VA/DoD CLINICAL PRACTICE GUIDELINE FOR DIAGNOSIS AND TREATMENT OF LOW BACK PAIN

Department of Veterans Affairs

Department of Defense

Clinician Summary

QUALIFYING STATEMENTS

The Department of Veterans Affairs and the Department of Defense guidelines are based upon the best information available at the time of publication. They are designed to provide information and assist decision making. They are not intended to define a standard of care and should not be construed as one. Neither should they be interpreted as prescribing an exclusive course of management.

This Clinical Practice Guideline is based on a systematic review of both clinical and epidemiological evidence. Developed by a panel of multidisciplinary experts, it provides a clear explanation of the logical relationships between various care options and health outcomes while rating both the quality of the evidence and the strength of the recommendation.

Variations in practice will inevitably and appropriately occur when clinicians take into account the needs of individual patients, available resources, and limitations unique to an institution or type of practice. Every healthcare professional making use of these guidelines is responsible for evaluating the appropriateness of applying them in the setting of any particular clinical situation.

These guidelines are not intended to represent TRICARE policy. Further, inclusion of recommendations for specific testing and/or therapeutic interventions within these guidelines does not guarantee coverage of civilian sector care. Additional information on current TRICARE benefits may be found at www.tricare.mil or by contacting your regional TRICARE Managed Care Support Contractor.

Version 2.0 – 2017

Table of Contents

I. Introduction

The Department of Veterans Affairs (VA) and Department of Defense (DoD) Evidence-Based Practice Work Group (EBPWG) was established and first chartered in 2004, with a mission to advise the "…Health Executive Council on the use of clinical and epidemiological evidence to improve the health of the population across the Veterans Health Administration and Military Health System," by facilitating the development of clinical practice guidelines (CPGs) for the VA and DoD populations.[1] This CPG is intended to provide healthcare providers with a framework by which to diagnose and treat the individual needs and preferences of patients with low back pain (LBP), thereby leading to improved clinical outcomes.

In 2007, the VA and DoD published a CPG for the diagnosis and treatment of LBP, which was based on evidence reviewed through November 2006. Since the release of that guideline, a growing body of research has expanded the general knowledge and understanding of LBP. Improved recognition of the complex nature of this condition has led to the adoption of new strategies for diagnosis and treatment of LBP.

Consequently, a recommendation to update the 2007 LBP CPG was initiated in 2016. The updated CPG, titled Clinical Practice Guideline for Diagnosis and Treatment of Low Back Pain (2017 LBP CPG), includes objective, evidence-based information on the diagnosis and management of acute and chronic LBP. It is intended to assist healthcare providers in all aspects of patient care, including, but not limited to, diagnosis, treatment, and management. The system-wide goal of this guideline is to improve the patient's health and wellbeing by providing evidence-based guidance to providers who are diagnosing or treating patients with LBP. The expected outcome of successful implementation of this guideline is to:

- Assess the patient's condition and determine, in collaboration with the patient, the best treatment method
- Optimize each individual's health outcomes and improve quality of life
- Minimize preventable complications and morbidity
- Emphasize the use of patient-centered care

II. Recommendations

The following recommendations were made using a systematic approach considering four domains as per the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach as detailed in the section on Methods and Appendix A in the full text LBP CPG. These domains include: confidence in the quality of the evidence, balance of desirable and undesirable outcomes (i.e., benefits and harms), patient or provider values and preferences, and other implications, as appropriate (e.g., resource use, equity, acceptability).

#	Recommendation	Strength*	Category†
A. Diagnostic Approach			
1.	For patients with low back pain, we recommend that clinicians conduct a history and physical examination, that should include identifying and evaluating neurologic deficits (e.g., radiculopathy, neurogenic claudication), red flag symptoms associated with serious underlying pathology (e.g., malignancy, fracture, infection), and psychosocial factors.	Strong for	Reviewed, Amended
2.	For patients with low back pain, we suggest performing a mental health screening as part of the low back pain evaluation and taking results into consideration during selection of treatment.	Weak for	Reviewed, New-replaced
3.	For patients with acute axial low back pain (i.e., localized, non-radiating), we recommend against routinely obtaining imaging studies or invasive diagnostic tests.	Strong against	Reviewed, Amended
4.	For patients with low back pain, we recommend diagnostic imaging and appropriate laboratory testing when neurologic deficits are serious or progressive or when red flag symptoms are present.	Strong for	Reviewed, Amended
5.	For patients with low back pain greater than one month who have not improved or responded to initial treatments, there is inconclusive evidence to recommend for or against any diagnostic imaging.	Not applicable	Reviewed, New-added
B. Education and Self-care			
6.	For patients with chronic low back pain, we recommend providing evidence-based information with regard to their expected course, advising patients to remain active, and providing information about self-care options.	Strong for	Reviewed, Amended
7.	For patients with chronic low back pain, we suggest adding a structured education component, including pain neurophysiology, as part of a multicomponent self-management intervention.	Weak for	Reviewed, New-added
C. Non-pharmacologic and Non-invasive Therapy			
8.	For patients with chronic low back pain, we recommend cognitive behavioral therapy.	Strong for	Reviewed, New-replaced
9.	For patients with chronic low back pain, we suggest mindfulness-based stress reduction.	Weak for	Reviewed, New-replaced
10.	For patients with acute low back pain, there is insufficient evidence to support the use of specific clinician-directed exercise.	Not applicable	Reviewed, New-replaced
11.	For patients with chronic low back pain, we suggest offering clinician-directed exercises.	Weak for	Reviewed, New-replaced
12.	For patients with acute or chronic low back pain, we suggest offering spinal mobilization/manipulation as part of a multimodal program.	Weak for	Reviewed, New-replaced
13.	For patients with acute low back pain, there is insufficient evidence to support the use of acupuncture.	Not applicable	Reviewed, New-replaced
14.	For patients with chronic low back pain, we suggest offering acupuncture.	Weak for	Reviewed, New-replaced

#	Recommendation	Strength*	Category†
15.	For acute or chronic low back pain, there is insufficient evidence for or against the use of lumbar supports.	Not applicable	Reviewed, Amended
16.	For patients with chronic low back pain, we suggest offering an exercise program, which may include Pilates, yoga, and tai chi.	Weak for	Reviewed, New-replaced
17.	For patients with low back pain, there is insufficient evidence to support the use of ultrasound.	Not applicable	Reviewed, New-added
18.	For patients with low back pain, there is inconclusive evidence to support the use of transcutaneous electrical nerve stimulation (TENS).	Not applicable	Reviewed, New-added
19.	For patients with low back pain, there is insufficient evidence to support the use of lumbar traction.	Not applicable	Reviewed, New-added
20.	For patients with low back pain, there is insufficient evidence to support the use of electrical muscle stimulation.	Not applicable	Reviewed, New-added
D. Pharmacologic Therapy			
21.	For patients with acute or chronic low back pain, we recommend treating with nonsteroidal anti-inflammatory drugs, with consideration of patient-specific risks.	Strong for	Reviewed, Amended
22.	For patients with chronic low back pain, we suggest offering treatment with duloxetine, with consideration of patient-specific risks.	Weak for	Reviewed, New-added
23.	For patients with acute low back pain or acute exacerbations of chronic low back pain, we suggest offering a non-benzodiazepine muscle relaxant for short-term use.	Weak for	Reviewed, New-added
24.	For patients with chronic low back pain, we suggest against offering a non-benzodiazepine muscle relaxant.	Weak against	Reviewed, New-added
25.	For patients with low back pain, we recommend against benzodiazepines.	Strong against	Reviewed, New-replaced
26.	For patients with acute or chronic low back pain with or without radiculopathy, we recommend against the use of systemic corticosteroids (oral or intramuscular injection).	Strong against	Reviewed, Amended
27.	For patients with low back pain, we recommend against initiating long-term opioid therapy. For patients who are already prescribed long-term opioid therapy, refer to the VA/DoD CPG for the Management of Opioid Therapy for Chronic Pain.[1]	Strong against	Reviewed, New-replaced
28.	For patients with acute low back pain or acute exacerbations of chronic low back pain, there is insufficient evidence to recommend for or against the use of time-limited opioid therapy. Given the significant risks and potential benefits of opioid therapy, patients should be evaluated individually, including consideration of psychosocial risks and alternative non-opioid treatments. Any opioid therapy should be kept to the shortest duration and lowest dose possible.	Not applicable	Reviewed, New-replaced
29.	For patients with acute or chronic low back pain, there is insufficient evidence to recommend for or against the use of time-limited (less than seven days) acetaminophen therapy.	Not applicable	Reviewed, New-replaced
30.	For patients with chronic low back pain, we recommend against the chronic use of oral acetaminophen.	Strong against	Reviewed, New-replaced
31.	For the treatment of acute or chronic low back pain, including patients with both radicular and non-radicular low back pain, there is insufficient evidence to recommend for or against the use of antiepileptics including gabapentin and pregabalin.	Not applicable	Reviewed, New-replaced

[1] See the VA/DoD Clinical Practice Guideline for the Management of Opioid Therapy for Chronic Pain. Available at: http://www.healthquality.va.gov/guidelines/Pain/cot/

#	Recommendation	Strength*	Category†
32.	For the treatment of low back pain, there is insufficient evidence to recommend for or against the use of topical preparations.	Not applicable	Reviewed, New-added
E. Dietary Supplements			
33.	For the treatment of low back pain, there is insufficient evidence to recommend for or against nutritional, herbal, and homeopathic supplements.	Not applicable	Reviewed, New-added
F. Non-surgical Invasive Therapy			
34.	For the long-term reduction of radicular low back pain, non-radicular low back pain, or spinal stenosis, we recommend against offering spinal epidural steroid injections.	Strong against	Reviewed, New-added
35.	For the very short-term effect (less than or equal to two weeks) of reduction of radicular low back pain, we suggest offering epidural steroid injection.	Weak for	Reviewed, New-added
36.	For the treatment of low back pain, we suggest against offering intra-articular facet joint steroid injections.	Weak against	Reviewed, New-added
37.	For patients with low back pain, there is inconclusive evidence to recommend for or against medial branch blocks and radiofrequency ablative denervation.	Not applicable	Reviewed, New-added
G. Team Approach to Treatment of Chronic Low Back Pain			
38.	For selected patients with chronic low back pain not satisfactorily responding to more limited approaches, we suggest offering a multidisciplinary or interdisciplinary rehabilitation program which should include at least one physical component and at least one other component of the biopsychosocial model (psychological, social, occupational) used in an explicitly coordinated manner.	Weak for	Reviewed, New-replaced

*For additional information, please refer to the section on Grading Recommendations in the full text LBP CPG.

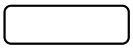
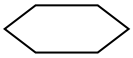
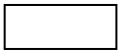
†For additional information, please refer to the section on Recommendation Categorization and Appendix A in the full text LBP CPG.

III. Algorithm

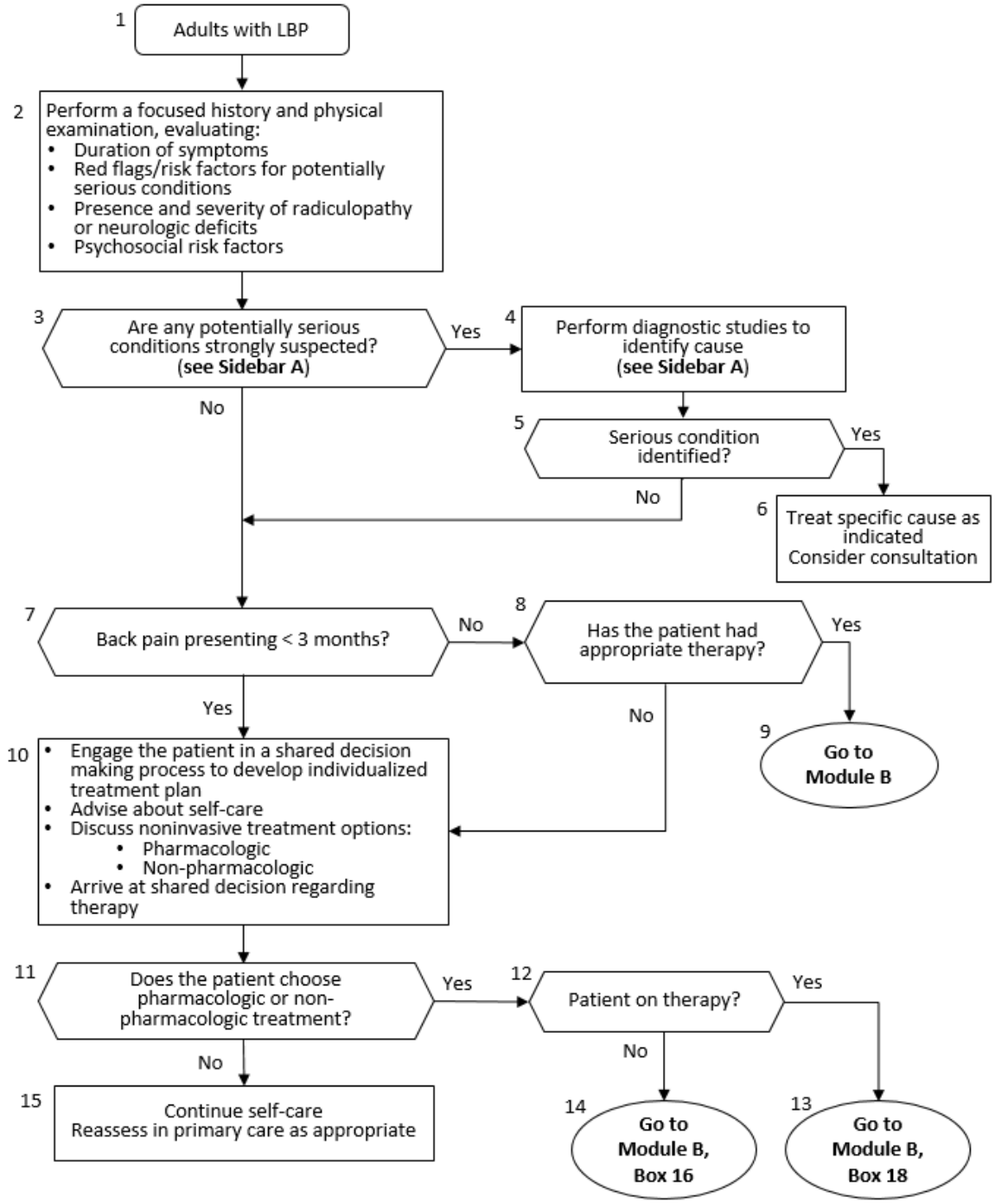
The CPG follows an algorithm that is designed to facilitate understanding of the clinical pathway and decision making process used in rehabilitation of LBP. The use of the algorithm format as a way to represent patient management was chosen based on the understanding that such a format may promote more efficient diagnostic and therapeutic decision making and has the potential to change patterns of resource use. Although the Work Group recognizes that not all clinical practices are linear, the simplified linear approach depicted through the algorithm and its format allows the provider to assess the critical information needed at the major decision points in the clinical process. It includes:

- An ordered sequence of steps of care
- Recommended observations and examinations
- Decisions to be considered
- Actions to be taken

For each guideline, the corresponding clinical algorithm is depicted by a step-by-step decision tree. Standardized symbols are used to display each step in the algorithm, and arrows connect the numbered boxes indicating the order in which the steps should be followed.[2]

	Rounded rectangles represent a clinical state or condition.
	Hexagons represent a decision point in the guideline, formulated as a question that can be answered Yes or No.
	Rectangles represent an action in the process of care.

A. Module A: Initial Evaluation of Low Back Pain



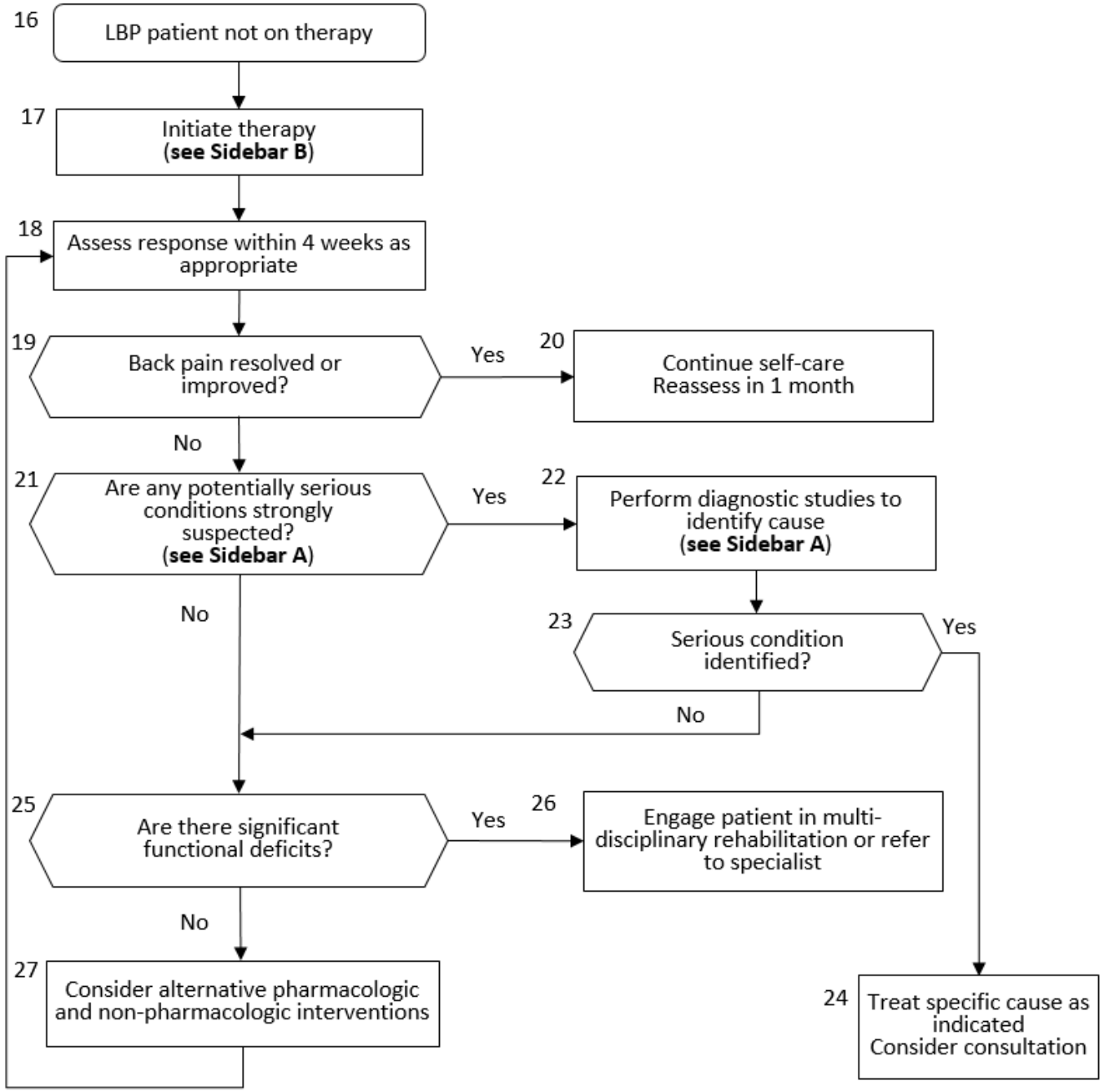
Sidebar A: Diagnostic Work-up		
Possible causes or conditions	**Red flags or risk factors on history or physical examination**	**Suggested diagnostic imaging**
Cancer	History of cancer with new onset of LBP Unexplained weight loss Failure of LBP to improve after 1 month Age > 50 years Multiple risk factors present	Lumbosacral plain radiography For inconclusive results, advanced imaging such as MRI with contrast* as appropriate
Infection	Fever Intravenous drug use Recent infection Immunosuppression	MRI with contrast* ESR
Fracture	History of osteoporosis Chronic use of corticosteroids Older age (≥75 years old) Recent trauma Younger patients with overuse at risk for stress fracture	Lumbosacral plain radiography For inconclusive results, advanced imaging such as MRI†, CT, or SPECT as appropriate
Ankylosing spondylitis	Morning stiffness Improvement with exercise Alternating buttock pain Awakening due to low back pain back pain during the second part of the night (early morning awakening) Younger age	Anterior-posterior pelvis plain radiography
Herniated disc	Radicular back pain (e.g., sciatica) Lower extremity dysesthesia and/or paraesthesia Positive straight-leg-raise test or crossed straight-leg-raise test	None
	Severe/progressive lower extremity neurologic deficits Symptoms present > 1 month	MRI†
Spinal stenosis	Radicular back pain (e.g., sciatica) Lower extremity dysesthesia and/or paraesthesia Neurogenic claudication Older age	None
	Severe/progressive lower extremity neurologic deficits Symptoms present > 1 month	MRI†
Cauda equina or conus medullaris syndrome	Urinary retention Urinary or fecal incontinence Saddle anesthesia Changes in rectal tone Severe/progressive lower extremity neurologic deficits	Emergent MRI† (preferred)

Abbreviations: CT: computed tomography; ESR: electron spin resonance; LBP: low back pain; MRI: magnetic resonance imaging; SPECT: single-photon emission computed tomography

*MRI with contrast, except where contraindicated (e.g., renal insufficiency), otherwise MRI without contrast

†MRI, except where contraindicated, (e.g., patients with pacemakers), otherwise CT or CT myelogram

B. Module B: Management of Low Back Pain



Sidebar B: Interventions			
		Low Back Pain Duration	
Category	**Intervention**	**Acute < 4 Weeks**	**Subacute or Chronic > 4 Weeks**
Self-care	Advice to remain active	X	X
	Books, handout	X	X
	Application of superficial heat	X	
Non-pharmacologic therapy	Spinal manipulation		X
	Clinician-guided exercise		X
	Acupuncture		X
	CBT and/or mindfulness-based stress reduction		X
	Exercise which may include Pilates, tai chi, and/or yoga		X
Pharmacologic therapy	NSAIDs	X	X
	Non-benzodiazepine skeletal muscle relaxants	X	
	Antidepressants (duloxetine)		X
Other therapies	Intensive interdisciplinary rehabilitation		X

Abbreviations: CBT: cognitive behavioral therapy; NSAIDs: nonsteroidal anti-inflammatory drugs

IV. Scope of the CPG

Regardless of setting, any patient in the healthcare system should be offered access to the interventions that are recommended in this guideline after taking into consideration the patient's specific circumstances.

Guideline recommendations are intended to be patient-centered. Thus, treatment and care should take into account a patient's needs and preferences. Good communication between healthcare professionals and the patient is essential and should be supported by evidence-based information tailored to the patient's needs. Use of an empathetic and non-judgmental approach facilitates discussions sensitive to gender, culture, and ethnic differences. The information that patients are given about treatment and care should be culturally appropriate and also available to people with limited literacy skills. It should also be accessible to people with additional needs such as physical, sensory, or learning disabilities. Family involvement should be considered if appropriate.

This CPG is designed to assist providers in managing or co-managing patients in rehabilitation for LBP. Moreover, the patient population of interest for this CPG is adults who are eligible for care within the VA and DoD healthcare delivery systems. It includes Veterans as well as deployed and non-deployed Active Duty Service Members and their adult beneficiaries. This CPG does not provide recommendations for rehabilitation of children or adolescents or pregnant women with LBP.

The literature review encompassed interventional studies (primarily randomized controlled trials [RCTs]), observational studies, and diagnostic tests studies published between January 2007 and June 2016. It targeted 10 key questions (KQs) focusing on the means by which the delivery of healthcare could be optimized for patients during rehabilitation of LBP. The selected KQs were prioritized by the Work Group from many possible KQs based on consensus as to their level of importance. Due to resource constraints, an extensive review of the evidence in all important aspects of care was not feasible for the update to this CPG.

V. Guideline Work Group

Guideline Work Group*	
Department of Veterans Affairs	***Department of Defense***
Sanjog Pangarkar, MD (Champion)	**MAJ Adam Bevevino, MD (Champion)**
Friedhelm Sandbrink, MD (Champion)	**MAJ Daniel Kang, MD (Champion)**
David Cory Adamson, MD	Curtis Aberle, RN, MSN, FNP
Francine Goodman, PharmD, BCPS	MAJ Chris Allen, DPT, DSc, FAAOMPT
Valerie Johnson, DC, DABCI	Rachael Coller, PharmD, BCPS, BCPP
Mitchell Nazario, PharmD	LTC Lisa Konitzer, PT, DSc, OCS, FAAOMPT
Sandra Smeeding, PhD, CNS, FNP	MAJ(P) Lex Mitchell, MD
Kirsten Tillisch, MD	MAJ Jeremiah Samson, PT, ScD(C), OCS, COMT, FAAOMPT
Rebecca Vogsland, DPT, OCS	LTC Jason Silvernail, DPT, DSc, FAAOMPT
	Evan Steil, MD, MBA, MHA
	Elaine P. Stuffel, BSN, MHA, RN
Office of Quality, Safety and Value Veterans Health Administration	***Office of Evidence Based Practice U.S. Army Medical Command***
Eric Rodgers, PhD, FNP, BC James Sall, PhD, FNP-BC Rene Sutton, BS, HCA	Corinne K. B. Devlin, MSN, RN, FNP-BC Elaine P. Stuffel, BSN, MHA, RN
Lewin Group	***ECRI Institute***
Clifford Goodman, PhD Christine Jones, MS, MPH, PMP Jacqlyn Witmer Riposo, MBA Nicolas Stettler-Davis, MD, MSCE	Jonathan Treadwell, PhD Kristen E. D'Anci, PhD Nancy Sullivan, BA Oluwaseun Akinyede, MPH James Reston, PhD, MPH Joann Fontanarosa, PhD Gina Giradi, MS Amy Tsou, MD Laura Koepfler, MLS
	Sigma Health Consulting, LLC
	Frances Murphy, MD, MPH

*Additional contributor contact information is available in Appendix F in the full text LBP CPG.

VI. Patient-centered Care

VA/DoD CPGs encourage clinicians to use a patient-centered care (PCC) approach that is individualized based on patient capabilities, needs, goals, prior treatment experience, and preferences. Regardless of setting, all patients in the healthcare system should be offered access to evidence-based interventions appropriate to that patient. When properly executed, PCC may decrease patient anxiety, increase trust in clinicians,[3] and improve treatment adherence.[4] Improved patient-clinician communication through PCC can be used to convey openness to discuss any future concerns.

As part of the PCC approach, clinicians should review the outcomes of past rehabilitation experiences and outcomes of possible future treatments with the patient. Additionally, they should involve the patient in prioritizing rehabilitation goals and setting specific goals regardless of the selected setting or level of care.

VII. Shared Decision Making

Throughout this VA/DoD CPG, the authors encourage clinicians to focus on shared decision making (SDM). The SDM model was introduced in 2001 *Crossing the Quality Chasm,* a National Academy of Medicine (formerly the Institute of Medicine) report.[5] It is readily apparent that patients with LBP, together with their clinicians, make decisions regarding the level of rehabilitation they choose to engage in; however, these patients require sufficient information to be able to make informed decisions. Clinicians must be adept at presenting information to their patients regarding individual rehabilitation plans and appropriate locations of care.

VIII. Diagnostic Approach

A. History and Physical Examination

1. **For patients with low back pain, we recommend that clinicians conduct a history and physical examination, that should include identifying and evaluating neurologic deficits (e.g., radiculopathy, neurogenic claudication), red flag symptoms associated with serious underlying pathology (e.g., malignancy, fracture, infection), and psychosocial factors. *(Strong for; Reviewed, Amended)***

    - The vast majority of patients initially presenting with LBP experience self-limited episodes with substantial improvement of symptoms within the first month.[6-8] However, a small proportion of LBP may be caused by a specific underlying condition (e.g., malignancy 0.7%, infection 0.01%, vertebral compression fracture 4%, spinal stenosis 3%, symptomatic herniated disc 4%),[9] including the possibility of referred pain from a proximate organ system (e.g., pancreatitis, nephrolithiasis, aortic aneurysm, endocarditis).
    - Clinicians should consider referred pain from the sacroiliac joint, hip joint or trochanteric bursa, which can sometimes manifest as LBP. LBP could also be a manifestation of a systemic condition (e.g., ankylosing spondylitis, rheumatoid arthritis) or multifocal underlying pain disorders (e.g., in patients with myofascial pain or fibromyalgia).
    - Clinicians should specifically identify the presence, duration, progression, and severity of neurologic symptoms and inquire about red flag symptoms. Rapidly progressive or severe neurologic deficits or LBP associated with a serious underlying condition (e.g., malignancy, fracture, infection, cauda equina syndrome [CES]) may necessitate additional diagnostic workup and prompt treatment.[9]

- A recent systematic review (SR) that analyzed red flag symptoms for malignancy found that a history of malignancy was the only red flag with significantly increased probability of malignancy as the serious underlying condition for LBP. Other risk factors had a low post-test probability.[10,11]
- An additional study suggested the following red flags for fracture: (1) older age (≥75 years old), (2) recent trauma, (3) osteoporosis, (4) severe back pain score ≥7 out of 10, and (5) thoracic pain. The presence of multiple red flags increases the probability of fracture to between 42% and 90%.[12]
- Red flag symptoms of LBP associated with infection may include fever, intravenous drug use, or recent infection.[9] CES is a rare condition with an estimated prevalence of 0.04% among patients presenting with LBP. The most frequent finding in CES are: urinary retention, severe/progressive bilateral radiating leg pain, severe/progressive neurologic deficits at more than one level, saddle anesthesia, and fecal incontinence. In patients without urinary retention, the probability of CES is approximately 1 in 10,000.[11]

B. Mental Health Screening

2. For patients with low back pain, we suggest performing a mental health screening as part of the low back pain evaluation and taking results into consideration during selection of treatment. ***(Weak for; Reviewed, New-replaced)***

- For adults with LBP, there is a greater risk of developing chronic LBP and poor outcomes when associated with the existence of pre-pain major depressive disorder or generalized anxiety disorder.[13-15]
- In a VA study, 51% of patients with chronic LBP had posttraumatic stress disorder (PTSD) symptoms.[2]
- The VA/DoD CPG for The Management of Major Depressive Disorder[3] recommends patients not currently receiving treatment be screened for depression with the Patient Health Questionnaire-2 (PHQ-2). For those with a diagnosis of depression, the Patient Health Questionnaire-9 (PHQ-9) can be used as a quantitative measure of depression severity.

C. Imaging and Diagnostic Testing

3. For patients with acute axial low back pain (i.e., localized, non-radiating), we recommend against routinely obtaining imaging studies or invasive diagnostic tests. ***(Strong against; Reviewed, Amended)***

4. **For patients with low back pain, we recommend diagnostic imaging and appropriate laboratory testing when neurologic deficits are serious or progressive or when red flag symptoms are present.** ***(Strong for; Reviewed, Amended)***

[2] See the VA National Center for PTSD Guide for Patients on Chronic Pain and PTSD: https://www.ptsd.va.gov/public/problems/pain-ptsd-guide-patients.asp

[3] See the VA/DoD Clinical Practice Guideline for the Management of Major Depressive Disorder. Available at: http://www.healthquality.va.gov/guidelines/MH/mdd/

5. **For patients with low back pain greater than one month who have not improved or responded to initial treatments, there is inconclusive evidence to recommend for or against any diagnostic imaging. *(Not applicable; Reviewed, New-added)***

- Routine diagnostic imaging for the patient with LBP and no red flags is not recommended during the acute period.[16] However, once patients have failed to improve or respond to initial therapies, many patients and/or clinicians consider diagnostic imaging.
- Pathologies of the spinal cord and/or nerve roots such as spinal dysraphism should prompt evaluation by a neurosurgeon.
    - Pathologies of the spinal column beyond age-appropriate degenerative changes, such as severe spondylolisthesis,[17] may necessitate evaluation by a spine surgeon.
    - Adjacent pathology mimicking LBP may warrant subspecialty evaluation, such as nephrolithiasis.
    - Patients with a history of prior lumbar fusion or minor trauma, such as a fall, may benefit from imaging to rule out hardware failure, adjacent segment degeneration, compression fractures, or worsened spondylolisthesis.
    - Facet or sacroiliac arthropathy may suggest continued judicious use of nonsteroidal anti-inflammatory drugs (NSAIDs).[18]
    - Even though efficacy studies are lacking for non-surgical invasive procedures, diagnostic imaging may be used in specific scenarios to guide therapies.[19] Spinal manipulation clinicians may benefit from assessing the degree of osteoporosis (e.g., in patients with history of steroid use).[20]
- The benefits of plain radiographs seem to outweigh the potential harms to the patients.
- Routine diagnostic imaging for LBP with no red flags will most likely reveal nonspecific findings unrelated to LBP (e.g., lumbar stenosis, degenerative disc changes, or Tarlov cysts are often asymptomatic radiographic findings). Excessive imaging may lead to concerns of radiation exposure and may lead to unnecessary invasive procedures.[21,22]

IX. Education and Self-care

6. **For patients with chronic low back pain, we recommend providing evidence-based information with regard to their expected course, advising patients to remain active, and providing information about self-care options. *(Strong for; Reviewed, Amended)***
7. **For patients with chronic low back pain, we suggest adding a structured education component, including pain neurophysiology, as part of a multicomponent self-management intervention. *(Weak for; Reviewed, New-added)***

- Providing information on LBP, including expected duration of symptoms, evidence-based self-care advice, and appropriate interventions, may reduce patient anxiety and positively affect attitudes regarding future outcomes.[6,8,23,24] Advice based predominantly on anatomic considerations is discouraged in favor of a biopsychosocial model that discusses pain physiology.
    - Patients with LBP should be advised to remain active and limit bedrest as much as reasonably possible.

- Use of thermal modalities, such as a heating pad, may increase comfort along with the use of a medium-firm mattress;[25] however, there is not enough evidence about the effect of the application of heat for LBP that lasts longer than three months or the application of cold for any duration.
- Individualized self-care education and interventions, along with more general information through an appropriate source, such as the Back Book,[26] may improve patient understanding.[27]
- For patients with overweight or obesity, discuss weight management (see the VA/DoD CPG on Management of Obesity and Overweight).[4]
- Smoking or tobacco cessation should be discussed with patients who smoke or use other tobacco products (see the VA/DoD CPG for Treating Tobacco Use and Dependence and the VA/DoD Substance Use Disorder CPG).[5,6]
- Patients should be advised that in most cases the pain will improve in the first month.[6,8]
- Occupation-specific restrictions and/or limitations may be appropriate.

X. Non-pharmacologic and Non-invasive Therapy

A. Mindfulness-based Stress Reduction and/or Cognitive Behavioral Therapy

8. **For patients with chronic low back pain, we recommend cognitive behavioral therapy. *(Strong for; Reviewed, New-replaced)***
9. **For patients with chronic low back pain, we suggest mindfulness-based stress reduction. *(Weak for; Reviewed, New-replaced)***

- Mindfulness-based stress reduction (MBSR) is a structured intervention focused on the concept of mindfulness (i.e., being in the present moment, without judgment) with an instructor specialized in MBSR.[28]
  - There is evidence for long-term benefit of MBSR for pain and function.[28]
  - There is also a potential benefit of MBSR for several comorbid disorders related to chronic LBP including depression, anxiety, somatization, and pain.[29]
- CBT is typically delivered by a mental health clinician, usually in an individual setting for eight to 12 visits. CBT for pain involves identifying and changing cognitions and behaviors that perpetuate pain as well as using relaxation and exposure techniques to reduce symptom-related distress.
- Based on low quality evidence, biofeedback, progressive relaxation, telephone-based health coaching, or transtheoretical model-based behavioral change may also be used as alternative treatments for chronic LBP. Patient preference, appropriateness of the group setting, and practitioner expertise should be considered when choosing between these options.
- MBSR and CBT are treatments with a low risk of adverse events, but the time required to participate and the availability of experienced practitioners can be barriers to participation.

[4] See the VA/DoD Clinical Practice Guideline for the Management of Obesity and Overweight. Available at: https://www.healthquality.va.gov/guidelines/CD/obesity/

[5] See the VA/DoD Clinical Practice Guideline for Treating Tobacco Use and Dependence. Available at: https://www.healthquality.va.gov/guidelines/CD/mtu/

[6] See the VA/DoD Clinical Practice Guideline for Management of Substance Use Disorder. Available at: https://www.healthquality.va.gov/guidelines/MH/sud/

B. Clinician-directed Exercises

10. For patients with acute low back pain, there is insufficient evidence to support the use of specific clinician-directed exercise. *(Not applicable; Reviewed, New-replaced)*

11. For patients with chronic low back pain, we suggest offering clinician-directed exercises. *(Weak for; Reviewed, New-replaced)*

- Clinician-directed exercise is favorable for the treatment of chronic LBP. Overall, the demonstrated improvements are small, but the risks are minimal compared to other interventions.
    - Moderate quality of evidence for modest improvements in pain, a lower likelihood of work disability at 12 months, but no meaningful benefit for function.[30]
- Among different forms of exercise, evidence favored motor control exercise over usual care for intermediate and long-term pain, disability and global improvement.[30] Motor control exercise can effectively be delivered in a group setting.[30,31]
- For patients with acute LBP, the effects of clinician-directed exercise are inconclusive.[30]
- Motor control exercise may provide a small long-term benefit compared to general exercise for function and pain medication need,[32] but it is not known how this compares to usual care.
- Early access to physical therapy (PT), including exercise and education, results in inconclusive or no important differences compared to usual care.[33,34]
- A publication, not included in our evidence review, shows that early access to PT in the military healthcare system results in lower healthcare utilization and LBP-related costs.[35]

C. Spinal Mobilization/Manipulation

12. For patients with acute or chronic low back pain, we suggest offering the inclusion of spinal mobilization/manipulation as part of a multimodal program. *(Weak for; Reviewed, New-replaced)*

- Spinal mobilization/manipulation delivered as an isolated intervention for patients with chronic LBP does not provide relevant improvements as compared to sham interventions.[36]
- Combined with self-care or clinician-directed exercise, spinal mobilization/manipulation may provide long-term benefits in perceived improvement, satisfaction with care, and medication use.[36,37] The additive effect to other treatments provides only small, and not clinically relevant, improvements in pain and disability.
- Compared to other effective conservative interventions (e.g., supervised exercise, home exercises, McKenzie repeated motion exercise or back school training), spinal mobilization/manipulation does not appear to have any clear and clinically relevant advantage.[36,38-41]
- For the treatment of acute LBP, spinal mobilization/manipulation has a small effect on pain and short-term function, but not disability.[41] The addition of spinal mobilization/manipulation to other interventions appears to yield short-term improvements in function but no clinically relevant difference in pain levels or disability.[41,42]
- The use of spinal mobilization/manipulation is a relatively low-risk intervention for patients with LBP, and the benefits likely outweigh potential harms.[43]

D. Acupuncture

13. For patients with acute low back pain, there is insufficient evidence to support the use of acupuncture. *(Not applicable; Reviewed, New-replaced)*

14. For patients with chronic low back pain, we suggest offering acupuncture. *(Weak for; Reviewed, New-replaced)*

- Acupuncture appears to help patients in the long term (3-6 months). Moderate quality evidence supports acupuncture for modest long-term improvements in disability and the perceived impact of pain. Data were inconclusive regarding general quality of life and adverse events.[30]
- There is large variation in patient preferences and acceptance of acupuncture.

E. Lumbar Supports

15. For acute or chronic low back pain, there is insufficient evidence for or against the use of lumbar supports. *(Not applicable; Reviewed, Amended)*

- There is low confidence in the quality of evidence to support offering lumbar supports (e.g., lumbar braces/commercial belts/canvas corsets) for acute or chronic LBP, with no reported associated harms or serious adverse events.[30,44] Low quality evidence favors lumbar support with subacute LBP (one to three months) for less pain, disability, and need for analgesics.[45]
- In the elderly population, one RCT supports using lumbar support for chronic LBP to improve pain and increase muscle endurance for a short period of time.[46]
- Clinicians should explain the proper selection and use of lumbar supports when indicated. The feasibility of using lumbar supports should be assessed on an individual basis with special attention being given to adequate compliance.
- Harms and benefits are balanced; patients may experience temporary relief for activities that would increase back discomfort (e.g., heavy or repetitive lifting), but may become less mobile.
- There is large variation in patient preferences for lumbar supports.
- Lumbar supports may not be readily available or accessible to all individuals.

F. Exercise

16. For patients with chronic low back pain, we suggest offering an exercise program, which may include Pilates, yoga, and tai chi. ***(Weak for; Reviewed, New-replaced)***

- Pilates, yoga, and tai chi are examples of exercise with evidence to support better outcomes when compared to minimal interventions, wait list, no exercise, and controls.
    - Yoga has some evidence to support better outcomes than strengthening exercise.[30,47,48]
    - Pilates was associated with slightly better outcomes compared to minimal interventions and controls.[49,50] Evidence is unclear or inconclusive comparing Pilates to other types of exercise,[49,50] massage therapy, and usual care.[51]
    - Evidence favored tai chi over no exercise, wait list, and backward walking and jogging, but not swimming, for improvement in chronic LBP.[30] Evidence also favored tai chi over physical rehabilitation for improvement in pain in two studies.[52]
- Other exercise options, including strength/resistance, coordination/stabilization, aquatics, cycling, and walking, may provide benefit in patients with chronic LBP.[30,47,48,53-56]

G. Ultrasound

17. For patients with low back pain, there is insufficient evidence to support the use of ultrasound. *(Not applicable; Reviewed, New-added)*

- There was insufficient evidence to make a recommendation for or against the use of ultrasound.[30] The evidence base was small and of primarily low quality, and suggested no difference in outcomes between ultrasound and sham ultrasound.

H. Transcutaneous Electrical Nerve Stimulation (TENS)

18. For patients with low back pain, there is inconclusive evidence to support the use of transcutaneous electrical nerve stimulation (TENS). *(Not applicable; Reviewed, New-added)*

- The evidence was inconclusive regarding TENS and the data did not find a significant difference in patient outcomes.[57]

I. Lumbar Traction

19. For patients with low back pain, there is insufficient evidence to support the use of lumbar traction. *(Not applicable; Reviewed, New-added)*

- The evidence was insufficient to support the use of lumbar traction.[58-61]

J. Electrical Muscle Stimulation

20. For patients with low back pain, there is insufficient evidence to support the use of electrical muscle stimulation. *(Not applicable; Reviewed, New-added)*

- There was no evidence found to support the use of electrical muscle stimulation for LBP.[30,62]

XI. Pharmacologic Therapy

A. Nonsteroidal Anti-inflammatory Drugs

21. For patients with acute or chronic low back pain, we recommend treating with nonsteroidal anti-inflammatory drugs, with consideration of patient-specific risks. *(Strong for; Reviewed, Amended)*

- Data favors NSAIDs over placebo for pain in patients with both acute and chronic LBP.[30,63]
- The data for disability and functional outcomes is inconclusive.[63]
- Most comparative trials showed no differences in pain relief among NSAIDs.[30,64]
- Cyclooxygenase-2 (COX-2) NSAIDs had statistically significantly fewer adverse effects than traditional NSAIDs.[30] We suggest the use of relatively COX-2 selective NSAIDs over non-selective NSAIDs based on patient risk factors, primarily gastrointestinal (GI) toxicity.[63,65] See Table 1 for a list of selected NSAIDs. Use of relatively COX-2 selective inhibitors may reduce the risk for GI events; however, this benefit is negated if the patient is using aspirin.[66]
- All NSAIDs, selective and non-selective, have box warnings for increased risk of cardiovascular (CV) events.[67] If an NSAID is required in a patient with CV risk, naproxen with a proton pump inhibitor may be a viable option.[66,68]

B. Antidepressants

22. For patients with chronic low back pain, we suggest offering treatment with duloxetine, with consideration of patient-specific risks. ***(Weak for; Reviewed, New-added)***

- The benefit of duloxetine for chronic LBP on pain and function is small.[30,69] However, when function was measured with the Roland-Morris Disability Questionnaire (RMDQ), the comparative data was inconclusive.[30]
- The effects of selective serotonin reuptake inhibitors (SSRI) on LBP are inconclusive.[30]
- Of the serotonin and norepinephrine reuptake inhibitors (SNRI) class, only duloxetine has been studied in LBP; theoretically, the SNRI class may demonstrate some benefit given a similar mechanism of action to duloxetine.
- Tricyclic antidepressants (TCAs) may be considered for use in certain patients. In a recent SR, no benefit was found with TCAs for either pain or function[30]; however, older studies suggest that TCAs provide a small improvement in pain intensity, but were inconclusive in regards to function, quality of life, or healthcare utilization.[70,71]
- Consideration of medical or psychiatric comorbidities are important and may influence the selection of SNRI or TCA. For some patients, addition of a low dose TCA to SSRI may be helpful, depending on medical or psychiatric comorbidities.
- There are more adverse effects associated with duloxetine when compared to placebo. These include nausea, insomnia, dry mouth, constipation, somnolence, and fatigue.[30] There is a risk of hepatotoxicity and duloxetine should not be used in individuals with a history of liver disease
- Per the VA/DoD PTSD CPG, duloxetine may not help to improve PTSD symptoms of patients with concomitant PTSD (see the VA/DoD PTSD CPG).[7]
- Caution should be used when prescribing TCAs to individuals with cardiac risk factors, and anticholinergic burden should be taken into account when used in geriatric patients.[72]
- Combining TCAs with other serotonergic medications increases the risk of serotonin syndrome and should be used with caution.
- In general, TCAs are not recommended in the elderly population.[73] Using TCAs at bedtime in low dosages may reduce side effects, but limit effectiveness for pain therapy that is dosage related.
- Adverse effects vary greatly and should be taken into account when choosing an antidepressant.

C. Non-benzodiazepine Muscle Relaxants

23. For patients with acute low back pain or acute exacerbations of chronic low back pain, we suggest offering a non-benzodiazepine muscle relaxant for short-term use. ***(Weak for; Reviewed, New-added)***

24. For patients with chronic low back pain, we suggest against offering a non-benzodiazepine muscle relaxant. ***(Weak against; Reviewed, New-added)***

- Moderate evidence supports offering a non-benzodiazepine muscle relaxant for acute LBP, although the evidence indicates benefit is limited to short-term use of three to seven days.[30,74]

[7] See the VA/DoD Clinical Practice Guideline for Management of Posttraumatic Stress Disorder and Acute Stress Reaction. Available at: https://www.healthquality.va.gov/guidelines/mh/ptsd

- There is limited evidence that suggests benefit of one agent over the other; however, it is important to recognize that the agents differ significantly in adverse effect profiles.
- Moderate evidence demonstrates no effect on disability in the short term.[74,75]
- In regard to long-term use, there is no evidence to suggest benefit for the use of skeletal muscle relaxants for chronic LBP.[30,74]
- Muscle relaxants were associated with higher rates of adverse events, such as central nervous system (CNS) effects including sedation, nausea, dizziness, and headache.[30,74]
    - When considering a skeletal muscle relaxant, clinicians should consider its adverse effect profile.
    - While it is important to note that one agent does not confer benefit over another agent, we do not recommend the use of carisoprodol for acute or chronic LBP due to its adverse effect profile, including CNS depression, as well as its risk of dependence. Carisoprodol is classified as a Schedule IV controlled substance by the U.S. Drug Enforcement Agency.
    - Agents such as cyclobenzaprine pose higher anticholinergic burden which may be of concern in the geriatric population. This agent in combination with other serotonergic medications may increase risk of serotonin syndrome.

D. Benzodiazepines

25. For patients with low back pain, we recommend against benzodiazepines. ***(Strong against; Reviewed, New-replaced)***

- There is insufficient evidence to support the use of benzodiazepines for acute LBP; the evidence in chronic LBP is less conclusive.
    - One good quality SR found inconclusive evidence for differences between diazepam and placebo with respect to LBP improvement.[30]
    - Another SR identified one RCT which reported better outcomes with placebo than with diazepam.[76]
- There is low quality data indicating that the harms/burden of benzodiazepine use outweigh the benefits.
    - There is little evidence regarding adverse events with the use of benzodiazepines for LBP specifically, but an expanded review of literature suggests potential harms.[77]
    - A good quality SR found CNS adverse events such as somnolence, fatigue, and lightheadedness were reported more frequently with benzodiazepines versus placebo.[30]
    - The potential for abuse, addiction/dependence, and overdose potentially resulting in respiratory depression, sleep apnea, and death do not justify their use. These associated risks are further compounded when combined with opioids (see the VA/DoD CPG on the Management of Opioid Therapy for Chronic Pain).[8]

[8] See the VA/DoD Clinical Practice Guideline for the Management of Opioid Therapy for Chronic Pain. Available at: http://www.healthquality.va.gov/guidelines/Pain/cot/

E. Systemic Corticosteroids

26. For patients with acute or chronic low back pain with or without radiculopathy, we recommend against the use of systemic corticosteroids (oral or intramuscular injection). *(Strong against; Reviewed, Amended)*

- In acute or chronic LBP, there is a lack of evidence for efficacy of systemic corticosteroids on pain, disability, quality of life, or healthcare utilization.[30,78]
- There are risks associated with corticosteroid use in the short term, and repeated use may have more significant implications.[79] While providers and patients may wish to try corticosteroids, the evidence suggests that efficacy does not outweigh the potential risks (insomnia, nervousness, increased appetite, indigestion, headache, joint pain, and sweating).[30,78]

F. Opioid Therapy

27. For patients with low back pain, we recommend against initiating long-term opioid therapy. For patients who are already prescribed long-term opioid therapy, refer to the VA/DoD CPG for the Management of Opioid Therapy for Chronic Pain.[8] *(Strong against; Reviewed, New-replaced)*

28. For patients with acute low back pain or acute exacerbations of chronic low back pain, there is insufficient evidence to recommend for or against the use of time-limited opioid therapy. Given the significant risks and potential benefits of opioid therapy, patients should be evaluated individually, including consideration of psychosocial risks and alternative non-opioid treatments. Any opioid therapy should be kept to the shortest duration and lowest dose possible. *(Not applicable; Reviewed, New-replaced)*

- While the current literature for patients with acute LBP or acute exacerbations of chronic LBP shows insufficient evidence to support time-limited (less than seven days) opioid therapy, on average, the potential harms of even short-term opioid therapy (less than six months) outweigh the potential benefits in patients with LBP.[30,74] See the VA/DoD CPG on Opioid Therapy for further discussion pertaining to prescribing opioid therapy.[8]
- Trials that compared opioids and other therapies (e.g., acetaminophen, NSAIDs, antidepressants) were limited. No clear differences were seen between long-acting opioids compared to other long-acting opioids or short-acting opioids.[30]
- No clinical trials identified by the evidence review evaluated time-limited (less than seven days) opioid therapy. Some trials may have been omitted from our evidence review if they did not evaluate outcomes after 12 weeks.
- The benefits and harms of time-limited opioid therapy for acute LBP are unclear and there is a high likelihood of rapid spontaneous recovery in the first month.[6]
- For acute LBP refractory to NSAIDs and non-benzodiazepine skeletal muscle relaxants (see Recommendation 21 and Recommendation 23), opioids are the only remaining drug treatment with evidence of effectiveness, although the analgesic effects were small relative to placebo and pertained to short-term, not necessarily time-limited (greater than seven days), therapy.
- Small, differential benefits of short-term opioid therapy were counterbalanced by increases in risks of adverse effects typically seen with short-term opioid therapy.[74] In four of eight trials, 50% of study patients discontinued treatment because of adverse events or lack of efficacy. The trials included in the SRs did not assess the risks of long-term opioid therapy.

  - Based on what is known for chronic non-cancer pain in general (not specific to LBP), the small effects of short-term opioid therapy seen in LBP trials may be substantially outweighed by serious risks including potentially fatal respiratory depression, overdose, misuse, abuse, addiction, and diversion. The risks of addiction, which may start with the first dose administered, need to be taken into consideration and weighed against the actual therapeutic benefits in individual cases.
- Opioid risks and risk assessment for chronic non-cancer pain are discussed in more detail in the VA/DoD CPG for Management of Opioid Therapy for Chronic Pain.[9]

G. Acetaminophen

29. For patients with acute or chronic low back pain, there is insufficient evidence to recommend for or against the use of time-limited (less than seven days) acetaminophen therapy. *(Not applicable; Reviewed, New-replaced)*

30. For patients with chronic low back pain, we recommend against the chronic use of oral acetaminophen. ***(Strong against; Reviewed, New-replaced)***

- A SR and a large RCT found no difference between acetaminophen and placebo on the outcomes of pain, disability, quality of life, or function at various time points.[30,80,81]
- As no benefits were shown in the evidence, the consideration of harm/burden (e.g., long-term liver effects at high dosage) predominates. The harms associated with other therapeutic options also need to be considered.
- Providers should educate patients about the risks and adverse events of acetaminophen.
- Elderly individuals and patients with hepatic insufficiency may be at the most risk for harm.

H. Antiepileptics

31. For the treatment of acute or chronic low back pain, including patients with both radicular and non-radicular low back pain, there is insufficient evidence to recommend for or against the use of antiepileptics including gabapentin and pregabalin. ***(Not applicable; Reviewed, New-replaced)***

- The evidence for the use of antiepileptics is mixed and limited to gabapentin or pregabalin.[82-84]
- Pregabalin may have a greater impact on pain and disability than amitriptyline, but the study is not of high enough quality to determine clearly potential benefits or harms.[30]
- There were no trials that addressed the use of antiepileptics in acute non-radicular pain.
- There are significant adverse effects associated with the use of gabapentin or pregabalin.
  - Adverse effects of gabapentin include fatigue; dry mouth; difficulties with mental concentration, memory, and visual accommodation; and loss of balance.[30,82]
  - An RCT studying the treatment of pregabalin in patients with radiculopathy, which was published after the closure of our evidence review, reported no significant reduction in leg pain intensity and a higher incidence of adverse events.[85]

[9] See the VA/DoD Clinical Practice Guideline for the Management of Opioid Therapy for Chronic Pain. Available at: http://www.healthquality.va.gov/guidelines/Pain/cot/

- Pregabalin is a controlled substance with potential for abuse and dependence. While gabapentin is not a scheduled medication, misuse and abuse may also occur. Gabapentin and pregabalin may provide small, short-term benefits, but, with insufficient clear evidence for benefit, we cannot substantiate that the benefits outweigh the harms.

I. Topical Preparations

32. For the treatment of low back pain, there is insufficient evidence to recommend for or against the use of topical preparations. *(Not applicable; Reviewed, New-added)*

- Topical pharmacotherapy preparations were included in the evidence search. However, the search yielded no studies that met inclusion criteria for the evidence review. Therefore, no recommendations can be made about these agents due to the lack of evidence at the time this CPG was published.

XII. Dietary Supplements

33. For the treatment of low back pain, there is insufficient evidence to recommend for or against nutritional, herbal, and homeopathic supplements. *(Not applicable; Reviewed, New-added)*

A. Nutritional, Herbal, and Homeopathic Supplements

- There were no studies on nutritional, herbal, or homeopathic supplements identified in the evidence review for this guideline that met inclusion criteria.
- The harms depend on each specific supplement. As a category, due to the wide variety of preparations and their possible bioactivity, it is likely that many supplements have harms that outweigh benefits (e.g., kava, ephedra). There is concern about the known and unknown adverse effects, drug-to-drug interactions, dosage, active ingredient, and purity of the supplements.
- Supplements are not approved by the U.S. Food and Drug Administration (FDA), so the quality may be inconsistent.
- There is variation in patient values and preferences; some patients may prefer "natural" supplements, while others may not want supplements if they are not perceived as "real" medicine.
- Although easily accessible over-the-counter, supplements may not be on the VA/DoD formularies and therefore may involve costs to the patient. Realizing that many patients use supplements, it is important for the provider to have a conversation with the patient about their individual use of supplements to identify potential harms that may be associated with specific supplements.

B. Glucosamine

- Evidence showed no difference between glucosamine and placebo.[86] However, the doses used in the studies may not have been sufficient to produce clinically significant results.
- The benefits and harms/burden are balanced. One study considered adverse effects and found they were not significantly different between glucosamine and placebo.[86]

- For patients with hip and/or knee osteoarthritis, clinicians should not prescribe chondroitin sulfate, glucosamine, and/or any combination of the two, to treat joint pain or improve function (see the VA/DoD CPG for the Non-Surgical Management of Hip & Knee Osteoarthritis).[10]

XIII. Non-surgical Invasive Therapy

34. For the long-term reduction of radicular low back pain, non-radicular low back pain, or spinal stenosis, we recommend against offering spinal epidural steroid injections. *(Strong against; Reviewed, New-added)*

35. For the very short-term effect (less than or equal to two weeks) of reduction of radicular low back pain, we suggest offering epidural steroid injection. *(Weak for; Reviewed, New-added)*

36. For the treatment of low back pain, we suggest against offering intra-articular facet joint steroid injections. *(Weak against; Reviewed, New-added)*

37. For patients with low back pain, there is inconclusive evidence to recommend for or against medial branch blocks and radiofrequency ablative denervation. *(Not applicable; Reviewed, New-added)*

- Studies of epidural steroid joint injections (ESI) were generally rated as low in quality.
- ESI did not perform better than saline or local anesthetic injections, with small effects and wide confidence intervals that could not exclude a real difference between groups.[87-89] There is evidence that, in the immediate term (5-14 days), ESI provided small, not clinically important, improvement in pain.[30] Trials examining the transforaminal approach were more likely to show benefits.
- Facet injections are utilized at many VA/DoD facilities for treatment and for the identification of painful structures. Facet injections of steroid did not generally perform better, at a clinically significant level, than saline injections for pain, function, return to work, or quality of life.[88] One multi-armed comparative trial showed that facet injection and oral NSAIDs resulted in superior outcomes to oral NSAIDs alone, though there was no sham control for injection in the study.[90]
- There was inconclusive evidence that selective nerve root block (SNRB) and radiofrequency ablation denervation (RFA) improve pain, function, return to work, or quality of life.[91-93]
- A SDM approach with discussion of the realistic expectations and risks is suggested.
- Subgroups of patients with nociception from the lumbar nerve root(s) could benefit from these procedures, but the evidence does not indicate if this subgroup exists.
- Patients with acute and intolerable radicular pain may benefit from referral to a specialist for ESI and may benefit from the procedure more than patients with more chronic symptoms.
- The primary role for ESI may be to provide a very short-term reduction in pain to support participation in active non-pharmacologic therapies.
- Given the limited duration of expected benefit and the modest expected effect size, use of ESI for chronic LBP outside of an active rehabilitation treatment plan is not recommended.
- The limited evidence for the benefit of these procedures should not lead to more frequent surgical consultation without a thorough risk/benefit consideration and SDM for such surgical options.

[10] See the VA/DoD Clinical Practice Guideline for the Non-Surgical Management of Hip & Knee Osteoarthritis. Available at: http://www.healthquality.va.gov/guidelines/CD/OA/

XIV. Team Approach to Treatment of Chronic Low Back Pain

38. For selected patients with chronic low back pain not satisfactorily responding to more limited approaches, we suggest offering a multidisciplinary or interdisciplinary rehabilitation program which should include at least one physical component and at least one other component of the biopsychosocial model (psychological, social, occupational) used in an explicitly coordinated manner. ***(Weak for; Reviewed, New-replaced)***

- A multidisciplinary biopsychosocial rehabilitation (MBR) approach may be beneficial for patients with chronic LBP, but no general consensus exists regarding the definition of MBR.[94-96]
- MBR had statistically significantly greater reductions in pain, disability, and work-related outcomes at both medium (≥ 3 months to ≤ 12 months) and long-term (≥ 12 months) follow-up.[94]
- MBR treatment programs require significant time and resource commitment from both the patient and healthcare staff.[94] Low-risk, non-pharmacologically based treatment options for chronic pain management, such as MBR, should be considered.

Table 1: Dosing for Select Pharmacologic Agents[1]

Generic	Starting Dose	Max/Day	Half-life (t½) (hrs)
Muscle Relaxants			
TIZANIDINE	2-4 mg TID	36 mg	2.5
BACLOFEN	5 mg TID	80 mg	~ 3.75
CYCLOBENZAPRINE[2]	5 mg TID	30 mg	18
METAXALONE[2]	800 mg TID	3,200 mg	~ 9
METHOCARBAMOL[2]	1.5 gm QID	4.5 gm	1-2
ORPHENADRINE[2]	100 mg BID	200 mg	14-16
Antidepressants			
AMITRIPTYLINE[2]	10-25 mg QHS	150 mg	~ 13-36
DESPIRAMINE[2]	10-25 mg QHS	150 mg	15-24
NORTRIPTYLINE[2]	10-25 mg QHS	150 mg	14-51
DULOXETINE[2]	30 mg QD	60 mg	~ 12
VENLAFAXINE ER	37.5 mg QD	225 mg	~ 11
NSAIDs[3]			
KETOROLAC	10 mg q 4-6H	40 mg	~ 5
KETOPROFEN	50 mg QID	300 mg	2-4
INDOMETHACIN	25 mg q 8H	200 mg	2.6-11.2
NAPROXEN	250 mg BID	1500 mg	12-17
IBUPROFEN	400 mg q 4-6H	3200 mg	~ 2
NABUMETONE	1000 mg QD	2000 mg	~ 24
PIROXICAM	20 mg QD	20 mg	50
SALSALATE	1000 mg TID	3000 mg	~ 1
SULINDAC	150mg BID	400 mg	7.8
DICLOFENAC NA	50-75 mg BID	150-200 mg	~ 2
CELECOXIB	100 mg BID	400 mg	~ 11
MELOXICAM	5–7.5 mg QD	15 mg	~ 15-22
ETODOLAC	200 mg q 8H	1000 mg	6.4

Dosing recommendations obtained from the FDA individual product prescribing information.
Listed in order of increased COX-2 Selectivity:[66,97,98]

More COX 1 Selective | < 5-fold COX-2 Selective | 5-50 fold COX-2 Selective

[1] Consult full prescribing information for individual drugs; dosing and half-life may be altered by patient age, renal and hepatic function, and product formulation; consider reduced dosing and/or frequency in the elderly.

[2] Use not recommended in patients > 65 years of age per American Geriatrics Society 2015 Updated Beers Criteria.[73]

[3] Avoid chronic use in the elderly, unless other alternatives are not effective and patient can take a gastroprotective agent (proton pump inhibitor or misoprostol).

Abbreviations: BID: twice a day; COX-2: cyclooxygenase-2; gm: gram; hrs: hours; max: maximum; mg: milligram; NSAIDs: nonsteroidal anti-inflammatory drug; q 4-6H: every 4-6 hours; q 8H: every 8 hours; QD: one a day; QID: four times a day; QHS: nightly at bedtime; TID: three times a day

XV. Additional Resources

- The Back Pain Information Page from the National Institute of Arthritis and Musculoskeletal and Skin Diseases: https://www.niams.nih.gov/Health_Info/Back_Pain/default.asp

References

1. U.S. Department of Veteran Affairs, Department of Defense. Guideline for Guidelines. Veterans Health Administration, Office of Quality & Performance, Evidence Review Subgroup; Revised April 10, 2013.
2. Society for Medical Decision Making Committee on Standardization of Clinical Algorithms. Proposal for clinical algorithm standards. *Med Decis Making.* Apr-Jun 1992;12(2):149-154.
3. Bertakis KD, Azari R. Patient-centered care is associated with decreased health care utilization. *J Am Board Fam Med.* May-Jun 2011;24(3):229-239.
4. Robinson JH, Callister LC, Berry JA, Dearing KA. Patient-centered care and adherence: Definitions and applications to improve outcomes. *J Am Acad Nurse Pract.* Dec 2008;20(12):600-607.
5. *Crossing the quality chasm: A new health system for the 21st century.* Washington DC: National Academies Press;2001.
6. Pengel LH, Herbert RD, Maher CG, Refshauge KM. Acute low back pain: Systematic review of its prognosis. *BMJ.* Aug 09 2003;327(7410):323.
7. van Tulder MW, Assendelft WJ, Koes BW, Bouter LM. Spinal radiographic findings and nonspecific low back pain. A systematic review of observational studies. *Spine (Phila Pa 1976).* Feb 15 1997;22(4):427-434.
8. Hestbaek L, Leboeuf-Yde C, Manniche C. Low back pain: What is the long-term course? A review of studies of general patient populations. *Eur Spine J.* Apr 2003;12(2):149-165.
9. Jarvik JG, Deyo RA. Diagnostic evaluation of low back pain with emphasis on imaging. *Ann Intern Med.* Oct 01 2002;137(7):586-597.
10. Downie A, Williams CM, Henschke N, et al. Red flags to screen for malignancy and fracture in patients with low back pain: Systematic review. *BMJ.* Dec 11 2013;347:f7095.
11. Deyo RA, Diehl AK. Cancer as a cause of back pain: Frequency, clinical presentation, and diagnostic strategies. *J Gen Intern Med.* May-Jun 1988;3(3):230-238.
12. Enthoven WT, Geuze J, Scheele J, et al. Prevalence and "red flags" regarding specified causes of back pain in older adults presenting in general practice. *Phys Ther.* Mar 2016;96(3):305-312.
13. Shaw WS, Means-Christensen AJ, Slater MA, et al. Psychiatric disorders and risk of transition to chronicity in men with first onset low back pain. *Pain Med.* Sep 2010;11(9):1391-1400.
14. Pinheiro MB, Ferreira ML, Refshauge K, et al. Symptoms of depression as a prognostic factor for low back pain: A systematic review. *Spine J.* Jan 01 2016;16(1):105-116.
15. Yarlas A, Miller K, Wen W, et al. A subgroup analysis found no diminished response to buprenorphine transdermal system treatment for chronic low back pain patients classified with depression. *Pain Pract.* Apr 2016;16(4):473-485.
16. Chou R, Fu R, Carrino JA, Deyo RA. Imaging strategies for low-back pain: Systematic review and meta-analysis. *Lancet.* Feb 07 2009;373(9662):463-472.
17. Rihn JA, Lee JY, Khan M, et al. Does lumbar facet fluid detected on magnetic resonance imaging correlate with radiographic instability in patients with degenerative lumbar disease? *Spine (Phila Pa 1976).* Jun 15 2007;32(14):1555-1560.
18. Manchikanti L, Abdi S, Atluri S, et al. An update of comprehensive evidence-based guidelines for interventional techniques in chronic spinal pain. Part II: Guidance and recommendations. *Pain Physician.* Apr 2013;16(2 Suppl):S49-283.

19. Beresford ZM, Kendall RW, Willick SE. Lumbar facet syndromes. *Curr Sports Med Rep.* Jan-Feb 2010;9(1):50-56.
20. Whedon JM, Mackenzie TA, Phillips RB, Lurie JD. Risk of traumatic injury associated with chiropractic spinal manipulation in Medicare part b beneficiaries aged 66 to 99 years. *Spine (Phila Pa 1976).* Feb 15 2015;40(4):264-270.
21. Jarvik JG, Hollingworth W, Martin B, et al. Rapid magnetic resonance imaging vs radiographs for patients with low back pain: A randomized controlled trial. *JAMA.* Jun 04 2003;289(21):2810-2818.
22. Lurie JD, Birkmeyer NJ, Weinstein JN. Rates of advanced spinal imaging and spine surgery. *Spine (Phila Pa 1976).* Mar 15 2003;28(6):616-620.
23. Hagen KB, Hilde G, Jamtvedt G, Winnem M. Bed rest for acute low-back pain and sciatica. *Cochrane Database Syst Rev.* Oct 18 2004(4):Cd001254.
24. Hilde G, Hagen KB, Jamtvedt G, Winnem M. Advice to stay active as a single treatment for low back pain and sciatica. *Cochrane Database Syst Rev.* 2002(2):Cd003632.
25. Kovacs FM, Abraira V, Pena A, et al. Effect of firmness of mattress on chronic non-specific low-back pain: Randomised, double-blind, controlled, multicentre trial. *Lancet.* Nov 15 2003;362(9396):1599-1604.
26. Royal College of General Practitioners, NHS Executive. *The Back Book; the best way to deal with back pain; get back active.* Second ed. Norwich, UK: The Stationary Office; 2002.
27. Burton AK, Waddell G, Tillotson KM, Summerton N. Information and advice to patients with back pain can have a positive effect. A randomized controlled trial of a novel educational booklet in primary care. *Spine (Phila Pa 1976).* Dec 01 1999;24(23):2484-2491.
28. Cherkin DC, Sherman KJ, Balderson BH, et al. Effect of mindfulness-based stress reduction vs cognitive behavioral therapy or usual care on back pain and functional limitations in adults with chronic low back pain: A randomized clinical trial. *JAMA.* Mar 22-29 2016;315(12):1240-1249.
29. Hempel S, Taylor SL, Marshall NJ, et al. VA evidence-based synthesis program reports. *Evidence map of mindfulness*. Washington (DC): Department of Veterans Affairs (US); 2014.
30. Chou R, Deyo R, Friedly J, et al. AHRQ comparative effectiveness reviews. *Noninvasive treatments for low back pain*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2016.
31. Diaz-Arribas MJ, Kovacs FM, Royuela A, et al. Effectiveness of the Godelieve Denys-Struyf (GDS) method in people with low back pain: Cluster randomized controlled trial. *Phys Ther.* Mar 2015;95(3):319-336.
32. Lehtola V, Luomajoki H, Leinonen V, Gibbons S, Airaksinen O. Sub-classification based specific movement control exercises are superior to general exercise in sub-acute low back pain when both are combined with manual therapy: A randomized controlled trial. *BMC Musculoskelet Disord.* Mar 22 2016;17:135.
33. Lau PM, Chow DH, Pope MH. Early physiotherapy intervention in an accident and emergency department reduces pain and improves satisfaction for patients with acute low back pain: A randomised trial. *Aust J Physiother.* 2008;54(4):243-249.
34. Fritz JM, Magel JS, McFadden M, et al. Early physical therapy vs usual care in patients with recent-onset low back pain: A randomized clinical trial. *JAMA.* Oct 13 2015;314(14):1459-1467.
35. Childs JD, Fritz JM, Wu SS, et al. Implications of early and guideline adherent physical therapy for low back pain on utilization and costs. *BMC Health Serv Res.* Apr 09 2015;15:150.
36. Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain: An update of a Cochrane review. *Spine (Phila Pa 1976).* Jun 2011;36(13):E825-846.
37. Bronfort G, Hondras MA, Schulz CA, Evans RL, Long CR, Grimm R. Spinal manipulation and home exercise with advice for subacute and chronic back-related leg pain: A trial with adaptive allocation. *Ann Intern Med.* Sep 16 2014;161(6):381-391.

38. Bronfort G, Maiers MJ, Evans RL, et al. Supervised exercise, spinal manipulation, and home exercise for chronic low back pain: A randomized clinical trial. *Spine J.* Jul 2011;11(7):585-598.
39. Petersen T, Larsen K, Nordsteen J, Olsen S, Fournier G, Jacobsen S. The McKenzie method compared with manipulation when used adjunctive to information and advice in low back pain patients presenting with centralization or peripheralization: A randomized controlled trial. *Spine (Phila Pa 1976).* Nov 15 2011;36(24):1999-2010.
40. Cecchi F, Molino-Lova R, Chiti M, et al. Spinal manipulation compared with back school and with individually delivered physiotherapy for the treatment of chronic low back pain: A randomized trial with one-year follow-up. *Clin Rehabil.* Jan 2010;24(1):26-36.
41. Rubinstein SM, Terwee CB, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for acute low back pain: An update of the Cochrane review. *Spine (Phila Pa 1976).* Feb 01 2013;38(3):E158-177.
42. Schneider M, Haas M, Glick R, Stevans J, Landsittel D. Comparison of spinal manipulation methods and usual medical care for acute and subacute low back pain: A randomized clinical trial. *Spine (Phila Pa 1976).* Feb 15 2015;40(4):209-217.
43. Dougherty PE, Karuza J, Dunn AS, Savino D, Katz P. Spinal manipulative therapy for chronic lower back pain in older Veterans: A prospective, randomized, placebo-controlled trial. *Geriatr Orthop Surg Rehabil.* Dec 2014;5(4):154-164.
44. Oleske DM, Lavender SA, Andersson GB, Kwasny MM. Are back supports plus education more effective than education alone in promoting recovery from low back pain?: Results from a randomized clinical trial. *Spine (Phila Pa 1976).* Sep 01 2007;32(19):2050-2057.
45. Calmels P, Queneau P, Hamonet C, et al. Effectiveness of a lumbar belt in subacute low back pain: An open, multicentric, and randomized clinical study. *Spine (Phila Pa 1976).* Feb 01 2009;34(3):215-220.
46. Sato N, Sekiguchi M, Kikuchi S, Shishido H, Sato K, Konno S. Effects of long-term corset wearing on chronic low back pain. *Fukushima J Med Sci.* 2012;58(1):60-65.
47. Goode AP, Coeytaux RR, McDuffie J, et al. An evidence map of yoga for low back pain. *Complement Ther Med.* Apr 2016;25:170-177.
48. Aboagye E, Karlsson ML, Hagberg J, Jensen I. Cost-effectiveness of early interventions for non-specific low back pain: A randomized controlled study investigating medical yoga, exercise therapy and self-care advice. *J Rehabil Med.* Feb 2015;47(2):167-173.
49. Kofotolis N, Kellis E, Vlachopoulos SP, Gouitas I, Theodorakis Y. Effects of Pilates and trunk strengthening exercises on health-related quality of life in women with chronic low back pain. *J Back Musculoskelet Rehabil.* Nov 21 2016;29(4):649-659.
50. Yamato TP, Maher CG, Saragiotto BT, et al. Pilates for low back pain: Complete republication of a Cochrane review. *Spine (Phila Pa 1976).* Jun 2016;41(12):1013-1021.
51. Kamioka H, Tsutani K, Katsumata Y, et al. Effectiveness of Pilates exercise: A quality evaluation and summary of systematic reviews based on randomized controlled trials. *Complement Ther Med.* Apr 2016;25:1-19.
52. Kong LJ, Lauche R, Klose P, et al. Tai chi for chronic pain conditions: A systematic review and meta-analysis of randomized controlled trials. *Sci Rep.* Apr 29 2016;6:25325.
53. Searle A, Spink M, Ho A, Chuter V. Exercise interventions for the treatment of chronic low back pain: A systematic review and meta-analysis of randomised controlled trials. *Clin Rehabil.* Dec 2015;29(12):1155-1167.
54. Waller B, Lambeck J, Daly D. Therapeutic aquatic exercise in the treatment of low back pain: A systematic review. *Clin Rehabil.* Jan 2009;23(1):3-14.
55. Marshall PW, Kennedy S, Brooks C, Lonsdale C. Pilates exercise or stationary cycling for chronic nonspecific low back pain: Does it matter? A randomized controlled trial with 6-month follow-up. *Spine (Phila Pa 1976).* Jul 01 2013;38(15):E952-959.

56. O'Connor SR, Tully MA, Ryan B, et al. Walking exercise for chronic musculoskeletal pain: Systematic review and meta-analysis. *Arch Phys Med Rehabil.* Apr 2015;96(4):724-734.e723.
57. Buchmuller A, Navez M, Milletre-Bernardin M, et al. Value of tens for relief of chronic low back pain with or without radicular pain. *Eur J Pain.* May 2012;16(5):656-665.
58. Wegner I, Widyahening IS, van Tulder MW, et al. Traction for low-back pain with or without sciatica. *Cochrane Database Syst Rev.* Aug 19 2013(8):Cd003010.
59. Moustafa IM, Diab AA. Extension traction treatment for patients with discogenic lumbosacral radiculopathy: A randomized controlled trial. *Clin Rehabil.* Jan 2013;27(1):51-62.
60. Diab AA, Moustafa IM. Lumbar lordosis rehabilitation for pain and lumbar segmental motion in chronic mechanical low back pain: A randomized trial. *J Manipulative Physiol Ther.* May 2012;35(4):246-253.
61. Diab AA, Moustafa IM. The efficacy of lumbar extension traction for sagittal alignment in mechanical low back pain: A randomized trial. *J Back Musculoskelet Rehabil.* 2013;26(2):213-220.
62. Luedtke K, Rushton A, Wright C, et al. Effectiveness of transcranial direct current stimulation preceding cognitive behavioural management for chronic low back pain: Sham controlled double blinded randomised controlled trial. *BMJ.* Apr 16 2015;350:h1640.
63. Kivitz AJ, Gimbel JS, Bramson C, et al. Efficacy and safety of tanezumab versus naproxen in the treatment of chronic low back pain. *Pain.* Jul 2013;154(7):1009-1021.
64. Zerbini C, Ozturk ZE, Grifka J, et al. Efficacy of etoricoxib 60 mg/day and diclofenac 150 mg/day in reduction of pain and disability in patients with chronic low back pain: Results of a 4-week, multinational, randomized, double-blind study. *Curr Med Res Opin.* Dec 2005;21(12):2037-2049.
65. Zippel H, Wagenitz A. A multicentre, randomised, double-blind study comparing the efficacy and tolerability of intramuscular dexketoprofen versus diclofenac in the symptomatic treatment of acute low back pain. *Clin Drug Investig.* 2007;27(8):533-543.
66. Herndon CM, Hutchison RW, Berdine HJ, et al. Management of chronic nonmalignant pain with nonsteroidal antiinflammatory drugs. Joint opinion statement of the Ambulatory Care, Cardiology, and Pain and Palliative Care Practice and Research Networks of the American College of Clinical Pharmacy. *Pharmacotherapy.* Jun 2008;28(6):788-805.
67. Nissen SE, Yeomans ND, Solomon DH, et al. Cardiovascular safety of celecoxib, naproxen, or ibuprofen for arthritis. *N Engl J Med.* Dec 29 2016;375(26):2519-2529.
68. Antman EM, Bennett JS, Daugherty A, Furberg C, Roberts H, Taubert KA. Use of nonsteroidal antiinflammatory drugs: An update for clinicians: A scientific statement from the American Heart Association. *Circulation.* Mar 27 2007;115(12):1634-1642.
69. Konno S, Oda N, Ochiai T, Alev L. A randomized, double-blind, placebo-controlled phase III trial of duloxetine monotherapy in Japanese patients with chronic low back pain. *Spine (Phila Pa 1976).* May 23 2016.
70. Staiger TO, Gaster B, Sullivan MD, Deyo RA. Systematic review of antidepressants in the treatment of chronic low back pain. *Spine (Phila Pa 1976).* Nov 15 2003;28(22):2540-2545.
71. Salerno SM, Browning R, Jackson JL. The effect of antidepressant treatment on chronic back pain: A meta-analysis. *Arch Intern Med.* Jan 14 2002;162(1):19-24.
72. Pamelor [package insert]. Hazelwood, MO: Mallinckrodt LLC. October 2012.
73. American Geriatrics Society 2015 updated Beers criteria for potentially inappropriate medication use in older adults. *J Am Geriatr Soc.* Nov 2015;63(11):2227-2246.
74. Abdel Shaheed C, Maher CG, Williams KA, Day R, McLachlan AJ. Efficacy, tolerability, and dose-dependent effects of opioid analgesics for low back pain: A systematic review and meta-analysis. *JAMA Intern Med.* Jul 01 2016;176(7):958-968.
75. Friedman BW, Dym AA, Davitt M, et al. Naproxen with cyclobenzaprine, oxycodone/acetaminophen, or placebo for treating acute low back pain: A randomized clinical trial. *JAMA.* Oct 20 2015;314(15):1572-1580.

76. Brotz D, Maschke E, Burkard S, et al. Is there a role for benzodiazepines in the management of lumbar disc prolapse with acute sciatica? *Pain.* Jun 2010;149(3):470-475.
77. French DD, Spehar AM, Campbell RR, et al. Advances in patient safety outpatient benzodiazepine prescribing, adverse events, and costs. In: K. Henriksen, J. B. Battles, E. S. Marks, D. I. Lewin, eds. *Advances in patient safety: From research to implementation (volume 1: Research findings)*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2005.
78. Goldberg H, Firtch W, Tyburski M, et al. Oral steroids for acute radiculopathy due to a herniated lumbar disk: A randomized clinical trial. *JAMA.* May 19 2015;313(19):1915-1923.
79. Stanbury RM, Graham EM. Systemic corticosteroid therapy--side effects and their management. *Br J Ophthalmol.* Jun 1998;82(6):704-708.
80. Saragiotto BT, Machado GC, Ferreira ML, Pinheiro MB, Abdel Shaheed C, Maher CG. Paracetamol for low back pain. *Cochrane Database Syst Rev.* Jun 07 2016(6):Cd012230.
81. Williams CM, Maher CG, Latimer J, et al. Efficacy of paracetamol for acute low-back pain: A double-blind, randomised controlled trial. *Lancet.* Nov 01 2014;384(9954):1586-1596.
82. Atkinson JH, Slater MA, Capparelli EV, et al. A randomized controlled trial of gabapentin for chronic low back pain with and without a radiating component. *Pain.* Jul 2016;157(7):1499-1507.
83. McCleane GJ. Does gabapentin have an analgesic effect on background, movement and referred pain? A randomised, double-blind, placebo controlled study *The Pain Clinic.* 2001;13(2):103-107.
84. Yildirim K, Şışecıoğlu M, Karatay S. The effectiveness of gabapentin in patients with chronic radiculopathy. *The Pain Clinic.* 2003;15(3):213-218.
85. Mathieson S, Maher CG, McLachlan AJ, et al. Trial of pregabalin for acute and chronic sciatica. *N Engl J Med.* Mar 23 2017;376(12):1111-1120.
86. Sodha R, Sivanadarajah N, Alam M. The use of glucosamine for chronic low back pain: A systematic review of randomised control trials. *BMJ Open.* Jun 20 2013;3(6).
87. Manchikanti L, Knezevic NN, Boswell MV, Kaye AD, Hirsch JA. Epidural injections for lumbar radiculopathy and spinal stenosis: A comparative systematic review and meta-analysis. *Pain Physician.* Mar 2016;19(3):E365-410.
88. Chou R, Hashimoto R, Friedly J, et al. AHRQ technology assessments. *Pain management injection therapies for low back pain*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2015.
89. Spijker-Huiges A, Winters JC, van Wijhe M, Groenier K. Steroid injections added to the usual treatment of lumbar radicular syndrome: A pragmatic randomized controlled trial in general practice. *BMC Musculoskelet Disord.* Oct 11 2014;15:341.
90. Sae-Jung S, Jirarattanaphochai K. Outcomes of lumbar facet syndrome treated with oral diclofenac or methylprednisolone facet injection: A randomized trial. *Int Orthop.* Jun 2016;40(6):1091-1098.
91. Maas ET, Ostelo RW, Niemisto L, et al. Radiofrequency denervation for chronic low back pain. *Cochrane Database Syst Rev.* Oct 23 2015(10):Cd008572.
92. Singh S, Kumar S, Chahal G, Verma R. Selective nerve root blocks vs. Caudal epidural injection for single level prolapsed lumbar intervertebral disc; a prospective randomized study. *Journal of Clinical Orthopaedics & Trauma.*
93. Koh W, Choi SS, Karm MH, et al. Treatment of chronic lumbosacral radicular pain using adjuvant pulsed radiofrequency: A randomized controlled study. *Pain Med.* Mar 2015;16(3):432-441.
94. Kamper SJ, Apeldoorn AT, Chiarotto A, et al. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain. *Cochrane Database Syst Rev.* Sep 02 2014(9):Cd000963.
95. Nazzal ME, Saadah MA, Saadah LM, et al. Management options of chronic low back pain. A randomized blinded clinical trial. *Neurosciences (Riyadh).* Apr 2013;18(2):152-159.
96. Dufour N, Thamsborg G, Oefeldt A, Lundsgaard C, Stender S. Treatment of chronic low back pain: A randomized, clinical trial comparing group-based multidisciplinary biopsychosocial rehabilitation

and intensive individual therapist-assisted back muscle strengthening exercises. *Spine (Phila Pa 1976).* Mar 01 2010;35(5):469-476.

97. Warner TD, Giuliano F, Vojnovic I, Bukasa A, Mitchell JA, Vane JR. Nonsteroid drug selectivities for cyclo-oxygenase-1 rather than cyclo-oxygenase-2 are associated with human gastrointestinal toxicity: A full in vitro analysis. *Proc Natl Acad Sci U S A.* Jun 22 1999;96(13):7563-7568.
98. Vane SJ. Aspirin and other anti-inflammatory drugs. *Thorax.* Oct 2000;55 Suppl 2:S3-9.