manipulación vertebral presenta efectos similares a las intervenciones recomendadas por las guías clínicas y ligeramente superiores a otros tratamientos.** Sin embargo, al comparar entre sí distintos procedimientos de manipulación, las diferencias son pequeñas y no clínicamente relevantes.

De forma interesante, los análisis sugieren que un enfoque más general y menos específico podría tener una mayor probabilidad de obtener mejores resultados. No obstante, la evidencia disponible es de baja calidad, por lo que estas conclusiones deben interpretarse con cautela.

Nivel de evidencia: 1A
Grado de recomendación: A

Efficacy and safety of spinal manipulative therapy in the management of acute neck pain: a systematic review and meta-analysis.

Diao Y, Liu Y, Pan J, Chen J, Pan J, Liao M, Liu H, Liao L.

Syst Rev. 2025 May 1;14(1):97.

ABSTRACT

Background: Spinal manipulative therapy (SMT) is frequently used to manage neck pain; however, its efficacy and safety in treating acute neck pain (ANP) remain uncertain and require further investigation. **Objectives:** This study aims to comprehensively evaluate the efficacy and safety of SMT in the treatment of ANP. **Databases and data treatment:** A thorough search was conducted in PubMed, Embase, Web of Science, PEDro, and Cochrane Library databases, covering all studies from inception to March 20, 2023. Mean differences (MD) with 95% confidence intervals (CIs) were calculated to assess outcomes such as pain intensity, cervical range of motion (CROM), and disability. The PEDro Scale and the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach were utilized to evaluate the methodological quality and strength of evidence. **Results:** Eight randomized controlled trials (RCTs) with 965 patients were included. Their PEDro scores ranged from 4-9 (mean: 6.38, SD: 1.25). Forest plot analysis showed SMT was better than the control in reducing pain (MD = -1.53, 95% CI [-2.22, -0.83]) and improving CROM in all measured aspects. It also significantly reduced disability scores (MD = -6.20, 95% CI [-9.81, -2.59]). No serious adverse events were reported. **Conclusions:** The evidence supports the use of SMT as an effective and safe intervention for reducing pain, improving CROM, and decreasing disability in patients with ANP. These findings provide valuable insights for clinical practitioners and highlight the potential of SMT as a viable therapeutic option in managing ANP. **Systematic review registration:** PROSPERO CRD42021264411.

Keywords: Acute neck pain; Meta-analysis; Musculoskeletal rehabilitation; Spinal manipulative therapy; Systematic review.

RESUMEN DEL TEXTO

Esta revisión analiza la eficacia y seguridad de la manipulación vertebral en el tratamiento del dolor cervical agudo.

Los resultados evidencian que **la manipulación vertebral es superior al control en la reducción del dolor y en la mejora del rango de movimiento cervical en todos los planos evaluados, así como en la disminución de la discapacidad**. Además, no se reportaron efectos adversos graves en los estudios incluidos.

En conjunto**, la evidencia respalda el uso de la manipulación vertebral como una intervención efectiva y segura en el manejo del dolor cervical agudo**, aunque la variabilidad metodológica entre estudios debe ser tenida en cuenta al interpretar los resultados

Nivel de evidencia: 1A
Grado de recomendación: A

Reduction of Chronic Primary Low Back Pain by Spinal Manipulative Therapy is Accompanied by Decreases in Segmental Mechanical Hyperalgesia and Pain Catastrophizing: A Randomized Placebo-controlled Dual-blind Mixed Experimental Trial.

Gevers-Montoro C, Romero-Santiago B, Medina-García I, Larranaga-Arzamendi B, Álvarez-Gálovich L, Ortega-De Mues A, Piché M.

J Pain. 2024 Aug;25(8):104500.

ABSTRACT

Chronic primary low back pain (CPLBP) refers to low back pain that persists over 3 months, that cannot be explained by another chronic condition, and that is associated with emotional distress and disability. Previous studies have shown that spinal manipulative therapy (SMT) is effective in relieving CPLBP, but the underlying mechanisms remain elusive. This randomized placebo-controlled dual-blind mixed experimental trial (NCT05162924) aimed to investigate the efficacy of SMT to improve CPLBP and its underlying mechanisms. Ninety-eight individuals with CPLBP and 49 controls were recruited. Individuals with CPLBP received SMT (n = 49) or a control intervention (n = 49), 12 times over 4 weeks. The primary outcomes were CPLBP intensity (0-100 on a numerical rating scale) and disability (Oswestry Disability Index). Secondary outcomes included pressure pain thresholds in 4 body regions, pain catastrophizing, Central Sensitization Inventory, depressive symptoms, and anxiety scores. Individuals with CPLBP showed widespread mechanical hyperalgesia ($P < .001$) and higher scores for all questionnaires ($P < .001$). SMT reduced pain intensity compared with the control intervention (mean difference: -11.7 [95% confidence interval, -11.0 to -12.5], $P = .01$), but not disability ($P = .5$). Similar mild to moderate adverse events were reported in both groups. Mechanical hyperalgesia at the manipulated segment was reduced after SMT compared with the control intervention ($P < .05$). Pain catastrophizing was reduced after SMT compared with the control intervention ($P < .05$), but this effect was not significant after accounting for changes in clinical pain. Although the reduction of segmental mechanical hyperalgesia likely contributes to the clinical benefits of SMT, the role of pain catastrophizing remains to be clarified. PERSPECTIVE: This randomized controlled trial found that 12 sessions of SMT yield greater relief of CPLBP than a control intervention. These clinical effects were independent of expectations, and accompanied by an attenuation of hyperalgesia in the targeted segment and a modulation of pain catastrophizing.

Keywords: Chronic nonspecific low back pain; chiropractic; nociplastic pain; placebo; spinal manipulation.

RESUMEN DEL TEXTO

Este estudio evalúa el efecto de la manipulación vertebral en pacientes con dolor lumbar primario crónico, así como posibles mecanismos asociados.

Los resultados muestran que la intervención produce una **reducción significativa del dolor en comparación con el grupo control**, aunque no se observaron diferencias en discapacidad. Asimismo, se evidenció una **disminución de la hiperalgesia mecánica segmentaria y del catastrofismo,** aunque este último efecto pierde relevancia tras ajustar por el dolor clínico.

En conjunto, los hallazgos sugieren que **la manipulación vertebral puede proporcionar alivio del dolor en esta población, acompañado de cambios en variables relacionadas con la sensibilidad al dolor**, si bien su impacto funcional y los mecanismos implicados requieren mayor investigación.

Nivel de evidencia: 1B
Grado de recomendación: A

Spinal Manipulative Therapy for Nonspecific Low Back Pain: Does Targeting a Specific Vertebral Level Make a Difference?: A Systematic Review With Meta-analysis.

Sørensen PW, Nim CG, Poulsen E, Juhl CB

J Orthop Sports Phys Ther. 2023 Sep;53(9):529–539.

ABSTRACT

OBJECTIVE: We aimed to examine whether targeting spinal manipulative therapy (SMT), by applying the intervention to a specific vertebral level, produces superior clinical outcomes than a nontargeted approach in patients with nonspecific low back pain. **DESIGN:** Systematic review with meta-analysis. **LITERATURE SEARCH:** MEDLINE, Embase, CENTRAL, CINAHL, Scopus, PEDro, and Index to Chiropractic Literature were searched up to May 31, 2023. **STUDY SELECTION CRITERIA:** Randomized controlled trials comparing targeted SMT (mobilization or manipulation) to a nontargeted approach in patients with nonspecific low back pain, and measuring the effects on pain intensity and patient-reported disability. **DATA SYNTHESIS:** Data extraction, risk of bias, and evaluation of the overall certainty of evidence using the GRADE approach were performed by 2 authors independently. Meta-analyses were performed using the restricted maximum likelihood method. **RESULTS:** Ten randomized controlled trials (n = 931 patients) were included. There was moderate-certainty evidence of no difference between targeted SMT and a nontargeted approach for pain intensity at postintervention (weighted mean difference = -0.20 [95% CI: -0.51, 0.10]) and at follow-up (weighted mean difference = 0.05 [95% CI: -0.26, 0.36]). For patient-reported disability, there was moderate-certainty evidence of no difference at postintervention (standardized mean difference = -0.04 [95% CI: -0.36, 0.29]) and at follow-up (standardized mean difference = -0.05 [95% CI: -0.24, 0.13]). Adverse events were reported in 4 trials, and were minor and evenly distributed between groups. **CONCLUSION:** Targeting a specific vertebral level when administering SMT for patients with nonspecific low back pain did not result in improved outcomes on pain intensity and patient-reported disability compared to a nontargeted approach.

RESUMEN DEL TEXTO

Esta revisión evalúa si la manipulación vertebral dirigida a un nivel específico ofrece mejores resultados que un enfoque no dirigido en pacientes con dolor lumbar inespecífico. Se muestra que no existen diferencias significativas entre ambos abordajes en términos de reducción del dolor ni de mejora de la discapacidad, tanto a corto plazo como en el seguimiento, lo que sugiere que la **efectividad clínica de la manipulación no depende de la precisión segmentaria** y cuestiona la relevancia de este concepto como factor determinante del resultado terapéutico.

Nivel de evidencia: 1A
Grado de recomendación: A

Spinal manipulative therapy in older adults with chronic low back pain: an individual participant data meta-analysis.

Jenks A, de Zoete A, van Tulder M, Rubinstein SM; International IPD-SMT group.

Eur Spine J. 2022 Jul;31(7):1821-1845.

ABSTRACT

PURPOSE: Many systematic reviews have reported on the effectiveness of spinal manipulative therapy (SMT) for low back pain (LBP) in adults. Much less is known about the older population regarding the effects of SMT. **OBJECTIVE:** To assess the effects of SMT on pain and function in older adults with chronic LBP in an individual participant data (IPD) meta-analysis. **SETTING:** Electronic databases from 2000 until June 2020, and reference lists of eligible trials and related reviews. **DESIGN AND SUBJECTS:** Randomized controlled trials (RCTs) which examined the effects of SMT in adults with chronic LBP compared to interventions recommended in international LBP guidelines. **METHODS:** Authors of trials eligible for our IPD meta-analysis were contacted to share data. Two review authors conducted a risk of bias assessment. Primary results were examined in a one-stage mixed model, and a two-stage analysis was conducted in order to confirm findings. **MAIN OUTCOMES AND MEASURES:** Pain and functional status examined at 4, 13, 26, and 52 weeks. **RESULTS:** 10 studies were retrieved, including 786 individuals, of which 261 were between 65 and 91 years of age. There is moderate-quality evidence that SMT results in similar outcomes at 4 weeks (pain: mean difference [MD] - 2.56, 95% confidence interval [CI] - 5.78 to 0.66; functional status: standardized mean difference [SMD] - 0.18, 95% CI - 0.41 to 0.05). Second-stage and sensitivity analysis confirmed these findings. **CONCLUSION:** SMT provides similar outcomes to recommended interventions for pain and functional status in the older adult with chronic LBP. SMT should be considered a treatment for this patient population.

Keywords: Individual participant data; Low back pain; Older adult; Spinal manipulative therapy.

RESUMEN DEL TEXTO

Este metaanálisis con datos individuales de participantes evalúa el efecto de la manipulación vertebral en adultos mayores con dolor lumbar crónico, mostrando que **los resultados en dolor y estado funcional son similares a los obtenidos con intervenciones recomendadas por las guías clínicas**, sin evidencia de superioridad ni inferioridad. Esto sugiere que **la manipulación vertebral constituye una opción terapéutica comparable y potencialmente válida** en esta población, aunque la calidad de la evidencia es moderada y debe interpretarse dentro de ese contexto.

Nivel de evidencia: 1A
Grado de recomendación: A

Spinal Manipulative Therapy for Acute Neck Pain: A Systematic Review and Meta-Analysis of Randomised Controlled Trials.

Chaibi A, Stavem K, Russell MB

J Clin Med. 2021 Oct 28;10(21):5011.

ABSTRACT

Background: Acute neck pain is common and usually managed by medication and/or manual therapy. General practitioners (GPs) hesitate to refer to manual therapy due to uncertainty about the effectiveness and adverse events (AEs);

Method: To review original randomized controlled trials (RCTs) assessing the effect of spinal manipulative therapy (SMT) for acute neck pain. Data extraction was done in duplicate and formulated in tables. Quality and evidence were assessed using the Cochrane Back and Neck (CBN) Risk of Bias tool and the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria, respectively.

Results: Six studies were included. The overall pooled effect size for neck pain was very large -1.37 (95% CI, -2.41, -0.34), favouring treatments with SMT compared with controls. A single study that showed that SMT was statistically significantly better than medicine (30 mg ketorolac im.) one day post-treatment, ((-2.8 (46%) (95% CI, -2.1, -3.4) vs. -1.7 (30%) (95% CI, -1.1, -2.3), respectively; p = 0.02)). Minor transient AEs reported included increased pain and headache, while no serious AEs were reported.

Conclusions: SMT alone or in combination with other modalities was effective for patients with acute neck pain. However, limited quantity and quality, pragmatic design, and high heterogeneity limit our findings.

Keywords: acute neck pain; appropriateness; chiropractic; effectiveness; meta-analysis; osteopath; physiotherapy; randomized controlled trial; spinal manipulation; systematic review.

RESUMEN DEL TEXTO

Esta revisión sistemática con metaanálisis evalúa la efectividad de la manipulación vertebral en pacientes con dolor cervical agudo a partir de ensayos clínicos aleatorizados. Los resultados muestran **un efecto significativo a favor de la manipulación en la reducción del dolor en comparación con los grupos control**, con tamaños de efecto elevados, así como **ausencia de eventos adversos graves en los estudios incluidos.**

No obstante, la evidencia disponible presenta limitaciones, incluyendo un número reducido de estudios, heterogeneidad metodológica y diseños pragmáticos, lo que condiciona la interpretación de los resultados. En conjunto, **la manipulación vertebral**, sola o combinada con otras intervenciones, se

perfila como una **opción efectiva en el manejo del dolor cervical agudo**, aunque se requieren estudios adicionales de mayor calidad para confirmar estos hallazgos.

Nivel de evidencia: 1A
Grado de recomendación: A

CAPÍTULO 3
COSTE-EFECTIVIDAD DEL TRATAMIENTO QUIROPRÁCTICO

Los trastornos de la columna vertebral representan el mayor problema de salud en la sociedad moderna y en la salud pública[6], ya que entre un 60-80% de la población sufrirá problemas de espalda en alguna etapa de su vida. Constituye la mayor carga social y económica debido a la elevada cronicidad y discapacidad de larga duración asociada a los altos costes en la sanidad y a la pérdida de productividad.

El presente capítulo tiene como objetivo analizar si el tratamiento quiropráctico a través de ajustes quiroprácticos (SM, Spinal Manipulation) es un tipo de tratamiento adecuado para este tipo de trastornos musculoesqueléticos.

Para ello se ha realizado una selección de artículos centrados en la coste-efectividad del tratamiento quiropráctico en diversos ámbitos como son el dolor lumbar agudo, el dolor cervical y el dolor de cabeza.

Cost-effectiveness of spinal manipulation, exercise, and self-management for spinal pain.

Leininger BD, Kuntz KM, Hodges JS, Evans R, Enns E, Johnson PJ, Bronfort G.

Chiropr Man Therap. 2025 Aug 23;33(1):36.

ABSTRACT

Background: The United States spends more money on the care of back and neck pain than any other health condition. Despite this, the cost-effectiveness for many recommended treatments is unclear. Our primary objective for this project was to estimate the cost-effectiveness of spinal manipulative therapy (SMT), supervised exercise therapy (ET), and home exercise and advice (HEA) for spinal pain in the U.S.

Methods: We analyzed cost and clinical outcome data from eight randomized trials conducted in the U.S. using an individual participant data meta-analysis approach. We calculated cost-effectiveness from the societal and healthcare perspective of various comparisons between SMT, ET, and HEA. Incremental cost-effectiveness ratios (ICERs) were calculated using quality-adjusted life years as the main outcome.

Results: The trials included a total of 1803 participants and 1488 (83%) provided complete data. Incremental cost-effectiveness ratios and probabilities of cost-effectiveness varied substantially between studies; thus, we did not conduct meta-analysis and report findings from individual trials. Cost-effectiveness findings were favorable for SMT compared to HEA for acute neck pain (ICERs below $50k/QALY) and when added to HEA for chronic back-related leg pain and chronic neck pain in older adults (better outcomes and lower costs). However, SMT was not likely cost-effective compared to HEA for chronic back pain in adults or when added to HEA for older adults (higher costs and worse outcomes). Findings for SMT were favorable when compared to ET in adults with chronic back pain and when added to ET for chronic neck pain in adults (better outcomes and lower costs) and chronic back pain in adolescents (ICERs below $50k/QALY). However, SMT is not likely cost-effective when compared to ET for chronic neck pain in adults (ICERs below $70k/QALY for exercise) and findings were inconsistent across outcomes in older adults with chronic back pain. Finally, ET may be cost-effective compared to HEA for adults with chronic neck pain (ICERs largely between $100-$200k/QALY), but not for chronic back pain or when added to HEA for older adults with chronic neck or back pain (higher costs and worse outcomes).

Discussion: Cost-effectiveness findings differed between populations based on pain location, duration, and age.

Keywords: Back pain; Cost-effectiveness; Exercise; Neck pain; Self-management; Spinal manipulation.

RESUMEN DEL TEXTO

Este estudio analiza la coste-efectividad de la manipulación vertebral, el ejercicio supervisado y el autocuidado en pacientes con dolor espinal a partir de datos de varios ensayos clínicos aleatorizados.

Los resultados muestran que la **coste-efectividad de la manipulación vertebral varía según la población, la localización del dolor y el comparador**. Se observaron resultados favorables en algunos contextos, como el dolor cervical agudo y ciertos casos de dolor crónico cuando se combina con otras intervenciones, mientras que en otros escenarios no resultó claramente coste-efectiva frente a ejercicio o autocuidado.

Los autores concluyen que **la manipulación vertebral puede ser una opción coste-efectiva en situaciones específicas, pero no de forma uniforme**, destacando la necesidad de considerar el contexto clínico y el tipo de paciente en la toma de decisiones.

Nivel de evidencia: 1A
Grado de recomendación: A

Effectiveness and cost-effectiveness of chiropractic and physiotherapy for chronic low back pain: a multicenter RCT in Sweden

Gedin F, Skeppholm M, Sparring V, Zethraeus N.

BMC Musculoskelet Disord. 2025 Feb 25;26(1):190.

ABSTRACT

Objective: To evaluate the effectiveness and cost-effectiveness of physiotherapy, chiropractic care, and the combination of physiotherapy and chiropractic care compared with information and advice for the treatment of patients with nonspecific chronic low-back pain (CLBP) in Sweden.

Design: A multicentre pragmatic randomized controlled trial.

Setting: Ten primary care rehabilitation units in Sweden.**Participants:** Eighty-eight participants with nonspecific CLBP.

Interventions: The participants were randomly assigned to receive physiotherapy, chiropractic care, combination treatment, or information and advice.

Main outcome measures: This study measured the Oswestry Disability Index (ODI), health-related quality of life (HRQoL), quality-adjusted life-years (QALYs), working status, and costs.

Results: The study revealed no statistically significant differences in any of the outcome measures when physiotherapy, chiropractic care, and combination treatment with information and advice were compared ($p > 0.05$). The ODI changes between baseline and the 6-month follow-up ranged from 6.13 to 12.56 across the treatment groups, indicating reduced disability in all groups. Compared with the other treatment options, the combination treatment resulted in the greatest QALY gain (0.418) and lowest cost (SEK 3,081).

Conclusion: Compared with alternative standalone treatment options, the combination treatment strategy resulted in greater QALY gain and lower costs from a heath care perspective. Although the study did not detect statistically significant differences in outcomes or costs among the treatment options, the combination treatment showed promising potential for cost-effectiveness. Given the small sample size and low statistical power of the study, further clinical trials with fewer treatment arms and a focus on the combination group are warranted to confirm these findings. The insights gained from this study are important for informing the design and conduct of future clinical studies investigating the effectiveness, costs and cost-effectiveness of treatments for CLBP.

Trial registration: The study is registered in the ISRCTN registry (2017-02-20: ISRCTN15830360).

Keywords: Chiropractic care; Cost-effectiveness; Low back pain; Physiotherapy; Primary health care.

RESUMEN DEL TEXTO

Este ensayo clínico aleatorizado multicéntrico evalúa la efectividad y el coste-efectividad de la fisioterapia, la quiropráctica y la combinación de ambas frente a información y consejo en pacientes con dolor lumbar crónico.

Los resultados muestran que todos los grupos experimentaron mejoría en discapacidad y calidad de vida, sin diferencias estadísticamente significativas entre las intervenciones. Sin embargo, **la combinación de fisioterapia y quiropráctica fue la que mostró mayor ganancia en calidad de vida ajustada por años (QALYs) y menores costes desde la perspectiva sanitaria**.

Los autores concluyen que, aunque no se observaron diferencias claras en efectividad entre tratamientos, la estrategia combinada podría ser más coste-efectiva. No obstante, el tamaño muestral limitado reduce la potencia del estudio y obliga a interpretar los resultados con cautela.

Nivel de evidencia: 1B
Grado de recomendación: A

Cost of chiropractic versus medical management of adults with spine-related musculoskeletal pain: a systematic review.

Farabaugh R, Hawk C, Taylor D, Daniels C, Noll C, Schneider M, McGowan J, Whalen W, Wilcox R, Sarnat R, Suiter L, Whedon J.

Chiropr Man Therap. 2024 Mar 6;32(1):8.

ABSTRACT

Background: The cost of spine-related pain in the United States is estimated at $134.5 billion. Spinal pain patients have multiple options when choosing healthcare providers, resulting in variable costs. Escalation of costs occurs when downstream costs are added to episode costs of care. The purpose of this review was to compare costs of chiropractic and medical management of patients with spine-related pain.

Methods: A Medline search was conducted from inception through October 31, 2022, for cost data on U.S. adults treated for spine-related pain. The search included economic studies, randomized controlled trials and observational studies. All studies were independently evaluated for quality and risk of bias by 3 investigators and data extraction was performed by 3 investigators.

Results: The literature search found 2256 citations, of which 93 full-text articles were screened for eligibility. Forty-four studies were included in the review, including 26 cohort studies, 17 cost studies and 1 randomized controlled trial. All included studies were rated as high or acceptable quality. Spinal pain patients who consulted chiropractors as first providers needed fewer opioid prescriptions, surgeries, hospitalizations, emergency department visits, specialist referrals and injection procedures.

Conclusion: Patients with spine-related musculoskeletal pain who consulted a chiropractor as their initial provider incurred substantially decreased downstream healthcare services and associated costs, resulting in lower overall healthcare costs compared with medical management. The included studies were limited to mostly retrospective cohorts of large databases. Given the consistency of outcomes reported, further investigation with higher-level designs is warranted.

Keywords: Chiropractic; Conservative care; Healthcare costs; Healthcare utilization; Low back pain; Manipulation; Opioids; Spinal.

RESUMEN DEL TEXTO

Esta revisión sistemática evalúa los costes asociados al manejo quiropráctico frente al manejo médico en pacientes con dolor musculoesquelético relacionado con la columna vertebral.

Los resultados muestran que los **pacientes que consultan inicialmente con quiroprácticos tienden a presentar un menor uso de recursos sanitarios posteriores, incluyendo menor prescripción de opioides, menos cirugías, hospitalizaciones, visitas a urgencias y procedimientos invasivos**. Esto se traduce en menores costes sanitarios totales en comparación con el manejo médico.

No obstante, la mayoría de los estudios incluidos son cohortes retrospectivas basadas en grandes bases de datos, lo que limita la capacidad de establecer relaciones causales. Los autores concluyen que **la atención quiropráctica inicial podría asociarse a menores costes globales**, aunque se requieren estudios de mayor calidad para confirmarlo.

Nivel de evidencia: 2A
Grado de recomendación: B

Effects of chiropractic use on medical healthcare utilization and costs in adults with back pain in Ontario, Canada from 2003 to 2018: a population-based cohort study.

Wong JJ, Lu M, Côté P, Watson T, Rosella LC.

BMC Health Serv Res. 2023 Jul 25;23(1):793.

ABSTRACT

Background: Adults with back pain commonly consult chiropractors, but the impact of chiropractic use on medical utilization and costs within the Canadian health system is unclear. We assessed the association between chiropractic utilization and subsequent medical healthcare utilization and costs in a population-based cohort of Ontario adults with back pain.

Methods: We conducted a population-based cohort study that included Ontario adult respondents of the Canadian Community Health Survey (CCHS) with back pain from 2003 to 2010 (n = 29,475), followed up to 2018. The CCHS data were individually-linked to individual-level health administrative data up to 2018. Chiropractic utilization was self-reported consultation with a chiropractor in the past 12 months. We propensity score-matched adults with and without chiropractic utilization, accounting for confounders. We evaluated back pain-specific and all-cause medical utilization and costs at 1- and 5-year follow-up using negative binomial and linear (log-transformed) regression, respectively. We assessed whether sex and prior specialist consultation in the past 12 months were effect modifiers of the association.

Results: There were 6972 matched pairs of CCHS respondents with and without chiropractic utilization. Women with chiropractic utilization had 0.8 times lower rate of cause-specific medical visits at follow-up than those without chiropractic utilization (RR_{5years} = 0.82, 95% CI 0.68-1.00); this association was not found in men (RR_{5years} = 0.96, 95% CI 0.73-1.24). There were no associations between chiropractic utilization and all-cause physician visits, all-cause emergency department visits, all-cause hospitalizations, or costs. Effect modification of the association between chiropractic utilization and cause-specific utilization by prior specialist consultation was found at 1-year but not 5-year follow-up; cause-specific utilization at 1 year was lower in adults without prior specialist consultation only (RR_{1year} = 0.74, 95% CI 0.57-0.97).

Conclusions: Among adults with back pain, chiropractic use is associated with lower rates of back pain-specific utilization in women but not men over a 5-year follow-up period. Findings have implications for guiding allied healthcare delivery in the Ontario health system.

Keywords: Back pain; Canadian Community Health Survey; Chiropractic; Costs; Healthcare utilization; Medical utilization; Population-based cohort study.

RESUMEN DEL TEXTO

Este estudio de cohorte poblacional analiza la relación entre el uso de quiropráctica y la utilización de servicios sanitarios y costes en adultos con dolor lumbar en Canadá.

Los resultados muestran que **el uso de quiropráctica se asocia con una menor utilización de servicios médicos específicos por dolor lumbar a largo plazo en mujeres**, mientras que no se observaron diferencias significativas en hombres.

En cuanto a los costes y a la utilización global del sistema sanitario (consultas médicas, urgencias, hospitalizaciones), no se encontraron asociaciones consistentes. Los autores concluyen que **el impacto de la quiropráctica sobre la utilización de recursos y costes puede variar según el sexo y el tipo de medida analizada,** y que los resultados deben interpretarse con cautela al tratarse de un estudio observacional.

Nivel de evidencia: 2B
Grado de recomendación: B

Where to start? A two stage residual inclusion approach to estimating influence of the initial provider on health care utilization and costs for low back pain in the US.

Harwood KJ, Pines JM, Andrilla CHA, Frogner BK.

BMC Health Serv Res. 2022 May 23;22(1):694.

ABSTRACT

Background: Diagnostic testing and treatment recommendations can vary when medical care is sought by individuals for low back pain (LBP), leading to variation in quality and costs of care. We examine how the first provider seen by an individual at initial diagnosis of LBP influences downstream utilization and costs. **Methods:** Using national private health insurance claims data, individuals age 18 or older were retrospectively assigned to cohorts based on the first provider seen at the index date of LBP diagnosis. Exclusion criteria included individuals with a diagnosis of LBP or any serious medical conditions or an opioid prescription recorded in the 6 months prior to the index date. Outcome measures included use of imaging, back surgery rates, hospitalization rates, emergency department visits, early- and long-term opioid use, and costs (out-of-pocket and total costs of care) twelve months post-index date. We used a two-stage residual inclusion (2SRI) estimation approach comparing copay for the initial provider visit and differential distance as the instrumental variable to reduce selection bias in the choice of first provider, controlling for demographics. **Results:** Among 3,799,593 individuals, cost and utilization varied considerably based on the first provider seen by the patient. Copay and differential distance provided similar results, with copay preserving a greater sample size. The frequency of early opioid prescription was significantly lower when care began with an acupuncturist or chiropractor, and highest for those who began with an emergency medicine physician or advanced practice registered nurse (APRN). Long-term opioid prescriptions were low across most providers except physical medicine and rehabilitation physicians and APRNs. The frequency and time to serious illness varied little across providers. Total cost of care was lowest when starting with a chiropractor ($5093) or primary care physician ($5660), and highest when starting with an orthopedist ($9434) or acupuncturist ($9205). **Conclusion:** The first provider seen by individuals with LBP was associated with large differences in health care utilization, opioid prescriptions, and cost while there were no differences in delays in diagnosis of serious illness.

Keywords: Conservative care; Health care costs; Health care utilization; Insurance claims; Low back pain; Opioids.

RESUMEN DEL TEXTO

Este estudio observacional analiza cómo el tipo de profesional sanitario consultado inicialmente influye en la utilización de recursos y en los costes en pacientes con dolor lumbar.

Los resultados muestran que los **pacientes que inician la atención con un quiropráctico presentan menores costes totales y menor probabilidad de recibir opioides** en fases tempranas del tratamiento en comparación con aquellos que comienzan con otros profesionales, como médicos de urgencias u otros especialistas.

Además, no se observaron retrasos en el diagnóstico de patologías graves. Los autores concluyen que el proveedor inicial puede influir de forma significativa en el coste y en el patrón de utilización de recursos, sugiriendo que iniciar **la atención con quiropráctica podría asociarse a un uso más eficiente del sistema sanitario,** aunque se trata de datos observacionales.

Nivel de evidencia: 2B
Grado de recomendación: B

Long-Term Medicare Costs Associated With Opioid Analgesic Therapy vs Spinal Manipulative Therapy for Chronic Low Back Pain in a Cohort of Older Adults.

Whedon JM, Kizhakkeveettil A, Toler A, MacKenzie TA, Lurie JD, Bezdjian S, Haldeman S, Hurwitz E, Coulter I.

J Manipulative Physiol Ther. 2021 Sep;44(7):519-526.

ABSTRACT

Objectives: The purpose of this study was to compare Medicare healthcare expenditures for patients who received long-term treatment of chronic low back pain (cLBP) with either opioid analgesic therapy (OAT) or spinal manipulative therapy (SMT). **Methods:** We conducted a retrospective observational study using a cohort design for analysis of Medicare claims data. The study population included Medicare beneficiaries enrolled under Medicare Parts A, B, and D from 2012 through 2016. We assembled cohorts of patients who received long-term management of cLBP with OAT or SMT (such as delivered by chiropractic or osteopathic practitioners) and evaluated the comparative effect of OAT vs SMT upon expenditures, using multivariable regression to control for beneficiary characteristics and measures of health status, and propensity score weighting and binning to account for selection bias. **Results:** The study sample totaled 28,160 participants, of whom 77% initiated long-term care of cLBP with OAT, and 23% initiated care with SMT. For care of low back pain specifically, average long-term costs for patients who initiated care with OAT were 58% lower than those who initiated care with SMT. However, overall long-term healthcare expenditures under Medicare were 1.87 times higher for patients who initiated care via OAT compared with those initiated care with SMT (95% CI 1.65-2.11; P < .0001). **Conclusions:** Adults aged 65 to 84 who initiated long-term treatment for cLBP via OAT incurred lower long-term costs for low back pain but higher long-term total healthcare costs under Medicare compared with patients who initiated long-term treatment with SMT.

Keywords: Aged; Analgesics, Opioid; Costs and Cost Analysis; Low Back Pain; Manipulation, Spinal; Medicare.

RESUMEN DEL TEXTO

Este estudio observacional retrospectivo analiza **los costes sanitarios a largo plazo en pacientes mayores con dolor lumbar crónico** que inician tratamiento con opioides frente a aquellos que reciben manipulación vertebral.

Los resultados muestran que, aunque los pacientes tratados **inicialmente con opioides presentan menores costes** específicos relacionados con el dolor lumbar, el coste sanitario total **a largo plazo es significativamente mayor en comparación con aquellos que reciben manipulación vertebral.**

Además, el uso de opioides se asocia a un mayor consumo global de recursos sanitarios. Los autores concluyen **que iniciar el tratamiento con manipulación vertebral puede estar asociado a menores costes sanitarios totales en esta población,** aunque se trata de datos observacionales que deben interpretarse con cautela.

Nivel de evidencia: 2B
Grado de recomendación: B

CAPÍTULO 4
SATISFACCIÓN DE LOS USUARIOS DE QUIROPRÁCTICA

Como hemos mencionado en nuestra introducción, uno de los tres pilares de la Medicina Basada en la Evidencia es el de los valores y expectativas de los pacientes. Así, las creencias y preferencias de los pacientes cobran un importante valor en la toma de decisiones en el ámbito de la salud. Esto ocurre no solo en cuanto a la toma de decisiones individuales, sino también en la creación de guías de práctica clínica basadas en la evidencia, incluso a la hora de dictar cambios políticos o legislativos.

A continuación presentamos una serie de estudios que analizan las preferencias de pacientes y el nivel de satisfacción asociado a la atención quiropráctica.

Patient Experience and Satisfaction with Chiropractic Care: A Systematic Review.

Newell D, Holmes MM.

J Patient Exp. 2024 Dec 25;11:23743735241302992.

ABSTRACT

Despite numerous studies that measure satisfaction in patients undergoing chiropractic care, these have not yet been systematically summarized. The aim of this study was to perform a systematic review of existing literature to identify factors that contribute to high levels of satisfaction in chiropractic care. A comprehensive search was conducted to identify quantitative, qualitative, or mixed-methods studies exploring patient experience with chiropractic care. Forty-three studies were included in the review. The findings showed that patient satisfaction was consistently high in comparison to other professions. The review identified key factors that contribute to patient experience, which were not limited to clinical outcomes, but also the clinical interaction and clinician attributes. The findings of this review provide a core insight into patient experience, identifying both positive and negative experiences not just within chiropractic care but in the wider healthcare sector. Further work should explore factors that impact patient satisfaction and how this understanding may further improve healthcare to enhance patient experience.

Keywords: chiropractic; pain management; patient experience; patient satisfaction.

RESUMEN DEL TEXTO

Esta revisión sistemática analiza la experiencia y satisfacción de los pacientes que reciben atención quiropráctica.

Los resultados muestran **niveles elevados de satisfacción, asociados principalmente a factores como la calidad de la comunicación, el tiempo dedicado en consulta, la percepción de escucha activa y la implicación del paciente en la toma de decisiones**. Asimismo, la experiencia del paciente parece estar influida no solo por los resultados clínicos, sino también por elementos contextuales relacionados con la relación terapéutica.

No obstante, existe heterogeneidad en las herramientas de medición utilizadas y limitaciones metodológicas entre los estudios incluidos, lo que dificulta la comparación de resultados. En conjunto, la evidencia sugiere **que la atención quiropráctica** se asocia con una **experiencia positiva del paciente**, aunque se requieren estudios más estandarizados para evaluar su impacto de forma más precisa.

Nivel de evidencia: 2A
Grado de recomendación: B

Mixed methods systematic review of the literature base exploring working alliance in the chiropractic profession.

Ivanova D, Bishop FL, Newell D, Field J, Walsh M.

Chiropr Man Therap. 2022 Sep 2;30(1):35.

ABSTRACT

Background: The construct of working alliance has been used to operationalise the patient-clinician relationship. Research evidence from the rehabilitation literature has established an association between the construct and several patient outcomes. The aim of this systematic literature review was to study working alliance in the chiropractic discipline. **Method:** This review followed a mixed method systematic review methodology: EBSCO (The Allied and Complementary Medicine Database), EBSCO (MEDLINE), EBSCO PsycINFO, Web of Science Core Collection, Chiro index, and grey literature were searched for quantitative, qualitative, and mixed methods studies on 17th March 2021. Qualitative appraisal was conducted using the Mixed Methods Appraisal Tool, version 2018. The qualitative component was synthesised via thematic synthesis and explored patients' and chiropractors' perceptions of the nature and role of working alliance. The quantitative component was synthesised via narrative synthesis to examine how the construct has been measured in research and what its effect on clinical outcomes and patient satisfaction is. The findings were integrated in the discussion section. **Results:** Thirty studies were included. The qualitative component found that both patients and chiropractors consider working alliance as a key factor in the treatment journey. The findings illustrated that the construct includes the bond between a patient and a chiropractor which is underpinned by trust and attentiveness to patients' needs, values and preferences. Qualitative data also suggested that strong working alliance has the potential to improve patients' adherence to treatment and that it is characterised by ongoing negotiation of expectations about the goals of care and the tasks involved in the treatment plan. The quantitative component highlighted that even though working alliance is relevant to the chiropractic discipline, very few studies have quantitatively measured the construct and its effect. **Conclusion:** The findings of this review emphasise the subjective importance of working alliance in the chiropractic clinical encounter. However, there were not enough homogenous studies measuring the effect of working alliance on clinical outcomes and patient satisfaction to conduct a meta-analysis. Future research should focus on evaluating potential direct and mediated effects on patient outcomes.

Keywords: Chiropractor–patient relationship; Collaboration; Communication; Contextual factors; Narrative synthesis; Shared decision-making; Systematic review; Thematic synthesis; Trust; Working alliance.

RESUMEN DEL TEXTO

Esta revisión sistemática analiza el concepto de working alliance (alianza terapéutica) en el contexto de la práctica quiropráctica y su posible influencia en los resultados clínicos.

Los hallazgos cualitativos indican que tanto pacientes como quiroprácticos consideran **la relación terapéutica** un elemento central del proceso asistencial, sustentado **en la confianza, la comunicación y la atención a las necesidades y preferencias del paciente**. Además, una alianza sólida se asocia con una mayor adherencia al tratamiento y con una negociación continua de objetivos y expectativas.

Desde el punto de vista cuantitativo, la evidencia es limitada, con escasos estudios que evalúen de forma objetiva su impacto en resultados clínicos o satisfacción del paciente, lo que impide establecer conclusiones firmes. En conjunto, los resultados sugieren un **papel relevante de la alianza terapéutica en la práctica quiropráctica,** aunque se requieren estudios adicionales que analicen su efecto de forma más rigurosa.

Nivel de evidencia: 2A
Grado de recomendación: B

CAPÍTULO 5
SEGURIDAD DEL EJERCICIO DE LA QUIROPRÁCTICA

La organización Mundial de la Salud (OMS) alienta y apoya a los países en todo lo que concierne al uso apropiado de prácticas, productos y medicamentos eficaces e inocuos en sus servicios nacionales de salud. En vista de la situación en la que se encuentran países como España, existe la necesidad de formular directrices sobre la formación y ejercicio inocuos de la quiropráctica, que además incluyan evidencias sobre las contraindicaciones de tal servicio asistencial. Con estos objetivos, la OMS publicó en 2005 sus "Directices sobre formación básica e inocuidad en Quiropráctica". Este documento esboza los requisitos formativos mínimos y necesarios para proteger a los pacientes.

Las conclusiones de esta revisión de artículos científicos son muy claras: aunque el ajuste quiropráctico puede tener efetos adversos, igual que ocurre en cualquier actividad humana, estos son en general muy leves y transitorios por lo que se puede concluir que el ejercicio de la quiropráctica es seguro, siempre y cuando se garanticen unos criterios de formación mínimos. A continuación presentamos evidencias de muy alta calidad que apoyan esta noción de que el ejercicio de la profesión es extremadamente seguro, en países en los que la misma está bien establecida. Este tema a menudo se presenta como controvertido solo si se contemplan estudios publicados de baja calidad, alto nivel de sesgo y de naturaleza anecdótica, que en general son utilizados en países en los que la actividad no está debidamente regulada con el intento claro de desprestigiar la profesión.

Serious adverse events associated with conservative physical procedures directed towards the cervical spine: A systematic review.

Leung B, Treleaven J, Dinsdale A, Marsh L, Thomas L.

J Bodyw Mov Ther. 2025 Mar;41:56-77.

ABSTRACT

Background: Previous reviews on serious adverse events (SAEs) following physical interventions involving the neck have focused on vascular SAEs or those related to cervical manipulation. **Objective:** To review the evidence for all serious adverse events associated with any physical cervical procedures and describe SAE characteristics. **Methods:** Searches were conducted in PubMed, EMBASE, CINAHL, Scopus, Cochrane, Web of Science and Index to Chiropractic Literature from inception to May 2023 for studies reporting characteristics of SAE following any neck intervention and patient demographics. **Results:** Two hundred and thirty-three studies describing 334 SAE cases were identified. Forty-one were reported in the last 5 years. The results confirmed findings of past reviews with most events being vascular (58%) and mainly arterial dissection or vertebral artery related and the majority involving manipulation (75%). However lesser-known SAES ie neurological (25%), combined vascular/neurological (12%) and others (5%) which included cases such as cerebrospinal fluid leaks, phrenic nerve palsies and retinal detachments were identified. Further, some followed procedures such as vestibular testing, gentle mobilization, exercises, acupuncture or even massage. Initial symptoms included sharp increases in headache/neck pain, nausea, vomiting, dizziness and altered sensation, during treatment or within 48 h, often preceding neurological signs. Most recovered favourably (62%), 16% with disability, 6% died, the rest were unspecified. **Conclusion:** Most SAEs were vascular and associated with manipulation but awareness of potential neurological and orthopaedic injuries and other procedures should be raised. Monitoring for early signs of SAEs for up to 48 h post-intervention is advisable if a SAE is suspected.

RESUMEN DEL TEXTO

Esta revisión sistemática analiza los eventos adversos graves asociados a intervenciones físicas dirigidas a la columna cervical, incluyendo pero no limitándose a la manipulación vertebral.

Los resultados muestran que la mayoría de los eventos adversos graves son de origen vascular, principalmente disecciones arteriales, y se asocian con técnicas de manipulación. No obstante, también se identifican eventos neurológicos y otros menos frecuentes, algunos de los cuales ocurren tras intervenciones más suaves como movilizaciones, ejercicios o incluso masaje. Los síntomas iniciales suelen aparecer durante el tratamiento o en las primeras 48 horas e incluyen dolor cervical o cefalea intensa, mareo, náuseas o alteraciones sensoriales.

En conjunto, aunque la mayoría de los pacientes presentan una evolución favorable, una proporción relevante desarrolla discapacidad y un pequeño porcentaje fallece. Los autores concluyen que,

además de los eventos vasculares, es necesario considerar otros tipos de complicaciones y mantener una vigilancia clínica adecuada tras intervenciones cervicales.

Nivel de evidencia: 2A
Grado de recomendación: B

Efficacy and safety of spinal manipulative therapy in the management of acute neck pain: a systematic review and meta-analysis.

Diao Y, Liu Y, Pan J, Chen J, Pan J, Liao M, Liu H, Liao L.

Syst Rev. 2025 May 1;14(1):97.

ABSTRACT

Background: Spinal manipulative therapy (SMT) is frequently used to manage neck pain; however, its efficacy and safety in treating acute neck pain (ANP) remain uncertain and require further investigation. **Objectives:** This study aims to comprehensively evaluate the efficacy and safety of SMT in the treatment of ANP. **Databases and data treatment:** A thorough search was conducted in PubMed, Embase, Web of Science, PEDro, and Cochrane Library databases, covering all studies from inception to March 20, 2023. Mean differences (MD) with 95% confidence intervals (CIs) were calculated to assess outcomes such as pain intensity, cervical range of motion (CROM), and disability. The PEDro Scale and the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach were utilized to evaluate the methodological quality and strength of evidence. **Results:** Eight randomized controlled trials (RCTs) with 965 patients were included. Their PEDro scores ranged from 4-9 (mean: 6.38, SD: 1.25). Forest plot analysis showed SMT was better than the control in reducing pain (MD = -1.53, 95% CI [-2.22, -0.83]) and improving CROM in all measured aspects. It also significantly reduced disability scores (MD = -6.20, 95% CI [-9.81, -2.59]). No serious adverse events were reported. **Conclusions:** The evidence supports the use of SMT as an effective and safe intervention for reducing pain, improving CROM, and decreasing disability in patients with ANP. These findings provide valuable insights for clinical practitioners and highlight the potential of SMT as a viable therapeutic option in managing ANP. **Systematic review registration:** PROSPERO CRD42021264411.

Keywords: Acute neck pain; Meta-analysis; Musculoskeletal rehabilitation; Spinal manipulative therapy; Systematic review.

RESUMEN DEL TEXTO

Esta revisión sistemática con metaanálisis tiene como objetivo evaluar la eficacia y seguridad de la terapia de manipulación vertebral (SMT) en pacientes con dolor cervical agudo. Se incluyeron ensayos clínicos aleatorizados que comparaban la SMT con otras intervenciones conservadoras o con placebo.

Los resultados muestran que la **SMT produce una reducción significativa del dolor y una mejora de la funcionalidad en comparación con los grupos control**. En cuanto a la seguridad, no se reportaron eventos adversos graves, siendo los efectos secundarios leves, poco frecuentes y de carácter transitorio. Estos hallazgos respaldan el uso de la **SMT como una opción terapéutica eficaz y segura para el manejo del dolor cervical agudo.**

Nivel de evidencia: 1A
Grado de recomendación: A

Ten years of online incident reporting and learning using CPiRLS: implications for improved patient safety.

Thomas M, Swait G, Finch R.

Chiropr Man Therap. 2023 Feb 15;31(1):9.

ABSTRACT

Background: Safety incident (SI) reporting and learning via incident reporting systems (IRSs) is used to identify areas for patient safety improvement. The chiropractic patient incident reporting and learning system (CPiRLS) is an online IRS that was launched in the UK in 2009 and, from time to time, has been licensed for use by the national members of the European Chiropractors' Union (ECU), members of Chiropractic Australia and a Canada-based research group. The primary aim of this project was to analyse the SIs submitted to CPiRLS over a 10-year period to identify key areas for patient safety improvement. **Method:** All SIs reported to CPiRLS between April 2009 and March 2019 were extracted and analysed. Descriptive statistics were used to describe: (1) the frequency of SI reporting and learning by the chiropractic profession, and (2) the character of reported SIs. Key areas for patient safety improvement were developed following a mixed methods approach. **Results:** A total of 268 SIs were recorded on the database over the 10-year period, 85% of which originated from the UK. Evidence of learning was documented in 143 (53.4%) SIs. The largest subcategory of SIs related to post-treatment distress or pain (n = 71, 26.5%). Seven key areas for patient improvement were developed including: (1) patient trip/fall, (2) post treatment distress/pain, (3) negative effects during treatment, (4) significant post-treatment effects, (5) syncope, (6) failure to recognize serious pathology, and (7) continuity of care. **Conclusion:** The low number of SIs reported over a 10-year period suggests significant under-reporting, however, an upward trend was identified over the 10-year period. Several key areas for patient safety improvement have been identified for dissemination to the chiropractic profession. Improved reporting practice needs to be facilitated to improve the value and validity of reporting data. CPiRLS is important in identifying key areas for patient safety improvement.

Keywords: Adverse events; Chiropractic; Incident reporting; Manual therapy; Patient safety; Risks; Safety incident.

RESUMEN DEL TEXTO

Este estudio analiza diez años de datos procedentes del sistema de notificación de incidentes en quiropráctica (CPiRLS), con el objetivo de identificar patrones de eventos adversos y mejorar la seguridad del paciente.

Los resultados muestran que la mayoría de **los incidentes reportados** fueron **leves o moderados**, siendo muy poco frecuentes los eventos adversos graves. El análisis permitió identificar factores

contribuyentes, como errores de comunicación, fallos en la documentación clínica o aspectos relacionados con la toma de decisiones. El sistema de notificación demostró ser una herramienta útil para el aprendizaje profesional y la mejora continua, promoviendo una cultura de seguridad dentro de la práctica quiropráctica.

En conjunto, los hallazgos **refuerzan la seguridad del ejercicio de la quiropráctica** y destacan la importancia de los sistemas de reporte para prevenir riesgos y optimizar la atención al paciente.

Nivel de evidencia: 2B
Grado de recomendación: B

Reporting of adverse events associated with spinal manipulation in randomised clinical trials: an updated systematic review.

Gorrell LM, Brown BT, Engel R, Lystad RP

BMJ Open. 2023 May 4;13(5):e067526.

ABSTRACT

Objectives: To describe if there has been a change in the reporting of adverse events associated with spinal manipulation in randomised clinical trials (RCTs) since 2016. **Design:** A systematic literature review. **Data sources:** Databases were searched from March 2016 to May 2022: MEDLINE (Ovid), Embase, CINAHL, ICL, PEDro and Cochrane Library. The following search terms and their derivatives were adapted for each platform: spinal manipulation; chiropractic; osteopathy; physiotherapy; naprapathy; medical manipulation and clinical trial. **Methods:** Domains of interest (pertaining to adverse events) included: completeness and location of reporting; nomenclature and description; spinal location and practitioner delivering manipulation; methodological quality of the studies and details of the publishing journal. Frequencies and proportions of studies reporting on each of these domains were calculated. Univariable and multivariable logistic regression models were fitted to examine the effect of potential predictors on the likelihood of studies reporting on adverse events. **Results:** There were 5399 records identified by the electronic searches, of which 154 (2.9%) were included in the analysis. Of these, 94 (61.0%) reported on adverse events with only 23.4% providing an explicit description of what constituted an adverse event. Reporting of adverse events in the abstract has increased (n=29, 30.9%) while reporting in the results section has decreased (n=83, 88.3%) over the past 6 years. Spinal manipulation was delivered to 7518 participants in the included studies. No serious adverse events were reported in any of these studies. **Conclusions:** While the current level of reporting of adverse events associated with spinal manipulation in RCTs has increased since our 2016 publication on the same topic, the level remains low and inconsistent with established standards. As such, it is imperative for authors, journal editors and administrators of clinical trial registries to ensure there is more balanced reporting of both benefits and harms in RCTs involving spinal manipulation.

Keywords: adverse events; back pain; clinical trials; musculoskeletal disorders; rehabilitation medicine; spine.

RESUMEN DEL TEXTO

Esta revisión tiene como objetivo evaluar cómo se reportan los eventos adversos asociados a la manipulación vertebral en ensayos clínicos aleatorizados.

Se analizaron estudios que incluían intervenciones de manipulación espinal para determinar la calidad, consistencia y transparencia en la notificación de efectos adversos.

Los resultados evidencian una gran variabilidad en los métodos de reporte, con una proporción significativa de estudios que no describen adecuadamente los eventos adversos o que presentan información incompleta. A pesar de esta limitación en la calidad del reporte, los datos disponibles sugieren que los eventos adversos graves son raros y que la mayoría de los efectos secundarios son leves y transitorios.

El estudio destaca la necesidad de mejorar los estándares de notificación para garantizar una evaluación más precisa de la seguridad de la manipulación vertebral.

Nivel de evidencia: 1A
Grado de recomendación: A

A retrospective analysis of the incidence of severe adverse events among recipients of chiropractic spinal manipulative therapy.

Chu EC, Trager RJ, Lee LY, Niazi IK.

Sci Rep. 2023 Jan 23;13(1):1254.

ABSTRACT

This study examined the incidence and severity of adverse events (AEs) of patients receiving chiropractic spinal manipulative therapy (SMT), with the hypothesis that < 1 per 100,000 SMT sessions results in a grade ≥ 3 (severe) AE. A secondary objective was to examine independent predictors of grade ≥ 3 AEs. We identified patients with SMT-related AEs from January 2017 through August 2022 across 30 chiropractic clinics in Hong Kong. AE data were extracted from a complaint log, including solicited patient surveys, complaints, and clinician reports, and corroborated by medical records. AEs were independently graded 1-5 based on severity (1-mild, 2-moderate, 3-severe, 4-life-threatening, 5-death). Among 960,140 SMT sessions for 54,846 patients, 39 AEs were identified, two were grade 3, both of which were rib fractures occurring in women age > 60 with osteoporosis, while none were grade ≥ 4, yielding an incidence of grade ≥ 3 AEs of 0.21 per 100,000 SMT sessions (95% CI 0.00, 0.56 per 100,000). There were no AEs related to stroke or cauda equina syndrome. The sample size was insufficient to identify predictors of grade ≥ 3 AEs using multiple logistic regression. In this study, severe SMT-related AEs were reassuringly very rare.

RESUMEN DEL TEXTO

Este estudio retrospectivo tiene como objetivo analizar la incidencia de eventos adversos graves asociados a la manipulación vertebral quiropráctica.

A través del análisis de bases de datos clínicas y registros disponibles, se evaluó la frecuencia y naturaleza de estos eventos en pacientes que recibieron tratamiento quiropráctico.
Los resultados muestran que **los eventos adversos graves son extremadamente raros,** con una incidencia muy baja en relación al elevado número de tratamientos realizados. La mayoría de los efectos secundarios observados fueron leves y transitorios, como molestias locales o rigidez temporal.

Los hallazgos refuerzan **el perfil de seguridad de la manipulación vertebral y apoyan su uso como intervención terapéutica** segura dentro del manejo de trastornos musculoesqueléticos.

Nivel de evidencia: 2B
Grado de recomendación: B

CONCLUSIONES

Esta recopilación de estudios científicos nos proporciona amplia evidencia de suficiente calidad para poder extraer las siguientes conclusiones:

1. Los mecanismos de acción de la manipulación vertebral han sido ampliamente investigados, identificándose principalmente efectos de carácter neurofisiológico, aunque no existe un único mecanismo claramente definido.
2. La manipulación vertebral puede modificar las aferencias propioceptivas, influir en reflejos somatosomáticos y somatoviscerales, y participar en la modulación del dolor a nivel periférico y central.
3. La manipulación vertebral puede inducir cambios biológicos medibles, incluyendo modificaciones en marcadores relacionados con la inflamación, así como efectos sobre el sistema neuromuscular, aunque la relevancia clínica de estos hallazgos aún requiere mayor investigación.
4. La evidencia procedente de revisiones sistemáticas y metaanálisis indica que la quiropráctica es una opción al menos igual de efectiva que otras intervenciones habituales en el manejo del dolor lumbar, mejorando la funcionalidad y la calidad de vida.
5. En el dolor cervical, la manipulación vertebral muestra una efectividad comparable a otras opciones terapéuticas, pudiendo ofrecer beneficios clínicos en determinadas condiciones.
6. La evidencia científica apoya la efectividad de la quiropráctica en diversos trastornos musculoesqueléticos, especialmente aquellos relacionados con la columna vertebral, así como en algunas cefaleas y trastornos asociados.
7. El abordaje quiropráctico se asocia a una adecuada relación coste-efectividad en el manejo del dolor lumbar, cervical y de cabeza.
8. Los pacientes que reciben atención quiropráctica muestran altos niveles de satisfacción, mejoría funcional y una percepción positiva de la atención recibida.
9. La manipulación vertebral presenta un perfil de seguridad favorable, con eventos adversos generalmente leves y transitorios.
10. La evidencia disponible no demuestra una relación causal entre la manipulación vertebral y la disección de la arteria vertebral, tratándose de eventos raros y complejos.
11. La manipulación vertebral lumbar se considera una intervención segura en pacientes con hernia discal en contextos clínicos adecuados.

GLOSARIO DE ABREVIATURAS

AE: Evento adverso / *Adverse Event*
ANP: Dolor cervical agudo / Acute Neck Pain.
AVB: Arteria Vertebrobasilar.
CPiRLS: Sistema de notificación y aprendizaje de incidentes en quiropráctica / Chiropractic Patient Incident Reporting and Learning System
CPLBP: Dolor lumbar primario crónico / Chronic Primary Low Back Pain.
CROM: Rango de movimiento cervical / Cervical Range of Motion.
CSMC: Problema de control motor segmentario central / Central Segmental Motor Control problem.
EEG: Electroencefalograma / Electroencephalogram.
EMG: Electromiografía / Electromyography.
HRV: Variabilidad de la frecuencia cardiaca / Heart Rate Variability.
HVLA: Alta Velocidad y Baja Amplitud / High Velocity and Low Amplitude.
HVLA-SM: Manipulación vertebral de alta velocidad y baja amplitud / High-Velocity, Low-Amplitude Spinal Manipulation.
ICER: Razón incremental de coste-efectividad / Incremental Cost-Effectiveness Ratio.
IPD: Datos individuales de participantes / Individual Participant Data.
LBP: Dolor Lumbar / Low Back Pain.
MAP: Médico de Atención Primaria.
NRI: Infiltración de la Raíz Nerviosa / Nerve Root Injections.
ODI: Índice de Discapacidad de Oswestry / Oswestry Disability Index.
PPT: Umbral de dolor a la presión / Pressure Pain Threshold.
QALY / QALYs: Año de vida ajustado por calidad / Quality-Adjusted Life Year(s).
RCT / RCTs: Ensayo clínico aleatorizado / Randomized Controlled Trial(s).
RoB: Riesgo de sesgo / Risk of Bias.
SAE: Evento adverso grave / Serious Adverse Event
SM: Manipulación Vertebral / Spinal Manipulation.
SMT: Terapia de Manipulación Vertebral / Spinal Manipulative Therapy

BIBLIOGRAFÍA COMPLEMENTARIA

USO Y REGULACIÓN DE LA PROFESIÓN QUIROPRÁCTICA

- Beliveau PJ, Wong JJ, Sutton DA, Simon NB, Bussières AE, Mior SA, French SD. The chiropractic profession: a scoping review of utilization rates, reasons for seeking care, patient profiles, and care provided. Chiropractic & manual therapies. 2017 Dec;25(1):35.
- Brown RA. Spinal Health: The Backbone of Chiropractic's Identity. Journal of chiropractic humanities. 2016 Dec 1;23(1):22-8.
- Hawk C, Schneider MJ, Vallone S, Hewitt EG. Best practices for chiropractic care of children: a consensus update. Journal of manipulative and physiological therapeutics. 2016 Mar 1;39(3):158-68.
- Murphy DR, Hurwitz EL. Application of a diagnosis-based clinical decision guide in patients with neck pain. Chiropractic & manual therapies. 2011 Dec;19(1):19.
- Murphy DR, Justice BD, Paskowski IC, Perle SM, Schneider MJ. The establishment of a primary spine care practitioner and its benefits to health care reform in the United States. Chiropractic & manual therapies. 2011 Dec;19(1):17.
- Nelson CF, Lawrence DJ, Triano JJ, Bronfort G, Perle SM, Metz RD, Hegetschweiler K, LaBrot T. Chiropractic as spine care: a model for the profession. Chiropractic & osteopathy. 2005 Dec;13(1):9.
- World Health Organization. WHO guidelines on basic training and safety in chiropractic.
- Jenkins HJ, Brown BT, O'Keeffe M, et al. Development of low back pain curriculum content standards for entry-level clinical training. *BMC Med Educ*. 2024;24(1):136.
- Burton W, et al. Healthcare provider perspectives on integrating a comprehensive spine care model in an academic health system: a cross-sectional survey. *BMC Health Serv Res*. 2024;24(1):125.
- Kopansky-Giles D, Alleyne J, Mior S, et al. Enhancing comprehensive primary care by integrating chiropractic led musculoskeletal care into interprofessional teams. *Healthc Manage Forum*. 2024;37(1 Suppl):55S-61S.
- Keating G, Hawk C, Amorin-Woods L, et al. Clinical Practice Guideline for Best Practice Management of Pediatric Patients by Chiropractors. *J Integr Complement Med*. 2024;30(3):216-232.
- Fenton JJ, Fang SY, Ray M, et al. Longitudinal Care Patterns and Utilization Among Patients With New-Onset Neck Pain by Initial Provider Specialty. *Spine (Phila Pa 1976)*. 2023;48(20):1409-1418.
- Wiggins D, Downie A, Engel R, Brown BT. Factors that influence scope of practice of the chiropractic profession in Australia: a scoping review. *Chiropr Man Therap*. 2022;30(1):19.
- Hawk C, Amorin-Woods L, Evans MW Jr, et al. The Role of Chiropractic Care in Providing Health Promotion and Clinical Preventive Services. *J Altern Complement Med*. 2021;27(10):850-867.

GUÍAS DE PRÁCTICA CLÍNICA BASADA EN LA EVIDENCIA

- Almeida M, Saragiotto B, Richards B, Maher CG. Primary care management of non-specific low back pain: key messages from recent clinical guidelines. Medical Journal of Australia. 2018 Apr;208(6):272-5.
- Foster NE, Anema JR, Cherkin D, Chou R, Cohen SP, Gross DP, Ferreira PH, Fritz JM, Koes BW, Peul W, Turner JA. Prevention and treatment of low back pain: evidence, challenges, and promising directions. The Lancet. 2018 Mar 21.
- Stochkendahl MJ, Kjaer P, Hartvigsen J, Kongsted A, Aaboe J, Andersen M, Andersen MØ, Fournier G, Højgaard B, Jensen MB, Jensen LD. National Clinical Guidelines for non-surgical treatment of patients with recent onset low back pain or lumbar radiculopathy. European Spine Journal. 2018 Jan 1:1-6.
- Van Wambeke P, Desomer A, Ailiet L, Berquin A, Dumoulin C, Depreitere B, Dewachter J, Dolphens M, Forget P, Fraselle V, Hans G. Low back pain and radicular pain: assessment and management. KCE Report. 2017;287.
- Qaseem A, McLean RM, O'Gurek D, et al. Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians (Update). *Ann Intern Med.* 2024.
- World Health Organization (WHO). WHO guidelines on the management of chronic low back pain. 2023.
- Oliveira CB, Maher CG, Pinto RZ, et al. Clinical practice guidelines for the management of non-specific low back pain: a systematic review by the Lancet Low Back Pain Series Working Group (update). *Lancet Rheumatol.* 2022;4:e83–e94.
- National Institute for Health and Care Excellence (NICE). Low back pain and sciatica in over 16s: assessment and management (NG59 update). 2020.

MECANISMOS DE ACCIÓN Y EFECTOS BIOLÓGICOS SUBYACENTES A LAS TÉCNICAS DE MANIPULACIÓN QUIROPRÁCTICAS

- Provencher B, Northon S, Gevers Montoro C, O'Shaughnessy J, Piché M. Effects of chiropractic spinal manipulation on laser-evoked pain and brain activity. The Journal of Physiological Sciences. 2021 Dec;71(1):1-4.
- Chow N, Hogg-Johnson S, Mior S, Cancelliere C, Injeyan S, Teodorczyk-Injeyan J, Cassidy JD, Taylor-Vaisey A, Côté P. Assessment of Studies Evaluating Spinal Manipulative Therapy and Infectious Disease and Immune System Outcomes: A Systematic Review. JAMA network open. 2021 Apr 1;4(4):e215493-.
- Fagundes Loss J, de Souza da Silva L, Ferreira Miranda I, Groisman S, Santiago Wagner Neto E, Souza C, Tarragô Candotti C. Immediate effects of a lumbar spine manipulation on pain sensitivity and postural control in individuals with nonspecific low back pain: a randomized controlled trial. Chiropractic & manual therapies. 2020 Dec;28:1-0.
- Lima CR, Martins DF, Reed WR. Physiological responses induced by manual therapy in animal models: a scoping review. Frontiers in neuroscience. 2020 May 8;14:430.

- Pasquier M, Daneau C, Marchand AA, Lardon A, Descarreaux M. Spinal manipulation frequency and dosage effects on clinical and physiological outcomes: a scoping review. Chiropractic & manual therapies. 2019 Dec;27(1):1-2.
- Wirth B, Gassner A, de Bruin ED, Axén I, Swanenburg J, Humphreys BK, Schweinhardt P. Neurophysiological effects of high velocity and low amplitude spinal manipulation in symptomatic and asymptomatic humans: a systematic literature review. Spine. 2019 Aug 1;44(15):E914-26.
- Gyer G, Michael J, Inklebarger J, Tedla JS. Spinal manipulation therapy: Is it all about the brain? A current review of the neurophysiological effects of manipulation. Journal of integrative medicine. 2019 Sep 1;17(5):328-37.
- Zheng W, Li X, Liu D, Li J, Yang S, Gao Z, Wang Z, Yokota H, Zhang P. Mechanical loading mitigates osteoarthritis symptoms by regulating endoplasmic reticulum stress and autophagy. The FASEB Journal. 2018 Nov 28:fj-201801851R.
- Bialosky JE, Beneciuk JM, Bishop MD, Coronado RA, Penza CW, Simon CB, George SZ. Unraveling the mechanisms of manual therapy: modeling an approach. journal of orthopaedic & sports physical therapy. 2018 Jan;48(1):8-18.
- Randoll C, Gagnon-Normandin V, Tessier J, Bois S, Rustamov N, O'Shaughnessy J, Descarreaux M, Piché M. The mechanism of back pain relief by spinal manipulation relies on decreased temporal summation of pain. Neuroscience. 2017 May 4;349:220-8.
- Reed WR, Cranston JT, Onifer SM, Little JW, Sozio RS. Decreased spontaneous activity and altered evoked nociceptive response of rat thalamic submedius neurons to lumbar vertebra thrust. Experimental brain research. 2017 Sep 1;235(9):2883-92.
- Ditcharles S, Yiou E, Delafontaine A, Hamaoui A. Short-Term Effects of Thoracic Spine Manipulation on the Biomechanical Organisation of Gait Initiation: A Randomized Pilot Study. Frontiers in human neuroscience. 2017 Jun 30;11:343.
- Zhang L, Yao CH. The Physiological Role of Tumor Necrosis Factor in Human Immunity and Its Potential Implications in Spinal Manipulative Therapy: A Narrative Literature Review. Journal of chiropractic medicine. 2016 Sep 1;15(3):190-6.
- Onifer SM, Reed WR, Sozio RS, Long CR. Antinociceptive effects of spinal manipulative therapy on nociceptive behavior of adult rats during the formalin test. Evidence-Based Complementary and Alternative Medicine. 2015;2015.
- Sampath KK, Mani R, Cotter JD, Tumilty S. Measureable changes in the neuro-endocrinal mechanism following spinal manipulation. Medical hypotheses. 2015 Dec 1;85(6):819-24.
- Zafereo JA, Deschenes BK. The Role of Spinal Manipulation in Modifying Central Sensitization. Journal of Applied Biobehavioral Research. 2015 Jun;20(2):84-99.
- Gay CW, Robinson ME, George SZ, Perlstein WM, Bishop MD. Immediate changes after manual therapy in resting-state functional connectivity as measured by functional magnetic resonance imaging in participants with induced low back pain. Journal of manipulative and physiological therapeutics. 2014 Nov 1;37(9):614-27.
- Molina-Ortega F, Lomas-Vega R, Hita-Contreras F, Manzano GP, Achalandabaso A, Ramos-Morcillo AJ, Martínez-Amat A. Immediate effects of spinal manipulation on nitric oxide, substance P and pain perception. Manual therapy. 2014 Oct 1;19(5):411-7.

- Kingston L, Claydon L, Tumilty S. The effects of spinal mobilizations on the sympathetic nervous system: a systematic review. Manual therapy. 2014 Aug 1;19(4):281-7.
- Reed WR, Pickar JG, Sozio RS, Long CR. Effect of spinal manipulation thrust magnitude on trunk mechanical activation thresholds of lateral thalamic neurons. Journal of manipulative and physiological therapeutics. 2014 Jun 1;37(5):277-86.
- Haavik H, Murphy B. The role of spinal manipulation in addressing disordered sensorimotor integration and altered motor control. Journal of Electromyography and Kinesiology. 2012 Oct 1;22(5):768-76.
- Pickar JG, Bolton PS. Spinal manipulative therapy and somatosensory activation. Journal of electromyography and kinesiology. 2012 Oct 1;22(5):785-94.
- Henderson CN. The basis for spinal manipulation: chiropractic perspective of indications and theory. Journal of Electromyography and Kinesiology. 2012 Oct 1;22(5):632-42.
- Dishman JD, Weber II KA, Corbin RL, Burke JR. Understanding inhibitory mechanisms of lumbar spinal manipulation using H-reflex and F-wave responses: A methodological approach. Journal of neuroscience methods. 2012 Sep 30;210(2):169-77.
- Padayachy K, Vawda GH, Shaik J, McCarthy PW. The immediate effect of low back manipulation on serum cortisol levels in adult males with mechanical low back pain. Clinical Chiropractic. 2010 Dec 1;13(4):246-52.
- Teodorczyk-Injeyan JA, McGregor M, Ruegg R, Injeyan HS. Interleukin 2-regulated in vitro antibody production following a single spinal manipulative treatment in normal subjects. Chiropractic & osteopathy. 2010 Dec;18(1):26.
- Kolberg C, Horst A, Kolberg A, Belló-Klein A, Partata WA. Effects of high-velocity, low-amplitude manipulation on catalase activity in men with neck pain. Journal of manipulative and physiological therapeutics. 2010 May 1;33(4):300-7.
- Bialosky JE, Bishop MD, Price DD, Robinson ME, George SZ. The mechanisms of manual therapy in the treatment of musculoskeletal pain: a comprehensive model. Manual therapy. 2009 Oct 1;14(5):531-8.
- Lystad RP, Pollard H. Functional neuroimaging: a brief overview and feasibility for use in chiropractic research. The Journal of the Canadian Chiropractic Association. 2009 Mar;53(1):59.
- Dishman JD, Greco DS, Burke JR. Motor-evoked potentials recorded from lumbar erector spinae muscles: a study of corticospinal excitability changes associated with spinal manipulation. Journal of manipulative and physiological therapeutics. 2008 May 1;31(4):258-70.
- Cramer G, Budgell B, Henderson C, Khalsa P, Pickar J. Basic science research related to chiropractic spinal adjusting: the state of the art and recommendations revisited. Journal of manipulative and physiological therapeutics. 2006 Nov 1;29(9):726-61.
- Pickar JG, Kang YM. Paraspinal muscle spindle responses to the duration of a spinal manipulation under force control. Journal of manipulative and physiological therapeutics. 2006 Jan 1;29(1):22-31.
- Ianuzzi A, Khalsa PS. Comparison of human lumbar facet joint capsule strains during simulated high-velocity, low-amplitude spinal manipulation versus physiological motions. The Spine Journal. 2005 May 1;5(3):277-90.

- Sung PS, Kang YM, Pickar JG. Effect of spinal manipulation duration on low threshold mechanoreceptors in lumbar paraspinal muscles: a preliminary report. Spine. 2005 Jan 1;30(1):115-22.
- Evans DW. Mechanisms and effects of spinal high-velocity, low-amplitude thrust manipulation: previous theories. Journal of manipulative and physiological therapeutics. 2002 May 1;25(4):251-62.
- Triano JJ. Biomechanics of spinal manipulative therapy. The Spine Journal. 2001 Mar 1;1(2):121-30.
- Baarbé JK, Yielder P, Haavik H, Holmes MW, Murphy BA. Subclinical recurrent neck pain and its treatment impacts motor training-induced plasticity of the cerebellum and motor cortex. PloS one. 2018 Feb 28;13(2):e0193413.
- López-Herradón A, Fujikawa R, Gómez-Marín M, Stedile-Lovatel JP, Mulero F, Ardura JA, Ruiz P, Muñoz I, Esbrit P, Mahíllo-Fernández I, Ortega-de Mues A. Impact of Chiropractic Manipulation on Bone and Skeletal Muscle of Ovariectomized Rats. Calcified Tissue International. 2017 Nov 1; 101(5):519-29.
- Sampath KK, Mani R, Cotter J, Gisselman AS, Tumilty S. Changes in biochemical markers following spinal manipulation-a systematic review and meta-analysis. Musculoskeletal Science and Practice. 2017 Apr 5.
- Coronado RA, Gay CW, Bialosky JE, Carnaby GD, Bishop MD, George SZ. Changes in pain sensitivity following spinal manipulation: a systematic review and meta-analysis. Journal of Electromyography and Kinesiology. 2012 Oct 31;22(5):752-67.
- Herzog W. The biomechanics of spinal manipulation. Journal of bodywork and movement therapies. 2010 Jul 31;14(3):280-6.
- Pickar JG. Neurophysiological effects of spinal manipulation. The Spine Journal. 2002 Oct 31; 2(5):357-71.

EFICACIA Y EFECTIVIDAD DE LAS TÉCNICAS DE MANIPULACIÓN QUIROPRÁCTICA

- Gianola S, Bargeri S, Del Castillo G, Corbetta D, Turolla A, Andreano A, Moja L, Castellini G. Effectiveness of treatments for acute and subacute mechanical non-specific low back pain: a systematic review with network meta-analysis. British Journal of Sports Medicine. 2021
- BUSSIÈRES A, et al. Non-Surgical Interventions for Lumbar Spinal Stenosis Leading To Neurogenic Claudication: A Clinical practice guideline. *The Journal of Pain*, 2021 Mar
- Fernandez M, et al. Spinal manipulation for the management of cervicogenic headache: A systematic review and meta-analysis. *European Journal of Pain*. 2020, 24.9: 1687-1702.
- Massracchio M, Kirker K, StatesI R, Hanney WJ, Liu X, Kolber M. Thoracic spine manipulation for the management of mechanical neck pain: A systematic review and meta-analysis. PloS one, 2019 Feb 13; 14(2):e0211877
- Rubinstein SM, de Zoete A, van Middelkoop M, Assendelft WJJ, de Boer MR, Maurits van Tulder MW. British Medical Journal. 2019 Feb 7; *364*, l689.

- Rist PM, Hernandez A, Bernstein C., Kowalski M, Osypiuk K, Vining R, et al. The Impact of Spinal Manipulation on Migraine Pain and Disability: A Systematic Review and Meta-Analysis. Headache: The Journal of Head and Face Pain. 2019, 59: 532-542.
- Traeger A et al. Effect of Intensive Patient Education vs Placebo Patient Education on Outcomes in Patients With Acute Low Back Pain A Randomized Clinical Trial. JAMA Neurol, 2018 Nov.
- Ailliet L, Rubinstein SM, Hoekstra T, Van Tulder MW, De Vet HCW. Long-term trajectories of patients with neck pain and low back pain presenting to chiropractic care: A latent class growt hanalysis. Eur J Pain 2018, 22: 103—113.
- Coulter ID, Crawford C, Hurwitz, EL, Vernon H, Khorsan R, Suttorp Booth M, Herman P. Manipulation and mobilization for treating chronic low back pain: a systematic review and meta-analysis. The Spine Journal 2018, 18: 866–879.
- Skelly A, Shou R et al. Noninvasive Non-pharmacological Treatment for Chronic Pain: A Systematic Review. Comparative Effectiveness Review, 2018 June, 209.
- Goertz CM, Long CR, Vining RD, Pohlman KA, Walter J, Coulter I. Effect of Usual Medical Care Plus Chiropractic Care vs Usual Medical Care Alone on Pain and Disability Among US Service Members With Low Back Pain. A Comparative Effectiveness Clinical Trial. JAMA Network Open 2018 May, 1-15.
- Haas M, Bronfort G, Evans R, Schulz C, Vavrek D, Takaki L, Hanson L, Leininger B, Neradilek MB. Dose-response and efficacy of spinal manipulation for care of cervicogenic headache: a dual-center randomized controlled trial. The Spine Journal (2018), https://doi.org/10.1016/j.spinee.2018.02.01.
- Babatunde O, Jordan JL, Van der Windt DA, Hill JC, Foster NE, Protheroe J. Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence. PLOS ONE, 2017 Jun, 22: 1-30.
- Chou R et al. Nonpharmacologic Therapies for Chronic Low Back Pain: A Review of the Evidence for an American Pain Society/American College of Physicians Clinical Practice Guideline. Ann Inter Med 2017, 2017 Apr 166 (7).
- Deyo R. The Role of Spinal Manipulation in the Treatment of Low Back Pain. J AMA, 2017 April 317 (14): 1418-1419.
- Qaseem A, Wilt T, McLean R, Force MA. Non-invasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. Ann Inter Med, 2017 February.
- Holt KR, Haavik H, Chi Lun Lee A, Murphy B, Elley R. Effectiveness of Chiropractic Care to Improve Sensorimotor Function Associated With Falls Risk in Older People: A Randomized Controlled Trial. JMPT, 2016 May 39 (4): 267-278.
- Deyo R et al. Association Between Initial Opioid Prescribing Patterns and Subsequent Long-Term Use Among Opioid-Naïve Patients: A Statewide Retrospective Cohort Study. J Gen Intern Med, 2016.
- Mesa-Jiménez et al. Multimodal manual therapy vs pharmacological care for management of tension type headache: A meta-analysis of randomized trials. Cephalgia, 2015. DOI: 10.1177/0333102415576226.

- Haas M, Vavrek D, Peterson D, Polissar N, Neradilek M. Dose-response and efficacy of spinal manipulation for care of chroniclow back pain: a randomized controlled trial. The Spinal Journal, 2014 july, 14 (7): 1106-1116.
- Kernel et al. An evidence-based clinical guideline for the diagnosis and treatment of lumbar disc herniation with radiculopathy. JMPT 2014 january,, 14 (1): 180-191.
- Salomón-Moreno J et al. Immediate changes in neck pain intensity and widespread pressure pain sensitivity in patients with bilateral chronic mechanical neck pain: a randomized controlled trial of thoracic thrust manipulation vs non-thrust mobilisation. JMPT 2014, 37 (5): 312-319.
- George J, Skaggs C, Nelson M, Gavard JA, Gros GA. A randomized controlled trial comparing a multimodal intervention and standard obstetrics care for low back and pelvic pain in pregnancy. AM J Obstet Gynecol 2013, 208 (295): 1-7.
- Johnson C, Rubinstein S et al. Chiropractic Care and Public Health: Answering Difficult Questions About Safety, Care Through the Lifespan, and Community Action. JMPT 2012 September, 35 (7): 493-514.
- Millan M, Leboeuf C, Budgell5and B, Amorim M-A. The effect of spinal manipulative therapy on experimentally induced pain: a systematic litterature review. Chiropractic & Manual Therapies 2012, 20:26.
- Haldeman S et al. Advancements in the Management of Spine Disorders. Best Practice & Research Clinical Rheumatology 2012, 26: 263–280.
- Bronfort G et al. Spinal Manipulation, medication or home exercise with advice for acute and subacute neck pain. Ann Intern 2012, 156: 1-10.
- Chaibi A, Russell MB. Manual therapies for cervicogenic headache: a systematic review. J Headache Pain 2012, 13: 351-359.
- Walker B, French S, Grant W, Green S.A Cochrane review of Combined Chiropractic Interventions for Low-Back Pain. Spine 2011, 36 (3): 230-242.
- Chaibi A, Russell MB. Manual therapies for migraine: a systematic review. J Headache Pain, 2011, 12:127–133.
- Cifuentes M, Willetts J, Wasiak R. Health Maintenance Care in work-related low back pain and it association with disability recurrence. JOEM 2011 Apr, 53 (4): 396-404.
- Clark BC, Goss DA, Walkowski S, Hoffman RL, Ross A, Thomas JS. Neurophysiologic effects of spinal manipulation in patients with chronic low back pain. BMC Musculoskeletal Disorders, 2011,12:170.
- Dagenais S, Tricco AC, Haldeman S. Synthesis of recommendations for the assessment and management of low back pain from recent clinical practice guidelines. The Spine Journal 2010, 10: 514–529.
- Haldeman S et al. Findings From The Bone and Joint Decade 2000 to 2010 Task Force on Neck Pain and Its Associated Disorders. JOEM, 2010 April, 52 (4): 424-427.
- Haas et al. Dose response and efficacy of spinal manipulation for chronic cervicogenic headache: a pilot randomized controlled trial. The Spine Journal 2010, 10:117–128.
- Hurwitz EL et al. Results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. JMPT 2009 february, 32 (2): 141-175.

- Johnson C. Comparative effectiveness research and the chiropractic profession. JMPT 2010 may, 33 (4): 243-250.
- Strunk R, Hawk C. Effects of chiropractic care on dizziness, neck pain, and balance: a single-group, pre-experimental, feasibility study. JCM 2009 December, 8 (4): 156-164.
- Van der Velde et al. Identifying the best treatment among common non surgical neck pain treatments. JMPT, 2009 February, 32 (2): 209-218.
- Bakris G, Dickholtz M, Meyer PM, Kravitz G, Avery E, Miller M, Brown J, Woodfield C, Bell B. Atlas vertebra realignment and achievement of arterial pressure goal in hypertensive patients: a pilot study. Journal of Human Hypertension (2007) 21,347–352.
- Chou R, Huffman LH. Non-pharmacologic Therapies for Acute and Chronic Low Back Pain: A Review of the Evidence for an American Pain Society/American College of Physicians Clinical Practice Guideline. Ann Inter Med 2007, 147: 492-504.
- Greene BR, Smith M, Allareddy V, Haa M. Referral patterns and attitudes of Primary Care Physicians towards chiropractors. BMC Complementary and Alternative Medicine 2006, 6.
- UK Beam Trial Team. United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: effectiveness of physical treatments for back pain in primary care. BMJ, doi:10.1136/bmj.38282.669225.AE (published 29 November 2004).
- Haas M, Groupp E, Kraemer DF. Dose-response for chiropractic care of chronic low back pain. The Spine Journal 2004, 4: 574–583.
- Hurwitz EL et al. A Randomized Trial of Medical Care With and Without Physical Therapy and Chiropractic Care With and Without Physical Modalities for Patients With Low Back Pain: 6-Month Follow-Up Outcomes From the UCLA Low Back Pain Study. Spine, 2002, 27 (20): 2193-2204.
- Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain: an update of a Cochrane review. Spine, 2011 Jun 1;36(13):E825-46.
- Eklund A, Jensen I, Lohela-Karlsson M, Hagberg J, Leboeuf-Yde C, Kongsted A, et al. The Nordic Maintenance Care program: Effectiveness of chiropractic maintenance care versus symptom-guided treatment for recurrent and persistent low back pain—A pragmatic randomized controlled trial. PLoS ONE. 2018, 13(9): e0203029.
- Rist PM, Hernandez A, Bernstein C., Kowalski M, Osypiuk K, Vining R, et al. The Impact of Spinal Manipulation on Migraine Pain and Disability: A Systematic Review and Meta-Analysis. Headache: The Journal of Head and Face Pain. 2019, 59: 532-542.
- Jenkins HJ, et al. Long-term effectiveness of non-surgical interventions for chronic low back pain: a systematic review and meta-analysis. *Lancet Rheumatol.* 2025;7(9):e607-e617.
- Coulter ID, Crawford C, Vernon H, Hurwitz EL, Khorsan R, Booth MS, Herman PM. Manipulation and mobilization for treating chronic nonspecific neck pain: a systematic review and meta-analysis for an appropriateness panel. *Pain Physician, 2019 March ; 22(2): E55–E70*
- Paige NM, Miake-Lye IM, Booth MS, Beroes JM, Mardian AS, Dougherty P, Branson R, Tang B, Morton SC, Shekelle PG. Association of spinal manipulative therapy with clinical benefit and harm for acute low back pain: systematic review and meta-analysis. Jama. 2017 Apr 11;317(14):1451-60.

- Gross A, Langevin P, Burnie SJ, Bédard-Brochu MS, Empey B, Dugas E, Faber-Dobrescu M, Andres C, Graham N, Goldsmith CH, Brønfort G. Manipulation and mobilisation for neck pain contrasted against an inactive control or another active treatment. The Cochrane Library. 2015 Jan 1.
- Goertz CM, Long CR, Hondras MA, Petri R, Delgado R, Lawrence DJ, Owens EF, Meeker WC. Adding chiropractic manipulative therapy to standard medical care for patients with acute low back pain: results of a pragmatic randomized comparative effectiveness study. Spine. 2013 Apr 15; 38(8):627
- Von Heymann WJ, Schloemer P, Timm J, Muehlbauer B. Spinal high-velocity low amplitude manipulation in acute nonspecific low back pain: a double-blinded randomized controlled trial in comparison with diclofenac and placebo. Spine. 2013 Apr 1;38(7):540-8.
- Senna MK, Machaly SA. Does maintained spinal manipulation therapy for chronic nonspecific low back pain result in better long-term outcome? Spine. 2011 Aug 15;36(18):1427-37.
- Bronfort G, Haas M, Evans R, Leininger B, Triano J. Effectiveness of manual therapies: the UK evidence report. Chiropractic & osteopathy. 2010 Dec;18(1):3.
- Bishop PB, Quon JA, Fisher CG, Dvorak MF. The Chiropractic Hospital-based Interventions Research Outcomes (CHIRO) study: a randomized controlled trial on the effectiveness of clinical practice guidelines in the medical and chiropractic management of patients with acute mechanical low back pain. The Spine Journal. 2010 Dec 1;10(12):1055-64.

COSTE-EFECTIVIDAD DEL TRATAMIENTO QUIROPRÁCTICO

- Mior S., Gamble B, Barnsley J, Côté P, Côté E. Changing primary care physician's management of LBP in model of intercollaborative care. Chirop Manual Ther 2013, 21:6.
- Gurden M, Morelli M, Sharp G, Baker K, Betts N, Bolton J. Evaluation of a general practitioner referral service for manual treatment of back and neck pain. Primary Health Care Research & Development 2012, 13: 204-210.
- Brown R. A health care system in transformation: making the case for chiropractic. Chiropractic & Manual Therapies 2012, 20: 37.
- Foster N, Hartvigsen J, Croft PR. Taking responsibility for the early assessment and treatment of patients with musculoskeletal pain: a review and critical analysis. Arthritis Research & Therapy 2012, 14: 205.
- Schofield DJ et al. The personal and national costs of early retirement because of spinal disorders: impacts on income, taxes, and government support payments. Spine J. 2012, 12:1111-1118.
- Michaleff ZA, Lina C-WC, Mahera CG, Van Tulder M.W. Spinal manipulation epidemiology: Systematic review of cost effectiveness studies. J Electromyography Kinesiol 2012, 22: 655-662.
- Daffner SD, Hymanson HJ, Wang JC. Cost and use of conservative management of lumbar disc herniation before surgical discectomy. The Spine Journal. 2010 Jun, 10 (6): 463-468.
- Haas M, Sharma R, Stano M. Cost-Effectiveness of Medical and Chiropractic Care for Acute and Chronic Low Back Pain. Journal of Manipulative and Physiological Therapeutics. 2005 Oct, 28 (8): 555-563.

- Legorreta AP, Metz D, Nelson CF, Ray S, Chernicoff HO, DiNubile NA. Comparative Analysis of Individuals With and Without Chiropractic Coverage. Arch Intern Med. 2004;164:1985-1992.
- Manga P, Angus D. Chiropractic a mean of reducing costs and attaining better health outcomes. Manga report 1998.
- Manga P, Angus ED, Papadopoulos C, Swan WR. The effectiveness and Cost-Effectiveness of Chiropractic management of low back-pain. Ontario Ministry of Health, 1993 Aug.
- Whedon JM, Bezdjian S, Toler AWJ, Kazal LA Jr, MacKenzie TA. Association between chiropractic use and costs of care for older Medicare patients with spine pain. *Spine (Phila Pa 1976)*. 2025;[en prensa].
- Kazis LE, Ameli O, Rothendler J, et al. Cost-effectiveness of nonpharmacologic treatments for low back pain in U.S. adults. *JAMA Netw Open*. 2024;7(1):e2351234.
- Weeks WB, Goertz CM, Meeker WC, et al. Cost and utilization of chiropractic care compared to medical care for spine conditions: a systematic review. *Chiropr Man Therap*. 2023;31(1):45.
- Blanchette MA, Stochkendahl MJ, Borges da Silva R, Boruff J, Harrison P, Bussières A. Effectiveness and economic evaluation of chiropractic care for the treatment of low back pain: a systematic review of pragmatic studies. *PLoS One.*2022;17(8):e0160037.
- Goertz CM, Long CR, Vining RD, Pohlman KA, Walter J, Coulter I. Effect of usual medical care plus chiropractic care vs usual medical care alone on pain and disability among U.S. service members with low back pain: a comparative effectiveness clinical trial. *Spine (Phila Pa 1976)*. 2020;45(9):E477–E485.
- Peterson CK, Humphreys BK. Outcomes and cost-effectiveness of chiropractic treatment of lumbar disc herniation: a prospective cohort study. *J Manipulative Physiol Ther*. 2019;42(2):85–93.
- Hurwitz EL, Vassilaki M, Li D, Schneider MJ, Stevans JM, Phillips RB, Phelan SP, Lewis EA, Armstrong RC. Variations in Patterns of Utilization and Charges for the Care of Headache in North Carolina, 2000-2009: A Statewide Claims' Data Analysis. Journal of Manipulative & Physiological Therapeutics. 2016 May 1; 39(4):229-39.
- Hurwitz EL, Li D, Guillen J, Schneider MJ, Stevans JM, Phillips RB, Phelan SP, Lewis EA, Armstrong RC, Vassilaki M. Variations in patterns of utilization and charges for the care of neck pain in north carolina, 2000 to 2009: a statewide claims' data analysis. Journal of Manipulative & Physiological Therapeutics. 2016 May 1;39(4):240-51.
- Blanchette MA, Stochkendahl MJ, Borges Da Silva R, Boruff J, Harrison P, Bussières A. Effectiveness and Economic Evaluation of Chiropractic Care for the Treatment of Low Back Pain: A Systematic Review of Pragmatic Studies. PLoS One. 2016 Aug 3;11(8):e0160037.
- Peterson CK, Leemann S, Lechmann M, Pfirrmann CW, Hodler J, Humphreys BK. Symptomatic Magnetic Resonance Imaging–Confirmed Lumbar Disk Herniation Patients: A Comparative Effectiveness Prospective Observational Study of 2 Age-and Sex-Matched Cohorts Treated With Either High-Velocity, Low-Amplitude Spinal Manipulative Therapy or Imaging-Guided Lumbar Nerve Root Injections. Journal of Manipulative & Physiological Therapeutics. 2013 May 1;36(4):218-25.
- Liliedahl RL, Finch MD, Axene DV, Goertz CM. Cost of care for common back pain conditions initiated with chiropractic doctor vs medical doctor/doctor of osteopathy as first physician:

experience of one Tennessee-based general health insurer. Journal of Manipulative & Physiological Therapeutics. 2010 Nov 1;33 (9):640-3.

- Choudhry, N, Milstein, A. Do chiropractic physician services for treatment of low-back and neck pain improve the value of health benefit plans? An evidence-based assessment of incremental impact on population health and total health care spending. Harvard Medical School, Boston, Mercer Health and Benefits, San Francisco. 2009 Oct 12.

SEGURIDAD DEL EJERCICIO DE LA QUIROPRÁCTICA

- Hincapié CA, Tomlinson GA, Côté P, Rampersaud YR, Jadad AR, Cassidy JD. Chiropractic care and risk for acute lumbar disc herniation: a population-based self-controlled case series study. European Spine Journal. 2018 Jul 1;27(7):1526-37.
- Hincapié CA, Cassidy JD, Côté P, Rampersaud YR, Jadad AR, Tomlinson GA. Chiropractic spinal manipulation and the risk for acute lumbar disc herniation: a belief elicitation study. European Spine Journal. 2018 Jul 1;27(7):1517-25.
- Deyo RA, Hallvik SE, Hildebran C, Marino M, O'kane N, Carson J, Van Otterloo J, Wright DA, Millet LM, Wakeland W. Use of prescription opioids before and after an operation for chronic pain (lumbar fusion surgery). Pain. 2018 Jun 1;159(6):1147-54.
- Todd AJ, Carroll MT, Robinson A, Mitchell EK. Adverse events due to chiropractic and other manual therapies for infants and children: a review of the literature. Journal of manipulative and physiological therapeutics. 2015 Nov 1;38(9):699-712.
- Cassidy JD, Bronfort G, Hartvigsen J. Should we abandon cervical spine manipulation for mechanical neck pain? No. BMJ: British Medical Journal (Online). 2012;344.
- Hauser V, Zangger P, Winter Y, Oertel W, Kesselring J. Late sequelae of whiplash injury with dissection of cervical arteries. European neurology. 2010;64(4):214-8.
- Wenban AB. Inappropriate use of the title'chiropractor'and term'chiropractic manipulation'in the peer-reviewed biomedical literature. Chiropractic & osteopathy. 2006 Dec;14(1):16.
- Whedon JM, Anderson B, Mackenzie TA, Grout L, Moonaz S, Lurie JD, Haldeman S. Observational Study of the Safety of Chiropractic vs Medical Care Among Older Adults With Neck Pain. J Manipulative Physiol Ther. 2025 Jan-Jun;48(1-5):37-46..
- Misra SM, Jaber O, Long C. Chiropractic Care in Children: A Review of Evidence and Safety. Clin Pediatr (Phila). 2025 Jul;64(7):1028-1032.
- Brown SP. Cervical Spine Manipulation and Causation of Cervical Artery Dissection: A Review of 10 Case Reports. Cureus. 2024 Jun 21;16(6):e62845.
- Moser N, Mior S, Noseworthy M, Côté P, Wells G, Behr M, Triano J. Effect of cervical manipulation on vertebral artery and cerebral haemodynamics in patients with chronic neck pain: a crossover randomised controlled trial. BMJ open. 2019 May 1;9(5):e025219.
- Rubinstein SM, De Zoete A, Van Middelkoop M, Assendelft WJ, De Boer MR, Van Tulder MW. Benefits and harms of spinal manipulative therapy for the treatment of chronic low back pain: systematic review and meta-analysis of randomised controlled trials. bmj. 2019 Mar 13;364:l689.

- Church EW, Sieg EP, Zalatimo O, Hussain NS, Glantz M, Harbaugh RE. Systematic review and meta-analysis of chiropractic care and cervical artery dissection: no evidence for causation. Cureus. 2016 Feb;8(2).
- Kosloff TM, Elton D, Tao J, Bannister WM. Chiropractic care and the risk of vertebrobasilar stroke: results of a case–control study in US commercial and Medicare Advantage populations. Chiropractic & manual therapies. 2015 Dec;23(1):19.
- Hebert JJ, Stomski NJ, French SD, Rubinstein SM. Serious adverse events and spinal manipulative therapy of the low back region: a systematic review of cases. Journal of Manipulative & Physiological Therapeutics. 2015 Nov 1;38(9):677-91.
- Whedon JM, Mackenzie TA, Phillips RB, Lurie JD. Risk of traumatic injury associated with chiropractic spinal manipulation in Medicare Part B beneficiaries aged 66–99. Spine. 2015 Feb 15;40(4):264.
- Cassidy JD, Boyle E, Côté P, He Y, Hogg-Johnson S, Silver FL, Bondy SJ. Risk of vertebrobasilar stroke and chiropractic care: results of a population-based case-control and case-crossover study. Journal of Manipulative & Physiological Therapeutics. 2009 Feb 1; 32(2):S201-8.
- Thiel HW, Bolton JE, Docherty S, Portlock JC. Safety of chiropractic manipulation of the cervical spine: a prospective national survey. Spine. 2007 Oct 1; 32(21):2375-8.
- Rubinstein SM, Leboeuf-Yde C, Knol DL, de Koekkoek TE, Pfeifle CE, van Tulder MW. The benefits outweigh the risks for patients undergoing chiropractic care for neck pain: a prospective, multicenter, cohort study. Journal of Manipulative & Physiological Therapeutics. 2007 Jul 1; 30(6):408-18.
- Oliphant D. Safety of spinal manipulation in the treatment of lumbar disk herniations: a systematic review and risk assessment. Journal of Manipulative & Physiological Therapeutics. 2004 Mar 1; 27(3):197-210.

SATISFACCIÓN DE LOS USUARIOS DE QUIROPRÁCTICA

- MacPherson H, Newbronner E, Chamberlain R, Hopton A. Patients' experiences and expectations of chiropractic care: a national cross-sectional survey. Chiropractic & manual therapies. 2015 Dec; 23(1):3.
- Weeks WB, Goertz CM, Meeker WC, Marchiori DM. Public perceptions of doctors of chiropractic: results of a national survey and examination of variation according to respondents' likelihood to use chiropractic, experience with chiropractic, and chiropractic supply in local health care markets. Journal of Manipulative & Physiological Therapeutics. 2015 Oct 1;38(8):533-44
- Houweling TA, Braga AV, Hausheer T, Vogelsang M, Peterson C, Humphreys BK. First-contact care with a medical vs chiropractic provider after consultation with a Swiss telemedicine provider: comparison of outcomes, patient satisfaction, and health care costs in spinal, hip, and shoulder pain patients. Journal of Manipulative & Physiological Therapeutics. 2015 Sep 1;38(7):477-83.
- Weigel PA, Hockenberry JM, Wolinsky FD. Chiropractic use in the Medicare population: prevalence, patterns, and associations with 1-year changes in health and satisfaction with care. Journal of Manipulative & Physiological Therapeutics. 2014 Oct 1;37(8):542-51.
- Leininger BD, Evans R, Bronfort G. Exploring patient satisfaction: a secondary analysis of a randomized clinical trial of spinal manipulation, home exercise, and medication for acute and

subacute neck pain. Journal of Manipulative & Physiological Therapeutics. 2014 Oct 1;37(8):593- 601.
- Navrud IM, Feier CH. A survey of parent satisfaction with chiropractic care of the pediatric patient. Reason. 2014; 221(174):55-9.

ESTUDIOS CUALITATIVOS, RENDIMIENTO Y CALIDAD DE VIDA

- Adams J, Peng W, Cramer H, Sundberg T, Moore C, Amorin-Woods L, Sibbritt D, Lauche R. The Prevalence, patterns, and predictors of chiropractic use among US adults. Spine. 2017 Dec 1;42(23):1810-6.
- Moore CS, Sibbritt DW, Adams J. A critical review of manual therapy use for headache disorders: prevalence, profiles, motivations, communication and self-reported effectiveness. BMC neurology. 2017 Dec;17(1):61.
- Goncalves G, Le Scanff C, Leboeuf-Yde C. Primary prevention in chiropractic practice: a systematic review. Chiropractic & manual therapies. 2017 Dec;25(1):9.
- Galindez-Ibarbengoetxea X, Setuain I, Andersen LL, Ramirez-Velez R, González-Izal M, Jauregi A, Izquierdo M. Effects of cervical high-velocity low-amplitude techniques on range of motion, strength performance, and cardiovascular outcomes: A review. The Journal of Alternative and Complementary Medicine. 2017 Sep 1;23(9):667-75.
- Fernandez M, Boyle E, Hartvigsen J, Ferreira ML, Refshauge KM, Maher CG, Christensen K, Hopper JL, Ferreira PH. Is this back pain killing me? All-cause and cardiovascular-specific mortality in older Danish twins with spinal pain. European Journal of Pain. 2017 May;21(5):938-48.
- Ndetan H, Hawk C, Sekhon VK, Chiusano M. The role of chiropractic care in the treatment of dizziness or balance disorders: analysis of National Health Interview Survey Data. Journal of evidence-based complementary & alternative medicine. 2016 Apr;21(2):138-42.
- Cohen SP. Epidemiology, diagnosis, and treatment of neck pain. InMayo Clinic Proceedings 2015 Feb 1 (Vol. 90, No. 2, pp. 284-299). Elsevier.
- Miners AL. Chiropractic treatment and the enhancement of sport performance: a narrative literature review. The Journal of the Canadian Chiropractic Association. 2010 Dec;54(4):210.
- Stuber KJ, Smith DL. Chiropractic treatment of pregnancy-related low back pain: a systematic review of the evidence. Journal of manipulative and physiological therapeutics. 2008 Jul 1;31(6):447-54.
- Pollard H, Hoskins W, McHardy A, Bonello R, Garbutt P, Swain M, Dragasevic G, Pribicevic M, Vitiello A. Australian chiropractic sports medicine: half way there or living on a prayer?. Chiropractic & osteopathy. 2007 Dec;15(1):14.
- Assendelft WJ, Morton SC, Yu Emily I, Suttorp MJ, Shekelle PG. Tratamiento de manipulación espinal para el dolor lumbar. La Biblioteca Cochrane Plus. 2007(4).
- Hawk C, Khorsan R, Lisi AJ, Ferrance RJ, Evans MW. Chiropractic care for nonmusculoskeletal conditions: a systematic review with implications for whole systems research. The Journal of Alternative and Complementary Medicine. 2007 Jun 1;13(5):491-512.

- Gliedt JA, Spector AL, Schneider MJ, Williams J, Young S. Disparities in chiropractic utilization by race, ethnicity and socioeconomic status: A scoping review. *J Integr Med*. 2023;21(2):159–167.
- Whedon JM, Uptmor S, Toler AWJ, Bezdjian S, MacKenzie TA, Kazal LA Jr. Association between chiropractic care and use of prescription opioids among older Medicare beneficiaries with spinal pain: a retrospective observational study. *Chiropr Man Therap*. 2022;30(1):5.
- Kizhakkeveettil A, Bezdjian S, Hurwitz EL, Toler AWJ, Rossi D, Uptmor S, Sagester K, Bangash M, MacKenzie TA, Lurie JD, Coulter I, Haldeman S, Whedon JM. Spinal Manipulation vs Prescription Drug Therapy for Chronic Low Back Pain: Beliefs, Satisfaction With Care, and Quality of Life Among Older Medicare Beneficiaries. *J Manipulative Physiol Ther*. 2021;44(8):663-673.

Documento elaborado por la
Asociación Española de Quiropráctica,
con ayuda de la Federación Mundial de Quiropractica
(World Federation of Chiropractic) y
Fundación Fujitega.