DRAFT – FOR COMMENT ONLY

Sacroiliac Joint Injections

DRAFT – FOR COMMENT ONLY

NASS NORTH AMERICAN SPINE SOCIETY

DEFINING APPROPRIATE COVERAGE POSITIONS

Important Note: The following is a working DRAFT document that should not be considered an official NASS position until finalized. This DRAFT document is being shared ONLY for purposes of receiving comments, suggestions and/or edits from our members, and should not be used for any other purpose. Specifically, no decisions on patient care or coverage should be made on the basis of this DRAFT document, as this document and all information contained herein is subject to change significantly during the review process. Please visit spine.org to access our FINAL Coverage Recommendations.

North American Spine Society 7075 Veterans Blvd. Burr Ridge, IL 60527
spine.org

COVERAGE COMMITTEE

Introduction

North American Spine Society (NASS) coverage policy recommendations are intended to assist payers and members by proactively defining appropriate coverage positions. Historically, NASS has provided comment on payer coverage policy upon request. However, in considering coverage policies received by the organization, NASS believes proactively examining medical evidence and recommending credible and reasonable positions may be to the benefit of both payers and members in helping achieve consensus on coverage before it becomes a matter of controversy.

Methodology

The coverage policies put forth by NASS use an evidence-based approach to spinal care when possible. In the absence of strict evidence-based criteria, policies reflect the multidisciplinary and non-conflicted experience and expertise of the authors in order to reflect reasonable standard practice indications in the United States.

NASS Coverage Policy Methodology

Scope and Clinical Indications

Management of chronic low back pain is a significant contributor to the national health care budget. When using comparative anesthetic blocks with a high degree of pain relief, the prevalence of sacroiliac joint pain likely ranges from 20% to 30% in patients with suspected SIJ pain based on history and physical examination [1-5]. Sacroiliac (SI) joint injections have been used to diagnose and treat pain from this structure. Lateral branch blocks and radiofrequency ablation have similarly been used to diagnose and treat pain from the SI joint or from the posterior sacroiliac complex.

Pain from the SI joint may arise from a variety of disorders but most commonly is thought to be from degenerative or inflammatory arthritis. Certain conditions can increase the prevalence of SI joint pain, these include prior lumbar fusion[6-9], older patient age[10-12], and history of trauma[10,13].

There is a known high false positive rate, at around 20% with SI joint injections[1,2,14,15]. In order to increase the likelihood of the presence of this condition in patients whom an injection is considered, physical examination can be helpful. The literature has not demonstrated a single physical exam maneuver with a likelihood ratio greater than 1.3 for predicting a positive response to intra-articular

anesthetic[2,16,17]. However, other studies[15,18,19] have reported that responses to at least three exam maneuvers (FABER, thigh thrust, Gaenslen's, distraction, sacral thrust, and compression) were predictive of a positive response with a reported sensitivity of 78%.

Clinical Criteria for the Procedure

Item 1: Diagnostic SI joint injections

Intraarticular SI joint injections are indicated to aid in the **diagnostic** work-up of low back pain when ALL of the listed criteria are met. Of note, any and all SIJ injections should be performed with some form of radiographic image guidance (e.g. fluoroscopic, CT-guided). Further, volume of injectate should be limited to 2 mL[20-24], the inclusion of steroid with local anesthetic is not inappropriate. A diagnosis of SI joint pain is confirmed with at least 75% reduction of pain for the expected duration of the anesthetic used on two separate occasions.

a) Patient's report of non-radicular, typically unilateral pain that is caudal to the lumbar spine (L5 vertebrae), localized over the posterior SIJ, and consistent with SIJ pain
b) A thorough physical examination demonstrating localized tenderness with palpation over the sacral sulcus (Fortin's point, i.e. at the insertion of the long dorsal ligament inferior to the posterior superior iliac spine or PSIS) in the absence of tenderness of similar severity elsewhere (e.g. greater trochanter, lumbar spine, coccyx) and that other obvious sources for their pain do not exist.
c) Positive response to a cluster of three provocative tests (e.g. thigh thrust test, compression test, Gaenslen's test, distraction test, Patrick's sign, posterior provocation test). *Note that the thrust tests is not recommended in pregnant patients or those with connective tissue disorders.*

Item 2: Therapeutic SI joint injections

Intraarticular SI joint injections of corticosteroid with or without local anesthetic are indicated for the **treatment** of low back pain when all of the listed criteria are met:

a) Patient's report of non-radicular, typically unilateral pain that is caudal to the lumbar spine (L5 vertebrae), localized over the posterior SIJ, and consistent with SIJ pain.
b) A thorough physical examination demonstrating localized tenderness with palpation over the sacral sulcus (Fortin's point, i.e. at the insertion of the long dorsal ligament inferior to the

posterior superior iliac spine or PSIS) in the absence of tenderness of similar severity elsewhere (e.g. greater trochanter, lumbar spine, coccyx) and that other obvious sources for their pain do not exist.

c) Positive response to a cluster of three provocative tests (e.g. thigh thrust test, compression test, Gaenslen's test, distraction test, Patrick's sign, posterior provocation test). *Note that the thrust tests is not recommended in pregnant patients or those with connective tissue disorders.*
d) SIJ pain has been confirmed with diagnostic SIJ injections.

Rationale

Item 1:

Image-guidance: Some form of image guidance is considered requisite for performing SI joint injections. In 2003, Hansen[25], in an observational study, showed that blind needle placement for sacroiliac joint injection was successful in only 12% of patients. He subsequently recommended image-guidance. Rosenberg et al[26], in a prospective, double-blind study, showed intra-articular injections in only 22% of patients when no image guidance was used. Though multiple ultrasound-guided sacroiliac joint injection systems are available, Simopoulos et al[27] (2012) found no systematic evaluations of ultrasound for SI joint injections. In most recent systematic reviews of SI joint interventions, fluoroscopic or CT guidance has been considered an inclusion criteria[25,27-29].

Physical Exam Findings: The utility of physical exam findings in the diagnosis of SI joint pain has been well-studied. In a systemic review by Szadek (2009), meta-analysis of five individual provocation tests, compression, distraction, thigh thrust, Gaenslen's test, and Patrick's sign were evaluated[30]. Analysis showed that positive thigh thrust test or compression tests are likely to have SI joint pain. Also, threshold of three positive tests had good diagnostic validity for SI joint pain. Joint injection with varying degree of pain relief (as low as 50%) was the gold standard. In contrast, Dreyfuss (1996) reviewed 20 physical examination tests, including thigh thrust, Gaenslen's, Patrick's, sacral thrust, and compression[17]. This group showed that no single test or combination of tests was sufficiently useful in diagnosing sacroiliac joint pain. Of note, SI joint injection with high level of pain relief (>90%) was used as the gold standard. Three studies[15,18,19] have reported that responses to at least three exam maneuvers (FABER, thigh thrust, Gaenslen's, distraction, sacral thrust, and compression) were predictive of a positive response with a reported sensitivity of 78%. Finally, a review by Hancock (2007) found that single manual tests for SI joint pain were uninformative, although combinations of test were helpful[31].

Based on these available data, it seems reasonable to require documentation of at least three positive provocative physical examination maneuvers prior to consideration of a diagnostic or therapeutic injection.

Requirement of Radiographic Findings: Hansen (2007) reviewed the databases of EMBASE, MEDLINE and Cochrane reviews[32]. This group concluded that MRI can detect abnormalities of the cartilaginous sacroiliac joint, early spondyloarthropathy, and inflammatory and destructive changes of the SI joint. Similar to literature about the lack of correlation between disc degeneration and back pain, this group found that radiological SI findings have not been found to be an accurate indicator of symptoms. Interestingly, Hancock (2007), in a review of Medline, EMBASE, and CINAHL, found a positive bone scan may increase the probability of the SIJ being the source of pain, though a negative scan does not reduce the probability[31]. In a more detailed analysis, Blum (1996) showed that MRI was more sensitive and specific than scintigraphy or radiography for sacroilitis[33]. Simopoulos (2012) concluded that MRI appears to be useful for early sacroilitis and to follow patients with spondyloarthropathy[27]. Thus, imaging is considered be helpful in identifying patients who might benefit from further evaluations such as a diagnostic injection, though the absence of abnormalities on imaging does not negate the appropriateness of performing the procedure.

Utility of Diagnostic Injections: There have been seven studies using controlled blocks to diagnose SI joint pain. Increasing the percentage of pain relief required for a positive block also decreases the reported prevalence of SIJ pain. Differences mainly arose when relaxing criteria from >75% to >50% pain relief (Table 1).

Single diagnostic injections have been used in multiple studies[3,11,14,16,17,22,23,34-40]. When comparing controlled blocks with single diagnostic injections, the known false positive rate of injections is clearly demonstrated. Studies utilizing single blocks report rates of 29-63%, while studies utilizing dual blocks report rates between 10-33% (with only one study showing higher rates at 45%). For this reason, dual diagnostic blocks, with at least a 75% reduction in pain, are needed to confirm the diagnosis of SI joint pain.

Item 2:

Therapeutic SI joint injections: The utility of therapeutic SI joint injections has been well-studied. Hansen (2012) in a systematic review for therapy of SI joint pain found limited (or poor) evidence for intra-

articular steroid injection and limited (or poor) evidence for peri-articular injection of local anesthetic and steroid or botulinum toxin[25]. Hawkins (2009), in a retrospective audit of 155 patients, showed 77% of patients with short-term pain relief after one injection[41]. Of those who showed pain relief, approximately one-third remained improved after one injection, and two-thirds remained improved after one or two injections. Of those who received two or more injections, the duration of relief averaged 9.3 months. Liliang (2009), in a prospective case series of sacroiliac joint pain determined by dual blocks, showed 66.7% patients with pain relief of more than six weeks[5]. All patients required a second injection, which then had a mean duration of pain relief of 36.8 weeks. Interestingly, the 33.3% with a positive diagnostic injection but less than six weeks of pain relief had pain reduction mean of 4.4 weeks.

Luukkainen (2002) demonstrated in a non-blinded, randomized single injection study a significant decrease in VAS and pain index at four weeks in patients with peri-articular methyl-prednisolone acetate and lidocaine injection compared to sodium chloride and lidocaine injection[42]. Borowsky (2008) showed in a retrospective review of two case series that injection of steroids in the SI joint and the posterior inter-osseous ligament and S1-3 lateral branches improved short-term (three months) clinical outcomes when compared to sacroiliac joint alone, although both were suboptimal (12.5% vs. 31.25%)[34]. McKenzie-Brown (2005) in a systematic review that included spondyloarthopathy concluded that evidence for intra-articular sacroiliac joint injections was moderate for short-term relief and limited for long-term relief[28].

Based on these data, it seems reasonable to offer coverage of therapeutic SI joint injections in those cases that fulfill the listed criteria. It is acknowledged that there will likely not be high quality data to support the predictive value of each of these criteria. However, considering the available evidence discussed above in Item 1, it seems reasonable to apply these criteria to therapeutic SI joint injections.

Table 1

	Percentage Positive	95% CI	References
Selection Based on Controlled Local Anesthetic Blocks			
At least 80% relief	10%	0 - 23%	Manchikanti 2001
At least 75% relief	19%	9 - 29%	Maigne 1996
At least 50% relief	45%	32% - 58%	Van Der Wurff 2006
Selection Based on Controlled Injections of Local Anesthetic and Steroid			
At least 80% relief	33%	20 - 46%	Laslett 2005
At least 75% relief	26%	19 - 33%	Liliang 2009
	33%	26 – 40%	Liliang 2011
At least 50% relief	27%	20 - 34%	Irwin 2007

References

1. Manchikanti L, Singh V, Pampati V, et al. Evaluation of the relative contributions of various structures in chronic low back pain. *Pain Physician.* 2001; 4: 308-16.

2. Maigne JY, Aivaliklis A, Pfefer F. Results of sacroiliac joint double block and value of sacroiliac pain provocation tests in 54 patients with low back pain. *Spine.* 1996; 21: 1889-92.

3. Maigne JY, Boulahdour H, Chatellier G. Value of quantitative radionuclide bone scanning in the diagnosis of sacroiliac joint syndrome in 32 patients with low back pain. *European Spine Journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society.* 1998; 7: 328-31.

4. Laslett M, McDonald B, Tropp H, Aprill CN, Oberg B. Agreement between diagnoses reached by clinical examination and available reference standards: a prospective study of 216 patients with lumbopelvic pain. *BMC Musculoskeletal Disorders.* 2005; 6: 28.

5. Liliang PC, Lu K, Weng HC, Liang CL, Tsai YD, Chen HJ. The therapeutic efficacy of sacroiliac joint blocks with triamcinolone acetonide in the treatment of sacroiliac joint dysfunction without spondyloarthropathy. *Spine.* 2009; 34: 896-900.

6. Liliang PC, Lu K, Liang CL, Tsai YD, Wang KW, Chen HJ. Sacroiliac joint pain after lumbar and lumbosacral fusion: Findings using dual sacroiliac joint blocks. *Pain Medicine.* 2011; 12: 565-70.

7. DePalma MJ, Ketchum JM, Saullo TR. Etiology of chronic low back pain in patients having undergone lumbar fusion. *Pain medicine (Malden, Mass).* 2011; 12: 732-9.

8. Maigne JY, Planchon CA. Sacroiliac joint pain after lumbar fusion. A study with anesthetic blocks. *European Spine Journal*. 2005; 14: 654-8.

9. Katz V, Schofferman J, Reynolds J. The sacroiliac joint: A potential cause of pain after lumbar fusion to the sacrum. *Journal of Spinal Disorders.* 2003; 16: 96-9.

10. DePalma MJ, Ketchum JM, Saullo T. What is the source of chronic low back pain and does age play a role? *Pain Medicine*. 2011; 12: 224-33.

11. Depalma MJ, Ketchum JM, Saullo TR. Multivariable analyses of the relationships between age, gender, and body mass index and the source of chronic low back pain. *Pain Medicine.* 2012; 13: 498-506.

12. Laplante BL, Ketchum JM, Saullo TR, DePalma MJ. Multivariable analysis of the relationship between pain referral patterns and the source of chronic low back pain. *Pain Physician.* 2012; 15: 171-8.

13. Weksler N, Velan GJ, Semionov M, et al. The role of sacroiliac joint dysfunction in the genesis of low back pain: the obvious is not always right. *Archives of Orthopaedic & Trauma Surgery.* 2007; 127: 885-8.

14. Chou LH, Slipman CW, Bhagia SM, et al. Inciting events initiating injection-proven sacroiliac joint syndrome. *Pain Medicine*. 2004; 5: 26-32.

15. Laslett M, Young SB, Aprill CN, McDonald B. Diagnosing painful sacroiliac joints: A validity study of a McKenzie evaluation and sacroiliac provocation tests. *Australian Journal of Physiotherapy.* 2003; 49: 89-97.

16. Schwarzer AC, Aprill CN, Bogduk N. The sacroiliac joint in chronic low back pain. *Spine.* 1995; 20: 31-7.

17. Dreyfuss P, Michaelsen M, Pauza K, McLarty J, Bogduk N. The value of medical history and physical examination in diagnosing sacroiliac joint pain. S*pine.* 1996; 21: 2594-602.

18. Laslett M, Aprill CN, McDonald B, Young SB. Diagnosis of sacroiliac joint pain: Validity of individual provocation tests and composites of tests. *Manual Therapy.* 2005; 10: 207-18.

19. Van Der Wurff P, Buijs EJ, Groen GJ. Intensity mapping of pain referral areas in sacroiliac joint pain patients. *Journal of Manipulative and Physiological Therapeutics.* 2006; 29: 190-5.

20. Dreyfuss P, Henning T, Malladi N, Goldstein B, Bogduk N. The ability of multi-site, multi-depth sacral lateral branch blocks to anesthetize the sacroiliac joint complex. *Pain Medicine.* 2009;10:679-88.

21. Dreyfuss P, Snyder BD, Park K, Willard F, Carreiro J, Bogduk N. The ability of single site, single depth sacral lateral branch blocks to anesthetize the sacroiliac joint complex. *Pain Medicine.* 2008; 9: 844-50.

22. Fortin JD, Aprill CN, Ponthieux B, Pier J, Derby Jr R. Sacroiliac joint: Pain referral maps upon applying a new injection/arthrography technique. Part II: Clinical evaluation. *Spine.* 1994; 19: 1483-9.

23. Fortin JD, Dwyer AP, West S, Pier J. Sacroiliac joint: Pain referral maps upon applying a new injection/arthrography technique. Part I: Asymptomatic volunteers. *Spine.* 1994; 19: 1475-82.

24. Fortin JD, Tolchin RB. Sacroiliac arthrograms and post-arthrography computerized tomography. *Pain Physician.* 2003; 6: 287-90.

25. Hansen HC. Is fluoroscopy necessary for sacroiliac joint injections? *Pain Physician.* 2003; 6: 155-8.

26. Rosenberg JM, Quint TJ, de Rosayro AM. Computerized tomographic localization of clinically-guided sacroiliac joint injections. *The Clinical Journal of Pain.* 2000; 16: 18-21.

27. Simopoulos TT, Manchikanti L, Singh V, et al. A systematic evaluation of prevalence and diagnostic accuracy of sacroiliac joint interventions. *Pain Physician.* 2012; 15: E305-E44.

28. McKenzie-Brown AM, Shah RV, Sehgal N, Everett CR. A systematic review of sacroiliac joint interventions. *Pain Physician.* 2005; 8: 115-25.

29. Rupert MP, Lee M, Manchikanti L, Datta S, Cohen SP. Evaluation of sacroiliac joint interventions: a systematic appraisal of the literature. *Pain Physician.* 2009; 12: 399-418.

30. Szadek KM, van der Wurff P, van Tulder MW, Zuurmond WW, Perez RS. Diagnostic validity of criteria for sacroiliac joint pain: a systematic review. *Journal of Pain.* 2009; 10: 354-68.

31. Hancock MJ, Maher CG, Latimer J, et al. Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain. *European Spine Journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society.* 2007; 16: 1539-50.

32. Hansen HC, McKenzie-Brown AM, Cohen SP, Swicegood JR, Colson JD, Manchikanti L. Sacroiliac joint interventions: a systematic review. *Pain Physician*. 2007; 10: 165-84.

33. Blum U, Buitrago-Tellez C, Mundinger A, et al. Magnetic resonance imaging (MRI) for detection of active sacroiliitis--a prospective study comparing conventional radiography, scintigraphy, and contrast enhanced MRI. *Journal of Rheumatology.* 1996; 23: 2107-15.

34. Borowsky CD, Fagen G. Sources of sacroiliac region pain: Insights gained from a study comparing standard intra-articular injection with a technique combining intra- and peri-articular injection. *Archives of Physical Medicine and Rehabilitation.* 2008; 89: 2048-56.

35. Chakraverty R, Dias R. Audit of conservative management of chronic low back pain in a secondary care setting - Part I: Facet joint and sacroiliac joint interventions. *Acupuncture in Medicine.* 2004; 22: 207-13.

36. Cohen SP, Hameed H, Kurihara C, et al. The effect of sedation on the accuracy and treatment outcomes for diagnostic injections: a randomized, controlled, crossover study. *Pain medicine (Malden, Mass).* 2014; 15: 588-602.

37. Slipman CW, Sterenfeld EB, Chou LH, Herzog R, Vresilovic E. The value of radionuclide imaging in the diagnosis of sacroiliac joint syndrome. *Spine.* 1996; 21: 2251-4.

38. Slipman CW, Sterenfeld EB, Chou LH, Herzog R, Vresilovic E. The predictive value of provocative sacroiliac joint stress maneuvers in the diagnosis of sacroiliac joint syndrome. *Archives of Physical Medicine and Rehabilitation.* 1998; 79: 288-92.

39. Stanford G, Burnham RS. Is it useful to repeat sacroiliac joint provocative tests post-block? *Pain Medicine.* 2010; 11: 1774-6.

40. Young S, Aprill C, Laslett M. Correlation of clinical examination characteristics with three sources of chronic low back pain. *Spine Journal.* 2003; 3: 460-5.

41. Hawkins J, Schofferman J. Serial therapeutic sacroiliac joint injections: a practice audit. *Pain Medicine.* 2009; 10: 850-3.

42. Luukkainen RK, Wennerstrand PV, Kautiainen HH, Sanila MT, Asikainen EL. Efficacy of periarticular corticosteroid treatment of the sacroiliac joint in non-spondylarthropathic patients with chronic low back pain in the region of the sacroiliac joint. *Clinical and Experimental Rheumatology.* 2002; 20: 52-4.

Authors

NASS Coverage Committee

Co-Chairs:

John Glaser, MD
Scott Kreiner, MD

Members:

Jamie Baisden, MD, FACS
Ray Baker, MD
Ashok Biyani, MD
Maxwell Boakye, MD
Christopher Bono, MD
Charles Cho, MD, MBA
R.S. Cowan, MD
Michael DePalma, MD
Donald Dietze, MD

Ronald Donelson, MD, MS
John Easa, MD
Gary Ghiselli, MD
James Harrop, MD
Timothy Holt, MD
Scott Horn, DO
Anthony Lapinski, MD
Darren Lebl, MD
Paul Matz, MD
David O'Brien, MD
Alpesh Patel, MD, FACS
Mitchell Reiter, MD
Charles Reitman, MD
Lee Riley, MD
Alok Sharan, MD
Jeffrey Summers, MD
William Tontz, MD
Scott Tromanhauser, MD, MBA
Eeric Truumees, MD

Financial Statement

These Coverage Recommendations were developed in their entirety by the North American Spine Society (NASS). All participating authors have disclosed potential conflicts of interest consistent with NASS' disclosure policy.

Author Disclosures

Baisden, Jamie L.: Nothing to Disclose.

Baker, Ray M.: Stock Ownership: Relievant (<1%); Private Investments: Nocimed (1.78%), Laurimed (<1%); Consulting: Medtronic (B), UnitedHealthcare (B), Mesoblast (B); Board of Directors: ISIS (Immediate Past President); Scientific Advisory Board: Collaborative Spine Research Foundation (Board Member), Spine-Health.com (B).

Biyani, Ashok: Royalties: Globus Medical (E), Custom Spine (C); Consulting: K2M (B).

Boakye, Maxwell: Nothing to Disclose.

Bono, Christopher M.: Royalties: Wolters Kluwer (B); Consulting: Harvard Clinical Research Institute (None), UnitedHealthcare (B); Board of Directors: North American Spine Society (1st Vice President); Other Office: JAAOS (B).

Cho, Charles: Board of Directors: North American Spine Society (Evidence Compilation and Analysis Chair, Travel expenses); Other Office: American Society of Neuroradiology (Finance Management Committee Co-Chair).

Cowan, R.S.: Relationships Outside the One Year Requirement: LDR (A, dissolved 2010).

DePalma, Michael J.: Consulting: VertiFlex, Inc. (Amount not disclosed, Paid directly to institution/employer); Trips/Travel: Medtronic (Travel expenses); Board of Directors: ISIS (Travel expenses, Paid directly to institution/employer), Virginia Spine Research Institute, Inc. (Amount not disclosed, President and Director of Research, Paid directly to institution/employer); Scientific Advisory Board: Medtronic (Amount not disclosed), Halyard (Amount not disclosed, Paid directly to institution/employer); Research Support (Investigator Salary): Relievant (B, Paid directly to institution/employer), SI-Bone (B, Paid directly to institution/employer), Mesoblast, Inc. (B, Paid directly to institution/employer), VertiFlex (B, Paid directly to institution/employer); Research Support (Staff/Materials): Relievant (B, Paid directly to institution/employer), Mesoblast (B, Paid directly to institution/employer), SI-Bone (B, Paid directly to institution/employer), VertiFlex (B, Paid directly to institution/employer); Relationships Outside the One Year Requirement: AOI Medical (None, dissolved 2010), Stryker Interventional Spine (B, dissolved 2010), St. Jude Medical (Amount not disclosed, dissolved 2010), Stryker Biotech (None, dissolved 2011). ATRM (None, dissolved 2011).

Dietze, Donald D.: Stock Ownership: Globus Medical (<1%, Paid directly to institution/employer); Consulting: Globus Medical (None, Paid directly to institution/employer).

Donelson, Ronald G.: Stock Ownership: Integrated Mechanical Care (4%); Consulting: The McKenzie Institute International (B); Other Office: Integrated Mechanical Care (Medical Director).

Easa, John E.: Stock Ownership: Janus Biotherapeutics (3%, Paid directly to institution/employer).

Ghiselli, Gary: Private Investments: Difusion (9%); Consulting: Biomet (B); Scientific Advisory Board: Difusion (Stock options).

Glaser, John A.: Grants: SI-Bone (D, Paid directly to institution/employer).

Harrop, James S.: Consulting: DePuy Synthes Spine (C, Paid directly to institution/employer); Board of Directors: Jefferson Medical College Physician Board (None); Scientific Advisory Board: AxioMed (Medical Advisory Board); Other Office: Bioventus (B), Asterias Biotherapeutics (B, Data Monitoring Safety Board); Other: Teijin (B, Data Safety Monitoring Board).

Holt, Timothy A.: Speaking and/or teaching arrangements: SI-Bone (E, Paid directly to institution/employer); Trips/Travel: SI-Bone (B).

Horn, Scott: Speaking and/or teaching arrangements: North American Spine Society (Travel expenses), AAPMR (Travel expenses), ISIS (Travel expenses); Other Office: ISIS (Travel expenses, CPT Advisor).

Kreiner, Scott: Stock Ownership: LDR (<1%); Speaking and/or teaching arrangements: North American Spine Society (Travel expenses); Trips/Travel: ISIS (Travel Expenses).

Lapinsky, Anthony S.: Royalties: RTI Surgical (B); Consulting: Orthofix (Amount not disclosed).

Lebl, Darren R.: Consulting: Medtronic (B); Scientific Advisory Board: K2M MI Advisory Board (Travel expenses).

Matz, Paul G.: Speaking and/or teaching arrangements: AO Spine North America (B); Trips/Travel: North American Spine Society (A).

O'Brien Jr., David R.: Speaking and/or teaching arrangements: North American Spine Society (B, Travel expenses); Trips/Travel: ISIS (Travel expenses), AAPMR (Travel expenses); Board of Directors: North American Spine Society (Health Policy Council Director); Other Office: ISIS (Socioeconomic Council Vice-Chair), AAPMR (NC CAC Representative).

Patel, Alpesh A.: Royalties: Amedica (B); Stock Ownership: Amedica (<1%), Cytonics (<1%), Nocimed (<1%), Vital5 (<1%); Consulting: Amedica (B), Stryker (None), Biomet (B), DePuy Synthes Spine (B); Board of Directors: Cervical Spine Research Society (None); Fellowship Support: OREF (D), Omega (B); Other: Amedica (<1%).

Reiter, Mitchell F.: Private Investments: CreOsso (4%).

Reitman, Charles A.: Trips/Travel: North American Spine Society (Travel expenses); Board of Directors: North American Spine Society (Research Council Director); Scientific Advisory Board: Clinical Orthopedics and Related Research (B, Deputy Editor, Paid directly to institution/employer).

Riley III, Lee H.: Stock Ownership: Spinal Kinetics (<1%); Speaking and/or teaching arrangements: AOSNA (B); Trips/Travel: DePuy Synthes Spine (B); Board of Directors: LifeNet Health (C); Other Office: CSRS (A); Grants: DePuy Synthes Spine (E, Paid directly to institution/employer).

Sharan, Alok D.: Other: Jaypee Brothers (A).

Summers, Jeffrey T.: Stock Ownership: Medworx (15%); Private Investments: Morris Innovative (<1%); Board of Directors: First Choice Insurance (None), ISIS (President, Travel expenses).

Tontz, William L.: Stock Ownership: Phygen (<1%, Paid directly to institution/employer); Consulting: Medtronic (C, Paid directly to institution/employer); Speaking and/or teaching arrangements: SpineArt (B); Trips/Travel: Medtronic (B); Scientific Advisory Board: Medtronic (consulting disclosed).

Tromanhauser, Scott G.: Stock Ownership: Soteira, Inc. (<1%).

Truumees, Eeric: Royalties: Stryker (C); Stock Ownership: Doctor's Research Group (<1%); Board of Directors: North American Spine Society (Administration and Development Council Director); Other Office: AAOS Communications Cabinet (Incoming Editor-in-Chief of AAOS Now, AAOS Communications Cabinet Member, Travel expenses); Research Support - Investigator Salary: Relevant (B, Paid directly to institution/employer); Research Support - Staff and/or Materials: Globus (B, Paid directly to institution/employer); Relationships Outside the One-Year Requirement: IP Evolutions (Private Investment, dissolved 2012), Stryker Biotech (Paid directly to institution/employer, dissolved 2004).

Comments

Comments regarding the coverage recommendations may be submitted to coverage@spine.org and will be considered in development of future revisions of the work.