Protocol for proposed guideline project: The use of epidural steroids to treat cervical and lumbar radicular pain and spinal stenosis

Proposal of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology

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DISCLOSURES

Pushpa Narayanaswami has received honoraria from AANEM and AAN for workshops and lectures at the annual meetings; has provided expert testimony and depositions as a medicolegal consultant; is a member of the Pharmacy and Therapeutics Committee, Blue Cross Blue Shield, MA; has prepared expert medical reports for Advance Medical and reviewed grant proposals for Boston Clinical Research Institute; has received research support from MERZ Pharmaceuticals, USA for an investigator-initiated trial and from the Agency for Healthcare Research and Quality (AHRQ 1R18HS022004-01); serves as a member of the Level of Evidence team for Neurology; and is a member of the editorial board of the Journal of Clinical Neuromuscular Disease (uncompensated).

Shaheen Lakhan serves on the AAN’s Distance Learning Subcommittee and is an editorial team member of the Resident & Fellow Section of Neurology.

Christine Peeters-Asdourian reports no financial disclosures.

Miroslav Bačkonja has served on the editorial boards for the Clinical Journal of Pain, European Journal of Pain, Journal of Pain, and Pain; he is currently employed by PRA Health Sciences.

Christopher J. Gilligan has served on scientific advisory boards for Cubist Pharmaceuticals, Mainstay Medical, and Medasense; has received honoraria from the American Society of Regional Anesthesia and the Principles and Practice of Pain Medicine Course at Harvard
Medical School; performs a clinical procedure, epidural steroid injections, as 15% of his clinical effort in his practice, which overlaps with the content of this evidence-based study; receives financial research support from the NIH; and has served as an expert witness for the US Attorney and Federal Bureau of Investigation and for 3 malpractice cases.

Sonja Potrebic has received funding for travel from the AAN to attend the Guidelines-International-Network meetings and has received honoraria and a subscription to *Continuum* from the AAN for her work on the AAN RITE exam work group.

Melissa Armstrong is supported by an ARHQ K08 career development award (K08HS24159-01); receives salary support from the AAN for work as an evidence-based medicine methodology consultant; is a member of the Level of Evidence editorial board for *Neurology* (uncompensated); has received stipends for serving as faculty at the International Congress of the International Parkinson and Movement Disorder Society (2013, 2014), at the annual meeting of AAN (2014, 2015), and on an AAN online course on evidence-based medicine (2015). In the last 2 years, she served as a local investigator for studies sponsored by the Parkinson Study Group, the Huntington Study Group, the CHDI Foundation, AbbVie, Biotie, and Insightec, and she received funding as a subinvestigator or local investigator on the National Institutes of Health (NIH) grants U01 AR057967-01, U01NS080818-01A1, and U01NS080840-01A1. She receives royalties for publication of *Parkinson’s Disease: Improving Patient Care* (Oxford University Press).
Thomas Getchius is a full-time employee of the AAN.

Shannon Merillat is a full-time employee of the AAN.

Carmel Armon serves as an associate editor for the Journal of Neurological Sciences; serves on the editorial board for Neurology and emedicine Neurology; receives royalties from chapters published in emedicine Neurology and UpToDate; has served as local principal investigator at Assaf Harofeh Medical Center, Israel, for a clinical trial in patients with Alzheimer disease, funded by Neuronix, Inc.; and has provided medicolegal consultative services.

DESCRIPTION OF AAN DOCUMENT TYPES
This protocol is the planning document for one of four AAN document types: focused systematic review, comprehensive systematic review, practice advisory (based on a systematic review), or practice guideline (based on a systematic review). The term Guideline is the general term that refers to all AAN evidence-based documents. Because it is for planning purposes only, this protocol document is not a substitute for the complete Guideline.
GUIDELINE PROJECT PROTOCOL

Guideline project development plan

This proposed project will be developed in accordance with the processes described in the 2011 edition of the AAN clinical practice guideline development process manual (as amended). The authors of this guideline project intend to develop a practice advisory based on a systematic review. This protocol will be posted for public comment. Patient representatives will not be included on the panel; however, literature regarding patient preferences will be reviewed to frame the questions.

Guideline project timeline

The tentative timeline for development of this practice advisory is as follows:

Panel formation: April 2015

Draft of protocol presented to the AAN GDDI: November 2015

Protocol posted for public comment: December 2015

Literature search: Completed by January 2016

Panel review of abstracts: January 2016–March 2016

Review of full articles, data extraction, and development of evidence tables: March 2016–July 2016

Systematic review draft submitted to AAN GDDI: October 2016

Systematic review posted for public comment: November 2016

Develop recommendations based on systematic review and other pillars (principles, strong related evidence from other conditions, inferences): August 2016–December 2016
Submit draft guideline to AAN GDDI for review and approval for public comment: January 2017

Post guideline for public comment: February 2017

Submit to AAN GDDI for review and approval of final: April 2017

Submission to Neurology: May 2017

Composition of the author panel

In July 2015, a multidisciplinary panel consisting of eight AAN physician members was recruited to develop this guideline project protocol. The physicians included content experts (PN, SL, CP-A, MB, CG, CA), a methodology expert (MA), and GDDI members (PN, SP). The physicians were required to submit online conflict of interest (COI) forms and copies of their curriculum vitae (CV). The panel leadership, consisting of the lead author (PN), the AAN methodologist (MA), and the AAN staff persons (TG, SM), reviewed the COI forms and CVs for financial and intellectual COIs. These documents were specifically screened to exclude both those individuals with a clear financial conflict and those whose professional and intellectual bias would diminish the credibility of the review in the eyes of the intended users. In accordance with AAN policy, the lead author (PN) has no COIs. One of the 8 authors was determined to have COIs, but the COIs were judged to be not significant enough to preclude him from authorship (CG). The author determined to have COIs (CG) will not be permitted to review or rate the evidence. This individual will be used in an advisory capacity to help with the validation of the key questions, the scope of the literature search, and the identification of seminal articles to validate the literature search. The panel member with COIs will be allowed to participate in the recommendation development process. The final list of panel members was recommended to
the AAN GDDI leadership, who reviewed the list of proposed authors and the panel leadership’s COI forms, and provided final approval. This panel will be solely responsible for the final decisions about the design, analysis, and reporting of the proposed systematic review and proposed subsequent practice advisory, which then will be submitted for approval to the AAN GDDI.

**Introduction to proposed project topic**

Since the publication of the previous AAN technology assessment report, titled “Use of epidural steroids to treat radicular lumbosacral pain,” additional studies have been published that assess the use of this therapeutic modality in both radicular pain and pain due to spinal stenosis. Reports of risks of these treatments have also increased. Epidural steroids are frequently used in the treatment of radicular pain and spinal stenosis, both cervical and lumbar.

In 2013, the incidence of back and neck pain, defined as the percentage of individuals aged 18 and older who reported pain in the previous 3 months, was 28.4% and 14.4%, respectively. The age-adjusted numbers have been stable at least since 1997. The US prevalence of lumbar spinal stenosis (LSS) has been estimated at 8% to 11%. A similar number—10%—was reported for a patient sample in Japan. When spinal narrowing is defined as 10 mm or less, the prevalence of LSS increases with age from 4% below 40 years to 19.4% above 60 years in a Framingham, US population-based sample. LSS was associated with a threefold higher risk of experiencing lower back pain (LBP). In another population-based sample in Japanese individuals aged 40 to 79 years, the prevalence of LSS-associated lower-limb symptoms was 18.8%; the prevalence of LSS was estimated to be 5.7% using a diagnostic support tool. The adjusted rate of lumbar
stenosis surgery per 100,000 Medicare beneficiaries was 137.4 in 2002 and 135.5 in 2007. This rate is expected to increase as the aging population increases. Stenosis of the central cervical and thoracic spine may result in myelopathy, and lateral canal stenosis can lead to radicular symptoms and signs such as pain and radicular weakness.

Epidural steroid injections (ESIs) are frequently used in the treatment of radicular pain and pain due to spinal stenosis. Between 2000 and 2011, the utilization of ESIs increased 130% per 100,000 Medicare beneficiaries, with an annual increase of about 7.5%. This contrasts with an increase in the number of Medicare beneficiaries per 100,000 population of only 18% in the same period, with an annual increase of 2.5%. The increases per 100,000 Medicare recipients were 123% for cervical/thoracic interlaminar epidural injections; 25% for lumbar/sacral interlaminar, or caudal epidural injections; 142% for cervical/thoracic transforaminal epidural injections; and 665% for lumbar/sacral transforaminal epidural injections. A 2001 study revealed a 7.7-fold geographic variability in the use of lumbar ESI from 5.2/1000 (Hawaii) to 39.9/1000 (Alabama). In areas with high injection rates, a significantly higher percentage of patients who sought care for low back pain received injections ($p < 0.001$). In addition, in areas with high injection rates, a significantly higher percentage of patients who presented with low back pain received both injections and lumbar surgery within the same year ($p < 0.001$), suggesting that ESIs were not substituting for surgery. An evidence-based review by the AAN in 2007 showed there was limited efficacy of lumbar spinal ESI in reduction of pain, and that its use did not result in reduced surgery rates. A 2012 narrative review that evaluated previously published systematic reviews found variations in systematic review methodology; the Cochrane reviews on the topic were predominantly nonconclusive. Several other systematic reviews that
evaluated different routes of injection (caudal, interlaminar, transforaminal) and the principal pathologies (spinal stenosis, disc herniation) found a moderate short-term benefit of ESIs vs placebo in patients with disc herniation and radiculitis.\(^\text{12}\)

As ESI use is increasing in the context of little evidence, a greater appreciation of ESI risks is also developing. Complications reported with interlaminar and transforaminal cervical ESI include nausea and vomiting, vasovagal reaction, and dural puncture. Bloating, facial flushing, fever, nerve root injury, pneumocephalus, epidural hematoma, subdural hematoma, stiff neck, Cushing’s syndrome, transient paresthesias, hypotension, respiratory insufficiency, transient blindness, epidural abscess, paralysis, cord injury, and death have been reported with cervical interlaminar ESI. Complications reported with transforaminal cervical and lumbar ESI include neck pain, transient increased radicular pain, headache, transient lightheadedness, dyspepsia, fluid retention, transient global amnesia, vertebral artery injury, paralysis, cord infarction and cerebellar infarction, and death.\(^\text{13,14}\) After fungal meningitis complicating the use of contaminated corticosteroids in 2012, the US Food and Drug Administration (FDA) issued a warning in 2014 that injection of corticosteroids into the epidural space may result in rare but serious adverse events, including loss of vision, stroke, paralysis, and death.\(^\text{15}\) There are no studies of cost-effectiveness of ESI. Given the prevalence of ESI use, the availability of new evidence since the last AAN review, the changing risk–benefit profile, and the costs associated with the procedure, the AAN GDDI approved an update to the 2011 guideline as proposed below.
Rationale for this practice advisory

The purpose of this Guideline is to systematically assess all high-quality randomized, controlled trials that evaluate the efficacy of ESI for cervical/lumbar radiculopathy and cervical stenosis/LSS and the risks associated with their use. The systematic review will then be used to develop recommendations regarding the use of ESI in these conditions.

Clinical questions

The systematic review for this practice advisory addresses the following questions:

1. In patients with radiculopathy (lumbar, cervical), do epidural corticosteroid injections, compared with placebo or active control: a) reduce pain; b) reduce disability or physical impairment, or improve physical function and activities of daily living (ADL)/self-management/independence; c) improve QOL or other patient-reported outcomes; d) influence subsequent surgery; e) reduce analgesic or opioid use; or f) reduce time to pain relief?

2. In patients with spinal stenosis (lumbar, cervical), do epidural corticosteroid injections, compared with placebo or active control: a) reduce pain; b) reduce disability or physical impairment, or improve physical function and ADL/self-management/independence; c) improve QOL or other patient-reported outcomes; d) influence subsequent surgery; e) reduce analgesic or opioid use; or f) reduce time to pain relief?

Adverse events related to ESI will be considered in the recommendation development process when weighing benefits and harms of this procedure.
<table>
<thead>
<tr>
<th>Question (Type)</th>
<th>Population</th>
<th>Intervention</th>
<th>Co-intervention</th>
<th>Outcome</th>
<th>Study design</th>
</tr>
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<tbody>
<tr>
<td>1 (Therapeutic)</td>
<td>Patients with radiculopathy (lumbar, cervical)</td>
<td>Epidural corticosteroid injections</td>
<td>Placebo or active control</td>
<td>Pain relief; reduced disability or physical impairment, or improved physical function and ADL/self-management/independence; improved QOL or other patient-reported outcomes; influence on subsequent surgery; reduction in analgesic and opioid use; shortened time to pain relief (with active control only)</td>
<td>RCT</td>
</tr>
<tr>
<td>2 (Therapeutic)</td>
<td>Patients with spinal stenosis</td>
<td>Epidural corticosteroid injections</td>
<td>Placebo or active control</td>
<td>Pain relief; reduced disability or physical impairment, or</td>
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improved physical function and ADL/self-management/independence; improved QOL or other patient-reported outcomes; influence on subsequent surgery; reduction in analgesic or opioid use; shortened time to pain relief (with active control only)

Abbreviations: ADL = activities of daily living; QOL = quality of life; RCT = randomized, controlled trial.

**Rationale for the clinical questions**

Lumbosacral and cervical radicular syndromes are common. The annual prevalence of lumbosacral radiculopathy in the general population varies from 9.9% to 25% and is likely the most common form of neuropathic pain.\textsuperscript{16,17} Cervical radiculopathy has a reported prevalence of 3.5/1000 persons.\textsuperscript{18} Radicular pain syndromes may be due to degenerative disc disease or to
spinal stenosis. The latter may also result in neurogenic claudication when it involves the lumbar region or myelopathy when it affects the cervical region. Commonly used treatments of radicular syndromes include conservative measures (physical therapy), oral analgesics, oral corticosteroids, epidural corticosteroids, and surgery.

Epidural steroids are frequently used in the treatment of radicular syndromes. They are invasive and associated with some rare but notable risks, as discussed above. Some other risks include systemic effects of glucocorticoids, cerebral vein thrombosis, neuroinfection (epidural abscess or septic meningitis), and cord ischemia. Hence, the risk–benefit ratio of ESI is an important parameter in the decision to use ESI. The primary goal of treatment with ESI is to reduce pain; this may be measured directly as pain relief or indirectly as improved function, disability, or QOL, or reduced opioid or other analgesic use. Another useful outcome measure is delay to surgical interventions when surgery is performed solely for the purpose of pain reduction and not for other indications such as radicular weakness or cervical spondylotic myelopathy. Patients describe these and other outcomes, such as delay or avoidance of surgical interventions, as priorities in their care (see below). The rationale for Questions 1 and 2 is to systematically assess the efficacy of ESI in treating radicular pain syndromes.

In order to assess the risk–benefit ratio of ESI use, information regarding the safety of this intervention is essential. Several concerns arise regarding the ESI use. Because the benefit, if any, of ESI is only short-term, repeated ESIs are often performed in chronic pain due to spinal stenosis. For patients on anticoagulants, reversal of anticoagulation is necessary before each ESI and may increase the risk of thromboembolic events. Other safety issues include the use of
particulate vs nonparticulate steroid preparations in the transforaminal approach. The particulate
corticosteroids are prednisolone, hydrocortisone, triamcinolone, betamethasone acetate, and
methylprednisolone, and the nonparticulate corticosteroid is dexamethasone. There is weak
evidence for greater efficacy for particulate corticosteroids, but they have been associated
with greater risks of serious embolic neurologic complications, including spinal cord infarction,
brainstem hemorrhage, cortical blindness, and brainstem infarction. The etiology is postulated to
be inadvertent intra-arterial injection of particulate corticosteroid. The safe cumulative dose
of steroids and the safe number of repetitive injections remain unclear. We will seek literature
regarding adverse events to inform the risk–benefit evaluation when developing
recommendations regarding ESI use.

Consideration of patient preferences
In developing the guideline questions, we reviewed literature regarding the patient experience
with low back pain and ESI. Outcomes identified as most important by patients in these
articles were: (1) effectiveness (particularly in reducing pain); (2) impact on life/daily activities,
physical functioning, self-management, and independence; (3) avoidance of surgical procedures;
and (4) time to relief. Theses priorities then were incorporated into the guideline questions as
outlined above. Studies regarding costs were not identified.

Relevant special populations and multiple morbidities
Because there is increasing evidence that not everyone responds to therapies in the same way
(whether due to race/ethnicity, sex, concomitant health issues, or other factors), AAN guidelines
now specifically identify special populations for whom recommendations might possibly be
different. There may or may not be available evidence for these special populations, but the
literature search will specifically look for evidence for efficacy in these populations in addition
to in the general population. Special populations of relevance to this practice advisory include:
age categories (elderly, >70 years vs younger patients), sex, race/ethnicity, occupation type
(sedentary vs physical), employment status, duration of pain (subacute, <12 weeks vs chronic,
>12 weeks), pain level, ongoing litigation, workers’ compensation status, pain type (traumatic vs
nontraumatic), and effect of previous treatments (physical therapy, chiropractic manipulation).
Multimorbidities of relevance to this practice advisory include concomitant use of
anticoagulants; prior surgery for spondylosis; obesity; depression, anxiety, or other psychiatric
illness; and medical illness contraindicating surgery.

Rationale for special populations and multiple morbidities
All of these factors may influence the choice or outcome of treatments. Baseline pain level,
response to prior treatments (such as physical therapy, prior spinal surgery), employment status
(need to return to work quickly), and occupation (effects on potential recurrence of pain) may all
influence the choice of treatment. Ongoing litigation; workers’ compensation status; and
depression, anxiety, or other psychiatric illness may modify the response to treatment with ESI.
Obesity may make ESI technically challenging. The use of anticoagulants and risk for bleeding
complications with ESI may modify the choice of treatments. Even if the benefit of ESI is low,
the risk–benefit ratio may favor the use of ESI compared with surgical interventions in elderly
patients or in patients with multimorbidities, such as concomitant medical illness that
contraindicate surgery, when they fail other conservative treatment modalities and are in
significant pain.
Plan to address special populations and multimorbidities in the guideline

We will include the terms for special populations and multimorbidities in the literature search (see keywords below) and address them as subparts of the major questions for the systematic review. We will consider these populations again when crafting the recommendations and use related evidence if available. If such evidence is unavailable, we will highlight the suggestions for future research, the special populations, and the multimorbidities that should be studied.

Study screening and selection criteria: inclusion and exclusion criteria for article selection

We will include only randomized, clinical trials describing the effects of ESI on cervical/lumbar radiculopathy and cervical stenosis/LSS. We will consider studies published in English and in other languages. When considering adverse effects of ESI during the recommendation process, where benefits and risks are transparently weighed, we will accept evidence of a lower level of quality. We will also use evidence from related conditions, expert opinion, case reports, and anecdotal sources for this question. The previous guideline reviewed literature up to 2005; therefore, we will review literature from 2005 onward.

Types of participants

Our literature search will specifically focus on adults, aged >18 years with cervical/lumbar radiculopathy or cervical stenosis/LSS. The criteria for diagnosis of radiculopathy/spinal stenosis in each selected article will be noted, and at the time of evidence synthesis, we will evaluate the diagnostic criteria for uniformity. Because diagnostic criteria for these disorders vary across studies, and in the absence of a reliable reference standard for these disorders, it is not possible to
set diagnostic criteria a priori. We will specifically search for literature addressing the special
populations and multimorbidities enumerated above.

Types of intervention

We will include epidural corticosteroid injections, transforaminal corticosteroid injections,
caudal corticosteroid injections, and interlaminar corticosteroid injections. Facet joint injections
and medial branch blocks will be excluded.

Comparison group

We will use placebo or active controls as our comparator groups. In the case of active control
studies, the AAN classification for active control studies will be used.

Types of outcome measures

Outcome measures will be divided into the following groups: a) pain reduction (and, in the case
of active control studies, time to relief of pain) or reduction in analgesic use with special
relevance to opioids; b) reduced disability/physical impairment or improved physical function or
ADL/self-management/independence; c) improved QOL or other patient-reported outcomes; d)
influence on subsequent surgery; and e) adverse effects.

Literature search strategy

Inclusion and exclusion criteria

We will include all randomized, controlled trials on adults (aged > 18 years), from 2005 to
present, in all languages. Reviews, systematic reviews, and meta-analyses will be used for cross-
checking references. Standard exclusion criteria are studies that are not relevant to the clinical question, that address an unrelated disease or irrelevant study population, and that are not peer reviewed.

Terms and databases to be used in the literature search

The panel developed the search terms described below on the basis of the proposed clinical questions and the inclusion and exclusion criteria listed above. A research librarian will perform literature searches of the MEDLINE (PubMed and Ovid), EMBASE, and Cochrane randomized, controlled trials registry databases. The search strategy is presented below.

Keywords

a) Key text words and index words for the condition or closely related conditions, if appropriate (linked by the word "OR"):

Lumbar radiculopathy; sciatica; low back pain; lumbar spinal stenosis; spinal stenosis; radiculopathy, lumbar; lumbosacral radiculopathy; radiculopathy, lumbosacral; radicular low back pain

Cervical radiculopathy; neck pain; cervical spinal stenosis; spinal stenosis; radiculopathy; cervical; radicular neck pain

b) Key text words for identification of special populations and relevant comorbidities (linked by the word "OR"):

Age; gender; sex; occupation; duration; subacute; chronic; pain level; pain severity; workers’ compensation; litigation; surgery; trauma; physical therapy; chiropractic manipulation;
anticoagulant use; obesity; prior surgery; depression; anxiety; psychiatric illness; opioids;

analgesics

c) Key text words and index words for the intervention (linked by the word "OR"):

Epidural corticosteroid injections; epidural steroids; epidural corticosteroids; epidural steroid
injections; transforaminal corticosteroid injections; caudal corticosteroid injections; interlaminar
corticosteroid injections

Preliminary literature search

A preliminary literature search was performed in October 2015 and is provided below.

1. back pain/ or failed back surgery syndrome/ or low back pain/

2. ("back pain" or "failed back").mp. [mp=title, abstract, original title, name of substance word,
subject heading word, keyword heading word, protocol supplementary concept word, rare
disease supplementary concept word, unique identifier]

3. sciatica.mp. or Sciatica/

4. radiculopathy*.mp. or radiculopathy/ [mp=title, abstract, original title, name of substance word,
subject heading word, keyword heading word, protocol supplementary concept word, rare
disease supplementary concept word, unique identifier]

5. (4 or radiculitis.mp. or radiculitides.mp.) and (cervical or thoracic or lumbar or lumbosacral or
"lumbo sacral" or sacral).mp. [mp=title, abstract, original title, name of substance word, subject
heading word, keyword heading word, protocol supplementary concept word, rare disease
supplementary concept word, unique identifier]

6. spinal nerve roots/ or ganglia, spinal/
7. (6 or "nerve root*".mp.) and (4 or compress*.mp. or avuls*.mp. or disorder*.mp. or inflam*.mp.) [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

8. spinal stenosis.mp. or Spinal Stenosis/

9. atlanto-axial joint/ or sacroiliac joint/

10. 9 or sacroiliac*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

11. or/1-10

12. exp adrenal cortex hormones/ or steroid*.mp. or corticosteroid*.mp. or corticoid*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

13. 11 and 12

14. epidural analgesia.mp. or Analgesia, Epidural/

15. Injections, Epidural/

16. ((epidural* or peridural* or extradural* or interlamina* or caudal or transforaminal) adj2 injection*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

17. caudal anesthesia.mp. or Anesthesia, Caudal/

18. epidural anesthesia.mp. or Anesthesia, Epidural/
19. or/14-18
20. 13 and 19
21. limit 20 to (meta analysis or randomized controlled trial or "review" or systematic reviews)
22. 20 and (random* or "meta analysis" or systematic* or blind*).mp.
23. 21 or 22
24. limit 23 to yr="2005 - 2015"
25. ("research synthesis" or "synthesis of research" or meta-analysis or "meta analysis" or "meta-analytic" or "systematic review" or "realist synthesis" or "realist review" or "rapid realist" review" or "integrative review" or "quantitative review" or "quantitative synthesis" or "qualitative review" or "qualitative synthesis" or "qualitative evidence synthesis" or meta-study or "critical review" or "literature review" or "review of the literature" or "selective review" or "evidence-based review" or meta-synthesis or meta-ethnograph* or "narrative review" or "narrative synthesis" or "critical interpretive synthesis" or "thematic synthesis" or "refutational synthesis" or "congruent synthesis" or "umbrella review" or "rapid review" or "scoping review" or meta-review or "review of reviews" or "overview of systematic reviews" or "systematic overview*" or "theory driven review" or "integrative research review*" or "best-evidence synthesis" or "structured review" or "clinical review" or "descriptive review" or "comprehensive review" or "international review" or "literature synthesis" or "knowledge synthesis" or "interpretive synthesis" or "synthesis of evidence" or "synthesis of the literature" or "descriptive synthesis" or "updated synthesis" or "synthesis of qualitative research" or "synthesis of available evidence" or "overview of reviews" or "critical analysis of the literature" or "literature-based study" or " compilation of the literature" or "review and synthesis" or "data synthesis" or "evidence synthesis" or metaanal* or meta-analytical or "systematic reviews" or "research
The search strategy identified 358 publications from MEDLINE, 160 from Cochrane CENTRAL, and 402 from EMBASE. After duplicates were removed, 548 articles were retrieved.
DISCLAIMER

Clinical practice guidelines, practice advisories, systematic reviews and other guidance published by the American Academy of Neurology and its affiliates are assessments of current scientific and clinical information provided as an educational service. The information: 1) should not be considered inclusive of all proper treatments, methods of care, or as a statement of the standard of care; 2) is not continually updated and may not reflect the most recent evidence (new evidence may emerge between the time information is developed and when it is published or read); 3) addresses only the question(s) specifically identified; 4) does not mandate any particular course of medical care; and 5) is not intended to substitute for the independent professional judgment of the treating provider, as the information does not account for individual variation among patients. In all cases, the selected course of action should be considered by the treating provider in the context of treating the individual patient. Use of the information is voluntary. AAN provides this information on an “as is” basis, and makes no warranty, expressed or implied, regarding the information. AAN specifically disclaims any warranties of merchantability or fitness for a particular use or purpose. AAN assumes no responsibility for any injury or damage to persons or property arising out of or related to any use of this information or for any errors or omissions.

CONFLICT OF INTEREST

The American Academy of Neurology is committed to producing independent, critical, and truthful clinical practice guidelines (CPGs). Significant efforts are made to minimize the potential for conflicts of interest to influence the recommendations of this CPG. To the extent possible, the AAN keeps separate those who have a financial stake in the success or failure of the
products appraised in the CPGs and the developers of the guidelines. Conflict of interest forms were obtained from all authors and reviewed by an oversight committee prior to project initiation. AAN limits the participation of authors with substantial conflicts of interest. The AAN forbids commercial participation in, or funding of, guideline projects. Drafts of the guideline have been reviewed by at least three AAN committees, a network of neurologists, Neurology peer reviewers, and representatives from related fields. The AAN Guideline Author Conflict of Interest Policy can be viewed at www.aan.com. For complete information on this process, access the 2011 AAN process manual.\textsuperscript{1}
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    Methylprednisolone in the Treatment of Lumbar Radiculopathy. Clin J Pain [Internet].

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    Epidural Injection with Particulate and Nonparticulate Corticosteroids in Lumbar


