Noninvasive Treatments for Low Back Pain: Current State of the Evidence

Focus of This Summary

This review examines the evidence on the comparative benefits and harms of noninvasive treatments for acute, subacute, and chronic low back pain from 156 studies that were published before April 2015. Excluded from the review were studies conducted among patients with low back pain related to cancer, infection, inflammatory arthropathy, high-velocity trauma, or fracture or low back pain associated with severe or progressive neurological deficits. The full report, listing all studies, is available at *www.effectivehealthcare.ahrq.gov/low-back-pain*. This summary is provided to assist in informed clinical decisionmaking. However, reviews of evidence should not be construed to represent clinical recommendations or guidelines.

Background

Low back pain is one of the most frequently encountered conditions in clinical practice. Up to 84 percent of adults have low back pain at some time in their lives, and over one quarter of U.S. adults report recent (in the last 3 months) low back pain. Low back pain has high direct and indirect costs and is a common reason for missed work.

Radiculopathy (characterized by pain, numbness, tingling, or weakness in the arms or legs) may be caused by nerve root impingement that often results from a herniated intervertebral disc or may be caused by spinal stenosis. These types of radiculopathy are each present in about 4 to 5 percent of patients with low back pain. The natural history and response to treatment for these conditions may differ from back pain without radicular involvement.

The prognosis for acute nonradicular low back pain is generally favorable. Studies have shown that improvements in pain (mean reduction to 58% of initial pain scores) occurred in 1 month.[1] In patients with persistent symptoms, continued improvement is often seen in the subacute phase between 4 and 12 weeks. In a minority of patients, nonradicular low back pain lasts longer than 12 weeks, at which point it is considered chronic. Patients with chronic back pain account for the bulk of the burden and cost of low back pain. Predictors of chronicity are related to various psychosocial factors, the presence of nonorganic signs or symptoms, high baseline functional impairment, and low general health status.

Multiple treatment options for acute and chronic low back pain are available. This systematic review aimed to assess the benefits and harms of different pharmacological and noninvasive nonpharmacological therapies for adults with acute, subacute, or chronic nonradicular or radicular low back pain.

1. Pengel LH, Herbert RD, Maher CG, et al. Acute low back pain: systematic review of its prognosis. BMJ. 2003 Aug;327(7410):323. PMID: 12907487.

Conclusions

Several interventions for low back pain are associated with small-to-moderate, primarily short-term effects on pain versus a control. Effects on function are generally smaller than effects on pain.

Radicular low back pain (*see Table 1*)

- **Nonpharmacological interventions:** Exercise may be effective in treating radicular low back pain (low strength of evidence [SOE]).
- **Pharmacological interventions:** Nonsteroidal anti-inflammatory drugs (NSAIDs) may be effective in treating radicular low back pain (low SOE).

Nonradicular acute or subacute low back pain (*see Table 2*)

- **Nonpharmacological interventions:** Superficial heat is effective in treating acute or subacute low back pain (moderate SOE).
- **Pharmacological interventions:** NSAIDs and skeletal muscle relaxants are effective in treating acute low back pain (moderate SOE).

Nonradicular chronic low back pain (*see Table 3*)

- **Nonpharmacological interventions:** Exercise, acupuncture, spinal manipulation, and multidisciplinary rehabilitation[a] are effective in treating chronic low back pain (moderate SOE).
- **Pharmacological interventions:** NSAIDs, opioids, and duloxetine are effective in treating chronic low back pain (moderate SOE).
  - » **Note:** No evidence supporting the effectiveness and safety of opioids in the long term is available. Clinicians should consider the potential for increased risk of misuse, abuse, addiction, overdose, and death associated with opioids.

For nonpharmacological therapies, assessment of harms was suboptimal. However, serious harms appear to be rare. (*See Table 4.*)

Pharmacological therapies are associated with increased risk of adverse events when compared with placebo. (*See Table 4.*)

[a] A coordinated program with both physical and psychosocial treatment components provided by professionals from at least two different specialties.

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Overview of Clinical Research Evidence

Most trials enrolled patients with pain symptoms of at least moderate intensity (e.g., >5 on a 0- to 10-point numerical rating scale for pain).

- Across interventions, pain intensity was the most commonly reported outcome, followed by back-specific function.
- When present, observed benefits for pain were generally in the small (5 to 10 points on a 0- to 100-point visual analogue scale or 0.5 to 1.0 points on a 0- to 10-point numerical rating scale) to moderate (10 to 20 points) range.
- Outcomes were mostly measured at short-term (up to 6 months) followup.
- Effects on function were generally smaller than effects on pain; additionally, fewer studies measured function only.

The key findings are listed in Tables 1 through 4 below.

Table 1: Radicular Low Back Pain: Summary of Key Findings and Strength of Evidence for Interventions

Intervention	Compared Intervention	Outcome	Studies	Findings	SOE
Nonpharmacological interventions					
Exercise	Usual care	Pain, function	3 RCTs	+	●○○
Traction	Physiotherapy or other interventions	Pain, function	2 SRs	↔	●○○
Spinal manipulation + home exercise + advice	Home exercise + advice	Pain	1 RCT	+	●○○
Pharmacological interventions					
NSAIDs	Placebo	Pain	1 SR	+	●○○
Diazepam	Placebo	Pain	1 SR	–	●○○
Systemic corticosteroids	Placebo	Pain, function	5 RCTs	–	●●○

+ = small effect favoring the intervention; – = no effect versus placebo; ↔ = no difference between the interventions; NSAID = nonsteroidal anti-inflammatory drug; RCT = randomized controlled trial; SOE = strength of evidence; SR = systematic review

Table 2: Nonradicular Acute or Subacute Low Back Pain: Summary of Key Findings and Strength of Evidence for Interventions

Intervention	Compared Intervention	Outcome	Studies	Findings	SOE
Nonpharmacological interventions					
Massage	Sham massage or usual care	Pain, function	1 SR	+ to ++	●○○
Heat wrap	Placebo	Pain, function	1 SR + 2 additional trials	++	●●○
Pharmacological interventions					
NSAIDs	Placebo	Pain	1 SR	+	●●○
		Function	2 RCTs	+	●○○
	Another NSAID	Pain	1 SR	↔	●●○
Skeletal muscle relaxants	Placebo	Pain relief	1 SR + 1 additional RCT	++	●●○
Acetaminophen	Placebo	Pain, function	1 RCT	–	●○○

+ = small effect favoring the intervention; ++ = moderate effect favoring the intervention; – = no effect versus placebo; ↔ = no difference between the interventions; NSAID = nonsteroidal anti-inflammatory drug; RCT = randomized controlled trial; SOE = strength of evidence; SR = systematic review

Strength of Evidence Scale*

High:	●●●	High confidence that the evidence reflects the true effect. Further research is very unlikely to change our confidence in the estimate of effect.
Moderate:	●●○	Moderate confidence that the evidence reflects the true effect. Further research may change our confidence in the estimate of effect and may change the estimate.
Low:	●○○	Low confidence that the evidence reflects the true effect. Further research is likely to change our confidence in the estimate of effect and is likely to change the estimate.
Insufficient:	○○○	Evidence either is unavailable or does not permit a conclusion.

*The overall evidence grade was assessed based on the ratings for the following domains: study limitations, directness, consistency, precision, and reporting bias. Other domains were considered, as appropriate: dose-response association, plausible confounding, and strength of association (i.e., magnitude of effect). For additional details on the methodology used to assess strength of evidence, please refer to: Owens DK, Lohr KN, Atkins D, et al. AHRQ series paper 5: grading the strength of a body of evidence when comparing medical interventions—Agency for Healthcare Research and Quality and the Effective Health-Care Program. J Clin Epidemiol. 2010 May;63(5):513-23. PMID: 19595577.

Overview of Clinical Research Evidence (*Continued*)

Table 3: Nonradicular Chronic Low Back Pain: Summary of Key Findings and Strength of Evidence for Interventions

Intervention	Compared Intervention	Outcome	Studies	Findings	SOE
Nonpharmacological interventions					
Exercise therapy	Usual care	Pain, function	2 SRs	+	●●○
	Another exercise therapy	Pain, function	>20 trials	↔	●●○
Motor control exercise**	Minimal intervention	Pain	1 SR	++	●○○
		Function	1 SR	+	
	General exercise or physical therapy	Pain, function	2 SRs	+ to ++	●○○
Motor control exercise + exercise	Exercise therapy alone	Pain	2 RCTs	↔	●○○
Tai chi	Waitlist control† or no tai chi	Pain	2 RCTs	++	●○○
	Other exercise therapy	Pain	1 RCT	++	●○○
Yoga	Usual care	Pain, function	1 RCT	++	●○○
	Education	Pain, function	5 RCTs	+	●○○
Psychological therapies (include progressive relaxation, operant therapy, EMG biofeedback, and cognitive behavioral therapy)	Waitlist control or placebo	Pain	4 SRs	++ (except + for operant therapy)	●○○
		Function	4 SRs	− (except + for progressive relaxation)	●○○
	Another psychological therapy	Function	10 RCTs	↔	●●○
Acupuncture	No acupuncture	Pain, function	1 SR	++	●●○
	Medications	Pain, function	1 SR	+	●○○
Multidisciplinary rehabilitation††	Usual care or no multidisciplinary rehabilitation	Pain, function (short- and long-term)	2 SRs	+ to ++ (pain) + (function)	●○○ to ●●○
	Physical therapy	Pain, function (short- and long-term)	2 SRs	++	●●○
Spinal manipulation	Sham manipulation or inert treatment	Pain	11 RCTs	− to +	●○○
	Exercise, usual care, medications, or massage	Pain, function	6 RCTs	↔	●●○
Other: Interventions including massage, ultrasound, transcutaneous electrical nerve stimulation, low-level laser therapy, and Kinesio® taping had small to no effects on pain.					●○○
Pharmacological interventions					
NSAIDs	Placebo	Pain	1 SR	++	●●○
		Function	1 SR	+	●○○
	Another NSAID	Pain	6 RCTs	↔	●●○
Opioids—tramadol	Placebo	Pain (short-term)	1 SR + 2 additional RCTs	++	●●○
		Function (short-term)		+	
Opioids—other§	Placebo	Pain, function (short-term)	1 SR	+	●●○
Antidepressants—duloxetine	Placebo	Pain, function	3 RCTs	+	●●○
Other antidepressants§§	Placebo	Pain	2 SRs	−	●●○

+ = small effect favoring the intervention; ++ = moderate effect favoring the intervention; − = no effect versus placebo; ↔ = no difference between the interventions; EMG = electromyography; NSAID = nonsteroidal anti-inflammatory drug; RCT = randomized controlled trial; SOE = strength of evidence; SR = systematic review

** A retraining program to improve activity of muscles assessed to have poor control and to reduce activity of any muscle identified to be overactive.

† The patients assigned to the waitlist control group were asked to wait for a prespecified time period, after which they were offered the intervention. During the waiting period, patients were not allowed to undergo diagnostic or therapeutic procedures.

†† A coordinated program with both physical and psychosocial treatment components (e.g., exercise therapy and cognitive behavioral therapy) provided by professionals from at least two different specialties.

§ Other opioids that were evaluated included oxycodone, hydrocodone, hydromorphone, morphine, and fentanyl.

§§ Other antidepressants that were evaluated included tricyclic antidepressants, selective serotonin reuptake inhibitors, and tetracyclic antidepressants.

Table 4: Adverse Effects of Interventions for Low Back Pain

Nonpharmacological Interventions	Pharmacological Interventions
■ Although assessment of adverse effects for nonpharmacological therapies was suboptimal, serious harms appeared rare (●○○). » Examples of reported adverse effects included mild bleeding at needling sites with acupuncture, skin irritation with massage oils, and application site skin reactions with transcutaneous electrical nerve stimulation.	■ Pharmacological therapies were associated with increased risk of adverse events when compared with placebo (●○○ to ●●○). » Although rates appeared to be low and there was no increased risk of serious adverse effects versus placebo, a significant risk from some treatments could not be ruled out. » Clinicians are advised to refer to individual studies in the report or to the drug labels of each drug for comprehensive information on their potential adverse effects.

Table 5: FDA Black Box Warnings for Drugs Used To Treat Low Back Pain

Drugs	FDA Black Box Warning
Opioids (immediate-release)	■ Misuse, abuse, addiction, overdose, and death
Nonsteroidal anti-inflammatory drugs	■ Cardiovascular thrombotic events, including myocardial infarction and stroke ■ Gastrointestinal bleeding or ulceration ■ Perforation of the stomach or intestines, which can be fatal
Antidepressants	■ Suicidal thoughts and behaviors

FDA = U.S. Food and Drug Administration

Other Findings of the Review

- Although clinical practice guidelines recommend acetaminophen as treatment for acute and chronic low back pain, evidence from a recent randomized, controlled trial suggests that acetaminophen is ineffective in treating acute low back pain (low SOE; *see Table 2*).

What To Discuss With Your Patients and Their Caregivers

- The currently available pharmacological and noninvasive nonpharmacological treatments for low back pain and how well they work
- The available evidence for the adverse effects associated with the medications and noninvasive nonpharmacological treatments for low back pain
- Their values and preferences for using pharmacological or nonpharmacological interventions in treating their low back pain
- The limited evidence for the benefits of opioids in treating chronic low back pain and the risks involved with their prolonged use

Companion Resource for Patients

Noninvasive Treatments for Low Back Pain: A Summary of the Research for Adults is a free companion to this clinician research summary. It can help patients and their caregivers talk with their health care professionals about the various treatment options that are available to treat acute, subacute, and chronic low back pain.

Ordering Information

- For electronic copies of this clinician research summary, the companion patient resource, and the full systematic review, visit *www.effectivehealthcare.ahrq.gov/low-back-pain*. To order free print copies of the patient resource, call the AHRQ Publications Clearinghouse at 800-358-9295.

Gaps in Knowledge and Limitations of the Evidence Base

Outcomes:

- Other outcomes (such as quality of life, mood, return to work, analgesic use, or utilization of health care resources) were generally reported inconsistently, and data were too sparse to permit reliable conclusions.

Disease Characteristics:

- More research is needed to determine effective treatments for low back pain with radicular symptoms.
- It is unclear if the effectiveness of interventions varies based on the etiology of low back pain.

Interventions:

- Most trials of antidepressants excluded patients with depression or only included a minority of such patients. It is unclear whether antidepressants might have additional effects on mood in patients with low back pain and depression. Furthermore, several of the trials evaluating antidepressants were funded by the manufacturers of the drugs.
- The evidence is insufficient to determine the efficacy of some pharmacological treatments (e.g., pregabalin, topiramate, topical capsaicin, topical lidocaine) for any type of low back pain.
- The evidence is insufficient to determine the efficacy of some noninvasive nonpharmacological treatments (e.g., cognitive behavioral therapy alone, electrical muscle stimulation, percutaneous electrical nerve stimulation, superficial cold, short-wave diathermy) for any type of low back pain.
- Few trials directly compared the effectiveness of different pharmacological or different noninvasive nonpharmacological therapies or the effectiveness of pharmacological versus nonpharmacological therapies; no clear differences were observed in these trials.

Source

- The information in this summary is based on *Noninvasive Treatments for Low Back Pain*, Comparative Effectiveness Review No. 169, prepared by the Pacific Northwest Evidence-based Practice Center under Contract No. 290-2012-00014-I for the Agency for Healthcare Research and Quality, February 2016. Available at *www.effectivehealthcare.ahrq.gov/low-back-pain*. This summary was prepared by the John M. Eisenberg Center for Clinical Decisions and Communications Science at Baylor College of Medicine, Houston, TX.

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