CLINICAL GUIDELINE

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Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians

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Description: The American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain.

Methods: Using the ACP grading system, the committee based these recommendations on a systematic review of randomized, controlled trials and systematic reviews published through April 2015 on noninvasive pharmacologic and nonpharmacologic treatments for low back pain. Updated searches were performed through November 2016. Clinical outcomes evaluated included reduction or elimination of low back pain, improvement in back-specific and overall function, improvement in health-related quality of life, reduction in work disability and return to work, global improvement, number of back pain episodes or time between episodes, patient satisfaction, and adverse effects.

Target Audience and Patient Population: The target audience for this guideline includes all clinicians, and the target patient population includes adults with acute, subacute, or chronic low back pain.

Recommendation 1: *Given that most patients with acute or subacute low back pain improve over time regardless of treatment, clinicians and patients should select nonpharmacologic treatment with superficial heat (moderate-quality evidence), massage, acupuncture, or spinal manipulation (low-quality evidence). If pharmacologic treatment is desired, clinicians and patients should select nonsteroidal anti-inflammatory drugs or skeletal muscle relaxants (moderate-quality evidence). (Grade: strong recommendation)*

Recommendation 2: *For patients with chronic low back pain, clinicians and patients should initially select nonpharmacologic treatment with exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction (moderate-quality evidence), tai chi, yoga, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavioral therapy, or spinal manipulation (low-quality evidence). (Grade: strong recommendation)*

Recommendation 3: *In patients with chronic low back pain who have had an inadequate response to nonpharmacologic therapy, clinicians and patients should consider pharmacologic treatment with nonsteroidal anti-inflammatory drugs as first-line therapy, or tramadol or duloxetine as second-line therapy. Clinicians should only consider opioids as an option in patients who have failed the aforementioned treatments and only if the potential benefits outweigh the risks for individual patients and after a discussion of known risks and realistic benefits with patients. (Grade: weak recommendation, moderate-quality evidence)*

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Low back pain is one of the most common reasons for physician visits in the United States. Most Americans have experienced low back pain, and approximately one quarter of U.S. adults reported having low back pain lasting at least 1 day in the past 3 months (1).

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Low back pain is associated with high costs, including those related to health care and indirect costs from missed work or reduced productivity (2). The total costs attributable to low back pain in the United States were estimated at $100 billion in 2006, two thirds of which were indirect costs of lost wages and productivity (3).

Low back pain is frequently classified and treated on the basis of symptom duration, potential cause, presence or absence of radicular symptoms, and corresponding anatomical or radiographic abnormalities. Acute back pain is defined as lasting less than 4 weeks, subacute back pain lasts 4 to 12 weeks, and chronic back pain lasts more than 12 weeks. Radicular low back pain results in lower extremity pain, paresthesia, and/or

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weakness and is a result of nerve root impingement. Most patients with acute back pain have self-limited episodes that resolve on their own; many do not seek medical care (4). For patients who do seek medical care, pain, disability, and return to work typically improve rapidly in the first month (5). However, up to one third of patients report persistent back pain of at least moderate intensity 1 year after an acute episode, and 1 in 5 report substantial limitations in activity (6). Many noninvasive treatment options are available for radicular and nonradicular low back pain, including pharmacologic and nonpharmacologic interventions.

GUIDELINE FOCUS AND TARGET POPULATION

The purpose of this American College of Physicians (ACP) guideline is to provide treatment guidance based on the efficacy, comparative effectiveness, and safety of noninvasive pharmacologic and nonpharmacologic treatments for acute (<4 weeks), subacute (4 to 12 weeks), and chronic (>12 weeks) low back pain in primary care. This guideline does not address topical pharmacologic therapies or epidural injection therapies. It serves as a partial update of the 2007 ACP guideline (it excludes evidence on diagnosis). These recommendations are based on 2 background evidence reviews (7, 8) and a systematic review sponsored by the Agency for Healthcare Research and Quality (AHRQ) (9). The target audience for this guideline includes all clinicians, and the target patient population includes adults with acute, subacute, or chronic low back pain.

METHODS

Systematic Review of the Evidence

The evidence review was conducted by the AHRQ's Pacific Northwest Evidence-based Practice Center. Additional methodological details can be found in the **Appendix** (available at Annals.org) as well as in the accompanying articles (7, 8) and full report (9). Reviewers searched several databases for studies published in English from January 2008 through April 2015 and updated the search through November 2016. Studies published before 2007 were identified using the 2007 ACP/American Pain Society (APS) systematic reviews (10, 11). Reviewers combined data when possible using meta-analysis and assessed risk of bias and study quality according to established methods. The study population included adults (aged ≥18 years) with acute, subacute, or chronic nonradicular low back pain, radicular low back pain, or symptomatic spinal stenosis.

The review evaluated pharmacologic (acetaminophen, nonsteroidal anti-inflammatory drugs [NSAIDs], opioids, skeletal muscle relaxants [SMRs], benzodiazepines, antidepressants, antiseizure medications, and systemic corticosteroids) and nonpharmacologic (psychological therapies, multidisciplinary rehabilitation, spinal manipulation, acupuncture, massage, exercise and related therapies, and various physical modalities) treatments for low back pain. Evaluated outcomes included reduction or elimination of low back pain, improvement in back-specific and overall function, improvement in health-related quality of life, reduction in work disability, return to work, global improvement, number of back pain episodes or time between episodes, patient satisfaction, and adverse effects.

Table. The American College of Physicians Guideline Grading System*

Quality of Evidence	Strength of Recommendation	
	Benefits Clearly Outweigh Risks and Burden or Risks and Burden Clearly Outweigh Benefits	**Benefits Finely Balanced With Risks and Burden**
High	Strong	Weak
Moderate	Strong	Weak
Low	Strong	Weak
Insufficient evidence to determine net benefits or risks		

* Adopted from the classification developed by the GRADE (Grading of Recommendations Assessment, Development and Evaluation) workgroup.

The magnitude of effect (small, moderate, or large) was determined as previously described (10, 11). A small effect on pain was defined as a mean between-group difference after treatment of 5 to 10 points on a visual analogue scale of 0 to 100 or equivalent, a mean between-group difference of 0.5 to 1.0 point on a numerical rating scale of 0 to 10, or a standardized mean difference of 0.2 to 0.5. A moderate effect was defined as a mean between-group difference of greater than 10 to no more than 20 points on a visual analogue scale of 0 to 100 or equivalent, a mean between-group difference of greater than 1.0 to no more than 2.0 points on a numerical rating scale of 0 to 10 or equivalent, or a standardized mean difference greater than 0.5 but no more than 0.8. For function, a small effect was defined as a mean between-group difference of 5 to 10 points on the Oswestry Disability Index (ODI), a mean between-group difference of 1 to 2 points on the Roland Morris Disability Questionnaire (RDQ), or a standardized mean difference of 0.2 to 0.5. A moderate effect on function was defined as a mean between-group difference of greater than 10 to no more than 20 points on the ODI, a mean between-group difference of greater than 2 to no more than 5 points on the RDQ, or a standardized mean difference greater than 0.5 but no more than 0.8. No large effects were found with any intervention.

Grading the Evidence and Developing Recommendations

This guideline was developed by ACP's Clinical Guidelines Committee (CGC) according to ACP's guideline development process, details of which can be found in the methods paper (12). The CGC used the evidence tables in the accompanying evidence reviews (7, 8) and full report (9) when reporting the evidence

and graded the recommendations using the ACP's guideline grading system (Table).

Peer Review

The AHRQ systematic review was sent to invited peer reviewers and posted on the AHRQ Web site for public comments. The accompanying evidence reviews (7, 8) also underwent a peer review process through the journal. The guideline underwent a peer review process through the journal and was posted online for comments from ACP Regents and ACP Governors, who represent ACP members at the regional level.

BENEFITS AND COMPARATIVE BENEFITS OF PHARMACOLOGIC THERAPIES

Acute or Subacute Low Back Pain

Appendix Table 1 (available at Annals.org) summarizes the findings for all therapies for acute or subacute low back pain.

Acetaminophen

Low-quality evidence showed no difference between acetaminophen and placebo for pain intensity or function through 4 weeks or between acetaminophen and NSAIDs for pain intensity or likelihood of experiencing global improvement at 3 weeks or earlier (13, 14).

NSAIDs

Moderate-quality evidence showed that NSAIDs were associated with a small improvement in pain intensity compared with placebo (14, 15), although several randomized, controlled trials (RCTs) showed no difference in likelihood of achieving pain relief with NSAIDs compared with placebo (16–18). Low-quality evidence showed a small increase in function with NSAIDs compared with placebo (19). Moderate-quality evidence showed that most head-to-head trials of one NSAID versus another showed no differences in pain relief in patients with acute low back pain (14). Low-quality evidence showed no differences in pain between cyclooxygenase (COX)-2–selective NSAIDs versus traditional NSAIDs (14).

SMRs

Moderate-quality evidence showed that SMRs improved short-term pain relief compared with placebo after 2 to 4 and 5 to 7 days (20, 21). Low-quality evidence showed no differences between different SMRs for any outcomes in patients with acute pain (20). Low-quality evidence showed inconsistent findings for the effect on pain intensity with a combination of SMRs plus NSAIDs compared with NSAIDs alone (20, 22, 23).

Systemic Corticosteroids

Low-quality evidence showed no difference in pain or function between a single intramuscular injection of methylprednisolone or a 5-day course of prednisolone compared with placebo in patients with acute low back pain (24, 25).

Other Therapies

Evidence was insufficient to determine effectiveness of antidepressants, benzodiazepines (26, 27), antiseizure medications, or opioids versus placebo in patients with acute or subacute low back pain.

Chronic Low Back Pain

Appendix Table 2 (available at Annals.org) summarizes the findings for all therapies for chronic low back pain.

NSAIDs

Moderate-quality evidence showed that NSAIDs were associated with small to moderate pain improvement compared with placebo (14, 28, 29). Low-quality evidence showed that NSAIDs were associated with no to small improvement in function (28–31). Moderate-quality evidence showed that most head-to-head trials of one NSAID versus another showed no differences in pain relief in patients with chronic low back pain (14). There were no data on COX-2–selective NSAIDs.

Opioids

Moderate-quality evidence showed that strong opioids (tapentadol, morphine, hydromorphone, and oxymorphone) were associated with a small short-term improvement in pain scores (about 1 point on a pain scale of 0 to 10) and function compared with placebo (32–36). Low-quality evidence showed that buprenorphine patches improved short-term pain more than placebo in patients with chronic low back pain; however, the improvement corresponded to less than 1 point on a pain scale of 0 to 10 (37–40). Moderate-quality evidence showed no differences among different long-acting opioids for pain or function (33, 41–44), and low-quality evidence showed no clear differences in pain relief between long- and short-acting opioids (45–50). Moderate-quality evidence showed that tramadol achieved moderate short-term pain relief and a small improvement in function compared with placebo (32, 51, 52).

SMRs

Evidence comparing SMRs versus placebo was insufficient (53–55). Low-quality evidence showed no differences in any outcome between different SMRs for treatment of chronic low back pain (20).

Benzodiazepines

Low-quality evidence showed that tetrazepam improved pain relief at 5 to 7 days and resulted in overall

improvement at 10 to 14 days compared with placebo (20).

Antidepressants

Moderate-quality evidence showed no difference in pain between tricyclic antidepressants (TCAs) or selective serotonin reuptake inhibitors (SSRIs) versus placebo, and low-quality evidence showed no differences in function for antidepressants (56). Moderate-quality evidence showed that duloxetine was associated with a small improvement in pain intensity and function compared with placebo (57–59).

Other Therapies

Evidence was insufficient to determine the effect of acetaminophen, systemic corticosteroids, or antiseizure medications on chronic low back pain.

Radicular Low Back Pain

Appendix Table 3 (available at Annals.org) summarizes the findings for all treatments for radicular low back pain.

Benzodiazepines

Low-quality evidence showed no difference between diazepam and placebo for function at 1 week through 1 year and analgesic use, return to work, or likelihood of surgery through 1 year of follow-up in patients with acute or subacute radicular pain (60). Diazepam resulted in a lower likelihood of pain improvement at 1 week compared with placebo.

Systemic Corticosteroids

Moderate-quality evidence showed no differences in pain between systemic corticosteroids and placebo and no to small effect on function in patients with radicular low back pain (61–66).

Other Therapies

No RCTs evaluated acetaminophen, SMRs, antidepressants, or opioids for radicular low back pain. Results for NSAIDs were inconsistent for pain, and evidence was therefore insufficient (22). There was insufficient evidence to determine the effect of antiseizure medications on radicular low back pain (67–71).

Harms of Pharmacologic Therapies

Harms were derived from the identified systematic reviews. Adverse effects generally associated with the drugs can be found in Appendix Table 4 (available at Annals.org).

Moderate-quality evidence showed no difference among scheduled acetaminophen, acetaminophen taken as needed, or placebo for serious adverse events (13). Moderate-quality evidence showed that more adverse effects occurred with NSAIDs than placebo, COX-2–selective NSAIDs were associated with a decreased risk for adverse effects compared with traditional NSAIDs, and acetaminophen was associated with a lower risk for adverse effects than NSAIDs (14). Moderate-quality evidence showed that short-term use of opioids increased nausea, dizziness, constipation, vomiting, somnolence, and dry mouth compared with placebo, and SMRs increased risk for any adverse event and central nervous system adverse events (mostly sedation) compared with placebo (20). Moderate-quality evidence showed that antidepressants increased risk for any adverse event compared with placebo, although rates of specific adverse events did not differ (72). The risk for serious adverse events did not differ between duloxetine and placebo, although duloxetine was associated with increased risk for withdrawal due to adverse events (57–59). Low-quality evidence showed no clear differences in adverse effects for gabapentin versus placebo (67, 68). Low-quality evidence showed that benzodiazepines caused more frequent somnolence, fatigue, and lightheadedness than placebo (20). Harms were not well-reported, and no RCTs assessed long-term use of benzodiazepines or risks for addiction, abuse, or overdose. Adverse events for systemic corticosteroids were not well-reported in RCTs, but the largest trial found that oral prednisone was associated with increased risk for any adverse event, insomnia, nervousness, and increased appetite (66). However, low-quality evidence showed no cases of hyperglycemia that required medical attention (24, 61, 64).

Comparative Benefits of Nonpharmacologic Therapies

Acute or Subacute Low Back Pain

Exercise

Low-quality evidence showed no difference between exercise therapy and usual care for pain or function in patients with acute or subacute pain (11); additional trials reported inconsistent results (73–75). Moderate-quality evidence showed no clear differences between different exercise regimens in more than 20 head-to-head RCTs in patients with acute low back pain.

Acupuncture

Low-quality evidence showed that acupuncture resulted in a small decrease in pain intensity compared with sham acupuncture with nonpenetrating needles, but there were no clear effects on function (76–78). Low-quality evidence showed that acupuncture slightly increased the likelihood of overall improvement compared with NSAIDs (76, 79–83).

Massage

Low-quality evidence showed that massage moderately improved short-term (1 week) pain and function compared with sham therapy for subacute low back pain (84), although 1 trial (85) showed no difference in pain or function at 5 weeks. Moderate-quality evidence showed that massage improved short-term pain relief

and function compared with other interventions (manipulation, exercise therapy, relaxation therapy, acupuncture, or physiotherapy) for patients with subacute to chronic low back pain, but effects were small (84, 86). Low-quality evidence showed that a combination of massage plus another intervention (exercise, exercise and education, or usual care) was superior to the other intervention alone for short-term pain in patients with subacute to chronic low back pain (84).

Spinal Manipulation

Low-quality evidence showed that spinal manipulation was associated with a small effect on function compared with sham manipulation; evidence was insufficient to determine the effect on pain (87, 88). Low-quality evidence showed no difference in pain relief at 1 week between spinal manipulation and inert treatment (educational booklet, detuned ultrasound, detuned or actual short-wave diathermy, antiedema gel, or bed rest), although 1 trial showed better longer-term pain relief (3 months) with spinal manipulation (89). Function did not differ between spinal manipulation and inert treatment at 1 week or 3 months (89). Moderate-quality evidence showed no difference between spinal manipulation and other active interventions for pain relief at 1 week through 1 year or function (analyses included exercise, physical therapy, or back school as the comparator) (89, 90). Low-quality evidence showed that a combination of spinal manipulation plus exercise or advice slightly improved function at 1 week compared with exercise or advice alone, but these differences were not present at 1 or 3 months (89).

Superficial Heat

Moderate-quality evidence showed that a heat wrap moderately improved pain relief (at 5 days) and disability (at 4 days) compared with placebo (91). Low-quality evidence showed that a combination of heat plus exercise provided greater pain relief and improved RDQ scores at 7 days compared with exercise alone in patients with acute pain (92). Low-quality evidence showed that a heat wrap provided more effective pain relief and improved RDQ scores compared with acetaminophen or ibuprofen after 1 to 2 days (93). Low-quality evidence showed no clear differences between a heat wrap and exercise in pain relief or function (92).

Low-Level Laser Therapy

Low-quality evidence showed that a combination of low-level laser therapy (LLLT) and NSAIDs largely decreased pain intensity and resulted in a moderate improvement in function (as measured by the ODI) compared with sham laser therapy plus NSAIDs in patients with acute or subacute pain (94).

Lumbar Supports

Low-quality evidence showed no difference in pain or function between lumbar supports added to an educational program compared with an educational program alone or other active interventions in patients with acute or subacute low back pain (95).

Other Therapies

Evidence was insufficient to determine the effectiveness of transcutaneous electrical nerve stimulation (TENS), electrical muscle stimulation, inferential therapy, short-wave diathermy, traction, superficial cold, motor control exercise (MCE), Pilates, tai chi, yoga, psychological therapies, multidisciplinary rehabilitation, ultrasound, and taping.

Chronic Low Back Pain

Exercise

Moderate-quality evidence showed that exercise resulted in a small improvement in pain relief and function compared with no exercise (11, 96). Moderate-quality evidence showed that compared with usual care, exercise resulted in small improvements in pain intensity and function at the end of treatment, although effects were smaller at long-term follow-up (96). Moderate-quality evidence showed no clear differences between different exercise regimens in more than 20 head-to-head RCTs in patients with chronic low back pain.

MCE

Motor control exercise focuses on restoring coordination, control, and strength of the muscles that control and support the spine. Low-quality evidence showed that MCE moderately decreased pain scores and slightly improved function in short- to long-term follow-up compared with a minimal intervention (97). Low-quality evidence showed that MCE resulted in small improvements in pain intensity at short-term (≥6 weeks to <4 months) and intermediate-term (≥4 to <8 months) follow-up compared with general exercise, although improvements were small and no longer significant at long-term follow-up (97). Motor control exercise also resulted in small improvements in function in the short and long term (97). Low-quality evidence showed that MCE resulted in a moderate improvement in pain intensity and function compared with multimodal physical therapy at intermediate follow-up (97). Low-quality evidence showed no clear differences in pain with a combination of MCE plus exercise versus exercise alone (98, 99).

Pilates

Low-quality evidence showed that Pilates resulted in small or no clear effects on pain and no clear effects on function compared with usual care plus physical activity (100–107). Low-quality evidence showed no clear differences between Pilates and other types of exercise for pain or function (108–110).

Tai Chi

Low-quality evidence showed that tai chi resulted in moderate pain improvement compared with wait-list controls or no tai chi (111, 112), and 1 study showed a small increase in function (111). Moderate-quality evidence showed that tai chi moderately decreased pain intensity at 3 and 6 months compared with backward walking or jogging but not versus swimming (112).

Yoga

Low-quality evidence showed that Iyengar yoga resulted in moderately lower pain scores and improved function compared with usual care at 24 weeks (113). Low-quality evidence showed that yoga resulted in a small decrease in pain intensity compared with exercise (114–118). Low-quality evidence showed that, compared with education, yoga resulted in a small decrease in short-term (≤12 weeks) but not long-term (about 1 year) pain intensity and a small increase in short- and long-term function (119).

Psychological Therapies

Low-quality evidence showed that progressive relaxation therapy moderately improved pain intensity and functional status compared with wait-list controls (120). Low-quality evidence showed that electromyography biofeedback training moderately decreased pain intensity (reduction of 5 to 13 points on a 100-point pain scale) compared with wait-list controls, but there was no effect on function (120). Low-quality evidence showed that operant therapy (behavioral therapy involving reinforcement) slightly improved pain intensity compared with wait-list control, although there was no difference for function (120). Low-quality evidence showed that cognitive behavioral therapy (CBT) and other combined psychological therapies (involving education, problem-solving training, coping techniques, imagery, relaxation, goal setting, cognitive pain control, and exercises) were associated with moderately improved pain intensity compared with wait-list controls, but there was no difference in function (120). Moderate-quality evidence showed that mindfulness-based stress reduction is an effective treatment for chronic low back pain. One study showed a small improvement in pain at 26 and 52 weeks and in function at 26 weeks compared with usual care (121). The same study showed no difference between mindfulness-based stress reduction and CBT for improvements in pain or function. Two other studies showed improvement in pain and function compared with education (122, 123). Low-quality evidence showed no difference between psychological therapies and exercise or physical therapy for pain intensity (120). Low-quality evidence showed no differences in pain or function between a combination of psychological therapy plus exercise or physiotherapy compared with exercise or physiotherapy alone (120). Moderate-quality evidence showed no differences between different psychological therapies for pain or function outcomes (120).

Multidisciplinary Rehabilitation

Moderate-quality evidence showed that multidisciplinary rehabilitation moderately reduced short-term (<3 months) and slightly reduced long-term pain intensity and disability compared with usual care, although there was no difference in return to work (124). Low-quality evidence showed that multidisciplinary rehabilitation was associated with moderately lower short-term pain intensity and slightly lower disability than no rehabilitation (124). Moderate-quality evidence showed that multidisciplinary rehabilitation was associated with slightly lower short-term pain intensity and disability, moderately lower long-term pain intensity, and improved function compared with physical therapy and a greater likelihood of returning to work compared with nonmultidisciplinary rehabilitation (124).

Acupuncture

Low-quality evidence showed that acupuncture was associated with moderate improvement in pain relief immediately after treatment and up to 12 weeks later compared with sham acupuncture, but there was no improvement in function (125–130). Moderate-quality evidence showed that acupuncture was associated with moderately lower pain intensity and improved function compared with no acupuncture at the end of treatment (125). Low-quality evidence showed a small improvement in pain relief and function compared with medications (NSAIDs, muscle relaxants, or analgesics) (125).

Massage

Low-quality evidence showed no difference in pain between foot reflexology and usual care for patients with chronic low back pain (131–133). Moderate-quality evidence showed that massage improved short-term pain relief and function compared with other interventions (manipulation, exercise therapy, relaxation therapy, acupuncture, physiotherapy, or TENS) for patients with subacute to chronic low back pain, although effects were small (84, 86). Low-quality evidence showed that a combination of massage plus another intervention (exercise, exercise and education, or usual care) was superior to the other intervention alone for short-term pain in patients with subacute to chronic low back pain (84).

Spinal Manipulation

Low-quality evidence showed no difference in pain with spinal manipulation versus sham manipulation at 1 month (134, 135). Low-quality evidence showed that spinal manipulation slightly improved pain compared with an inert treatment (136–142). Moderate-quality evidence showed no clear differences in pain or function compared with another active intervention. Low-quality evidence showed that a combination of spinal manipulation with another active treatment resulted in greater pain relief and improved function at 1, 3, and 12

months compared with the other treatment alone (134, 143–147).

Ultrasound

Low-quality evidence showed no difference between ultrasound and sham ultrasound for pain at the end of treatment or 4 weeks after treatment (148–150). Low-quality evidence showed no difference between ultrasound and no ultrasound for pain or function (151, 152).

TENS

Low-quality evidence showed no difference between TENS and sham TENS for pain intensity or function at short-term follow-up (153). Low-quality evidence showed no difference between TENS and acupuncture in short- or long-term pain (154).

LLLT

Low-quality evidence showed that LLLT slightly improved pain compared with sham laser (155–157), and 1 RCT (155) showed that LLLT slightly improved function compared with sham laser.

Lumbar Support

Evidence was insufficient to compare lumbar support versus no lumbar support. Low-quality evidence showed no difference between a lumbar support plus exercise (muscle strengthening) versus exercise alone for pain or function at 8 weeks or 6 months (158). Low-quality evidence showed no clear differences between lumbar supports and other active treatments (traction, spinal manipulation, exercise, physiotherapy, or TENS) for pain or function (159–161).

Taping

Low-quality evidence showed no differences between Kinesio taping and sham taping for back-specific function after 5 or 12 weeks, although effects on pain were inconsistent between the 2 trials (162, 163). Low-quality evidence showed no differences between Kinesio taping and exercise for pain or function (164, 165).

Other Therapies

Evidence was insufficient to determine the effectiveness of electrical muscle stimulation, interferential therapy, short-wave diathermy, traction, or superficial heat or cold.

Radicular Low Back Pain

Exercise

Low-quality evidence showed that exercise resulted in small improvements in pain and function compared with usual care or no exercise (166–168).

Traction

Low-quality evidence showed no clear differences between traction and other active treatments, between traction plus physiotherapy versus physiotherapy alone, or between different types of traction in patients with low back pain with or without radiculopathy (169).

Other Therapies

Evidence was insufficient for ultrasound, MCE, Pilates, tai chi, yoga, psychological therapies, multidisciplinary rehabilitation, acupuncture, massage, spinal manipulation, LLLT, electrical muscle stimulation, short-wave diathermy, TENS, interferential therapy, superficial heat or cold, lumbar support, and taping.

HARMS OF NONPHARMACOLOGIC THERAPIES

Evidence on adverse events from the included RCTs and systematic reviews was limited, and the quality of evidence for all available harms data is low. Harms were poorly reported (if they were reported at all) for most of the interventions.

Low-quality evidence showed no reported harms or serious adverse events associated with tai chi, psychological interventions, multidisciplinary rehabilitation, ultrasound, acupuncture, lumbar support, or traction (9, 95, 150, 170–174). Low-quality evidence showed that when harms were reported for exercise, they were often related to muscle soreness and increased pain, and no serious harms were reported. All reported harms associated with yoga were mild to moderate (119). Low-quality evidence showed that none of the RCTs reported any serious adverse events with massage, although 2 RCTs reported soreness during or after massage therapy (175, 176). Adverse events associated with spinal manipulation included muscle soreness or transient increases in pain (134). There were few adverse events reported and no clear differences between MCE and controls. Transcutaneous electrical nerve stimulation was associated with an increased risk for skin site reaction but not serious adverse events (177). Two RCTs (178, 179) showed an increased risk for skin flushing with heat compared with no heat or placebo, and no serious adverse events were reported. There were no data on cold therapy. Evidence was insufficient to determine harms of electrical muscle stimulation, LLLT, percutaneous electrical nerve stimulation, interferential therapy, short-wave diathermy, and taping.

COMPARISON OF CONCLUSIONS WITH THOSE OF THE 2007 GUIDELINE

Some evidence has changed since the 2007 ACP guideline and supporting evidence review. The 2007 review concluded that acetaminophen was effective for acute low back pain, based on indirect evidence from trials of acetaminophen for other conditions and trials of acetaminophen versus other analgesics. However, this update included a placebo-controlled RCT in patients with low back pain that showed no difference in effectiveness between acetaminophen and placebo (low-quality evidence). In addition, contrary to the 2007

review, current moderate-quality evidence showed that TCAs were not effective for chronic low back pain compared with placebo. Additional pharmacologic treatments addressed in the current review included duloxetine and the antiseizure medication pregabalin. Many conclusions about nonpharmacologic interventions are similar between the 2007 review and the update. Additional modalities assessed (with at least low-quality evidence) include mindfulness-based stress reduction, MCE, taping, and tai chi. Additional evidence or changes from the updated review include that superficial heat was found to be more effective for acute or subacute low back pain (moderate-quality evidence) and neither ultrasound nor TENS was shown to be effective compared with controls (low-quality evidence).

The **Figure** summarizes the recommendations and clinical considerations. Additional details on the evidence are available in **Appendix Tables 1** to **4** and the accompanying evidence reviews (7, 8).

RECOMMENDATIONS

Recommendation 1: Given that most patients with acute or subacute low back pain improve over time regardless of treatment, clinicians and patients should select nonpharmacologic treatment with superficial heat (moderate-quality evidence), massage, acupuncture, or spinal manipulation (low-quality evidence). If pharmacologic treatment is desired, clinicians and patients should select nonsteroidal anti-inflammatory drugs or skeletal muscle relaxants (moderate-quality evidence). (Grade: strong recommendation)

Clinicians should inform all patients of the generally favorable prognosis of acute low back pain with or without sciatica, including a high likelihood for substantial improvement in the first month (5, 180). Clinicians should also provide patients with evidence-based information with regard to their expected course, advise them to remain active as tolerated, and provide information about effective self-care options. Clinicians and patients should use a shared decision-making approach to select the most appropriate treatment based on patient preferences, availability, harms, and costs of the interventions. Nonpharmacologic interventions shown to be effective for improving pain and function in patients with acute or subacute low back pain include superficial heat (moderate-quality evidence and moderate improvement in pain and function) and massage (low-quality evidence and small to moderate improvement in pain and function). Low-quality evidence showed that acupuncture had a small effect on improving pain and spinal manipulation had a small effect on improving function compared with sham manipulation but not inert treatment. Harms of nonpharmacologic interventions were sparsely reported, and no serious adverse events were reported. Superficial heat was associated with increased risk for skin flushing, and massage and spinal manipulation were associated with muscle soreness.

We recommend that the choice between NSAIDs and SMRs be individualized on the basis of patient preferences and likely individual medication risk profile. Treatment with NSAIDs resulted in a small improvement in both pain intensity (moderate-quality evidence) and function (low-quality evidence), and treatment with SMRs resulted in a small improvement in pain relief (moderate-quality evidence). There was no evidence for the effect of SMRs on function. Nonsteroidal anti-inflammatory drugs are associated with gastrointestinal and renal risks. Clinicians should therefore assess renovascular and gastrointestinal risk factors before prescribing NSAIDs and recommend the lowest effective doses for the shortest periods necessary. Although they are associated with lower risk for adverse effects than nonselective NSAIDs, COX-2–selective NSAIDs were not assessed for improvement in pain or function. Skeletal muscle relaxants are associated with central nervous system adverse effects, especially sedation.

The updated evidence showed that acetaminophen was not effective at improving pain outcomes versus placebo. However, this study assessed pain at 3 weeks after the intervention, and evidence from head-to-head trials showed no difference between acetaminophen and NSAIDs. Low-quality evidence showed that systemic steroids were not effective in treating acute or subacute low back pain, and we recommend against these drugs for treatment of acute low back pain.

Recommendation 2: For patients with chronic low back pain, clinicians and patients should initially select nonpharmacologic treatment with exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction (moderate-quality evidence), tai chi, yoga, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavioral therapy, or spinal manipulation (low-quality evidence). (Grade: strong recommendation)

Nonpharmacologic interventions are considered as first-line options in patients with chronic low back pain because fewer harms are associated with these types of therapies than with pharmacologic options. It is important that physical therapies be administered by providers with appropriate training. Moderate-quality evidence showed that exercise therapy resulted in small improvements in pain and function. Specific components associated with greater effects on pain included individually designed programs, supervised home exercise, and group exercise; regimens that included stretching and strength training were most effective. Moderate-quality evidence showed that, compared with usual care, multidisciplinary rehabilitation resulted in moderate pain improvement in the short term (<3 months), small pain improvement in the long term, and small improvement in function in both the short and long term. Low-quality evidence showed that multidisciplinary rehabilitation resulted in a moderate improvement in pain and a small improvement in function compared with no multidisciplinary rehabilitation. Acupuncture had a moderate effect on pain and function compared with no acupuncture (moderate-quality evi-

Figure. Summary of the American College of Physicians guideline on noninvasive treatments for acute, subacute, or chronic low back pain.

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Summary of the American College of Physicians Guideline on Noninvasive Treatments for Acute, Subacute, or Chronic Low Back Pain

Disease/Condition	Low back pain
Target Audience	All clinicians
Target Patient Population	Adults with acute, subacute, or chronic low back pain
Interventions Evaluated	Pharmacologic interventions: NSAIDs, nonopioid analgesics, opioid analgesics, tramadol and tapentadol, antidepressants, SMRs, benzodiazepines, corticosteroids, antiepileptic drugs Nonpharmacologic interventions: interdisciplinary or multicomponent rehabilitation; psychological therapies; exercise and related interventions, such as yoga or tai chi; complementary and alternative medicine therapies, including spinal manipulation, acupuncture, and massage; passive physical modalities, such as heat, cold, ultrasound, transcutaneous electrical nerve stimulation, electrical muscle stimulation, interferential therapy, short-wave diathermy, traction, LLLT, lumbar supports/braces
Outcomes Evaluated	Pain, function, health-related quality of life, work disability/return to work, global improvement, number of back pain episodes or time between episodes, patient satisfaction, adverse effects
Benefits	Acute low back pain Pharmacologic NSAIDs: improved pain and function (small effect) SMRs: improved pain (small effect) Nonpharmacologic Heat wrap: improved pain and function (moderate effect) Massage: improved pain and function (at 1 but not 5 wk) (small to moderate effect) Acupuncture: improved pain (small effect) Spinal manipulation: improved function (small effect) Chronic low back pain Pharmacologic NSAIDs: improved pain (small to moderate effect) and function (no to small effect) Opioids: improved pain and function (small effect) Tramadol: improved pain (moderate effect) and function (small effect) Buprenorphine (patch or sublingual): improved pain (small effect) Duloxetine: improved pain and function (small effect) Nonpharmacologic Exercise: improved pain and function (small effect) Motor control exercise: improved pain (moderate effect) and function (small effect) Tai chi: improved pain (moderate effect) and function (small effect) Mindfulness-based stress reduction: improved pain and function (small effect) Yoga: improved pain and function (small to moderate effect, depending on comparator) Progressive relaxation: improved pain and function (moderate effect) Multidisciplinary rehabilitation: improved pain (moderate effect) and function (no to small effect) Acupuncture: improved pain (moderate effect) and function (no to moderate effect, depending on comparator) LLLT: improved pain and function (small effect) Electromyography biofeedback: improved pain (moderate effect) Operant therapy: improved pain (small effect) Cognitive behavioral therapy: improved pain (moderate effect) Spinal manipulation: improved pain (small effect) Radicular low back pain Exercise: improved pain or function (small effect)
Harms	Generally poorly reported Pharmacologic NSAIDs: increased adverse effects compared with placebo and acetaminophen (COX-2–selective NSAIDs decreased risk for adverse effects compared with traditional NSAIDs) Opioids: nausea, dizziness, constipation, vomiting, somnolence, and dry mouth SMRs: increased risk for any adverse event and central nervous system adverse events (mostly sedation) Benzodiazepines: somnolence, fatigue, lightheadedness Antidepressants: increased risk for any adverse event Nonpharmacologic Poorly reported, but no increase in serious adverse effects

Continued on following page

Figure–Continued

Recommendations	***Recommendation 1: Given that most patients with acute or subacute low back pain improve over time regardless of treatment, clinicians and patients should select nonpharmacologic treatment with superficial heat (moderate-quality evidence), massage, acupuncture, or spinal manipulation (low-quality evidence). If pharmacologic treatment is desired, clinicians and patients should select nonsteroidal anti-inflammatory drugs or skeletal muscle relaxants (moderate-quality evidence). (Grade: strong recommendation)*** ***Recommendation 2: For patients with chronic low back pain, clinicians and patients should initially select nonpharmacologic treatment with exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction (moderate-quality evidence), tai chi, yoga, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavioral therapy, or spinal manipulation (low-quality evidence). (Grade: strong recommendation)*** ***Recommendation 3: In patients with chronic low back pain who have had an inadequate response to nonpharmacologic therapy, clinicians and patients should consider pharmacologic treatment with nonsteroidal anti-inflammatory drugs as first-line therapy, or tramadol or duloxetine as second-line therapy. Clinicians should only consider opioids as an option in patients who have failed the aforementioned treatments and only if the potential benefits outweigh the risks for individual patients and after a discussion of known risks and realistic benefits with patients. (Grade: weak recommendation, moderate-quality evidence)***
High-Value Care	**Clinicians should reassure patients that acute or subacute low back pain usually improves over time regardless of treatment and should avoid prescribing costly and potentially harmful treatments. Systemic steroids were not shown to provide benefit and should not be prescribed for patients with acute or subacute low back pain, even with radicular symptoms. For treatment of chronic low back pain, clinicians should select therapies that have the fewest harms and lowest costs. Clinicians should avoid prescribing costly therapies and those with substantial potential harms, such as long-term opioids, and pharmacologic therapies that were not shown to be effective, such as tricyclic antidepressants and selective serotonin reuptake inhibitors.**
Clinical Considerations	**Clinicians should inform patients with acute or subacute low back pain of the generally very favorable outcome. Thus, patients can avoid potentially harmful and costly tests and treatments.** **Clinicians should advise patients with acute, subacute, or chronic low back pain to remain active as tolerated.** **Improvements in pain and function due to pharmacologic and nonpharmacologic interventions were small and often showed no clear differences compared with controls.** **Few differences in recommended therapies were found when they were studied in head-to-head trials. Therefore, clinicians should base treatment recommendations on patient preferences that also minimize harms and costs.**

COX-2 = cyclooxygenase-2; LLLT = low-level laser therapy; NSAID = nonsteroidal anti-inflammatory drug; SMR = skeletal muscle relaxant.

dence) and a moderate effect on pain with no clear effect on function compared with sham acupuncture (low-quality evidence). Moderate-quality evidence showed that mindfulness-based stress reduction resulted in small improvements in pain and function (small effect), and 1 study showed that it was equivalent to CBT for improving back pain and function.

Low-quality evidence showed that tai chi had a moderate effect on pain and a small effect on function. Tai chi sessions in included studies lasted 40 to 45 minutes and were done 2 to 5 times per week for 10 to 24 weeks. Low-quality evidence showed that yoga improved pain and function by a moderate amount compared with usual care and by a small amount compared with education. Low-quality evidence showed that MCE had a moderate effect on pain and a small effect on function. Motor control exercise, tai chi, and yoga were favored over general exercise (low-quality evidence).

Low-quality evidence showed that progressive relaxation had a moderate effect on pain and function, electromyography biofeedback and CBT each had a moderate effect on pain and no effect on function, and operant therapy had a small effect on pain and no effect on function. Low-quality evidence showed that LLLT had a small effect on pain and function. Low-quality evidence showed that spinal manipulation had a small effect on pain compared with inert treatment but no effect compared with sham manipulation. There were no clear differences between spinal manipulation and other active interventions (moderate-quality evidence).

Harms were poorly reported for nonpharmacologic therapies, although no serious harms were reported for any of the recommended interventions. Muscle soreness was reported for exercise, massage, and spinal manipulation.

Ultrasound, TENS, and Kinesio taping had no effect on pain or function compared with control treatments (low-quality evidence).

Recommendation 3: In patients with chronic low back pain who have had an inadequate response to nonpharmacologic therapy, clinicians and patients should consider pharmacologic treatment with nonsteroidal anti-inflammatory drugs as first-line therapy, or tramadol or duloxetine as second-line therapy. Clinicians should only consider opioids as an option in patients who have failed the aforementioned treatments and only if the potential benefits outweigh the risks for individual patients and after a discussion of known risks and realistic benefits with patients. (Grade: weak recommendation, moderate-quality evidence)

Pharmacologic therapy should be considered for patients with chronic low back pain who do not improve with nonpharmacologic interventions. Nonsteroidal anti-inflammatory drugs had a small to moderate effect on pain (moderate-quality evidence) and no to

small effect on function (low-quality evidence) and should be the first option considered. Moderate-quality evidence showed no difference in pain improvement when different NSAIDs were compared with one another. Nonsteroidal anti-inflammatory drugs are associated with gastrointestinal and renal risks. Clinicians should therefore assess renovascular and gastrointestinal risk factors before prescribing NSAIDs and should recommend the lowest effective doses for the shortest periods necessary. COX-2–selective NSAIDs were not assessed for improvement in pain or function, although they are associated with lower risk for adverse effects than nonselective NSAIDs.

For second-line therapies, moderate-quality evidence showed that tramadol had a moderate effect on pain and a small effect on function in the short term. Of note, tramadol is a narcotic and, like other opioids, is associated with the risk for abuse (181). Moderate-quality evidence showed that duloxetine had a small effect on pain and function.

Moderate-quality evidence showed that opioids (morphine, oxymorphone, hydromorphone, and tapentadol) had a small effect on short-term pain and function. Low-quality evidence showed that buprenorphine (patch or sublingual) resulted in a small improvement in pain. Opioids should be the last treatment option considered and should be considered only in patients for whom other therapies have failed because they are associated with substantial harms. Moderate-quality evidence showed no difference in pain or function when different long-acting opioids were compared with one another. Harms of short-term use of opioids include increased nausea, dizziness, constipation, vomiting, somnolence, and dry mouth compared with placebo. Studies assessing opioids for the treatment of chronic low back pain did not address the risk for addiction, abuse, or overdose, although observational studies have shown a dose-dependent relationship between opioid use for chronic pain and serious harms (182).

Moderate-quality evidence showed that TCAs did not effectively improve pain or function (low-quality evidence) in patients with chronic low back pain, which is contrary to the 2007 guideline. In addition, moderate-quality evidence showed that SSRIs did not improve pain.

Areas of Inconclusive Evidence

Evidence is insufficient or lacking to determine treatments for radicular low back pain. Most RCTs enrolled a mixture of patients with acute, subacute, and chronic low back pain, so it is difficult to extrapolate the benefits of treatment compared with its duration. Use of opioids for chronic pain is an important area that requires further research to compare benefits and harms of therapy. The evidence is also insufficient for most physical modalities. Evidence is insufficient on which patients are likely to benefit from which specific therapy. Evidence on patient-important outcomes, such as disability or return to work, was largely unavailable, and available evidence showed no clear connection with improvements in pain.

High-Value Care

Clinicians should reassure patients that acute or subacute low back pain usually improves over time, regardless of treatment. Thus, clinicians should avoid prescribing costly and potentially harmful treatments for these patients, especially narcotics. In addition, systemic steroids were not shown to provide benefit and should not be prescribed for patients with acute or subacute low back pain, even with radicular symptoms. For treatment of chronic low back pain, clinicians should select therapies that have the fewest harms and lowest costs because there were no clear comparative advantages for most treatments compared with one another. Clinicians should avoid prescribing costly therapies; those with substantial potential harms, such as long-term opioids (which can be associated with addiction and accidental overdose); and pharmacologic therapies that were not shown to be effective, such as TCAs and SSRIs.

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Appendix: Detailed Methods

The evidence review was conducted by the AHRQ's Pacific Northwest Evidence-based Practice Center. Details of the ACP guideline development process can be found in ACP's methods paper (12). Disclosures of interests and management of any conflicts can be found at www.acponline.org/clinical_information/guidelines/guidelines/conflicts_cgc.htm.

Key Questions Addressed

1. What are the comparative benefits and harms of different pharmacologic therapies for acute or chronic nonradicular low back pain, radicular low back pain, or spinal stenosis, including NSAIDs, acetaminophen, opioids, muscle relaxants, antiseizure medications, antidepressants, corticosteroids, and topical or patch-delivered medications?

2. What are the comparative benefits and harms of different nonpharmacologic, noninvasive therapies for acute or chronic nonradicular low back pain, radicular low back pain, or spinal stenosis, including but not limited to interdisciplinary rehabilitation, exercise (various types), physical modalities (ultrasound, TENS, electrical muscle stimulation, interferential therapy, heat [various forms], and ice), traction tables/devices, back supports/bracing, spinal manipulation, various psychological therapies, acupuncture, massage therapy (various types), yoga, magnets, and low-level lasers?

Search Strategy

Reviewers searched MEDLINE, the Cochrane Central Register of Controlled Trials, and the Cochrane Database of Systematic Reviews for trials published from January 2008 through April 2015. Searches were updated through November 2016. Studies published before 2008 were identified using the 2007 ACP/APS systematic reviews (10, 11).

Quality Assessment

Randomized trials were evaluated using methods developed by the Cochrane Back Review Group and the AHRQ (183), and systematic reviews were assessed using AMSTAR (A Measurement Tool to Assess Systematic Reviews) (184).

Population Studied

Adults with acute, subacute, or chronic nonradicular low back pain, radicular low back pain, or symptomatic spinal stenosis.

Interventions Evaluated

Oral or topical pharmacologic therapies included NSAIDs, acetaminophen, opioids, tramadol and tapentadol, antidepressants, SMRs, benzodiazepines, corticosteroids, antiepileptic medications, capsaicin, and lidocaine.

Noninvasive, nonpharmacologic therapies included interdisciplinary or multicomponent rehabilitation (physical therapy plus psychological therapy with some coordination), psychological therapies, exercise and related interventions (such as yoga or tai chi), complementary and alternative medicine therapies (spinal manipulation, acupuncture, and massage), passive physical modalities (such as heat, cold, ultrasound, TENS, electrical muscle stimulation, interferential therapy, short-wave diathermy, traction, LLLT, and lumbar supports/braces), and taping.

Comparators

Interventions were compared with each other or with placebo (drug trials), sham (functionally inert) treatments, or no treatment.

Outcomes

Outcomes included reduction or elimination of low back pain (including related leg symptoms), improvement in back-specific and overall function, improvement in health-related quality of life, reduction in work disability and return to work, global improvement, number of back pain episodes or time between episodes, patient satisfaction, and adverse effects of interventions.

Timing

Timing of outcomes was stratified as long-term (≥1 year) and short-term (≤6 months).

Setting

Settings included inpatient and outpatient.

Target Audience

The target audience includes all clinicians.

Target Patient Population

The target patient population includes adults with acute (<4 weeks), subacute (4 to 12 weeks), or chronic (>12 weeks) nonradicular low back pain, radicular low back pain, or symptomatic spinal stenosis. Children or adolescents with low back pain; pregnant women; and patients with low back pain from sources outside the back (nonspinal low back pain), fibromyalgia or other myofascial pain syndromes, and thoracic or cervical back pain are not included.

Peer Review

The AHRQ systematic review was sent to invited peer reviewers and posted on the AHRQ Web site for public comments. The accompanying evidence reviews (7, 8) also underwent a peer review process through the journal. The guideline underwent a peer review process through the journal and was posted online for comments from ACP Regents and ACP Governors, who represent ACP members at the regional level.

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Appendix Table 1. Pharmacologic and Nonpharmacologic Treatments for Acute or Subacute Low Back Pain

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Pharmacologic treatments vs. placebo (acute only)				
Acetaminophen				
	Pain	No effect	Low (1 RCT)	0 to 10 scale: Score differences, ≤0.20 point
	Function	No effect	Low (1 RCT)	RDQ: Score differences, ≤0.60 point
NSAIDs				
	Pain	Small (pain intensity) No effect (pain relief)	Moderate (5 RCTs)	0 to 100 scale: WMD, −8.39 (95% CI, −12.68 to −4.10; chi-square, 3.47; $P > 0.10$)
	Function	Small	Low (2 RCTs)	0 to 24 RDQ: Score differences, 2.4 to 2.9 points; $P < 0.001$
SMRs				
	Pain	Small	Moderate (5 RCTs)	0- to 10-point visual analogue scale 2 to 4 d: RR, 1.25 (CI, 1.12 to 1.41) 5 to 7 d: RR, 1.72 (CI, 1.32 to 2.22)
Systemic corticosteroids				
	Pain	No effect	Low (2 RCTs)	No clear difference (single intramuscular injection or a 5-d course of systemic corticosteroids)
	Function	No effect	Low (2 RCTs)	
Nonpharmacologic treatments vs. sham, no treatment, or usual care (acute or subacute)				
Exercise vs. usual care				
	Pain	No effect	Low (6 RCTs)	0 to 100 scale Acute, intermediate-term: WMD, 0.59 (CI, −11.51 to 12.69) Subacute: WMD, 1.89 (CI, −1.13 to 4.91)
	Function	No effect	Low (6 RCTs)	Acute, short-term: WMD, −2.82 (CI, −15.35 to 9.71) Acute, intermediate-term: WMD, 2.47 (CI, −0.26 to 5.21) Subacute: WMD, 1.07 (CI, −3.18 to 5.32)
Acupuncture vs. sham acupuncture				
	Pain	Small	Low (2 RCTs)	0 to 100 scale MD, 9.38 (CI, 1.76 to 17.0; $I^2 = 27\%$) 3 other trials reported effects consistent with these findings
	Function	No effect	Low (5 RCTs)	No clear effect
Massage vs. sham massage				
	Pain	1 wk: Moderate 5 wk: No effect	Low (2 RCTs)	1 wk: SMD, −0.92 (CI, −1.35 to −0.48) There was no significant difference in pain at 5 wk in 1 trial
	Function	1 wk: Moderate 5 wk: No effect	Low (2 RCTs)	1 wk: SMD, −1.76 (CI, −3.19 to −0.32) There was no significant difference in function at 5 wk in 1 trial
Spinal manipulation vs. inert treatment				
	Pain	No effect	Low (3 RCTs)	0 to 10 scale at 1 wk: WMD, 0.14 (CI, −0.69 to 0.96; $I^2 = 27\%$), although 1 trial found spinal manipulation to be associated with better pain relief at 3 mo; MD, −1.20 (CI, 2.11 to −0.29)
	Function	No effect	Low (2 RCTs)	1 wk: SMD, −0.08 (CI, −0.37 to 0.21; $I^2 = 0\%$) 3 mo: SMD, −0.28 (CI, −0.59 to 0.02)
Spinal manipulation vs. sham treatment				
	Function	Small	Low (2 RCTs)	Statistically significant in 1 trial
Heat wrap vs. placebo				
	Pain	Moderate	Moderate (4 RCTs)	0 to 5 scale, 5 d: MD, 1.06 (CI, 0.68 to 1.45) 0 to 100 scale, 3 to 4 d: score differences, 16 to 20 points
	Function	Moderate	Moderate (2 RCTs)	RDQ, 4 d: MD, −2.10 (CI, −3.19 to −1.01)

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Appendix Table 1–Continued

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Comparative benefits of pharmacologic and nonpharmacologic treatments				
NSAID vs. NSAID				
	Pain	No difference	Moderate (21 RCTs)	No reported differences in 15 of 21 trials
Acetaminophen vs. NSAID				
	Pain	No difference	Low (4 RCTs)	Pooled SMD, 0.21 (CI, −0.02 to 0.43)
	Function	No difference	Low (4 RCTs)	RR, 0.81 (CI, 0.58 to 1.14)
COX-2–selective NSAID vs. traditional NSAID				
	Pain	No difference	Low (3 RCTs)	No clear differences
SMR vs. another SMR				
	Pain	No difference	Low (2 RCTs)	No differences for carisoprodol vs. cyclobenzaprine or tizanidine vs. chlorzoxazone
	Function	No difference	Low (2 RCTs)	
Exercise vs. exercise				
	Pain	No difference	Moderate (>20 RCTs)	No clear differences in >20 head-to-head trials of patients
	Function	No difference	Moderate (>20 RCTs)	
Lumbar support vs. other active treatments				
	Pain	No difference	Low (3 RCTs)	3 trials found no clear differences between lumbar supports vs. other active treatments in pain or function
	Function	No difference	Low (3 RCTs)	
Acupuncture vs. NSAIDs				
	Overall improvement	Small	Low (5 RCTs)	RR, 1.11 (CI, 1.06 to 1.16; I^2 = 0%)
Spinal manipulation vs. other active treatments (exercise, physical therapy, or back school)				
	Pain	No difference	Moderate (3 RCTs)	0 to 10 scale 1 wk: WMD (CI, −0.53 to 0.65; I^2 = 0%) 1 mo: WMD, −0.15 (CI, −0.49 to 0.18; I^2 = 0%) 3 to 6 mo: WMD, −0.20 (CI, −1.13 to 0.73; I^2 = 81%) 1 y: mean difference, 0.40 (CI, −0.08 to 0.88)
	Function	No difference	Moderate (3 RCTs)	Findings were similar for function, with no differences observed at any time point
Heat vs. simple analgesics				
	Pain	Small	Low (1 RCT)	0 to 10 scale 1 to 2 d, acetaminophen: MD, 0.90 (CI, 0.50 to 1.30) 1 to 2 d, ibuprofen: MD, 0.65 (CI, 0.25 to 1.05)
	Function	Small	Low (1 RCT)	RDQ 1 to 2 d, acetaminophen: MD, 2.00 (CI, 0.86 to 3.14) 1 to 2 d, ibuprofen: MD, 2.20 (CI, 1.11 to 3.29)
Heat vs. exercise				
	Pain	No difference	Low (1 RCT)	0 to 10 scale Days 1 to 2: MD, 0.40 (CI, −0.15 to 0.95) Day 7: MD, 0.30 (CI, −0.68 to 1.28)
	Function	No difference	Low (1 RCT)	RDQ Day 4: MD, −0.70 (CI, −2.09 to 0.69) Day 7: MD, −0.90 (CI, −2.84 to 1.04)

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Appendix Table 1–Continued

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Combination therapy treatments vs. monotherapy treatments or no treatment (acute or subacute)				
SMR + NSAID vs. NSAID alone				
	Pain	Inconsistent benefit	Low (3 RCTs)	Estimate from 3 trials favored combination therapy: RR, 1.56 (CI, 0.92 to 2.70; I^2 = 84%), but another trial found no effect
Massage vs. other treatments (manipulation, exercise therapy, relaxation therapy, acupuncture, or physiotherapy) vs. other treatment alone (subacute to chronic)				
	Pain	Small	Moderate (9 RCTs)	0 to 10 scale, short-term: Better effects in 7 of 9 trials (MDs, −0.6 to −0.94 points)
	Function	Small	Moderate (4 RCTs)	Short-term: Better effects on short-term function in 3 of 4 trials
Massage plus another active treatment (exercise, exercise and education, or usual care) vs. the other treatment alone (subacute to chronic)				
	Pain	Improved	Low (5 RCTs)	Short-term: Superior to other intervention without massage; effects stronger when massage combined with exercise
	Function	Improved	Low (5 RCTs)	Long-term: Few differences
Spinal manipulation plus exercise or advice vs. exercise or advice alone				
	Function	1 wk: Small 1 or 3 mo: No difference	Low (4 RCTs)	1 wk: SMD, −0.41 (CI, −0.73 to −0.10; I^2 = 18%) 1 mo: SMD, −0.09 (CI, −0.39 to 0.21; I^2 = 37%) 3 mo: SMD, −0.22 (CI, −0.61 to 0.16; I^2 = 41%)
Heat plus exercise vs. exercise alone				
	Pain	Small	Low (1 RCT)	0 to 10 scale: MD, 1.40 (CI, 0.69 to 2.11)
	Function	Small	Low (1 RCT)	RDQ at 7 d: MD, −3.20 (CI, −5.42 to 0)
LLLT + NSAID vs. sham + NSAID				
	Pain	Large	Low (1 RCT)	0 to 100 scale at 3 wk: Mean change, −30.0 vs. −15.7 vs. −20.8
	Function	Moderate	Low (1 RCT)	ODI at 3 wk: Mean change, −12.0 vs. −6.5 vs. −10.0
Lumbar support plus education vs. education				
	Pain	No difference	Low (1 RCT)	No reported differences after 1 y
	Function	No difference	Low (1 RCT)	

COX-2 = cyclooxygenase-2; LLLT = low-level laser therapy; MD = mean difference; NSAID = nonsteroidal anti-inflammatory drug; ODI = Oswestry Disability Index; RCT = randomized, controlled trial; RDQ = Roland Morris Disability Questionnaire; RR = relative risk; SMD = standardized mean difference; SMR = skeletal muscle relaxant; WMD = weighted mean difference.

Appendix Table 2. Pharmacologic and Nonpharmacologic Treatments for Chronic Low Back Pain

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Pharmacologic treatments vs. placebo				
NSAIDs				
	Pain	Small to moderate	Moderate (6 RCTs)	0 to 100 scale, 12 wk: WMD, −12.40 (95% CI, −15.53 to −9.26; chi-square, 1.82; $P > 0.5$) 0 to 10 scale, 12 to 16 wk: Score changes, 0.41 to 0.59 ≥30% pain relief: 56.8% vs. 31.7% and 37% vs. 27%
	Function	Small to no effect	Low (4 RCTs)	RDQ: MDs, ~0.02 to 2.00 points
Strong opioids				
	Pain	Small	Moderate (10 RCTs)	0 to 10 scale: SMD, −0.43 (CI, −0.52 to −0.33; $I^2 = 0\%$; MD, ~1 point)
	Function	Small	Moderate (8 RCTs)	RDQ: SMD, −0.26 (CI, −0.37 to −0.15; $I^2 = 0\%$; MD, ~1 point)
Tramadol				
	Pain	Moderate	Moderate (7 RCTs)	0 to 10 scale: SMD, −0.55 (CI, −0.66 to −0.44; $I^2 = 86\%$; MD, ≤1 point)
	Function	Small	Moderate (7 RCTs)	RDQ: SMD, −0.18 (CI, −0.29 to −0.07; $I^2 = 0\%$); MD, ~1 point)
Opioids: buprenorphine patch or sublingual (subacute or chronic)				
	Pain	Small	Low (3 RCTs)	0 to 10 scale: Score difference, ~1 point
Tetrazepam				
	Pain	Lower likelihood of failure to improve	Low (2 RCTs)	5 to 7 d: RR, 0.82 (CI, 0.72 to 0.94) 10 to 14 d: RR, 0.71 (CI, 0.54 to 0.93)
	Overall improvement	Lower likelihood of failure to improve	Low (2 RCTs)	10 to 14 d: RR, 0.63 (CI, 0.42 to 0.97)
TCAs				
	Pain	No effect	Moderate (4 RCTs)	SMD, −0.10 (CI, −0.51 to 0.31; $I^2 = 32\%$)
Antidepressants				
	Function	No effect	Low (2 RCTs)	SMD, −0.06 (CI, −0.40 to 0.29; $I^2 = 0\%$)
SSRI				
	Pain	No effect	Moderate (3 RCTs)	SMD, 0.11 (CI, −0.17 to 0.39; $I^2 = 0\%$)
Duloxetine				
	Pain	Small	Moderate (3 RCTs)	0 to 10 scale: Mean between-group difference, 0.58 to 0.74
	Function	Small	Moderate (3 RCTs)	RDQ: Mean change from baseline, −2.69 vs. −2.22; $P = 0.26$
Nonpharmacologic treatments vs. sham, no treatment, or usual care				
Exercise vs. no exercise				
	Pain	Small	Moderate (19 RCTs)	0 to 100 scale: WMD, 10.0 (CI, 1.31 to 19.09)
	Function	Small	Moderate (18 RCTs)	0 to 100 scale: Not statistically significant; WMD, 3.0 (CI, −0.53 to 6.48)
Exercise vs. usual care				
	Pain	Small	Moderate (3 RCTs)	0 to 100 scale Treatment end: WMD, −9.23 (CI, −16.02 to −2.43) Long-term: MD, −4.94 (CI, −10.45 to 0.58)
	Function	Small	Moderate (18 RCTs)	0 to 100 scale Treatment end: WMD, −12.35 (CI, −23.0 to −1.69) Long-term: MD, −3.17 (CI, −5.96 to −0.38)
MCE vs. minimal intervention				
	Pain	Moderate	Low (2 RCTs)	0 to 100 scale Short-term: WMD, −12.48 (CI, −19.04 to −5.93) Intermediate-term: WMD, −10.18 (CI, −16.64 to −3.72) Long-term: WMD, −13.32 (CI, −19.75 to −6.90)
	Function	Small	Low (3 RCTs)	0 to 100 scale Short-term: WMD, −9.00 (CI, −15.28 to −2.73) Intermediate-term: WMD, −5.62 (CI, −10.46 to −0.77) Long-term: WMD, −6.64 (CI, −11.72 to −1.57)
Tai chi vs. wait list or no tai chi				
	Pain	Moderate	Low (2 RCTs)	0 to 10 scale: MDs, 0.9 and 1.3
	Function	Small	Low (1 RCT)	RDQ: MD, 2.6 (CI, 1.1 to 3.7)

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Appendix Table 2–Continued

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Yoga vs. usual care				
	Pain	Moderate	Low (1 RCT)	0 to 100 VAS, 24 wk: Mean scores, 24 vs. 37 ($P < 0.001$)
	Function	Moderate	Low (1 RCT)	0 to 100 ODI, 24 wk: Mean scores, 18 vs. 21 ($P < 0.01$)
Yoga vs. education				
	Pain	Short-term: Small Long-term: No difference	Low (5 RCTs)	Short-term; SMD, −0.45 (CI, −0.63 to −0.26; $I^2 = 0\%$) Long-term: Not statistically significant; SMD, −0.28 (CI, −0.58 to −0.02; $I^2 = 47\%$)
	Function	Small	Low (5 RCTs)	Short-term: SMD, 0.45 (CI, −0.65 to −0.25; $I^2 = 8\%$) Long-term: SMD, 0.39 (CI, −0.66 to −0.11; $I^2 = 40\%$)
Mindfulness-based stress reduction vs. usual care				
	Pain	Improved	Moderate (3 RCTs)	0 to 10 scale, 26 wk: Score difference, −0.64 ≥30% improvement: RR, 1.64 (CI, 1.15 to 2.34)
	Function	Improved	Moderate (3 RCTs)	RDQ, 26 wk: score difference, −1.37 ≥30% improvement: RR, 1.37 (CI, 1.06 to 1.77)
Progressive relaxation vs. wait-list control				
	Pain	Moderate	Low (3 RCTs)	0 to 100 VAS: MD, −19.77 (CI, −34.0 to −5.20; $I^2 = 57\%$)
	Function	Moderate	Low (3 RCTs)	SMD, −0.88 (CI, −1.36 to −0.39; $I^2 = 0\%$)
Electromyography biofeedback vs. wait-list control or placebo				
	Pain	Moderate	Low (3 RCTs)	SMD, −0.80 (CI, −1.32 to −0.28; $I^2 = 0\%$)
	Function	No effect	Low (3 RCTs)	No clear effect
Operant therapy vs. wait-list control				
	Pain	Small	Low (3 RCTs)	0 to 100 VAS or 0 to 78 McGill: SMD, −0.43 (CI, −0.75 to −0.1; $I^2 = 0\%$)
	Function	No effect	Low (2 RCTs)	0 to 100 Sickness Impact Profile: MD, −1.18 (CI, −3.53 to 1.18)
CBT vs. wait-list control				
	Pain	Moderate	Low (5 RCTs)	0 to 100 VAS or 0 to 78 McGill: SMD, −0.60 (CI, −0.97 to −0.22; $I^2 = 40\%$)
	Function	No effect	Low (4 RCTs)	Sickness Impact Profile: Not statistically significant; SMD, −0.37 (CI, −0.87 to 0.13; $I^2 = 50\%$)
Multidisciplinary rehabilitation vs. usual care				
	Pain	Short-term: Moderate Long-term: Small	Moderate (9 RCTs)	0 to 10 scale <3 mo: SMD, −0.55 (CI, −0.83 to −0.28) or ~1.4-point MD Long-term: SMD, −0.21 (CI, −0.37 to −0.04) or ~0.5-point MD
	Disability	Small	Moderate (9 RCTs)	RDQ <3 mo: SMD, −0.41 (CI, −0.62 to −0.19) or ~2.5-point MD Long-term: SMD, −0.23 (CI, −0.40 to −0.06) or ~1.4-point MD
	Return to work	No effect	Moderate (7 RCTs)	Short-term: OR, 1.07 (CI, 0.60 to 1.90) Long-term: OR, 1.04 (CI, 0.73 to 1.47)
Multidisciplinary rehabilitation vs. no multidisciplinary rehabilitation				
	Pain	Moderate	Low (3 RCTs)	0 to 10 scale: SMD, −0.73 (CI, −1.22 to −0.24; $I^2 = 64\%$) or ~1.7-point MD
	Disability	Small	Low (3 RCTs)	RDQ: Pooled SMD, −0.49 (CI, −0.76 to −0.22; $I^2 = 0\%$) or ~2.9-point MD
Acupuncture vs. sham acupuncture				
	Pain	Moderate	Low (9 RCTs)	Immediately at the end of treatment: WMD, −16.76 (CI, −33.3 to −0.19; $I^2 = 90\%$) 12 wk: WMD, −9.55 (CI, −16.5 to −2.58; $I^2 = 40\%$)
	Function	No effect	Low (9 RCTs)	No reported differences
Acupuncture vs. no acupuncture				
	Pain	Moderate	Moderate (4 RCTs)	Immediately: SMD, −0.72 (CI, −0.94 to −0.49; $I^2 = 51\%$)
	Function	Moderate	Moderate (3 RCTs)	Immediately: SMD, −0.94 (CI, −1.41 to −0.47; $I^2 = 78\%$)

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Appendix Table 2–Continued

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Massage vs. usual care				
Pain		No effect	Low (1 RCT)	1 trial found no difference between foot reflexology vs. usual care in pain or function, and 1 trial found structural or relaxation massage to be associated with better function (mean, 2.5 to 2.9 points on the RDQ) vs. usual care at 10 wk; effects were less pronounced at 52 wk
Spinal manipulation vs. sham treatment				
Pain		No effect	Low (4 RCTs)	0 to 100 scale, 1 mo: WMD, −3.24 (CI, −13.62 to 7.15)
Spinal manipulation vs. inert treatment				
Pain		Small	Low (7 RCTs)	0 to 10 scale: MD, 0.9 (CI, 0.1 to 1.7)
Ultrasound vs. sham ultrasound				
Pain		No effect	Low (5 RCTs)	0 to 100 scale Immediately: MD, −7.12 (CI, −18.0 to 3.75; I^2 = 77%) 4 wk: No reported differences in 2 trials
Ultrasound vs. no ultrasound				
Pain		No effect	Low (5 RCTs)	0 to 100 scale: MD, −2.16 (CI, −4.66 to 0.34; I^2 = 0%)
Function		No effect	Low (5 RCTs)	0 to 100 scale: MD, −0.41 (CI, −3.14 to 2.32)
TENS vs. sham treatment				
Pain		No effect	Low (4 RCTs)	0 to 100 scale: WMD, −4.47 (CI, −12.84 to 3.89)
Disability		No effect	Low (2 RCTs)	0 to 100 scale: WMD, −1.36 (CI, −4.38 to 1.66)
LLLT vs. sham laser				
Pain		Small	Low (3 RCTs)	3 of 4 trials showed improvement
Function		Small	Low (1 RCT)	1 trial showed improvement
Kinesio taping vs. sham taping				
Function		No effect	Low (2 RCTs)	No effect on back-specific function at 5 or 12 wk
Comparative benefits of pharmacologic and nonpharmacologic treatments				
NSAID vs. NSAID				
Pain		No difference	Moderate (6 RCTs)	No reported differences in 6 of 6 trials
Long-acting opioids vs. long-acting opioids				
Pain		No difference	Moderate (4 RCTs)	No clear differences (oral morphine vs. transdermal fentanyl or oxymorphone vs. oxycodone or morphine vs. oxycodone)
Function		No difference	Moderate (4 RCTs)	
Long-acting opioids vs. short-acting opioids*				
Pain		No difference	Low (6 RCTs)	No clear differences
SMR vs. another SMR				
Pain		No difference	Low (2 RCTs)	No reported differences (pridinol vs. thiocolchicoside)
Diazepam vs. cyclobenzaprine				
Muscle spasms		No difference	Low (2 RCTs)	No clear difference
MCE vs. general exercise				
Pain		Small	Low (6 RCTs)	0 to 100 scale Short-term: WMD, −7.80 (CI, −10.95 to −4.65) Intermediate-term: WMD, −6.06 (CI, −10.94 to −1.18) Long-term: Not statistically significant; WMD, −3.10 (CI, −7.03 to 0.83)
Function		Small	Low (6 RCTs)	0 to 100 scale Short-term: WMD, −4.65 (CI, −6.20 to −3.11) Long-term: WMD, −4.72 (CI, −8.81 to −0.63)
MCE vs. multimodal physical therapy				
Pain		Moderate	Low (4 RCTs)	0 to 100 scale, intermediate-term: WMD, −14.20 (CI, −21.23 to −7.16)
Function		Moderate	Low (2 RCTs)	0 to 100 scale, intermediate-term: WMD, −12.98 (CI, −19.49 to −6.47)

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Appendix Table 2–Continued

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Exercise vs. exercise				
	Pain	No difference	Moderate (>20 RCTs)	No clear differences in >20 head-to-head trials of patients
	Function	No difference	Moderate (>20 RCTs)	
Pilates vs. usual care + physical activity				
	Pain	Small to no effect	Low (7 RCTs)	Small (MD, −1.6 to −4.1 points) to no effect on pain
	Function	No effect	Low (7 RCTs)	No clear effects
Pilates vs. other exercise				
	Pain	No difference	Low (3 RCTs)	No clear differences
	Function	No difference	Low (3 RCTs)	
Tai chi vs. other exercise				
	Pain	Moderate	Low (1 RCT)	Backward walking or jogging through 6 mo: MDs, −0.7 and −0.8 Swimming: No reported differences (MD, −0.1 at 3 and 6 mo)
Yoga vs. exercise				
	Pain	Small	Low (5 RCTs)	Lower pain intensity vs. exercise in most trials, although effects were small and differences were not always statistically significant
Psychological therapies vs. exercise or physical therapy				
	Pain	No difference	Low (6 RCTs)	No clear differences
Psychological therapies vs. other psychological therapies				
	Pain	No difference	Moderate (10 RCTs)	No clear differences
	Function	No difference	Moderate (10 RCTs)	
Multidisciplinary rehabilitation vs. physical therapy				
	Pain	Short-term: Small Long-term: Moderate	Moderate (13 RCTs)	0 to 10 NRS Short-term: SMD, −0.30 (CI, −0.54 to −0.06) or ~0.6-point MD Long-term: SMD, −0.51 (CI, −1.04 to 0.01) or ~1.2-point MD
	Function	Short-term: Small Long-term: Moderate	Moderate (13 RCTs)	0 to 10 NRS, short-term: SMD, −0.39 (CI, −0.68 to −0.10) or ~1.2 point MD RDQ, long-term function: SMD, −0.68 (CI, −1.19 to −0.16) or ~4.0-point MD Greater likelihood of return to work: OR, 1.87 (CI, 1.39 to 2.53)
Acupuncture vs. medications (NSAIDs, muscle relaxants, and analgesics)				
	Pain	Small	Low (3 RCTs)	0 to 100 scale, immediately: WMD, −10.56 (CI, −20.34 to −0.78)
	Function	Small	Low (3 RCTs)	0 to 100 scale, immediately: SMD, −0.36 (CI, −0.67 to −0.04)
Spinal manipulation vs. other treatments (exercise, usual care, medications, or massage)				
	Pain	No difference	Moderate (6 RCTs)	0 to 100 scale Short-term: WMD, −2.76 (CI, −5.19 to −0.32; I^2 = 27%) 6 mo: WMD, −3.07 (CI, −5.42 to −0.71; I^2 = 0%) 12 mo: WMD, −0.76 (CI, −3.19 to 1.66; I^2 = 0%)
	Function	No difference	Moderate (6 RCTs)	1 mo: SMD, −0.17 (CI, −0.29 to −0.06) 6 mo: SMD, −0.12 (CI, −0.23 to 0.00) 12 mo: SMD, −0.06 (CI, −0.16 to 0.05)
TENS vs. acupuncture				
	Pain	No difference	Low (4 RCTs)	Short-term: SMD, 0.15 (CI, −0.33 to 0.63) Long-term: SMD, 0.32 (CI, −0.33 to 0.96)
Lumbar supports vs. other active treatments (traction, spinal manipulation, exercise, physiotherapy, or TENS)				
	Pain	No difference	Low (4 RCTs)	No clear differences
	Function	No difference	Low (4 RCTs)	

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Appendix Table 2–Continued

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Kinesio taping vs. exercise therapy				
Pain		No difference	Low (2 RCTs)	No clear differences
Function		No difference	Low (2 RCTs)	
Combination therapy treatments vs. monotherapy treatments or no treatment				
MCE plus exercise vs. exercise alone				
Pain		No difference	Low (2 RCTs)	No clear differences
Psychological therapy + exercise or physiotherapy vs. exercise or physiotherapy alone				
Pain		No difference	Low (6 RCTs)	No clear differences
Function		No difference	Low (6 RCTs)	
Spinal manipulation plus another active treatment vs. the other treatment alone				
Pain		Small	Low (3 RCTs)	0 to 100 scale 1 mo: WMD, −5.88 (CI, −10.85 to −0.90) 3 mo: MD, −7.23 (CI, −11.72 to −2.74) 12 mo: MD, −3.31 (CI, −6.60 to −0.02)
Function		Improved	Low (3 RCTs)	0 to 100 scale 1 mo: SMD, −0.40 (CI, −0.73 to −0.07) 3 mo: SMD, −0.22 (CI, −0.38 to −0.06) 12 mo: SMD, −0.21 (CI, −0.34 to −0.09)
Lumbar support plus exercise vs. exercise alone (muscle strengthening)				
Pain		No difference	Low (1 RCT)	No difference in short-term (8 wk) or long-term (6 mo)
Function		No difference	Low (1 RCT)	

CBT = cognitive behavioral therapy; LLLT = low-level laser therapy; MCE = motor control exercise; MD = mean difference; NSAID = nonsteroidal anti-inflammatory drug; NRS = numerical rating scale; ODI = Oswestry Disability Index; OR = odds ratio; RCT = randomized, controlled trial; RDQ = Roland Morris Disability Questionnaire; RR = relative risk; SMD = standardized mean difference; SMR = skeletal muscle relaxant; SSRI = selective serotonin reuptake inhibitor; TCA = tricyclic antidepressant; TENS = transcutaneous electrical nerve stimulation; VAS = visual analogue scale; WMD = weighted mean difference.

* Although some RCTs found that long-acting opioids were associated with greater pain relief, patients randomly assigned to long-acting opioids also received higher doses.

Appendix Table 3. Pharmacologic and Nonpharmacologic Treatments for Radicular Low Back Pain

Intervention	Outcome	Magnitude of Effect	Strength of Evidence (Studies)	Data
Pharmacologic treatments vs. placebo				
Diazepam (acute or subacute radicular pain)				
	Pain	Lower likelihood of ≥50% improvement	Low (1 RCT)	5 mg twice daily for 5 d: 41% vs. 79%; RR, 0.5 (95% CI, 0.3–0.8)
	Function	No effect	Low (1 RCT)	RDQ: No difference through 1 y of follow-up
Systemic corticosteroids				
	Pain	No effect	Moderate (6 RCTs)	No clear effect
	Function	Small to no effect	Moderate (6 RCTs)	
Nonpharmacologic treatments vs. sham, no treatment, or usual care (acute or subacute)				
Exercise vs. usual care				
	Pain	Small	Low (3 RCTs)	Favored exercise, although effects were small
	Function	Small	Low (3 RCTs)	
Comparative benefits of pharmacologic and nonpharmacologic treatments				
Traction vs. other treatments				
	Pain	No difference	Low (15 RCTs)	No clear differences
	Function	No difference	Low (15 RCTs)	
Traction vs. other type of traction				
	Pain	No difference	Low (5 RCTs)	No clear differences
	Function	No difference	Low (5 RCTs)	
Combination therapy vs. monotherapy or no treatment				
Traction + physiotherapy vs. physiotherapy alone				
	Pain	No difference	Low (5 RCTs)	No clear differences
	Function	No difference	Low (5 RCTs)	

RCT = randomized, controlled trial; RDQ = Roland Morris Disability Questionnaire; RR = relative risk.

Appendix Table 4. Adverse Events for Treatments for Acute, Chronic, and Radicular Low Back Pain

Interventions	Data on Adverse Events (Quality of Evidence; Studies)	Adverse Effects
Adverse events reported for pharmacologic treatments		
Acetaminophen	Versus placebo: No difference in risk for serious adverse events (moderate quality; 1 RCT) Versus NSAIDs: A systematic review found that acetaminophen was associated with lower risk for adverse events; RR, 0.57 (95% CI, 0.36–0.89) (moderate quality; 3 RCTs)	Thrombocytopenia, agranulocytosis, pancytopenia, hemolytic anemia, methemoglobinemia, hypoglycemia, hypothermia, pancreatitis, nephrotoxicity, hepatotoxicity (with overdose), hepatic necrosis, pneumonitis, rash, and hypersensitivity
NSAIDs	Versus placebo: NSAIDs associated with more adverse effects; RR, 1.35 (CI, 1.09–1.68) (moderate quality; 10 RCTs)	Abdominal pain or cramps, dyspepsia, diarrhea, gastrointestinal bleeding, gastrointestinal perforation, dizziness, headache, edema, rash, heartburn, tinnitus, and pruritus
COX-2–selective NSAIDs	Versus nonselective NSAIDs: COX-2–selective NSAIDs associated with lower risk for adverse effects; RR, 0.83 (CI, 0.70–0.99) (moderate quality; 4 RCTs)	Abdominal pain, diarrhea, dizziness, dyspepsia, edema, flatulence, headache, nausea, rash, upper respiratory tract infection, influenza-like illness, and musculoskeletal and connective tissue signs and symptoms (back pain, muscle spasms, and musculoskeletal pain)
Opioids	Versus placebo: Short-term use associated with higher risk; risks higher in trials that did not use an enriched enrollment and withdrawal design; trials were not designed to assess risks for overdose, abuse, and addiction or long-term harms (moderate quality; 16 studies)	Short-term use: Nausea, dizziness, constipation, vomiting, somnolence, and dry mouth Long-term use: Addiction, abuse, overdose, fractures, cardiovascular events, sexual dysfunction, and motor vehicle accidents
SMRs	Versus placebo (any adverse event): SMRs associated with increased risk; RR, 1.50 (CI, 1.14–1.98) (moderate quality; 8 RCTs) Versus placebo (central nervous system events): SMRs associated with increased risk (primarily sedation); RR, 2.04 (CI, 1.23–3.37) (moderate quality; 8 RCTs)	Sedation, drowsiness, and dizziness
Benzodiazepines	Versus placebo: Central nervous system adverse events reported more frequently with benzodiazepines, although harms were not reported well; no trial was designed to evaluate risks with long-term use (low quality; 9 RCTs)	Somnolence, fatigue, lightheadedness, addiction, abuse, overdose, and fractures
Antidepressants	Versus placebo: Antidepressants associated with higher risk for any adverse events but no differences in rates of specific adverse events or serious adverse events (moderate quality; 12 RCTs) Duloxetine associated with nausea and increased risk for withdrawal due to adverse event	Drowsiness, dizziness, dry mouth, constipation, sexual dysfunction, and nausea
Systemic corticosteroids	Versus placebo: Trials did not report serious adverse events, but adverse events were not reported well in some trials (low quality; 12 RCTs)	Hyperglycemia requiring medical treatment, facial flushing, infection, and gastrointestinal bleeding
Adverse events reported for nonpharmacologic treatments*		
Exercise, Tai chi, massage, and spinal manipulation: Harms typically related to muscle soreness and/or small increases in pain were reported.		
Yoga: Reporting was suboptimal, but almost all adverse events were classified as mild to moderate.		
TENS: Evidence was limited but suggests an increased risk for skin reactions without an increased risk for serious adverse events.		
Heat: Heat was not associated with increased risk for skin flushing vs. no heat or placebo in 2 trials.		

COX-2 = cyclooxygenase-2; NSAID = nonsteroidal anti-inflammatory drug; RCT = randomized, controlled trial; RR = relative risk; SMR = skeletal muscle relaxant; TENS = transcutaneous electrical nerve stimulation.
* Harms were poorly reported in most trials of nonpharmacologic interventions. No serious adverse events were reported.