Development of a Clinical Decision Aid for Chiropractic Management of Common Conditions Causing Low Back Pain in Veterans: Results of a Consensus Process

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Abstract

Objective: The purpose of this study was to develop a clinical decision aid for chiropractic management of common conditions causing low back pain (LBP) in veterans receiving treatment in US Veterans Affairs (VA) health care facilities.

Methods: A consensus study using an online, modified Delphi technique and Research Electronic Data Capture web application was conducted among VA doctors of chiropractic. Investigators reviewed the scientific literature pertaining to diagnosis and treatment of nonsurgical, neuromusculoskeletal LBP. Thirty seed statements summarizing evidence for chiropractic management, a graphical stepped management tool outlining diagnosis-informed treatment approaches, and support materials were then reviewed by an expert advisory committee. Email notifications invited 113 VA chiropractic clinicians to participate as Delphi panelists. Panelists rated the appropriateness of the seed statements and the stepped process on a 1-to-9 scale using the RAND/University of California, Los Angeles methodology. Statements were accepted when both the median rating and 80% of all ratings occurred within the highly appropriate range.

Results: Thirty-nine panelists (74% male) with a mean (standard deviation) age of 46 (11) years and clinical experience of 17 (11) years participated in the study. Accepted statements addressed included (1) essential components of chiropractic care, (2) treatments for conditions causing or contributing to LBP, (3) spinal manipulation mechanisms, (4) descriptions and mechanisms of commonly used chiropractic interventions, and (5) a graphical stepped clinical management tool.

Conclusion: This study group produced a chiropractic clinical decision aid for LBP management, which can be used to support evidence-based care decisions for veterans with LBP. (J Manipulative Physiol Ther 2019;42:677-693)

Key Indexing Terms: *Decision Support Techniques; Low Back Pain; Chiropractic; Complementary Therapies; United States; Consensus; Veterans*

Introduction

A clinical decision aid is an instrument providing information to assist clinicians and patients in making decisions about health care.[1] Inherent within an evidence-based decision aid is the concept that decisions practitioners make should include careful integration of experiential knowledge, scientific evidence, and patient preferences.[2] Decision aids are not designed to dictate decisions. Rather, they are designed to organize and summarize information gleaned from the scientific literature to help inform decision-making.

Low back pain (LBP) is highly prevalent, often leading to substantial disability.[3] The absence of tests that definitively categorize the many conditions causing LBP adds to the challenge of identifying a specific diagnosis to inform management decisions.[4] Although diagnoses often simply describe the main symptom, such as lumbalgia or low back pain, they can be more specific, theoretically leading to more informed clinical decision-making.[5-7] Several evidence-based classification systems are available to guide diagnostic evaluation.[8-11]

Doctors of chiropractic (DCs), including those employed within US Veterans Affairs (VA) health care facilities,

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provide nonpharmacologic, multimodal, conservative care primarily for musculoskeletal conditions, most often for LBP.[12] A fast-growing discipline within VA, chiropractic services are available at over 65 clinics nationwide, accounting for over 159,000 patient visits in 2016.[12] US Department of Defense and VA clinical practice guidelines recommend identifying specific diagnoses such as radiculopathy, neurogenic claudication, and psychosocial factors contributing to LBP. These recommendations are based on the premise that specific management options for these conditions are known, or considered, to be more appropriate than others.[13] Alhough guidelines generally describe evidence-based treatments for persons with LBP, they typically do not provide chiropractic management recommendations at a condition level for a range of commonly occurring diagnoses causing or contributing to neuromusculoskeletal LBP.[14-16]

To address this information gap, the authors searched the scientific literature for evidence to inform chiropractic management decisions for patients with specific known or suspected LBP diagnoses and other factors that contribute to symptom augmentation or perpetuation. The purpose of this research was to develop and present an evidence-based chiropractic, multimodal treatment decision aid for managing LBP in US veterans using a consensus-building Delphi process.

Methods

Project Overview

This study was part of a funded research project (5UG3AT009761-02) designed to evaluate the comparative effectiveness of various treatment dose levels of chiropractic care for veterans with LBP. Two thematically related studies accompanied this project. The first was a systematic review of evidence for diagnosing common conditions causing LBP and recommendations for standardized terminology use. The systematic review then informed the development of a practical diagnostic checklist and clinical exam leading to evidence-based and specific working diagnoses.[17,18] The purpose of this study was to develop an in-office resource functioning as a treatment decision aid summarizing research evidence to inform VA chiropractic providers caring for US military veterans with LBP.

Human Participant Considerations

This study, using modified Delphi panel consensus methods, was exempted by the Palmer College of Chiropractic Institutional Review Board with the assurance number X2018-4-10-V on May 14, 2018. All expert advisors and Delphi panelists provided consent to participate in the study and those acknowledged in the manuscript provided signed permission. Expert advisors were offered an honorarium for their involvement in the project.

Research Personnel and Participants

The investigative team consisted of members with expertise in chiropractic, clinical research, and Delphi process methodology. This team reviewed relevant research literature, developed seed statements and supporting documents, identified external advisors and potential Delphi panelists, managed the data collection process, and finalized all findings. Three leaders in evidence-based chiropractic practice reviewed all Delphi materials and provided iterative feedback. All VA chiropractic providers designated as *chiropractor* within the VA e-mail system (n = 113), not including chiropractic residents, interns, or students (n = 20), were invited to rate the clinical decision aid materials and provide critical feedback.

Source Documents and Seed Statements

The lead investigator (R.V.) prepared initial seed statements based on literature obtained from topic-based reviews of the published literature. Because clinical management of LBP represents the compilation of many topics, systematic reviews of each area were not performed. Retrieved documents were categorized according to an evidence hierarchy. The highest available levels of evidence, such as systematic reviews and meta-analyses, were prioritized for seed statement development.[19,20] For some statements, no systematic reviews were available. In these instances, randomized controlled trials and observational studies provided evidentiary support. Some statements, such as those describing mechanisms influenced by interventions, were supported by basic science research or best-practice documents.

Seed statements were refined though an iterative process among 3 additional investigators (S.S., Z.S., A.M.), then organized into thematic headings. Statements included a graphical, stepped-process, clinical management tool for patients with LBP. The external advisors reviewed and rated each seed statement and the stepped-process clinical management tool and provided written feedback, which included suggestions for additional references to support statements. Using ratings and comments from external advisors conducted through 2 separate rounds, the investigative team finalized revisions and approved statements for distribution to Delphi panelists.

Modified Delphi Consensus Process

We used a modification of the RAND Corporation/University of California, Los Angeles consensus methodology on appropriateness ratings to conduct this study.[21] Data collection was conducted electronically using Research

Electronic Data Capture (REDCap) (Vanderbilt University, Nashville, Tennessee). REDCap is a secure web-based application designed for research, providing (1) an interface for validated data entry, (2) audit trails for tracking data manipulation and export procedures, (3) automated export procedures for analysis with common statistical packages, and (4) procedures for importing data from external sources.[22] Electronically facilitated Delphi processes have been used within the profession to develop guidelines and best-practice documents.[15,23,24]

The Delphi process launched in August 2018 and concluded in September 2018. Potential panelists first received an informational e-mail about the upcoming Delphi-process study from the chiropractic program director for VA. One week later, e-mail invitations were sent through REDCap to 113 potential panelists. This invitation contained a description of the decision aid development process and a link to a consent document. Potential panelists who agreed to be part of the Delphi panel submitted a recent curriculum vitae to confirm eligibility. Eligible panelists received an e-mailed link to the first-round survey in REDCap. Panelists completed demographic information and an investigator-designed questionnaire to assess self-reported knowledge of evidence-based, multimodal chiropractic interventions for LBP. Responses were recorded on a 5-point scale ranging from not at all knowledgeable (1) to very knowledgeable (5), with results collapsed into 3 categories for reporting purposes.

Individual panelists rated each seed statement and the stepped management tool along a 9-item numeric scale. Possible ratings ranged from 1 to 3 (highly inappropriate), 4 to 6 (undecided), and 7 to 9 (highly appropriate). Appropriateness was defined as a statement suggesting the expected health benefit to the patient exceeds the expected negative consequences by a sufficiently wide margin that the recommendation is worth doing, exclusive of cost.[21] To increase transparency, each seed statement included electronic links to PubMed abstracts for supporting references and a classification list identifying the study design of supporting references. For any statements not receiving a 7-to-9 rating, we asked panelists to provide rationale and references. Comments about seed statements, regardless of rating, were encouraged through instructions and with available free text boxes throughout the survey. Consensus was defined when at least 80% of panelists rated a statement within a 7-to-9 range and the median rating was also located within the same range. Before panelist review, the authors determined that statements not meeting consensus would be revised after each round and removed after the third round if no consensus was achieved.

Panelists' rating and feedback data were exported from REDCap as a de-identified data set into Microsoft Excel. Deidentified demographic data were analyzed separately in SPSS Statistics for Windows, version 25.0 (Armonk, NY, IBM Corp).

Table 1. *Characteristics of VA DCs Participating as Delphi Panelists (n = 39)*

Characteristics	n (%)
Male	29 (74)
Age (y)—mean (SD)	46 (11)
Range	28-65
Race	
White	36 (92)
Other	3 (8)
Not Hispanic or Latino	36 (92)
Additional graduate degree	13 (33)
Clinical diplomate or certificate	27 (70)
Veteran	3 (8)
Years since DC graduation—median (IQR)	15 (9-26)
Years practiced in VA—median (IQR)	4 (2-7)
Patient visits per wk—mean (SD)	68 (28)
Range	18-185
Previous Delphi participation	23 (59)
Previous practice guideline, care pathway, or decision aid participation	25 (64)
Use a decision aid in practice	30 (77)
Use general diagnosis for LBP	19 (49)
Use tissue-specific diagnosis for LBP	36 (92)

n (%) unless otherwise noted.
DC, doctor of chiropractic; *IQR*, interquartile range (25%-75%); *LBP*, low back pain; *SD*, standard deviation; *VA*, Veterans Affairs.

Results

Thirty-nine VA DCs served as consensus panelists (35% response rate). Demographic characteristics (Table 1) included a mean (standard deviation) age of 46 (11) years, 17 (11) years of clinical experience in chiropractic, and 5 (5) years employed as a VA chiropractor. Over 50% of panelists reported prior involvement in a Delphi consensus study, 77% reported using a decision aid in practice, and 92% reported using tissue-specific diagnoses to characterize LBP. Table 2 displays self-reported knowledge of multimodal chiropractic care. Most panelists reported being "quite" or

Table 2. *Delphi Panelist Self-Reported Knowledge of Interventions (n = 39)*

Intervention	Not at All Knowledgeable (%)	A Little or Somewhat Knowledgeable (%)	Quite or Very Knowledgeable (%)
Patient education		1 (3)	38 (97)
Self-management		1 (3)	38 (97)
Spinal manipulation (thrust)			39 (100)
Spinal manipulation (non-thrust)		6 (15)	32 (82)
Extremity or other joint manipulation (thrust or non-thrust)		12 (31)	26 (67)
Heat		7 (18)	32 (82)
Massage		14 (36)	25 (64)
Low-level laser	9 (23)	24 (62)	6 (15)
Motor control exercises	1 (3)	9 (23)	29 (74)
Mindfulness-based stress reduction	1 (3)	21 (54)	17 (43)
Tai chi	8 (21)	22 (56)	9 (23)
Yoga	4 (10)	23 (59)	12 (31)
Progressive relaxation	8 (21)	21 (54)	10 (26)
Regional muscle strengthening		12 (31)	27 (69)
Directional preference exercises	4 (10)	10 (26)	25 (64)
Myofascial therapies		4 (10)	35 (90)
Home or general exercise		1 (3)	38 (97)
Neural mobilization	9 (23)	12 (31)	18 (46)
Lumbar mobilization exercise		6 (15)	33 (85)
Graded exposure training	12 (31)	19 (49)	8 (21)
Relaxation	2 (5)	24 (62)	13 (33)
Body positioning techniques	2 (5)	18 (46)	19 (49)
Spinal stabilization exercise		8 (21)	31 (80)
Flexibility exercise		6 (15)	33 (85)
Fear avoidance/catastrophizing reduction	1 (3)	11 (28)	27 (69)
Cognitive behavioral therapy[a]	2 (5)	21 (54)	15 (39)
Acupuncture	7 (18)	14 (36)	18 (46)

[a]One missing response.

"very" knowledgeable (≥85%) regarding spinal manipulation (thrust), patient education, self-management, home/general exercise, myofascial therapies, lumbar mobilization exercise, and flexibility exercise.

Seed statements included definitions of 6 distinct components of chiropractic care. Each component was reviewed under the framework that VA DCs should consider each component for each patient. In some

instances, an individual component may not be employed owing to circumstances or characteristics unique to each patient.

Consensus Statements: 6 Components of Multimodal Chiropractic Care

- Education: All chiropractic care or evaluation should include education to inform patients about their condition and interventions and to foster health literacy. The goal of such education is to provide information to enable patients to make appropriate health care decisions.[13,25] Education can provide long-term reassurance, and it is recommended to help patients manage chronic conditions.[26,27] Conversely, low health literacy is associated with poor health outcomes through limiting the capacity to acquire self-care knowledge and skills.[28,29]
- Passive interventions: Passive interventions require patients to receive treatment rendered by another person, such as spinal manipulation and acupuncture. Continuous dependence on passive treatments can reinforce patient feelings of powerlessness, create dependency on providers, and place the majority of pain management responsibility on providers.[30]
- Transitional interventions: Transitional interventions are monitored or guided by a provider but performed by a patient during active care to reinforce or enhance the effectiveness of provider-based passive treatment. An example of a transitional treatment is repeated motion exercise, designed for patients to conduct on their own and between visits to reduce pain and improve flexibility.[30]
- Active interventions: Active interventions are controlled and performed by a patient independent from passive or transitional interventions. Examples of active interventions are mindfulness, general exercise, yoga, and tai chi.[30]
- Self-management: Self-management refers to a process individuals use to self-monitor, control, or reduce the impact of a condition over time.[31] This continuous process requires sufficient knowledge of a condition and skills necessary to maintain good psychosocial function.[31] Doctors of chiropractic should recommend self-management strategies, such as general exercise, as appropriate.[32-34]
- Visit frequency and duration (intervention dose): Visit frequency and duration should be determined by synthesizing clinical information such as the diagnosis, physical condition, care goals, intervention options, and expected response. Although general visit frequency and duration should be planned before treatment begins, response to care and changes in patient presentation, or other new information, may warrant changing a prescribed visit frequency and duration at any point during care.[35]

Evidence-Based Interventions for Conditions That Cause, Complicate, or Otherwise Contribute to Low Back Pain

- Facet (zygapophysial/z-joint) joint pain: pain perceived from nociceptive signaling originating within or surrounding a facet joint[36]
  - Interventions:
    - Education about the condition[13,25-29,33,34]
    - Spinal manipulation (thrust or non-thrust as tolerated)[10,13,37-39]
    - Heat, massage, low-level laser[37,38]
    - Motor control exercise[37,38]
    - General self-care and self-management advice[37,38]
    - Consider recommending mindfulness-based stress reduction, tai chi, yoga, and progressive relaxation[37,38]

- Sacroiliac joint pain: Pain stemming from a sacroiliac joint[36]
  - Interventions:
    - Education about the condition[13,25-29,33,34]
    - Spinal manipulation[40]
    - Regional muscle strengthening[41]
    - Motor control exercise[37,38]
    - Heat, massage, low-level laser[37,38]
    - General self-care and self-management advice[37,38]
    - Consider recommending mindfulness-based stress reduction, tai chi, yoga, and progressive relaxation[37,38]

- Discogenic pain: lumbar spinal pain, with or without referred pain, stemming from a lumbar intervertebral disk[36]
  - Interventions:
    - Education about the condition[13,25-29,33,34]
    - Spinal manipulation (thrust and/or non-thrust as tolerated)[37,38]
    - Directional preference exercises[9,42]
    - Motor control exercise[37,38]
    - Heat, massage, low-level laser[37,38]
    - General self-care and self-management advice[37,38]
    - Consider recommending mindfulness-based stress reduction, tai chi, yoga, and progressive relaxation[37,38]

- Myofascial pain: pain arising from muscles or related fascia[43]
  - Interventions:
    - Education about the condition[13,25-29,33,34]
    - Myofascial-oriented therapies such as ischemic compression as indicated and as tolerated[44]

    - Spinal manipulation[37,38]
    - Motor control exercise[37,38]
    - Heat, massage, low-level laser[37,38]
    - Self-management advice such as self-stretching, self-massage, home exercise, and home heat/ice[44]
    - Comanage with other provider(s) when needed[44]
    - Consider recommending mindfulness-based stress reduction, tai chi, yoga, and progressive relaxation[37,38]

- Pain of radicular origin: As defined by the International Association for the Study of Pain, radiculopathy and radicular pain are separate and distinct. However, the conditions may coexist or be caused by a single pathology.[45] Radiculopathy is defined as the loss of sensory or motor axon conduction owing to nerve root compression or ischemia.[45] Radicular pain is defined as ectopic nociceptive firing within spinal nerves due to inflammation, mechanical strain, or possible ischemic damage to dorsal root ganglia, resulting in pain perceived in the nerve-supplied territory.[45]
    - Interventions:
        - Education about the condition[13,25-29,33,34]
        - Neurodynamics (neural mobilization) when tolerated[46]
        - Spinal manipulation (thrust and/or non-thrust as tolerated)[10,14,16,39,47]
        - Directional preference exercises[42]

- Neurogenic claudication: pain caused by intermittent compression and/or ischemia of a single or multiple nerve roots[48]
    - Interventions:
        - Education about the condition[13,25-29,33,34]
        - Spinal manipulation (thrust and/or non-thrust as tolerated)[49-51]
        - Neurodynamics (neural mobilization)[49-51]
        - Muscle stretching[49,51]
        - Lumbar mobilization exercise[49,51]
        - Self-management via a cognitive behavioral approach including goal-setting, graded activity, pacing, relaxation, and body positioning techniques to reduce lumbar lordosis[49,51]
        - Home exercises when tolerated[49,51]
        - Comanage with other providers when needed[52]

- Central sensitization: increased responsiveness of nociceptive neurons to their normal input or recruitment of a response to normally subthreshold inputs[36]
    - Interventions:
        - Education about chronic pain mechanisms[53-55]
        - Myofascial therapy to prevent and/or manage myofascial derangement from painful postures and/or movements[56]
        - Spinal manipulation exhibits short-term influence on neural pain processes[57-62]
        - Consider recommending graded exposure training[63] and mindfulness-based stress reduction[37,38]

- Poor muscle coordination potentially reducing functional spinal stability
    - Interventions:
        - Education about the condition[13,25-29,33,34]
        - Motor control or other exercise training[37,38,64]
        - Spinal stabilization or other forms of exercise such as brisk walking or cycling[65]
        - Self-management advice such as movement-based strategies for spine stability[9,25]

- General muscle weakness or improving overall physical fitness
    - Interventions:
        - Education about the condition[13,25-29,33,34]
        - Activity-specific or physical fitness exercise[66]
        - Self-management advice such as nutritional, and general activity advice to improve fitness/strength[9]

- Psychosocial factors or conditions (eg, fear, emotional trauma, depression, anxiety, social disconnection, passive coping)
    - Interventions:
        - Education to prevent/reduce fears, passive coping, and catastrophizing, and to promote self-efficacy[53]
        - Refer/comanage with mental health provider[67-69] for evidence-based treatments such as cognitive behavioral therapy,[70,71] and acceptance and commitment therapy[72] when appropriate
        - Mindfulness-based stress reduction[37,38]

Spinal Manipulation

Research evidence supports the skilled use of spinal manipulation for a wide range of conditions that cause low back pain. The American College of Physicians recommends spinal manipulation along with other conservative treatments as an appropriate first-line therapeutic approach for low back pain.[13,16,37]

Currently, both manual thrust (high-velocity, low amplitude) and non-thrust (low-velocity, variable amplitude) spinal manipulative procedures show roughly equal

therapeutic benefit for patients with low back pain. This suggests the choice of manipulative technique to use for patients should be determined by patient history, preference, tolerance to a given procedure, available equipment, and provider familiarity and skill.[73-77]

Suspected Mechanisms Underlying Spinal Manipulation

- Pain reduction: Research evidence suggests spinal manipulation has a pain-modulating effect on central nervous system processing in the short term. Research is inconclusive if central nervous system changes influenced by spinal manipulation occur in the long term.[58,61,78-80]
- Joint or regional mobility: Tissue stretching and neurophysiological mechanisms initiated during spinal manipulation are thought to contribute to increased joint or regional mobility.[81,82]
- Muscular effects: Research evidence suggests spinal manipulation can potentially alter motor neuron facilitation or disinhibition.[83-85] Other not fully understood, but observed, effects include changes in muscle tone[86,87] and increased trunk and multifidus muscle thickness.[88]
- Joint function: Theoretical and basic science evidence suggests that spinal manipulation may disrupt intra- or periarticular adhesions located in disused, injured, or degenerated tissues within and around spinal joints.[89-91] However, this has not yet been observed in human studies.
- Myofascial tissues: Theoretical and basic science evidence suggests that tissue stretching during spinal manipulation may generate shearing movements between fascial layers of paraspinal tissues.[92]

Other Interventions

- Friction massage: repeated rubbing over designated areas (muscles, tendons, fascia) to generate friction within myofascial tissues, applied manually or with specialized tools[93]
  - Suspected/proposed mechanism(s):
    - Disrupt adhesions between adjacent tissues that restrict movement or cause pain
    - Temporarily increase blood or lymphatic flow
    - Reduce pain, disrupt adhesions, reduce muscle tone, and stimulate lymphatic flow
  - Treatment goal(s):
    - Improve joint or myofascial motion, improve local circulation, and reduce pain

- Myofascial techniques (soft tissue manipulation or mobilization): pressure applied to myofascial tissues, sometimes combined with stretching[94,95]
  - Suspected/proposed mechanism(s):
    - Disrupt myofascial adhesions that restrict movement or cause pain
    - Stretch contracted tissue(s)
    - Stimulate or improve lymphatic circulation
  - Treatment goal(s):
    - Improve joint and/or myofascial motion, improve local circulation, and reduce pain

- Strengthening, fitness, motor control, or stability exercises: activities focused on developing strength, endurance, coordination, or joint/regional stability through enhancing muscle function[64]
  - Suspected/proposed mechanism(s):
    - Improve muscle strength, endurance, and/or coordination through exercises designed to enhance targeted performance
  - Treatment goal(s):
    - Improve ability to perform specific activities, reduce pain, and/or prevent injury during identified activity

- Neurodynamics (neural mobilization): carefully controlled movement of the head, spine, or limb(s) causing nerve stretching or movement[46,96,97]
  - Suspected/proposed mechanism(s):
    - Improve nerve or lower extremity mobility by reducing abnormal tension and disrupting adhesions located around nerves
    - Desensitize neural structures
  - Treatment goal(s):
    - Reduce nerve tension-related pain
    - Reduce or prevent fibrous neural entrapment
    - Improve lower extremity flexibility
    - Reduce pain and disability

- Graded activity and exposure training: graded activity and exposure to progressively more functional activities and behaviors using a cognitive behavioral approach[63,98,99]
  - Suspected/proposed mechanism(s):
    - Decrease disability
    - Improve patient understanding of condition
    - Understand and set feasible activity goals
    - Improve self-efficacy, active coping
    - Reduce catastrophizing
    - Desensitize neural structures
  - Treatment goal(s):
    - Reduce fear of activities through education and experience with safe activities

    - Achieve progressive functional improvement, especially in areas where patient is fearful of safe-to-perform activities

- Directional preference exercise: repeated movement causing centralization, symptom reduction, or improved range of motion[42]
    - Suspected/proposed mechanism(s):
        - Relieves or reduces mechanical irritation or inflammation of pain-producing tissue(s)
        - Treatment goal(s):
        - Reduce pain, increase range of motion, and encourage self-care and safe movement
- Low-level laser: noninvasive and painless light generated by electrical stimulation of a specialized gas, liquid, crystal, dye, or semiconductor[100]
    - Suspected/proposed mechanism(s):
        - May produce anti-inflammatory effects and/or stimulate other physiological changes within tissues and individual cells
    - Treatment goal(s):
        - Stimulate tissue repair, stimulate acupuncture points

Figure 1 displays the management tool modeling a process with 5 distinct decision-making steps. Although each step is discrete from others, decision-making may occur simultaneously. Figure 2 lists evidence-based interventions by diagnostic category. Figure 3 lists 6 essential components of chiropractic care. Figure 4 displays evidence-based intervention descriptions. Each figure was designed as a single-page summary of results from this study. The resulting 4-page document provides a quick-access, topical information resource for clinical office settings. We have provided an instructional video that provides an overview of this information (see video file online).

Discussion

Although multimodal chiropractic care is a prominent practice pattern, DCs select from among dozens of possible interventions.[101,102] Few tools are available to assist in this decision-making process. The decision aid developed in this study is supported by varying levels of evidence. Whenever possible, systematic reviews and meta-analyses, or guidelines and reports based on systematic reviews and meta-analyses, were used to support statements. Other evidence considered lower on the evidence hierarchy was used when systematic reviews and meta-analyses were unavailable or when reviews were incomplete or missing relevant studies.

Perhaps the most significant factors influencing the quality of research involving manual therapies employed by DCs is the inability to blind patients and practitioners in clinical trials and the absence of inert sham procedures. Other factors influencing the quality of research supporting some statements is the relative absence of randomized controlled trials conducted in symptomatic populations combined with the current limited understanding of the mechanisms underlying spinal manipulation. Statements describing suspected or proposed mechanisms underlying spinal manipulation and other manual treatments are typically based on basic science research using animal models, studies with asymptomatic persons, or clinical studies measuring associations without the ability to draw clear causal relationships.

There is a general lack of evidence for noninvasive treatments focused on managing specific conditions causing or contributing to LBP. Many of the references supporting statements represent research on the effect of noninvasive treatments for LBP labeled as nonspecific, including some used to support statements on central sensitization, poor muscle coordination, and psychosocial factors. Studies on interventions for more specific diagnoses were referenced when available.

General exercise and specific exercises, such as lumbar mobilization, stabilization, and neurodynamics, are suggested as intervention options in this decision aid. Systematic reviews suggest there is no difference in outcomes when comparing specific versus general exercises in clinical studies.[65] Therefore, recommending an exercise enjoyed by a patient or one a patient is willing to perform may be better than a limited or condition-specific exercise regimen.

Strengths and Limitations

There were 3 unique strengths of this study. The first was incorporating definitions into the seed statements. Diagnostic terminology is not used consistently in the literature or among clinicians. Referenced definitions helped avoid confusion and provided a common framework to assess statement appropriateness. The second was the ability of panelists to link directly to the PubMed abstract and, oftentimes the peer-reviewed publication, for every supporting reference. Evidence that this feature was used by panelists was indicated in their numerous comments referring to abstract review. Third, we included a description of the type of research supporting each reference, such as systematic review and meta-analysis, randomized controlled trial, observational study, narrative review, clinical guideline, and expert recommendations. These descriptors added another level of transparency.

This study had several limitations. Although the inclusion of 39 panelists was considered a good response rate (35%), it is possible that additional respondents could have alternately influenced results. Many consensus process studies are conducted among recognized experts among several disciplines. This study was conducted with VA providers from a single discipline without explicitly seeking expert status. These factors may also influence results. A systematic review of the literature pertaining to each topic in the decision aid was not performed. Literature supporting or refuting some statements may have been

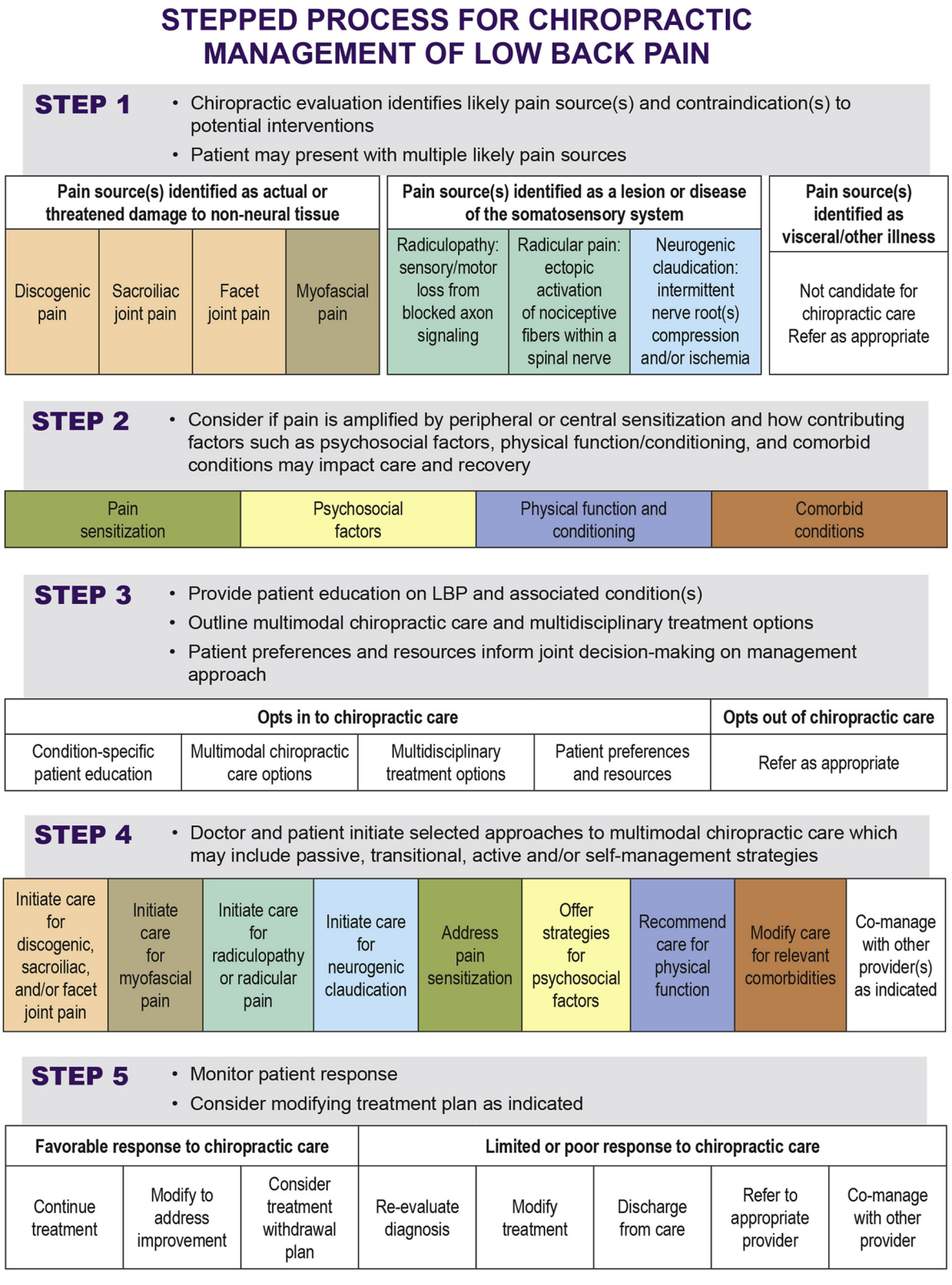

Fig 1. *Evidence-based 5-step chiropractic management tool for low back pain. Reprinted with permission from Palmer College of Chiropractic.*

EVIDENCE BASED INTERVENTIONS FOR PROBLEMS CONTRIBUTING TO LOW BACK PAIN

Problem	Interventions
Discogenic pain, Facet joint pain, Sacroiliac joint pain	• Education about condition • Spinal manipulation • Motor control exercise • Directional preference exercises • Heat, massage, low level laser, stretching, massage, home exercise • General self-care and self-management advice
Myofascial pain	• Education about condition • Myofascial oriented therapies such as ischemic compression as indicated • Motor control exercise • Spinal manipulation • Heat, low level laser, massage, stretching, home exercise • Mindfulness-based stress reduction, tai chi, yoga, progressive relaxation
Radicular pain: ectopic activation of nociceptive fibers within a spinal nerve **Radiculopathy: sensory and/or motor loss from blocked axon signaling**	• Education about condition • Neurodynamics (neural mobilization) when tolerated • Spinal manipulation • Directional preference exercise • Exercise
Neurogenic claudication: intermittent nerve root(s) compression and/or ischemia	• Education about condition • Spinal manipulation • Neurodynamics (neural mobilization) • Muscle stretching • Lumbar mobilization exercise • Goal setting, graded activity, pacing, relaxation, body positioning techniques • Home exercise when tolerated
Sensitization: pain amplified through peripheral or central sensitization mechanisms	• Education about condition • Graded exposure training • Mindfulness-based stress reduction • Myofascial therapy to prevent and/or manage myofascial derangement from painful postures and/or movements • Spinal manipulation
Psychosocial factors or conditions	• Education to prevent/reduce fear, passive coping, catastrophizing, and promote self-efficacy • Mindfulness-based stress reduction • Acceptance and commitment therapy • Cognitive behavioral therapy • Refer/co-manage with mental health provider when appropriate
Muscle weakness or lack of overall fitness	• Education about condition • Activity specific or physical fitness exercise • Self-management advice to improve fitness/strength
Muscle coordination leading to lack of functional spinal stability	• Education about condition • Motor control or other exercise training • Spinal stabilization or other forms of exercise such as brisk walking or cycling • Self-management advice such as movement based strategies for spine stability

Fig 2. *Evidence-based interventions for common diagnoses causing or contributing to low back pain. Reprinted with permission from Palmer College of Chiropractic.*

COMPONENTS OF MULTIMODAL CHIROPRACTIC CARE

Component 1: Education	Care should include education to inform patients about their condition, interventions, and to foster health literacy. The goal of education is to provide information to enable patients to make appropriate healthcare decisions. Education can provide long term reassurance and it is recommended to help patients manage chronic conditions. Low health literacy is associated with poor health outcomes through limiting the capacity to acquire self-care knowledge and skills.
Component 2: Passive interventions	Passive interventions require patients to receive treatment rendered by another person, such as spinal manipulation. Continuous dependence on passive treatments can reinforce patient feelings of powerlessness, create dependency on providers, and place the majority of pain management responsibility on providers.
Component 3: Transitional interventions	Transitional interventions are monitored or guided by a provider but performed by a patient during active care to reinforce or enhance the effectiveness of provider based passive treatment. An example of transitional treatment is repeated motion exercise, designed for patients to conduct on their own and between visits to reduce pain and improve flexibility.
Component 4: Active interventions	Active interventions are controlled and performed by a patient independent from passive or transitional interventions. Examples of active interventions are mindfulness, general exercise, yoga, and tai chi.
Component 5: Self-management	Self-management refers to a process individuals use to self-monitor, control and/or reduce the impact of a condition over time. This continuous process requires sufficient knowledge of a condition and skills necessary to maintain good psychosocial function.
Component 6: Visit frequency and duration	Visit frequency and duration should be determined by synthesizing clinical information such as the diagnosis, physical condition, care goals, intervention options, and expected response. Though a general visit frequency and duration should be planned before treatment begins, response to care and changes in patient presentation, or other new information, may warrant changing a prescribed visit frequency and duration at any point during care.

Fig 3. *6 essential components of chiropractic care. Reprinted with permission from Palmer College of Chiropractic.*

COMMON CHIROPRACTIC INTERVENTIONS

Interventions	Description	Suspected/Proposed Mechanisms	Goal(s)
Spinal manipulation	• High-velocity, low amplitude (thrust) • Low-velocity varable amplitude (non-thrust)	• Central nervous system pain processing effects • Tissue stretch, other mechanical and neurophysiological mechanisms influencing joint/regional mobility	• Pain reduction • Improved joint/regional mobility
Friction massage	• Repeated manual or manually controlled rubbing to generate friction within myofascial tissues	• Temporary increase blood/lymphatic flow • Disrupt or stretch tissue or fibers restricting movement between adjacent soft tissue layers	• Reduce pain • Improve motion between or within myofascial tissues
Myofascial techniques	• Pressure applied to soft tissues, sometimes combined with stretching or movement	• Disrupt or stretch tissue or fibers restricting movement between adjacent soft tissue layers • Mechanically stimulate lymphatic flow	• Improve joint or myofascial tissue motion • Reduce pain • Improve local tissue circulation
Strengthening, fitness, motor control, or stability exercise	• Activities focused on developing strength, endurance, coordination, or joint/regional stability through enhancing muscular function	• Improve muscle strength, endurance, and/or coordination through exercises designed to enhance targeted performance	• Improve performance of specific activities • Reduce pain and/or prevent injury during activity
Neurodynamics (neural mobilization)	• Carefully controlled movement of head, spine, or limb(s) causing nerve stretching or movement	• Reducing abnormal tension and/or stretching/disrupting adhesions located around nerves • Desensitize neural structures	• Reduce nerve-related pain • Improve lower extremity mobility • Reduce/prevent fibrous nerve entrapment
Graded exposure training	• Graded activity and exposure to progressively more functional activities and behaviors using a cognitive behavioral approach	• Reducing peripheral and central sensitization mechanisms • Improving understanding of condition	• Reduce fear of safe to perform activities • Progressive functional improvement
Directional preference exercise	• Repeated movement causing symptom centralization, reduction, or improved range of motion	• Relieves and/or reduces mechanical irritation or inflammation of pain producing tissue(s)	• Reduce pain • Increase range of motion • Encourage self-care
Low level laser	• Non-invasive light from specialized gas, liquid, crystal, dye, or semiconductor	• May produce anti-inflammatory effects and/or stimulate other physiological changes within tissues	• Stimulate tissue repair

Fig 4. *Descriptions for common evidence-based interventions for patients with low back pain. Reprinted with permission from Palmer College of Chiropractic.*

missed. Several statements were supported by limited evidence and thus could change when new or higher-quality research becomes available. Evidence interpretation of authors and expert advisors may also influence results. Some research supporting statements evaluated multimodal treatment approaches to a specific patient diagnosis. Conclusions regarding single therapies used within a multimodal treatment package should be made with caution because these studies did not assess the relative contribution of individual treatments.

As expected, we observed disparate views of evidence interpretation. For example, except for the statement describing joint mobility, at least 1 panelist expressed that statements describing mechanisms initiated or influenced by spinal manipulation were insufficiently supported by the references provided. Most panelists reported limited knowledge of several evidence-based approaches to LBP management, such as graded exposure training, tai chi, yoga, mindfulness-based stress reduction, and cognitive behavioral therapy, which has implications for the validity of the panelists' appropriateness ratings. This finding also suggests potential training opportunities for DCs and chiropractic students, both within and outside VA. For example, VA Patient Centered Care and Whole Health for Life initiatives seek to enhance self-care by veterans, particularly those with chronic health conditions.[103] Although it is unlikely that most chiropractors would apply cognitive behavioral therapy or mindfulness-based stress reduction in their clinics, additional training about such modalities may help DCs better identify and refer individuals most likely to benefit from such activities.

Lastly, the materials that we present in this study need to be tested clinically. We cannot say if these documents will help with providing improved diagnoses or better care for patients. Additional research is needed to understand the effects of this decision aid on management decisions and clinical outcomes.

Conclusion

This article offers an evidence-based clinical decision aid for multimodal chiropractic care for veterans with LBP. A 4-page document outlines the management process, evidence-based treatments for specific conditions, intervention descriptions, and definitions for 6 essential components of chiropractic care. The decision aid was validated through a web-based consensus process including DCs practicing in VA health care facilities.

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Contributorship Information

Concept development (provided idea for the research): R.V., C.G., S.S.
Design (planned the methods to generate the results): R.V., S.S., Z.S., L.C., A.M.
Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): R.V., S.S.
Data collection/processing (responsible for experiments, patient management, organization, or reporting data): Z.S., L.C.
Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): Z.S., L.C., R.V., S.S., A.M.
Literature search (performed the literature search): R.V., Z.S.

Writing (responsible for writing a substantive part of the manuscript): R.V., S.S.
Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): R.V., S.S., Z.S., A.M., L.C., C.G.

Practical Applications

- A diagnosis-based and consensus-driven decision aid provides more specific chiropractic management recommendations for low back pain (LBP) than can be found among clinical guidelines.
- The decision aid condenses a wide array of scientific evidence into a 4-page resource document describing a stepped decision--making process for managing LBP, intervention descriptions, evidence-based treatments, and 6 principal components of chiropractic care.
- Together, these summarize key evidence to inform care decisions by doctors of chiropractic. The decision aid will be used in an upcoming clinical trial within Veterans Affairs health care facilities.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jmpt.2019.03.009.

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