Physician Advisory Committee
PROPOSED OKLAHOMA TREATMENT GUIDELINES – SPINE
As Submitted to the Governor and Legislature for Review Pursuant to 85 O.S., §373

INTRODUCTION

BACKGROUND: The Physician Advisory Committee (PAC) is a statutorily created advisory body to the Oklahoma Workers' Compensation Court. It is composed of nine physicians from various practice areas as specified by law. The Governor, President Pro Tempore of the State Senate, and the Speaker of the Oklahoma House of Representatives each appoint three members.

The PAC was directed by statute, 85 O.S., §373, to develop and adopt Oklahoma Treatment Guidelines (OTG) for injuries to the cervical, thoracic and lumbar spine covering treatment not addressed by the current edition of the Work Loss Data Institute's *Official Disability Guidelines* (ODG) or addressed but not recommended by the ODG. The OTG - Spine are subject to a state mandated review process involving the Physician Advisory Committee, Advisory Council on Workers' Compensation, Workers' Compensation Court Administrator and the State Legislature. The OTG - Spine become operative thirty (30) days following adjournment of the Legislature to which submitted, unless disapproved as provided by law. For OTG - Spine status, go to the Workers' Compensation Court's website at http://www.owcc.state.ok.us or contact the Court's Counselor Program at 405-522-8760 (Oklahoma City), 918-581-2393 (Tulsa) or in-state toll free at 1-800-522-8210.

DEVELOPMENT OF THE GUIDELINES: The Committee reviewed input from a wide variety of sources including employers, insurance carriers, health care providers, and the legal profession. Appropriate scientifically based and nationally peer reviewed literature, and statutory provisions, were reviewed, together with the *Official Disability Guidelines* published by the Work Loss Data Institute.

APPLICATION OF THE GUIDELINES: These Oklahoma Treatment Guidelines (OTG) - Spine concern only the low back, neck and upper back, and govern matters specifically covered therein. Matters not covered by the OTG - Spine are governed by the Work Loss Data Institute's *Official Disability Guidelines.*

Pursuant to 85 O.S., §326, compliance with treatment guidelines applicable by law is mandatory, unless the medical treatment was provided in a medical emergency, the medical treatment was preauthorized by the employer or insurance carrier, or the medical treatment is approved by the Workers' Compensation Court based on a determination that medical treatment according to either the ODG or OTG is not in the best interest of the employee.

Procedure Summary – Low Back	
Procedure/Topic	**Summary of Medical Evidence**
Bone-morphogenetic protein (BMP)	Currently, two BMPs have been approved by the FDA. rhBMP-2 (InFUSE®) has been approved as an allograft replacement in anterior interbody fusions and for treatment of open tibial fractures. rhBMP-7 (OP-1®) has been approved under the Humanitarian Device Exemption (HDE) process as an autograft

Procedure Summary – Low Back	
Procedure/Topic	**Summary of Medical Evidence**
	substitute of long bone nonunion and for revision posterolateral fusion, for which autologous bone and bone marrow harvest are not feasible or are not expected to promote fusion. All other applications are considered off label and not FDA approved. There is a lack of clear evidence of improved outcomes with the off-label use of BMP, and there is inadequate evidence of safety and efficacy to support routine use. (Carragee, 2009) The use of BMP may be off-label in clinical practice in up to 85% of procedures. (Ong, 2010) Complications are significant with off-label use, and application in the cervical spine has been associated with significant complications including respiratory and swallowing. (Mroz, 2010) There is a strong association between treatment with BMP and the incidence of a wide variety of cancers, based on a large lumbar fusion trial. (Carragee, 2011) See also the Neck Chapter. Recommendation: - rhBMP-2 (InFUSE®): Anterior Lumbar Interbody Fusion - rhBMP-7 (OP-1®): Revision Posterolateral Fusion when Autograft bone is unavailable or a substantial hardship to the patient
Discography	Recommended for the approved indications described below. Not recommended unless patient has been identified as a potential candidate for surgical fusion. Additionally, thoracic discography is not recommended; it is very rarely indicated as a diagnostic option, and remains challenging from a technical point of view. (Sing, 2004) While an MRI can detect disc degeneration, it cannot confirm if a disc is symptomatic and responsible for the patient's pain. Lumbar discography (also known as lumbar provocative discography and provocative lumbar discography) is usually carried out when MRI and other diagnostic tests have failed to identify the cause of Lower Back Pain (LBP). (Derby, 2005) Discography involves the injection of a water-soluble, radiopaque contrast material (1 to 3 ml) into the intervertebral disc to examine disc abnormality. (Aetna, 2011) Both routine x-ray imaging during the injection and post-injection CT examination of the injected discs are usually performed as part of the study. Information is recorded about: the pressure in the disc at the initiation and completion of injection, the amount of dye accepted, the configuration and distribution of the dye in the disc, the quality and intensity of the patient's pain experience and the pressure at which that pain experience is produced. There are two diagnostic objectives for performing discography: (1) to evaluate radiographically the extent of disc damage on discogram and (2) to characterize the pain response on disc injection to see if it compares with the typical pain symptoms the patient has been experiencing. Discography can provide radiographical evaluation of the integrity of the nucleus pulposus and annular

Procedure Summary – Low Back	
Procedure/Topic	**Summary of Medical Evidence**
	rings to determine tears or other lesions that could be the cause of Lower Back Pain (LBP). (Tomecek, 2002) It can measure disc nociception -- a normal disc should not cause pain when injected; however, a disc that is physiologically compromised can mimic the pain experienced by the patient. (Pneumaticos, 2006) A symptomatic degenerative disc is considered one that disperses injected contrast in an abnormal, degenerative pattern, extending to the outer margins of the annulus and at the same time reproduces the patient's lower back complaints (concordance) at a low injection pressure. Criteria exist to grade the degree of disc degeneration from none (normal disc) to severe. (American Society of Neuroradiology, 2001) Discography is not a sensitive test for radiculopathy and has no role in its confirmation. It is, rather, a confirmatory test in the workup of axial back pain and its validity is intimately tied to its indications and performance. As stated, discography is appropriately performed during the final stages of a diagnostic workup, for patients who have failed conservative care, remain highly symptomatic, and are potential candidates for surgical fusion. (Pneumaticos, 2006) The validity of discography is enhanced if an MRI demonstrates both dark and bright discs. The presence of normal discs is needed as an internal validity measure in discography. Discography should be performed according to contemporary diagnostic criteria. See also Functional anesthetic discography (FAD). It is critical that discography serve as an adjunct or compliment in patient evaluation, and that strict patient selection criteria are adhered to when determining if discography is indicated. As stated by Pneumaticos et al.: "Diskography should be considered when all other treatment modalities have failed and surgery is being contemplated. A position statement of the North American Spine Society advocates the use of discography within strict guidelines." This is particularly true because, despite the benefits of discography, its value and safety have been debated. Criticisms include a high false-positive rate, increased risk of complications, and the potential for introgenic disk injury and degeneration. (Chou, 2009) (Ohtori, 2009) However, low false positive rates have been associated with discography when strict patient selection criteria are applied (i.e., in subjects with normal psychometric profiles and without chronic pain). (Carragee, 2000) Discography has been historically associated with certain risks including infection (including diskitis and epidural abscess) vascular and spinal cord injury. (Guyer, 1995) (Walker, 2007) Most occurrences of these serious adverse events were reported during the early days of discography and improved discography injection technique, imaging, and contrast materials have led to decreased complication rates. (Walker, 2007)

Procedure Summary – Low Back	
Procedure/Topic	**Summary of Medical Evidence**
	Patient selection criteria for Discography: o Back pain of at least 4-6 months duration. o Failure of recommended conservative treatment including active physical therapy. o An MRI demonstrating one or more degenerated discs as well as one or more normal appearing discs to allow for an internal control injection (injection of a normal disc to validate the procedure by a lack of a pain response to that injection). o Satisfactory results from detailed psychosocial assessment (discography in subjects with emotional and chronic pain problems has been linked to reports of significant back pain for prolonged periods after injection, and therefore should be avoided). o Intended as a diagnostic tool to assist surgical decision making, i.e., the surgeon feels that lumbar spine fusion may be appropriate and is looking for this to help rule in or rule out the need for surgery. (Carragee, 2006) NOTE: In a situation where the selection criteria and other surgical indications for fusion are conditionally met, discography can be considered in preparation for the surgical procedure. Discography should not be ordered for a patient who does not meet surgical criteria. o Briefed on potential risks and benefits from discography and surgery.
Fusion (spinal)	*Lumbar fusion in workers' compensation patients:* In cases of workers' compensation, patient outcomes related to fusion may have other confounding variables that may affect overall success of the procedure, which should be considered. However, workers' compensation patients with chronic low back pain should not be excluded from lumbar spinal fusion if they meet the Patient Selection Criteria for Lumbar Spinal Fusion. (ISASS, 2011) (*NOTE: Except as otherwise noted, ODG text of this section remains unchanged.)*

########

REFERENCE SUMMARIES

Carragee EJ, Bono CM, Scuderi GJ. Pseudomorbidity in iliac crest bone graft harvesting: the rise of rhBMP-2 in short-segment posterior lumbar fusion. Spine J. 2009 Nov;9(11):873-9. Rating: 5b

Ong KL, Villarraga ML, Lau E, Carreon LY, Kurtz SM, Glassman SD. Off-label use of bone morphogenetic proteins in the United States using administrative data. Spine (Phila Pa 1976). 2010 Sep 1;35(19):1794-800. Rating: 4a

Mroz TE, Wang JC, Hashimoto R, Norvell DC. Complications related to osteobiologics use in spine surgery: a systematic review. Spine (Phila Pa 1976). 2010 Apr 20;35(9 Suppl):S86-104. Rating: 1b

Carragee EJ. Bone Morphogenetic Protein Increases Risk of Cancer. North American Spine Society (NASS) 26th Annual Meeting. Presented November 3, 2011. Rating: 10a

Carragee EJ, Lincoln T, Parmar VS, Alamin T. A gold standard evaluation of the "discogenic pain" diagnosis as determined by provocative discography. *Spine*. 2006 Aug 15;31(18):2115-23. Rating: 3a

Andersson GBJ, Cocchiarella L, American Medical Association. *Guides to the Evaluation of Permanent Impairment*, Fifth Edition. Hardcover - Dec 15, 2000. Rating: 9a

Gibson JN, Waddell G, Grant IC, Surgery for degenerative lumbar spondylosis, *Cochrane Database Syst Rev* 2000;(3):CD001352. Rating: 1b

Savolainen S, Rinne J, Hernesniemi J, A prospective randomized study of anterior single-level cervical disc operations with long-term follow-up: surgical fusion is unnecessary, *Neurosurgery* 1998 Jul;43(1):51-5. Rating: 2b, 91 cases

Wetzel FT, McCracken L, Robbins RA, Lahey DM, Carnegie M, Phillips FM, Temporal stability of the Minnesota Multiphasic Personality Inventory (MMPI) in patients undergoing lumbar fusion: a poor predictor of surgical outcome, *Am J Orthop* 2001 Jun;30(6):469-74. Rating: 3b, 60 cases

Molinari RW, Gerlinger T. Functional outcomes of instrumented posterior lumbar interbody fusion in active-duty US servicemen: a comparison with nonoperative management. Spine J. 2001 May-Jun;1(3):215-24. Rating: 3c

Bigos SJ, Perils, pitfalls, and accomplishments of guidelines for treatment of back problems, *Neurol Clin* 1999 Feb;17(1):179-92. Rating: 6a

Washington State Department of Labor and Industries, Medical Treatment Guidelines, Date Introduced: Nov. '95.

DeBerard MS, Masters KS, Colledge AL, Schleusener RL, Schlegel JD, Outcomes of posterolateral lumbar fusion in Utah patients receiving workers' compensation: a retrospective cohort study, *Spine.* 2001 Apr 1;26(7):738-46; discussion 747. Rating: 3b

Fritzell P, Hagg O, Wessberg P, Nordwall A; Swedish Lumbar Spine Study Group, 2001 Volvo Award Winner in Clinical Studies: Lumbar fusion versus nonsurgical treatment for chronic low back pain: a multicenter randomized controlled trial from the Swedish Lumbar Spine Study Group, *Spine* 2001 Dec 1;26(23):2521-32; discussion 2532-4. Rating: 2c

Fritzell P, Hagg O, Wessberg P, Nordwall A; Swedish Lumbar Spine Study Group. Chronic low back pain and fusion: a comparison of three surgical techniques: a prospective multicenter randomized study from the Swedish lumbar spine study group. Spine. 2002 Jun 1;27(11):1131-41. Rating: 2b

Deyo RA, Nachemson A, Mirza SK, Spinal-fusion surgery - the case for restraint, *N Engl J Med.* 2004 Feb 12;350(7):722-6. Rating: 5b

Gibson JN, Waddell G. Surgery for degenerative lumbar spondylosis: updated Cochrane Review. *Spine*. 2005 Oct 15;30(20):2312-20. Rating: 1b

Soegaard R, Christensen FB. Health economic evaluation in lumbar spinal fusion: a systematic literature review anno 2005. *Eur Spine J.* 2005 Dec 21;:1-9. Rating: 1b

Glassman S, Gornet MF, Branch C, Polly D Jr, Peloza J, Schwender JD, Carreon L. MOS short form 36 and Oswestry Disability Index outcomes in lumbar fusion: a multicenter experience. Spine J. 2006 Jan-Feb;6(1):21-6. Rating: 3b

Atlas SJ, Delitto A. Spinal Stenosis: Surgical versus Nonsurgical Treatment. *Clin Orthop Relat Res.* 2006 Feb;443:198-207. Rating: 5b

Resnick DK, Choudhri TF, Dailey AT, Groff MW, Khoo L, Matz PG, Mummaneni P, Watters WC 3rd, Wang J, Walters BC, Hadley MN; American Association of Neurological Surgeons/Congress of Neurological Surgeons. Guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine. Part 7: intractable low-back pain without stenosis or spondylolisthesis. J Neurosurg Spine. 2005 Jun;2(6):670-2. Rating: 1c

Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, Mannion AF, Reis S, Staal JB, Ursin H, Zanoli G; On behalf of the COST B13 Working Group on Guidelines for Chronic Low Back Pain. Chapter 4 European guidelines for the management of chronic nonspecific low back pain. *Eur Spine J*. 2006 Mar;15(Supplement 2):s192-s300. Rating: 8a

Ivar Brox J, Sorensen R, Friis A, Nygaard O, Indahl A, Keller A, Ingebrigtsen T, Eriksen HR, Holm I, Koller AK, Riise R, Reikeras O. Randomized clinical trial of lumbar instrumented fusion and cognitive intervention and exercises in patients with chronic low back pain and disc degeneration. *Spine.* 2003 Sep 1;28(17):1913-21. Rating: 2b

Keller A, Brox JI, Gunderson R, Holm I, Friis A, Reikeras O, Trunk Muscle Strength, Cross-sectional Area, and Density in Patients With Chronic Low Back Pain Randomized to Lumbar Fusion or Cognitive Intervention and Exercises, *Spine*. 2004 Jan 1;29(1):3-8. Rating: 2b

Fairbank J, Frost H, Wilson-MacDonald J, Yu LM, Barker K, Collins R; Spine Stabilisation Trial Group. Randomised controlled trial to compare surgical stabilisation of the lumbar spine with an intensive rehabilitation programme for patients with chronic low back pain: the MRC spine stabilisation trial. *BMJ*. 2005 May 28;330(7502):1233. Rating: 2a

Brox JI, Reikeras O, Nygaard O, Sorensen R, Indahl A, Holm I, Keller A, Ingebrigtsen T, Grundnes O, Lange JE, Friis A. Lumbar instrumented fusion compared with cognitive intervention and exercises in patients with chronic back pain after previous surgery for disc herniation: a prospective randomized controlled study. *Pain*. 2006 May;122(1-2):145-55. Epub 2006 Mar 20. Rating: 2b

Bagnall AM, Jones L, Duffy S, Riemsma RP. Spinal fixation surgery for acute traumatic spinal cord injury (Protocol for a Cochrane Review). In: The *Cochrane Library*, Issue 3, 2004. Chichester, UK: John Wiley & Sons, Ltd. Rating: 5b

Siebenga J, Leferink VJ, Segers MJ, Elzinga MJ, Bakker FC, Haarman HJ, Rommens PM, ten Duis HJ, Patka P. Treatment of traumatic thoracolumbar spine fractures: a multicenter prospective randomized study of operative versus nonsurgical treatment. *Spine*. 2006 Dec 1;31(25):2881-90. Rating: 3b

Wickizer TM, Franklin G, Gluck, JV, Fulton-Kehoe D, Improving Quality Through Identifying Inappropriate Care: The Use of Guideline-Based Utilization Review Protocols in the Washington State Workers' Compensation System, *J Occup Environ Med* - 2004 Mar; 46(3); 198. Rating: 4a

Weiner BK, Levi BH. The Profit Motive and Spine Surgery. *Spine.* 2004 Nov 15; 29(22): 2588-2591. Rating: 5b

Shah RV, Albert TJ, Bruegel-Sanchez V, Vaccaro AR, Hilibrand AS, Grauer JN. Industry support and correlation to study outcome for papers published in Spine. *Spine*. 2005 May 1;30(9):1099-104; discussion 1105. Rating: 5b

Abelson R. Side Effects: The Spine as Profit Center. New York Times. December 30, 2006. Rating: 11b

Deyo RA, Gray DT, Kreuter W, Mirza S, Martin BI. United States trends in lumbar fusion surgery for degenerative conditions. *Spine*. 2005 Jun 15;30(12):1441-5; discussion 1446-7. Rating: 5b

Weinstein JN, Lurie JD, Olson PR, Bronner KK, Fisher ES. United States' trends and regional variations in lumbar spine surgery: 1992-2003. *Spine*. 2006 Nov 1;31(23):2707-14. Rating: 4a

van Tulder MW, Koes B, Seitsalo S, Malmivaara A. Outcome of invasive treatment modalities on back pain and sciatica: an evidence-based review. *Eur Spine J.* 2006 Jan;15 Suppl 1:S82-92. Epub 2005 Dec 1. Rating: 5a

Maghout Juratli S, Franklin GM, Mirza SK, Wickizer TM, Fulton-Kehoe D. Lumbar fusion outcomes in Washington State workers' compensation. Spine. 2006 Nov 1;31(23):2715-23. Rating: 3a

Martin BI, Mirza SK, Comstock BA, Gray DT, Kreuter W, Deyo RA. Are lumbar spine reoperation rates falling with greater use of fusion surgery and new surgical technology? Spine. 2007 Sep 1;32(19):2119-26. Rating: 3a

CMS (Centers for Medicare and Medicaid Services) Medicare Coverage Advisory Committee. Technology Assessment. Spinal Fusion for the Treatment of Low Back Pain Secondary to Lumbar Degenerative Disc Disease. November 14, 2006. Rating: 8a

Burnett MG, Sonntag VK. Return to contact sports after spinal surgery. Neurosurg Focus. 2006 Oct 15;21(4):E5. Rating: 5a

Hallett A, Huntley JS, Gibson JN. Foraminal stenosis and single-level degenerative disc disease: a randomized controlled trial comparing decompression with decompression and instrumented fusion. *Spine*. 2007 Jun 1;32(13):1375-80. Rating: 2c

Derby R, Kim BJ, Lee SH, Chen Y, Seo KS, Aprill C. Comparison of discographic findings in asymptomatic subject discs and the negative discs of chronic LBP patients: can discography distinguish asymptomatic discs among morphologically abnormal discs? *Spine J*. 2005 Jul-Aug;5(4):389-94. Rating: 3b

Derby R, Lee SH, Kim BJ, Chen Y, Aprill C, Bogduk N. Pressure-controlled lumbar discography in volunteers without low back symptoms. *Pain Med*. 2005 May-Jun;6(3):213-21. Rating: 3c

Derby R, Howard MW, Grant JM, Lettice JJ, Van Peteghem PK, Ryan DP. The ability of pressure-controlled discography to predict surgical and nonsurgical outcomes. *Spine*. 1999 Feb 15;24(4):364-71; discussion 371-2. Rating:4b

Martin BI, Deyo RA, Mirza SK, Turner JA, Comstock BA, Hollingworth W, Sullivan SD. Expenditures and health status among adults with back and neck problems. *JAMA*. 2008 Feb 13;299(6):656-64. Rating: 5a

Chou R. American Pain Society; American College of Physicians. Nonpharmacologic therapies for acute and chronic low back pain: a review of the evidence for a clinical practice guideline. Recommendations on surgery and interventional treatments. American Pain Society 27th Annual Scientific Meeting: Symposium 312. Presented May 8, 2008. Rating: 10a

Hansson T, Hansson E, Malchau H. Utility of spine surgery: a comparison of common elective orthopaedic surgical procedures. *Spine.* 2008 Dec 1;33(25):2819-30. Rating: 3a

Deyo RA, Mirza SK, Turner JA, Martin BI. Overtreating chronic back pain: time to back off? *J Am Board Fam Med.* 2009 Jan-Feb;22(1):62-8. Rating: 5b

Juratli SM, Mirza SK, Fulton-Kehoe D, Wickizer TM, Franklin GM. Mortality after lumbar fusion surgery. Spine. 2009 Apr 1;34(7):740-7. Rating: 3a

Vaidya R, Carp J, Bartol S, Ouellette N, Lee S, Sethi A. Lumbar spine fusion in obese and morbidly obese patients. *Spine*. 2009 Mar 1;34(5):495-500. Rating: 4b

Chou R, Baisden J, Carragee EJ, Resnick DK, Shaffer WO, Loeser JD. Surgery for low back pain: a review of the evidence for an American Pain Society Clinical Practice Guideline. *Spine*. 2009 May 1;34(10):1094-109. Rating: 1b

Dai LY, Jiang LS, Jiang SD. Posterior short-segment fixation with or without fusion for thoracolumbar burst fractures. a five to seven-year prospective randomized study. *J Bone Joint Surg Am*. 2009 May;91(5):1033-41. Rating: 2b

Carragee EJ, Don AS, Hurwitz EL, Cuellar JM, Carrino J, Herzog R. Does Discography Cause Accelerated Progression of Degeneration Changes in the Lumbar Disc: A Ten-Year Matched Cohort Study. *Spine (Phila Pa 1976).* 2009 Sep 14. [Epub ahead of print]. Rating: 3a

Deyo RA, Mirza SK, Martin BI, Kreuter W, Goodman DC, Jarvik JG. Trends, major medical complications, and charges associated with surgery for lumbar spinal stenosis in older adults. *JAMA*. 2010 Apr 7;303(13):1259-65. Rating: 3a

Toyone T, Ozawa T, Kamikawa K, Watanabe A, Matsuki K, Yamashita T, Shiboi R, Takeuchi M, Wada Y, Inada K, Aoki Y, Inoue G, Ohtori S, Tanaka T. Subsequent vertebral fractures following spinal fusion surgery for degenerative lumbar disease: a mean ten-year follow-up. *Spine (Phila Pa 1976).* 2010 Oct 1;35(21):1915-8. Rating: 4b

Brox JI, Nygaard ØP, Holm I, Keller A, Ingebrigtsen T, Reikerås O. Four-year follow-up of surgical versus non-surgical therapy for chronic low back pain. *Ann Rheum Dis*. 2010 Sep;69(9):1643-8. Rating: 2b

ECRI Institute. Spinal fusion and discography for chronic low back pain and uncomplicated lumber degenerative disc disease. Plymouth Meeting (PA): ECRI Institute Health Technology Assessment Information Service; 2007 October 19. (Evidence Report). Available at URL address: http://www.ecri.org. Rating: 1b

Campbell PG, Yadla S, Malone J, Maltenfort MG, Harrop JS, Sharan AD, Ratliff JK. Complications related to instrumentation in spine surgery: a prospective analysis. Neurosurg Focus. 2011 Oct;31(4):E10. Rating: 4b

Fritzell P, Hagg O, Wessberg P, Nordwall A; Swedish Lumbar Spine Study Group, 2001 Volvo Award Winner in Clinical Studies: Lumbar fusion versus nonsurgical treatment for chronic low back pain: a multicenter randomized controlled trial from the Swedish Lumbar Spine Study Group, *Spine* 2001 Dec 1;26(23):2521-32; discussion 2532-4. Rating: 2c

Harris I, Mulford J, Solomon M, van Gelder JM, Young J. Association between compensation status and outcome after surgery: a meta-analysis. *JAMA*. 2005 Apr 6;293(13):1644-52. Rating: 1b

Maghout Juratli S, Franklin GM, Mirza SK, Wickizer TM, Fulton-Kehoe D. Lumbar fusion outcomes in Washington State workers' compensation. Spine. 2006 Nov 1;31(23):2715-23. Rating: 3a
Atlas SJ, Chang Y, Keller RB, Singer DE, Wu YA, Deyo RA. The impact of disability compensation on long-term treatment outcomes of patients with sciatica due to a lumbar disc herniation. *Spine*. 2006 Dec 15;31(26):3061-9. Rating: 3a

Texas. Striking the Balance: An Analysis of the Cost and Quality of Medical Care in the Texas Workers' Compensation System A Report to the 77th Texas Legislature. Research and Oversight Council on Workers' Compensation and Med-FX, LLC. January 2001. Rating: 10c

NCCI. Workers Compensation vs. Group Health: A Comparison of Utilization. November 2006. Rating: 10a

DeBerard MS, Masters KS, Colledge AL, Schleusener RL, Schlegel JD, Outcomes of posterolateral lumbar fusion in Utah patients receiving workers' compensation: a retrospective cohort study, Spine. 2001 Apr 1;26(7):738-46; discussion 747. Rating: 3b

DeBerard MS, Masters KS, Colledge AL, Holmes EB. Presurgical biopsychosocial variables predict medical and compensation costs of lumbar fusion in Utah workers' compensation patients. *Spine J.* 2003 Nov-Dec;3(6):420-9. Rating: 3b

Deyo RA, Mirza SK, Heagerty PJ, Turner JA, Martin BI. A prospective cohort study of surgical treatment [spinal fusion] for back pain with degenerated discs; study protocol. BMC Musculoskelet Disord. 2005 May 24;6(1):24. Rating: 3a (protocol)

LaCaille RA, DeBerard MS, Masters KS, Colledge AL, Bacon W. Presurgical biopsychosocial factors predict multidimensional patient: outcomes of interbody cage lumbar fusion. *Spine J*. 2005 Jan-Feb;5(1):71-8. Rating: 3b

Trief PM, Ploutz-Snyder R, Fredrickson BE. Emotional health predicts pain and function after fusion: a prospective multicenter study. *Spine.* 2006 Apr 1;31(7):823-30. Rating: 3b

LaCaille RA, DeBerard MS, LaCaille LJ, Masters KS, Colledge AL. Obesity and litigation predict workers' compensation costs associated with interbody cage lumbar fusion. Spine J. 2007 May-Jun;7(3):266-72. Rating: 3b

Nguyen T, Randolph D. Functional outcomes of lumbar fusion among the Ohio workers' compensation subjects. *Primary Care Forum VIII*, Amsterdam, Netherlands. 2007. Rating: 4a

Carreon L, Glassman S, Djurasovic M, Johnson J, Puno R, Campbell M, Dimar J. Clinical Outcomes in Worker's Compensation Patients: A Case-Control Study. The Spine Journal, Volume 9, issue 10 – Supplement (October, 2009), 92. Rating: 3c

Nguyen TH, Randolph DC, Talmage J, Succop P, Travis R. Long-term Outcomes of Lumbar Fusion Among Workers' Compensation Subjects: An Historical Cohort Study. *Spine (Phila Pa 1976).* 2011 Feb 15;36(4):320-31. Rating: 3a

Carreon LY, Glassman SD, Kantamneni NR, Mugavin MO, Djurasovic M. Clinical outcomes after posterolateral lumbar fusion in workers' compensation patients: a case-control study. Spine (Phila Pa 1976). 2010 Sep 1;35(19):1812-7. Rating: 3b

Rutka JT, Callaghan JJ, Getch CC, Gokaslan ZL, Errico TJ, Przybylski GJ, Wilson JA, Roach JW, Lenke LG. BlueCross BlueShield of North Carolina Lumbar Spine Fusion Surgery Notification. Letter dated December 15, 2010. Policy effective date of January 1, 2011. Rating: 5a

International Society for the Advancement of Spine Surgery (ISASS). Policy Statement on Lumbar Spinal Fusion Surgery. From: http://www.isass.org/public_policy/2011-07-15_policy_statement_lumbar_surgery.html#indicated.

Ekman P, Moller H, Hedlund R. The long-term effect of posterolateral fusion in adult isthmic spondylolisthesis: a randomized controlled study. Spine J. 2005 Jan-Feb;5(1):36-44. Rating: 2b

Carragee EJ, Lincoln T, Parmar VS, Alamin T. A gold standard evaluation of the "discogenic pain" diagnosis as determined by provocative discography. *Spine*. 2006 Aug 15;31(18):2115-23. Rating: 3a

Fernandez-Fairen M, Sala P, Ramirez H, Gil J. A prospective randomized study of unilateral versus bilateral instrumented posterolateral lumbar fusion in degenerative spondylolisthesis. *Spine*. 2007 Feb 15;32(4):395-401. Rating: 2b

Weinstein JN, Lurie JD, Tosteson TD, Hanscom B, Tosteson AN, Blood EA, Birkmeyer NJ, Hilibrand AS, Herkowitz H, Cammisa FP, Albert TJ, Emery SE, Lenke LG, Abdu WA, Longley M, Errico TJ, Hu SS. Surgical versus nonsurgical treatment for lumbar degenerative spondylolisthesis. *N Engl J Med*. 2007 May 31;356(22):2257-70. Rating: 3a

Deyo RA. Back surgery--who needs it? *N Engl J Med*. 2007 May 31;356(22):2239-43. Rating: 5c

Martin CR, Gruszczynski AT, Braunsfurth HA, Fallatah SM, O'Neil J, Wai EK. The surgical management of degenerative lumbar spondylolisthesis: a systematic review. Spine. 2007 Jul 15;32(16):1791-8. Rating: 1b

Mirza SK, Deyo RA. Systematic review of randomized trials comparing lumbar fusion surgery to nonoperative care for treatment of chronic back pain. Spine. 2007 Apr 1;32(7):816-23. Rating: 1c

Pearson A, Blood E, Lurie J, Tosteson T, Abdu WA, Hillibrand A, Bridwell K, Weinstein J. Degenerative spondylolisthesis versus spinal stenosis: does a slip matter? Comparison of baseline characteristics and outcomes (SPORT). *Spine (Phila Pa 1976)*. 2010 Feb 1;35(3):298-305. Rating: 3a

Pearson A, Blood E, Lurie J, Abdu W, Sengupta D, Frymoyer JW, Weinstein J. Predominant leg pain is associated with better surgical outcomes in degenerative spondylolisthesis and spinal stenosis: results from the Spine Patient Outcomes Research Trial (SPORT). *Spine (Phila Pa 1976)*. 2011 Feb 1;36(3):219-29. Rating: 2b

Tosteson AN, Tosteson TD, Lurie JD, Abdu W, Herkowitz H, Andersson G, Albert T, Bridwell K, Zhao W, Grove MR, Weinstein MC, Weinstein JN. Comparative effectiveness evidence from the spine patient outcomes research trial: surgical versus nonoperative care for spinal stenosis, degenerative spondylolisthesis, and intervertebral disc herniation. *Spine (Phila Pa 1976).* 2011 Nov 15;36(24):2061-8. Rating: 2a

Lonner BS, Newton P, Betz R, Scharf C, O'Brien M, Sponseller P, Lenke L, Crawford A, Lowe T, Letko L, Harms J, Shufflebarger H. Operative management of Scheuermann's kyphosis in 78 patients: radiographic outcomes, complications, and technique. Spine. 2007 Nov 15;32(24):2644-52. Rating: 3b

Andersson GBJ, Cocchiarella L, American Medical Association. *Guides to the Evaluation of Permanent Impairment*, Fifth Edition. Hardcover - Dec 15, 2000. Rating: 9a

Luers P. Spinal alteration of motion segment integrity. The Guides Newsletter. American Medical Association. March/April 2007. Rating: 9b

Andersson GBJ, Cocchiarella L, American Medical Association. *Guides to the Evaluation of Permanent Impairment*, Fifth Edition. Hardcover - Dec 15, 2000. Rating: 9a

Colorado Division of Workers' Compensation, Medical Treatment Guidelines, Rule XVII, Low Back Pain, 12/1/01. Rating: 7a

BlueCross BlueShield. Surgery Section - Lumbar Spine Surgery. Policy No: 101. Effective Date: 09/03/2002. Rating: 8c

Aetna. (2011, May 27). Clinical Policy Bulletin: Bone and Tendon Graft Substitutes and Adjuncts. From: http://www.aetna.com/cpb/medical/data/400_499/0411.html. ***ODG: 8.a.***

Blue Cross of Idaho. (2011, November). Medical Policy: Bone Morphogenetic Protein (MP 7.01.00). From: https://www.bcidaho.com/providers/medical_policies/sur/mp_701100.asp. ***ODG: 8.a.***

Boden, S.D., Zdeblick, T.A., Sandhu, H.S., Heim, S.E. (2000). The use of rhBMP-2 in interbody fusion cages. Definitive evidence of osteoinduction in humans: a preliminary report. *Spine* 2000; 25(3):376-81. ***ODG: 2.b.***

Burkus, J.K., Gornet, M.F., Dickman, C.A., Zdeblick, T.A. (2002). Anterior lumbar interbody fusion using rhBMP-2 with tapered interbody cages. *Journal of Spinal Disorders Techniques* 2002; 15(5):337-49. ***ODG: 2.b.***

Centers for Medicare and Medicaid Services, Agency for Healthcare Research and Quality. (2010, December 13). Bone Morphogenetic Protein: The State of the Evidence of On-Label and Off-Label Use. From: http://www.cms.gov/Medicare/Coverage/DeterminationProcess/downloads/id75ta.pdf. ***ODG: 1.a.***

Cigna. (2011, February 15). Cigna Medical Coverage Policy: Bone Graft Substitutes for Use in Bone Repair. From: http://www.cigna.com/customer_care/healthcare_professional/coverage_positions/medical/mm_0118_coveragepositioncriteria_recombinant_human_bone_morphogenetic_protein.pdf. ***ODG: 8.a.***

Food and Drug Administration. (2004, April 7). Summary of Safety and Probable Benefit: Osteogenic Protein 1. From: http://www.accessdata.fda.gov/cdrh_docs/pdf2/H020008b.pdf. ***ODG: 1.a.***

Vaccaro, A.R., Patel, T., Fischgrund, J. (2004). A pilot study evaluating the safety and efficacy of OP-1 Putting (rhBMP-7) as a replacement for iliac crest autograft in posterolateral lumbar arthrodesis for degenerative spondylolisthesis. *Spine* 2004; 29(17):1885-92. ***ODG: 3.a.***

Vaccaro, A.R., Anderson, D.G., Patel, T. (2005). Comparison of OP-1 Putty (rh-BMP-7) to iliac crest autograft for posterolateral lumbar arthrodesis: a minimum 2-year follow-up pilot study. *Spine* 2005; 30(24):2709-16. ***ODG: 3.a.***

Aetna. (2011, November 18). Clinical Policy Bulletin: Discography. From: http://www.aetna.com/cpb/medical/data/700_799/0733.html. ***ODG: 8.a.***

American Society of Neuroradiology. (2001). Nomenclature and Classification of Lumbar Disc Pathology. From: http://www.asnr.org/spine_nomenclature/discussion.shtml. ***ODG: 8.a.***

Carragee, E.J., Tanner, C.M., et al. (2000). The rates of false-positive lumbar discography in select patients without low back symptoms. Spine 2000;25(11):1373–80; discussion 1381. ***ODG: 2.b.***

Derby R., Kim B.J., Lee S.H., Chen Y., Seo K.S., Aprill C. Comparison of discographic findings in asymptomatic subject discs and the negative discs of chronic LBP patients: can discography distinguish asymptomatic discs among morphologically abnormal discs? Spine J. 2005 Jul-Aug;5(4):389-94. ***ODG: 3.b.***

Guyer, R.D., Ohnmeiss, D. D. (1995, September 15). Lumbar Discography: Position Statement From the North American Spine Society Diagnostic and Therapeutic Committee. Spine. 20(18):2048-2059, September 15, 1995. ***ODG: 5.b.***

Pneumaticos S.G., Reitman C.A., Lindsey R.W. Diskography in the evaluation of low back pain. *J Am Acad Orthop Surg*. 2006 Jan;14(1):46-55. ***ODG: 5.b.***

Tomecek F.J., Anthony C.S., Boxell C., Warren J. (2002, August 15) Discography interpretation and techniques in the lumbar spine. Neurosurgery Focus. 13(2):E13, August 15, 2002. ***ODG: 5.b.***

Walker J., El Abd O., Isaac Z., Muzin S. (2007). Discography in practice: a clinical and historical review. Current Review of Muscluoskeletal Medicine 2008;1:69-83. ***ODG: 5.a.***

Zeidman S., Thompson K., Ducker T. (1995). Complication of cervical discography: analysis of 4400 diagnostic disc injections. Neurosurgery 1995;37(3):414–7. ***ODG: 2.a.***

Procedure Summary – Neck & Upper Back	
Procedure/Topic	**Summary of Medical Evidence**
Discography	Recommended for indications below. Conflicting evidence exists in this area, though some recent studies do not support its use as a preoperative indication for IDET or Fusion, and indicate that discography may produce symptoms in control groups more than a year later, especially in those with emotional and chronic pain problems. (Carragee, 2000) (Carragee2, 2000) (Bigos, 1999) (Grubb, 2000) (Zeidman, 1995) (Manchikanti, 2009) Cervical discography has been used to assist in determining the specific level or levels causing neck pain and, potentially, which levels to fuse; however, controversy regarding the specificity of cervical discograms has also been debated and more research is needed. (Wieser, 2007) Although discography, especially combined with CT scanning, may be more accurate than other radiologic studies in detecting degenerative disc disease, it should be considered as part of the diagnostic tool kit and not a sole indicator of surgical outcomes. It is routinely used before IDET, yet only occasionally used before spinal fusion. (Cohen, 2005) See also the Low Back Chapter. **Patient selection criteria for Discography:** o Neck pain of 3 or more months o Failure of recommended conservative treatment o An MRI demonstrating one or more degenerated discs as well as one or more normal appearing discs to allow for an internal control injection (injection of a normal disc to validate the procedure by a lack of a pain response to that injection) o Satisfactory results from psychosocial assessment (discography in subjects with emotional & chronic pain has been associated with reports of significant prolonged back pain after injection, and thus should be avoided) o Should be considered a candidate for surgery o Should be briefed on potential risks and benefits both from discography and from surgery

########

REFERENCE SUMMARIES

Carragee EJ, Chen Y, Tanner CM, Truong T, Lau E, Brito JL, Provocative discography in patients after limited lumbar discectomy: A controlled, randomized study of pain response in symptomatic and asymptomatic subjects, *Spine* 2000 Dec 1;25(23):3065-71. Rating: 2b

Carragee EJ, Chen Y, Tanner CM, Hayward C, Rossi M, Hagle C, Can discography cause long-term back symptoms in previously asymptomatic subjects? *Spine* 2000 Jul 15;25(14):1803-8. Rating: 2b

Bigos SJ, Perils, pitfalls, and accomplishments of guidelines for treatment of back problems, *Neurol Clin* 1999 Feb;17(1):179-92. Rating: 6a

Grubb SA, Kelly CK. Cervical Discography: Clinical Implications from 12 Years of Experience. Spine 2000;25:1382-9. Rating: 4a, 160 cases

Zeidman SM, Thompson K, Ducker TB. Complications of Cervical Discography: Analysis of 4400 Diagnostic Disc Injections. Neurosurgery 1995;37:414-7. Rating: 4a, 1347 cases

Manchikanti L, Dunbar EE, Wargo BW, Shah RV, Derby R, Cohen SP. Systematic Review of Cervical Discography as a Diagnostic Test for Chronic Spinal Pain. Pain Physician 2009; 12:305-321.

Wieser ES, Wang JC. Surgery for neck pain. *Neurosurgery*. 2007 Jan;60(1 Supp1 1):S51-6. Rating: 5b

Cohen SP, Larkin TM, Barna SA, Palmer WE, Hecht AC, Stojanovic MP. Lumbar discography: a comprehensive review of outcome studies, diagnostic accuracy, and principles. *Reg Anesth Pain Med*. 2005 Mar-Apr;30(2):163-83. Rating: 1b

Aetna. (2011, November 18). Clinical Policy Bulletin: Discography. From: http://www.aetna.com/cpb/medical/data/700_799/0733.html. ***ODG: 8.a.***

American Society of Neuroradiology. (2001). Nomenclature and Classification of Lumbar Disc Pathology. From: http://www.asnr.org/spine_nomenclature/discussion.shtml. ***ODG: 8.a.***

Carragee, E.J., Tanner, C.M., et al. (2000). The rates of false-positive lumbar discography in select patients without low back symptoms. Spine 2000;25(11):1373–80; discussion 1381. ***ODG: 2.b.***

Derby R., Kim B.J., Lee S.H., Chen Y., Seo K.S., Aprill C. Comparison of discographic findings in asymptomatic subject discs and the negative discs of chronic LBP patients: can discography distinguish asymptomatic discs among morphologically abnormal discs? Spine J. 2005 Jul-Aug;5(4):389-94. ***ODG: 3.b.***

Guyer, R.D., Ohnmeiss, D. D. (1995, September 15). Lumbar Discography: Position Statement From the North American Spine Society Diagnostic and Therapeutic Committee. Spine. 20(18):2048-2059, September 15, 1995. ***ODG: 5.b.***

Pneumaticos S.G., Reitman C.A., Lindsey R.W. Diskography in the evaluation of low back pain. *J Am Acad Orthop Surg*. 2006 Jan;14(1):46-55. ***ODG: 5.b.***

Tomecek F.J., Anthony C.S., Boxell C., Warren J. (2002, August 15) Discography interpretation and techniques in the lumbar spine. Neurosurgery Focus. 13(2):E13, August 15, 2002. ***ODG: 5.b.***

Walker J., El Abd O., Isaac Z., Muzin S. (2007). Discography in practice: a clinical and historical review. Current Review of Muscluoskeletal Medicine 2008;1:69-83. ***ODG: 5.a.***

Zeidman S., Thompson K., Ducker T. (1995). Complication of cervical discography: analysis of 4400 diagnostic disc injections. Neurosurgery 1995;37(3):414–7. ***ODG: 2.a.***