

Review Article

# An evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis (update)

D. Scott Kreiner, MD<sup>a,\*</sup>, William O. Shaffer, MD<sup>b</sup>, Jamie L. Baisden, MD<sup>c</sup>,  
Thomas J. Gilbert, MD<sup>d</sup>, Jeffrey T. Summers, MD<sup>e</sup>, John F. Toton, MD<sup>f</sup>,  
Steven W. Hwang, MD<sup>g</sup>, Richard C. Mendel, MD<sup>h</sup>, Charles A. Reitman, MD<sup>i</sup>

<sup>a</sup>Ahwatukee Sports and Spine, 4530 E. Muirwood Drive, Suite 110, Phoenix, AZ 85048-7693, USA

<sup>b</sup>Northwest Iowa Bone, Joint & Sports Surgeons, 1200 1st Ave. E, Suite C, Spencer, IA 51301-4342, USA

<sup>c</sup>Department of Neurosurgery, Medical College of Wisconsin, 9200 W. Wisconsin Ave., Milwaukee, WI 53226-3522, USA

<sup>d</sup>Center for Diagnostic Imaging, 5775 Wayzata Blvd, Suite 140, Saint Louis Park, MN 55416-2660, USA

<sup>e</sup>NewSouth NeuroSpine, 2470 Flowood Drive, Flowood, MS 39232-9019, USA

<sup>f</sup>1310 Prentice Drive, Ste. G, Healdsburg, CA 95448-5005, USA

<sup>g</sup>Department of Neurosurgery, Tufts Medical Center, 800 Washington St, Boston, MA 02111-1552, USA

<sup>h</sup>255 Baptist Blvd, Ste. 305, Columbus, MS 39705-2006, USA

<sup>i</sup>Baylor Clinic, 6620 Main St, 13th Floor, Suite 1325, Houston, TX 77030, USA

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## Abstract

**BACKGROUND CONTEXT:** The evidence-based clinical guideline on the diagnosis and treatment of degenerative lumbar spinal stenosis by the North American Spine Society (NASS) provides evidence-based recommendations to address key clinical questions surrounding the diagnosis and treatment of degenerative lumbar spinal stenosis. The guideline is intended to reflect contemporary treatment concepts for *symptomatic degenerative lumbar spinal stenosis* as reflected in the highest quality clinical literature available on this subject as of July 2010. The goals of the guideline recommendations are to assist in delivering optimum efficacious treatment and functional recovery from this spinal disorder.

**PURPOSE:** Provide an evidence-based educational tool to assist spine care providers in improving quality and efficiency of care delivered to patients with degenerative lumbar spinal stenosis.

**STUDY DESIGN:** Systematic review and evidence-based clinical guideline.

**METHODS:** This report is from the Degenerative Lumbar Spinal Stenosis Work Group of the NASS's Evidence-Based Clinical Guideline Development Committee. The work group consisted of multidisciplinary spine care specialists trained in the principles of evidence-based analysis. The original guideline, published in 2006, was carefully reviewed. A literature search addressing each question and using a specific search protocol was performed on English language references found in MEDLINE, EMBASE (Drugs and Pharmacology), and four additional, evidence-based, databases to identify articles published since the search performed for the original guideline. The relevant literature was then independently rated by a minimum of three physician reviewers using the NASS-adopted standardized levels of evidence. An evidentiary table was created for each of the questions. Final recommendations to answer each clinical question were arrived at via work group discussion, and grades were assigned to the recommendations using standardized grades of recommendation. In the absence of Levels I to IV evidence, work group consensus statements have been

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\* Corresponding author. Ahwatukee Sports and Spine, 4530 E. Muirwood Drive, Suite 110, Phoenix, AZ 85048-7693, USA. Tel.: 480-763-5808

E-mail address: [skreiner@ahwatukeesportsandspine.com](mailto:skreiner@ahwatukeesportsandspine.com) (D.S. Kreiner)

developed using a modified nominal group technique, and these statements are clearly identified as such in the guideline.

**RESULTS:** Sixteen key clinical questions were assessed, addressing issues of natural history, diagnosis, and treatment of degenerative lumbar spinal stenosis. The answers are summarized in this document. The respective recommendations were graded by the strength of the supporting literature that was stratified by levels of evidence.

**CONCLUSIONS:** A clinical guideline for degenerative lumbar spinal stenosis has been updated using the techniques of evidence-based medicine and using the best available clinical evidence to aid both practitioners and patients involved with the care of this condition. The entire guideline document, including the evidentiary tables, suggestions for future research, and all references, will be available electronically at the NASS Web site ([www.spine.org](http://www.spine.org)) and will remain updated on a timely schedule. © 2013 Elsevier Inc. All rights reserved.

*Keywords:*

Degenerative lumbar spinal stenosis; Natural history; Diagnosis; Imaging; Medical/interventional treatment

## Introduction

In an attempt to improve and evaluate the knowledge base concerning the diagnosis and treatment of degenerative lumbar spinal stenosis, the Degenerative Lumbar Spinal Stenosis Work Group of the North American Spine Society's (NASS) Evidence-Based Clinical Guideline Development Committee has developed an evidence-based clinical guideline on the topic. The Institute of Medicine has defined a clinical guideline as “systematically developed statements to assist practitioner and patient decisions about health care for specific clinical situations” [1].

The application of the principles of evidence-based medicine (EBM) to guideline development helps to create an explicit linkage between the final recommendations in the guideline and the evidence on which these recommendations are based [2]. When using the principles of EBM, the clinical literature is extensively searched to answer specific questions about a disease state or medical condition. The literature that is identified in the search is then rated as to its scientific merit using levels of evidence, determined by specific rule sets that apply to human and clinical investigations. The specific questions asked are then answered using studies of the highest possible levels of evidence that have been obtained from the searches. As a final step, the answers to the clinical questions are reformulated as recommendations that are assigned grades of strength related to the best clinical evidence available at the time of answering each question. The intent of the grade of recommendation is to indicate the strength of the evidence used by the work group in answering the question asked.

## Methods

For this clinical guideline, the guideline development process was broken down into 12 steps. In Step 1, guideline participants, trained in the principles of EBM, carefully reviewed the key questions and content of the 2006 guideline. In Step 2, multidisciplinary teams composed of surgical, medical, interventional, and radiological specialists were

assigned to groups and assigned a subset of the questions to be considered and updated. Step 3 consisted of each group reviewing the original search parameters used in the 2006 guideline, and as necessary, updating the search terms and parameters to direct the literature search according to the NASS-instituted Literature Search Protocol. The literature search was then completed in Step 4 by a medical research librarian according to the NASS Literature Search Protocol and stored in a cross-referencing database for future use or reference. The following electronic databases were searched for English language publications: MEDLINE (PubMed), EMBASE (Drugs and Pharmacology), Cochrane Database of Systematic reviews, and Cochrane Central Register of Controlled Trials and Web of Science. Work group members then reviewed all abstracts from the literature search in Step 5. The best research evidence available was identified and used to answer the targeted clinical questions. That is, if adequate Level I, II, or III studies were available to answer a specific question, the work group was not required to review Level IV or V evidence. In Step 6, the members independently developed evidentiary tables summarizing study conclusions, identifying strengths and weaknesses, and assigning levels of evidence. To systematically control for bias, at least three work group members reviewed each article selected and independently assigned a level of evidence as per the NASS Levels of Evidence Table. The final level of evidence assigned was that agreed on by at least two-thirds of the reviewers.

To update and formulate evidence-based recommendations and incorporate expert opinion when necessary, work groups participated in webcasts in Step 7. Expert physician opinion was incorporated only in which Levels I to IV evidence was insufficient, and the work groups deemed a recommendation was warranted. For transparency in the incorporation of consensus, all consensus-based recommendations in this guideline are clearly stated as such. Voting on guideline recommendations was conducted using a modification of the nominal group technique in which each work group member independently and anonymously ranked a recommendation on a scale ranging from 1

Table  
Linking levels of evidence to grades of recommendation

Grade of recommendation	Standard language	Levels of evidence	
A	Recommended	Two or more consistent Level I studies	
B	Suggested	One Level I study with additional supporting Level II or III studies	Two or more consistent Level II or III studies
C	May be considered and is an option	One Level I, II, or III study with supporting Level IV studies	Two or more consistent Level IV studies
I (insufficient or conflicting evidence)	Insufficient evidence to make recommendation for or against	A single Level I, II, III, or IV study without other supporting evidence	More than one study with inconsistent findings*

Note: A technical report, including the literature search parameters and evidentiary tables developed by the authors, can be accessed at <http://www.spine.org/Documents/2011StenosisTechReport.pdf>.

\* Note that in the presence of multiple consistent studies and a single outlying inconsistent study, the grade of recommendation will be based on the level of the consistent studies.

(extremely inappropriate) to 9 (extremely appropriate) [3]. Consensus was obtained when at least 80% of work group members ranked the recommendation as 7, 8, or 9. When the 80% threshold was not attained, up to three rounds of discussion and voting were held to resolve disagreements. If disagreements were not resolved after these rounds, no recommendation was adopted. When the recommendations were established, work group members developed guideline content, referencing the literature that supported the recommendations.

In Step 8, the completed guideline was submitted to the NASS Evidence-Based Guideline Development Committee and the NASS Research Council for review and comment. Revisions to recommendations were considered only when substantiated by a preponderance of appropriate levels of evidence. Once evidence-based revisions were incorporated, the guideline was submitted to the NASS Board of Directors for review and approval in Step 9. In Step 10, the NASS Board-approved guideline was submitted for inclusion in the National Guidelines Clearinghouse.

In Step 11, the recommendations will be submitted to the AMA Physician Consortium for Performance Improvement, a multispecialty collaborative group engaged in the development of evidence-based performance measures. In Step 12, the guideline recommendations will be reviewed every 3 years and the literature base updated by an EBM-trained multidisciplinary team with revisions to the recommendations developed in the same manner as in the original guideline development.

## Results

### *Definition and natural history*

#### **Question #1: What is the best working definition of degenerative lumbar spinal stenosis?**

Degenerative lumbar spinal stenosis describes a condition in which there is diminished space available for the neural and vascular elements in the lumbar spine secondary to degenerative changes in the spinal canal. When symptomatic, this causes a variable clinical syndrome of gluteal and/or lower extremity pain and/or fatigue that may occur

with or without back pain. Symptomatic lumbar spinal stenosis has certain characteristic provocative and palliative features. Provocative features include upright exercise such as walking or positionally induced neurogenic claudication. Palliative features commonly include symptomatic relief with forward flexion, sitting, and/or recumbency.

#### Work Group Consensus Statement

#### **Question #2: What is the natural history of symptomatic degenerative lumbar spinal stenosis?**

Because of the limitations of the available literature, the work group was unable to definitively answer the question posed related to the natural history of degenerative lumbar spinal stenosis. In lieu of an evidence-based answer, the work group did reach consensus on the following statements addressing natural history.

In the absence of reliable evidence, it is the work group's opinion that the natural history of patients with clinically mild to moderately symptomatic degenerative lumbar stenosis can be favorable in about one-third to one-half of patients.

#### Work Group Consensus Statement

Based on evaluation of studies that contained varying and often relatively minimal or simple interventions, it appears that the natural history of mild to moderate degenerative lumbar stenosis may be favorable for 33% to 50% of patients. It is the consensus of the work group that some of the medical treatments used in the studies reviewed likely did not significantly alter the symptomatic course of the disease.

In the absence of reliable evidence, it is the work group's opinion that in patients with mild or moderately symptomatic degenerative lumbar stenosis, rapid or catastrophic neurologic decline is rare.

#### Work Group Consensus Statement

The literature evaluated for the degenerative lumbar spinal stenosis guideline project included numerous reports describing the clinical course of patients with mild to moderate spinal stenosis. None of these reports described rapid

or catastrophic neurologic decline in patients identified with mild or moderate lumbar spinal stenosis. Although anecdotal experience may indicate the possibility of such a decline, evidence suggests that the occurrence of such a decline is exceedingly rare.

In the absence of reliable evidence, it is the work group's opinion that information in the literature is insufficient to define the natural history of clinically or radiographically severe degenerative lumbar stenosis.

#### Work Group Consensus Statement

It should be noted that all the series reviewed excluded patients with severe neurologic compromise (or loss or dysfunction) who were regarded as candidates for surgery; therefore, no conclusions can be drawn about this patient population.

#### *Diagnosis and imaging*

#### **Question #3: What are the most appropriate historical and physical findings consistent with the diagnosis of degenerative lumbar spinal stenosis?**

The diagnosis of lumbar spinal stenosis may be considered in older patients presenting with a history of gluteal or lower extremity symptoms exacerbated by walking or standing which improves or resolves with sitting or bending forward. Patients whose pain is not made worse with walking have a low likelihood of stenosis [4–7].

Grade of Recommendation: C

There is insufficient evidence to make a recommendation for or against the use of self-administered questionnaires to improve accuracy of the diagnosis of spinal stenosis [4,7,9].

Grade of Recommendation: I (insufficient evidence)

There is insufficient evidence to make a recommendation for or against certain physical findings for the diagnosis of degenerative lumbar spinal stenosis including an abnormal Romberg test, thigh pain exacerbated with extension, sensorimotor deficits, leg cramps, and abnormal Achilles tendon reflexes [4,7,9].

Grade of Recommendation: I (insufficient evidence)

There is insufficient evidence to make a recommendation for or against the diagnostic reliability of patient-reported dominance of lower extremity pain and low back pain [8].

Grade of Recommendation: I (insufficient evidence)

#### **Question #4: What are the most appropriate diagnostic tests for degenerative lumbar spinal stenosis?**

In patients with history and physical examination findings consistent with degenerative lumbar spinal stenosis,

magnetic resonance imaging (MRI) is suggested as the most appropriate noninvasive test to confirm the presence of anatomic narrowing of the spinal canal or the presence of nerve root impingement [10–16].

Grade of Recommendation: B

In patients with history and physical examination findings consistent with degenerative lumbar spinal stenosis for whom MRI is either contraindicated or inconclusive, computed tomography (CT) myelography is suggested as the most appropriate test to confirm the presence of anatomic narrowing of the spinal canal or the presence of nerve root impingement [12,13,15,17].

Grade of Recommendation: B

In patients with history and physical examination findings consistent with degenerative lumbar spinal stenosis for whom MRI and CT myelography are contraindicated, inconclusive, or inappropriate, CT is the preferred test to confirm the presence of anatomic narrowing of the spinal canal or the presence of nerve root impingement [10,18–21].

Grade of Recommendation: B

MRI or CT with axial loading is suggested as a useful adjunct to routine imaging in patients who have clinical signs and symptoms of lumbar spinal stenosis, a dural sac area of less than 110 mm<sup>2</sup> at one or more levels, and suspected but not verified central or lateral stenosis on routine unloaded MRI or CT [22–32].

Grade of Recommendation: B

It is suggested that readers use well-defined, articulated, and validated criteria for anatomic canal narrowing on MRI, computed tomography myelography (CTM), and CT to improve interobserver and intraobserver reliability [10,33–39].

Grade of Recommendation: B

#### *Imaging correlation with clinical findings*

There is insufficient evidence to make a recommendation for or against a correlation between clinical symptoms or function with the presence of anatomic narrowing of the spinal canal on MRI, CTM, or CT [40–49].

Grade of Recommendation: I (insufficient evidence)

#### *Electrodiagnostics*

Few studies are dedicated to evaluating the utility of standard electrodiagnostic studies in lumbar spinal stenosis. Studies reviewed suggest that electrodiagnostic studies are

helpful for the evaluation of patients in which stenosis alone may not account for neurologic symptoms.

In the absence of reliable evidence, it is the work group's opinion that imaging studies be considered as a first-line diagnostic test in the diagnosis of degenerative lumbar spinal stenosis.

#### Work Group Consensus Statement

Electromyographic paraspinal mapping is suggested to confirm the diagnosis of degenerative lumbar spinal stenosis in patients with mild or moderate symptoms and radiographic evidence of stenosis [50,51].

#### Grade of Recommendation: B

There is insufficient evidence to make a recommendation for or against the use of F wave, H reflex, motor-evoked potential, motor nerve conduction studies, somatosensory-evoked potentials, dermatomal sensory-evoked potentials, and lower extremity electromyography (EMG) in the confirmation of lumbar spinal stenosis. These studies may be used to help identify other comorbidities [43,50,52–57].

#### Grade of Recommendation: I (insufficient evidence)

#### *Outcome measures for medical/interventional and surgical treatment*

#### **Question #5: What are the appropriate outcome measures to evaluate the treatment of degenerative lumbar spinal stenosis?**

The NASS has a publication entitled *Compendium of Outcome Instruments for Assessment and Research of Spinal Disorders*. To purchase a copy of the Compendium, visit [https://webportal.spine.org/Purchase/ProductDetail.aspx?Product\\_code=68cdd1f4-c4ac-db11-95b2-001143edb1c1](https://webportal.spine.org/Purchase/ProductDetail.aspx?Product_code=68cdd1f4-c4ac-db11-95b2-001143edb1c1).

For additional information about the Compendium, please contact the NASS Research Department at [nassresearch@spine.org](mailto:nassresearch@spine.org).

#### *Medical/interventional treatment*

#### **Question #6: Do medical/interventional treatments improve outcomes in the management of spinal stenosis compared to the natural history of the disease?**

A systematic review of the literature yielded no studies to answer this question. An extensive review of all articles cited in the reference section found no direct comparison of active treatment (medical/interventional) to an untreated control group (natural history).

#### **Question #7: What is the role of pharmacological treatment in the management of spinal stenosis?**

There is insufficient evidence to make a recommendation for or against the use of pharmacological treatment in the management of spinal stenosis [58–68].

Grade of Recommendation: I (insufficient evidence)

#### **Question #8: What is the role of physical therapy/exercise in the treatment of spinal stenosis?**

There is insufficient evidence to make a recommendation for or against the use of physical therapy or exercise as stand-alone treatments for degenerative lumbar spinal stenosis [68,69].

Grade of Recommendation: I (insufficient evidence)

In the absence of reliable evidence, it is the work group's opinion that a limited course of active physical therapy is an option for patients with lumbar spinal stenosis.

#### Work Group Consensus Statement

#### **Question #9: What is the role of manipulation in the treatment of spinal stenosis?**

There is insufficient evidence to make a recommendation for or against spinal manipulation for the treatment of lumbar spinal stenosis [70].

Grade of Recommendation: I (insufficient evidence)

#### **Question #10: What is the role of contrast-enhanced, fluoroscopic guidance in the routine performance of epidural steroid injections for the treatment of lumbar spinal stenosis?**

Contrast-enhanced fluoroscopy is recommended to guide epidural steroid injections to improve the accuracy of medication delivery [71–74].

Grade of Recommendation: A

#### **Question #11: What is the role of epidural steroid injections (ESI) in the treatment of lumbar spinal stenosis?**

Interlaminar epidural steroid injections are suggested to provide short-term (2 weeks to 6 months) symptom relief in patients with neurogenic claudication or radiculopathy. There is, however, conflicting evidence concerning long-term (21.5–24 months) efficacy [69,75–77].

Grade of Recommendation: B

A multiple injection regimen of radiographically guided transforaminal epidural steroid injection or caudal injections is suggested to produce medium-term (3–36 months) relief of pain in patients with radiculopathy or neurogenic intermittent claudication from lumbar spinal stenosis [78–82].

Grade of Recommendation: C

#### **Question 12: What is the role of ancillary treatments such as bracing, traction, electrical stimulation and**

### **transcutaneous electrical stimulation (TENS) in the treatment of lumbar spinal stenosis?**

The use of a lumbosacral corset is suggested to increase walking distance and decrease pain in patients with lumbar spinal stenosis. There is no evidence that results are sustained once the brace is removed [83–85].

Grade of Recommendation: B

There is insufficient evidence to make a recommendation for or against traction, electrical stimulation, or transcutaneous electrical stimulation for the treatment of patients with lumbar spinal stenosis.

Grade of Recommendation: I (insufficient evidence)

There is insufficient evidence to make a recommendation for or against acupuncture in for the treatment of patients with lumbar spinal stenosis [86].

Grade of Recommendation: I (insufficient evidence)

### **Question #13: What is the long-term (2 to 10 years) result of medical/interventional management of spinal stenosis?**

Medical/interventional treatment may be considered to provide long-term (2–10 years) improvement in patients with degenerative lumbar spinal stenosis and has been shown to improve outcomes in a large percentage of patients [63,87–89].

Grade of Recommendation: C

Because of the limited availability of evidence, the work group defined long-term results as any study that included 2 or more years of follow-up.

### *Surgical treatment*

### **Question #14: Does surgical decompression alone improve surgical outcomes in the treatment of spinal stenosis compared to medical/interventional treatment?**

Decompressive surgery is suggested to improve outcomes in patients with moderate to severe symptoms of lumbar spinal stenosis [87,90–97].

Grade of Recommendation: B:

Medical/interventional treatment may be considered for patients with moderate symptoms of lumbar spinal stenosis [87,98–101].

Grade of Recommendation: C

In the absence of evidence for or against any specific treatment, it is the work group's recommendation that

medical/interventional treatment be considered for patients with mild symptoms of lumbar spinal stenosis.

### Work Group Consensus Statement

There is insufficient evidence at this time to make a recommendation for or against the placement of an interspinous process spacing device in patients with lumbar spinal stenosis [89,102].

Grade of Recommendation: I (insufficient evidence)

### **Question #15: Does the addition of lumbar fusion, with or without instrumentation, to surgical decompression improve surgical outcomes in the treatment of spinal stenosis compared to treatment by decompression alone?**

For patients with degenerative lumbar spinal stenosis with concomitant spondylolisthesis, please refer to treatment recommendations and supporting evidence available in the NASS guideline *Diagnosis and Treatment of Degenerative Lumbar Spondylolisthesis (2008)*, available at [http://www.spine.org/Documents/Spondylolisthesis\\_Clinical\\_Guideline.pdf](http://www.spine.org/Documents/Spondylolisthesis_Clinical_Guideline.pdf).

Decompression alone is suggested for patients with leg predominant symptoms without instability [103–105].

Grade of Recommendation: B

### **Question #16: What is the long-term result (4+ years) of surgical management of spinal stenosis?**

Surgical treatment may be considered to provide long-term (4+ years) improvement in patients with degenerative lumbar spinal stenosis and has been shown to improve outcomes in a large percentage of patients [87,106–125].

Grade of Recommendation: C

Surgical decompression may be considered in patients aged 75 years or older with lumbar spinal stenosis [97,116].

Grade of Recommendation: C

### **Discussion**

This evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis has several functions. It is an educational tool for both clinicians and patients, and as such, this particular guideline is intended to facilitate the diagnosis and treatment of degenerative lumbar spinal stenosis. This guideline also serves to focus and rate the clinical data on this topic. An evidence-based guideline such as this allows a physician access to the best and most current evidence and reduces the burden of “keeping up with the literature” that spans

innumerable journals from a broad spectrum of disciplines. In addition, this evidence-based clinical guideline has the potential to improve the appropriateness and effectiveness of patient care by basing decisions on the best evidence available. Finally, the creation of this guideline serves to identify knowledge gaps in the clinical literature on the diagnosis and treatment of degenerative lumbar spinal stenosis. High-quality clinical guidelines ideally identify and suggest future research topics to improve guideline development and thus patient care, as detailed in the current guideline. The NASS Web site, [www.spine.org](http://www.spine.org), contains the complete clinical guideline summarized in this article, along with extensive descriptive narratives on each topic outlining the evidence and the work group rationale for the answers to each question. In addition, more extensive descriptions are provided for the guideline development process used at NASS, along with all the references used in this guideline and suggestions for future research studies on the diagnosis and treatment of degenerative lumbar spinal stenosis.

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