



UM-CDG-067 Cervical Fusion

Approved By:
Director, Health Services

Effective Date:
10/22/2025

This Policy applies to all SECUR affiliates, associates, and subsidiaries.

Approved by Courtney Gonzales, Director of Health Services on behalf of the Utilization Management Committee.

PURPOSE

This coverage determination guideline serves to address cervical fusion, a procedure that joints two or more vertebrae in the neck to create a single, solid piece of bone. The procedure involves removing the disc between the vertebrae, placing a bone graft, and fusing the vertebrae together. The graft may be harvested from the patient or from a donor. Typical procedures involve a small incision in the front of the neck but may also be done through the back.

For SECUR Health Plan members, National Coverage Determinations (NCD) and Local Coverage Determinations (LCD) will be applied to requests when applicable. SECUR Health Plan Coverage Determination Guidelines (CDG) will be utilized in the absence of an appropriate NCD and/or LCD.

DEFINITIONS

None

POLICY

SECUR Health Plan will consider surgical cervical fusion as medically necessary for the decompression of symptomatic cervical nerve root impingement when the following are met:

1. Persistent or recurrent moderate or severe arm pain (rating of 4 or greater on the visual analog scale (VAS) or equivalent) present for a minimum of twelve (12) weeks within the current episode of arm pain with documented failure to respond to multimodal conservative management, as tolerated, in the absence of exceptional circumstances below, and
2. Nerve compression negatively impacting activities of daily living (ADLs), and
3. All other potential sources of pain/neurological deficit have been excluded, and
4. Imaging (magnetic resonance imaging (MRI) or computed tomography (CT)) evidence of central, lateral recess or foraminal stenosis at the level corresponding with clinical symptoms and including at least one (1) of the following:
 - Cervical degenerative disc disease as indicated by the presence of herniated nucleus pulposus, narrowing of the intervertebral disc, disc osteophytes, facet hypertrophy, and/or synovial cysts.
 - Tumors (primary or metastatic)
 - Post infection radiographic findings
 - Spinal instability as defined by subluxation or translation more than 3.5 mm on static lateral views or dynamic radiographs or sagittal plane angulation of more than eleven (11) degrees between adjacent

segments.

SECUR Health Plan considers isolated chronic axial cervical pain as not medically necessary for the decompression of symptomatic cervical nerve root impingement.

Exceptions to conservative therapy requirement for decompression of symptomatic cervical nerve root impingement include:

1. Concomitant myelopathy or myeloradiculopathy
 - Cervical myelopathy class III or above, or
 - Progression of neurological deficits during the trial of conservative treatment
2. Isolated radiculopathy
 - Presenting with progressive motor weakness, or
 - Significant motor weakness interfering with ADLs, or
 - Severe radicular pain defined as pain limiting ability to perform ADLs and greater than or equal to 7/10 on VAS or equivalent scale, and associated with confirmatory imaging (CT or MRI) and clinical radiological correlation
3. Loss of bowel and/or bladder control due to cervical spinal cord compression.

SECUR Health Plan will consider surgical cervical fusion for the decompression of symptomatic cervical canal stenosis as medically necessary for the following:

1. Persistent or recurrent moderate to severe arm pain (4 or more on the VAS or equivalent) present for a minimum of twelve (12) weeks within the episode of arm pain with documented failure to respond to multimodal conservative management, as tolerated, in the absence of exceptional circumstances below, or
2. Nerve compression negatively impacting ADLs, or
3. Spastic gait, loss of manual dexterity, problems with sphincter control, and
4. All other potential sources of pain/neurological deficit have been excluded, and
5. Imaging (MRI or CT) evidence of central stenosis at the level corresponding with clinical signs and symptoms and including at least one (1) of the following:
 - Cervical degenerative disc disease as indicated by the presence of herniated nucleus pulposus, narrowing of the intervertebral disc, disc osteophytes, facet hypertrophy, and/or synovial cysts
 - Congenital short pedicles
 - Tumors (primary and metastatic)
 - Post infection radiographic findings
 - Ossification of the posterior longitudinal ligament
 - Spinal instability as defined by subluxation or translation more than 3.5 mm on static lateral views or dynamic radiographs, or sagittal plane angulation of more than eleven (11) degrees between adjacent segments
 - Cord compression with or without increased cord signal

SECUR Health Plan considers isolated chronic axial cervical pain and asymptomatic myelopathy, regardless of severity on imaging findings, as not medically necessary for surgical cervical fusion for decompression of symptomatic cervical canal stenosis.

Exceptions to conservative therapy requirement for decompression of symptomatic cervical canal stenosis include:

1. Myelopathy

- Cervical myelopathy class III or above, or
 - Progression of neurological deficits during the trial of conservative treatment
2. Radiculopathy
 - Presenting with progressive motor weakness, or
 - Significant motor weakness interfering with ADLs, or
 - Severe radicular pain defined as pain limiting ability to perform ADLs and greater than or equal to 7/10 on VAS or equivalent scale and associated with confirmatory imaging (CT or MRI) and clinical radiological correlation
 3. Loss of bladder and/or bowel function due to cervical spinal cord compression

SECUR Health Plan considers cervical fusion surgery for the decompression or stabilization of the cervical spine as medically necessary for the following:

1. Traumatic injuries including fracture, dislocation, fracture-dislocation, or traumatic ligamentous disruption when:
 - Fracture or dislocation is likely to result in spinal instability without neurological deficit(s), or
 - Fracture or dislocation associated with neurological deficit(s) at the impacted level, or
 - Instability is present
2. Spinal tumors involving the spine or spinal canal when:
 - Malignant or benign tumors have caused instability or neurologic deficit where treatment of the tumor will likely require stabilization of the spine, or
 - Expected treatment of the tumor whether by chemotherapy or radiation therapy or surgery will likely cause spinal instability or neurological deficits, or
 - Instability is present
3. Infection involving the spine in the form of discitis, osteomyelitis, or epidural abscess when:
 - Imaging or other studies demonstrate infection, and
 - Imaging evidence of vertebral body destruction or documentation that spinal debridement will cause vertebral instability, or
 - Instability is present
4. Deformities that include the cervical spine including:
 - Cervical kyphosis associated with cord compression or Atlantoaxial (C1-C2) subluxation or Basilar invagination of the odontoid process into the foramen magnum, or Subaxial (C2-T1) instability kyphosis, head drop syndrome, post laminectomy deformity, or
 - Symptomatic pseudarthrosis with radiological demonstration of non-union of post fusion after twelve (12) months since fusion surgery or with radiographic evidence of hardware failure, or
 - Spinal instability after laminectomy, or
 - Rheumatoid arthritis with associated instability, or
 - Cervical degenerative spondylolisthesis with spinal instability, and substantial functional limitation is present or progression of deformity

SECUR Health Plan considers cervical fusion for the decompression or stabilization of the cervical spine as not medically necessary when all the criteria above have not been met.

References:

1. White III AA, Johnson RM, Panjabi MM, Southwick WO. Biomechanical analysis of clinical stability in the cervical spine. *Clinical Orthopaedics and Related Research*®. 1975;109:85-96.
2. Boonstra AM, Preuper HRS, Balk GA, Stewart RE. Cut-off points for mild, moderate, and severe pain on

- the visual analogue scale for pain in patients with chronic musculoskeletal pain. *Pain*®. 2014;155(12):2545-2550.
3. (NASS) NASS. Cervical fusion: defining appropriate coverage positions. NASS Coverage Recommendations 2023 (May). North American Spine Society (NASS). www.spine.org. Accessed November 21, 2023.
 4. Surgeons AAoN. Spinal Tumors. <https://www.aans.org/Patients/Neurosurgical-Conditions-and-Treatments/Spinal-Tumors>. Accessed November 2, 2023.
 5. Nagashima H, Tanishima S, Tanida A. Diagnosis and management of spinal infections. *J Orthop Sci*. 2018;23(1):8-13.
 6. Elmajee M, Munasinghe C, Aljawadi A, Elawady K, Shuweihde F, Pillai A. Posterior stabilisation without formal debridement for the treatment of non-tuberculous pyogenic spinal infection in frail and debilitated population—A systematic review and meta-analysis. *Journal of Clinical Orthopaedics and Trauma*. 2021;15:9-15.
 7. Raja SN CD, Cohen M, Finnerup NB, Flor H, Gibson S, Keefe FJ, Mogil JS, Ringkamp M, Sluka KA, Song XJ, Stevens B, Sullivan MD, Tutelman PR, Ushida T, Vader K. . The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. *Pain*. 2020;161(9):1976-1982.
 8. Bono CM, Ghiselli G, Gilbert TJ, et al. An evidence-based clinical guideline for the diagnosis and treatment of cervical radiculopathy from degenerative disorders. *The Spine Journal*. 2011;11(1):64-72.
 9. Rondinelli RD, Genovese E, Katz RT, et al. *AMA guides to the evaluation of permanent impairment, Sixth Edition*. 2008.
 10. Menger DLSGWSMRP. Hangman's Fractures. Published 2023. Updated August 13, 2023. Accessed January 2023.
 11. Donnally III CJ, Hanna A, Odom CK. Cervical myelopathy. StatPearls Publishing. StatPearls [Internet] Web site. <https://www.ncbi.nlm.nih.gov/books/NBK482312/> Published 2023. Accessed October 27, 2023.
 12. Marquis BO, Capone PM. Myelopathy. *Handbook of clinical neurology*. 2016;136:1015-1026.
 13. Wirth FP, Dowd GC, Sanders HF, Wirth C. Cervical discectomy: a prospective analysis of three operative techniques. *Surgical neurology*. 2000;53(4):340-348.
 14. Panjabi MM, White III AA. Basic biomechanics of the spine. *Neurosurgery*. 1980;7(1):76-93.
 15. Kothari MJ, Chuang Kathy Treatment and prognosis of cervical radiculopathy. UpToDate. <https://www.uptodate.com/>. Published 2023. Updated February 28, 2023. Accessed November 1, 2023.
 16. Corp N, Mansell G, Stynes S, et al. Evidence-based treatment recommendations for neck and low back pain across Europe: a systematic review of guidelines. *European Journal of Pain*. 2021;25(2):275-295.
 17. Nikolaidis I, Fouyas IP, Sandercock PAG, Statham PF. Surgery for cervical radiculopathy or myelopathy. *Cochrane Database of Systematic Reviews*. 2010(1).
 18. Plener J, Csiernik B, To D, et al. Conservative Management of Cervical Radiculopathy: A Systematic Review. *Clin J Pain*. 2023;39(3):138-146.
 19. Liang L, Feng M, Cui X, et al. The effect of exercise on cervical radiculopathy: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2019;98(45):e17733.
 20. Walker MJ, Boyles RE, Young BA, et al. The Effectiveness of Manual Physical Therapy and Exercise for Mechanical Neck Pain: A Randomized Clinical Trial. *Spine*. 2008;33(22):2371-2378.
 21. Kuijper B, Tans JT, Beelen A, Nollet F, de Visser M. Cervical collar or physiotherapy versus wait and see policy for recent onset cervical radiculopathy: randomised trial. *Bmj*. 2009;339:b3883.
 22. Engquist M, Löfgren H, Öberg B, et al. Factors Affecting the Outcome of Surgical Versus Nonsurgical Treatment of Cervical Radiculopathy. *Spine*. 2015;40(20):1553-1563.
 23. Engquist M, Löfgren H, Öberg B, et al. A 5-to 8-year randomized study on the treatment of cervical

- radiculopathy: anterior cervical decompression and fusion plus physiotherapy versus physiotherapy alone. *Journal of Neurosurgery: Spine*. 2017;26(1):19-27.
24. Harrop JS, Mohamed B, Bisson EF, et al. Congress of neurological surgeons systematic review and evidence-based guidelines for perioperative spine: preoperative surgical risk assessment. *Neurosurgery*. 2021;89(Supplement_1):S9-S18.
 25. Thoomes E, Thoomes-de Graaf M, Cleland JA, Gallina A, Falla D. Timing of evidence-based nonsurgical interventions as part of multimodal treatment guidelines for the management of cervical radiculopathy: a Delphi study. *Physical Therapy*. 2022;102(5):pzab312.
 26. Berman D, Holtzman A, Sharfman Z, Tindel N. Comparison of Clinical Guidelines for Authorization of MRI in the Evaluation of Neck Pain and Cervical Radiculopathy in the United States. *Journal of the American Academy of Orthopaedic Surgeons*. 2023;31(2):64-70.
 27. Cervical Radiculopathy (Pinched Nerve in Neck). Cleveland Clinic. <https://my.clevelandclinic.org/health/diseases/22639-cervical-radiculopathy-pinched-nerve>. Published 2022. Updated March 29, 2022. Accessed October 18, 2023.
 28. Broekema AE, Groen RJ, de Souza NFS, et al. Surgical interventions for cervical radiculopathy without myelopathy: a systematic review and meta-analysis. *JBJS*. 2020;102(24):2182-2196.
 29. Fang W, Huang L, Feng F, et al. Anterior cervical discectomy and fusion versus posterior cervical foraminotomy for the treatment of single-level unilateral cervical radiculopathy: a meta-analysis. *J Orthop Surg Res*. 2020;15(1):202.
 30. Gao Q-Y, Wei F-L, Zhu K-L, et al. Clinical Efficacy and Safety of Surgical Treatments in Patients With Pure Cervical Radiculopathy. *Frontiers in Public Health*. 2022;10:892042.
 31. Goedmakers CMW, Janssen T, Yang X, Arts MP, Bartels R, Vleggeert-Lankamp CLA. Cervical radiculopathy: is a prosthesis preferred over fusion surgery? A systematic review. *Eur Spine J*. 2020;29(11):2640-2654.
 32. Katsuura Y, York PJ, Goto R, et al. Sagittal Reconstruction and Clinical Outcome Using Traditional ACDF, Versus Stand-alone ACDF Versus TDR: A Systematic Review and Quantitative Analysis. *Spine (Phila Pa 1976)*. 2019;44(19):E1151-E1158.
 33. Liu WJ, Hu L, Chou PH, Wang JW, Kan WS. Comparison of Anterior Cervical Discectomy and Fusion versus Posterior Cervical Foraminotomy in the Treatment of Cervical Radiculopathy: A Systematic Review. *Orthop Surg*. 2016;8(4):425-431.
 34. Zou T, Wang PC, Chen H, Feng XM, Sun HH. Minimally invasive posterior cervical foraminotomy versus anterior cervical discectomy and fusion for cervical radiculopathy: a meta-analysis. *Neurosurg Rev*. 2022;45(6):3609-3618.
 35. Gutman G, Rosenzweig DH, Golan JD. Surgical Treatment of Cervical Radiculopathy: Meta-analysis of Randomized Controlled Trials. *Spine (Phila Pa 1976)*. 2018;43(6):E365-E372.
 36. Fei Q, Li J, Su N, et al. Comparison between anterior cervical discectomy with fusion and anterior cervical corpectomy with fusion for the treatment of cervical spondylotic myelopathy: a meta-analysis. *Ther Clin Risk Manag*. 2015;11:1707-1718.
 37. Han YC, Liu ZQ, Wang SJ, Li LJ, Tan J. Is anterior cervical discectomy and fusion superior to corpectomy and fusion for treatment of multilevel cervical spondylotic myelopathy? A systemic review and meta-analysis. *PLoS One*. 2014;9(1):e87191.
 38. Li Z, Long C, Li B, Wei J. Efficacy and safety of surgical interventions for treating multilevel cervical spondylotic myelopathy via anterior approach: A network meta-analysis. *Pain Physician*. 2019;22(4):E275.
 39. Montano N, Ricciardi L, Olivi A. Comparison of Anterior Cervical Decompression and Fusion versus Laminoplasty in the Treatment of Multilevel Cervical Spondylotic Myelopathy: A Meta-Analysis of Clinical and Radiological Outcomes. *World Neurosurg*. 2019;130:530-536 e532.

40. Wang T, Guo J, Long Y, Hou Z. Comparison of Two Anterior Reconstructive Techniques in the Treatment of 3-Level and 4 Level Cervical Spondylotic Myelopathy: A Meta-analysis of Last Decade. *Geriatr Orthop Surg Rehabil.* 2022;13:21514593221124415.
41. Schuermans VNE, Smeets A, van de Kar LGC, et al. A Systematic Review on Neurological Outcomes for Cervical Degenerative Myelopathy After Anterior Decompression Surgery: Motion Preservation vs Fusion. *Int J Spine Surg.* 2022;16(6):969-976.
42. El-Ghandour NMF, Soliman MAR, Ezzat AAM, Mohsen A, Zein-Elabedin M. The safety and efficacy of anterior versus posterior decompression surgery in degenerative cervical myelopathy: a prospective randomized trial. *J Neurosurg Spine.* 2020:1-9.
43. Xu L, Sun H, Li Z, Liu X, Xu G. Anterior cervical discectomy and fusion versus posterior laminoplasty for multilevel cervical myelopathy: A meta-analysis. *Int J Surg.* 2017;48:247-253.
44. Zhao CM, Chen Q, Zhang Y, Huang AB, Ding WY, Zhang W. Anterior cervical discectomy and fusion versus hybrid surgery in multilevel cervical spondylotic myelopathy: A meta-analysis. *Medicine (Baltimore).* 2018;97(34):e11973.
45. Lee NJ, Kim JS, Park P, Riew KD. A comparison of various surgical treatments for degenerative cervical myelopathy: a propensity score matched analysis. *Global spine journal.* 2022;12(6):1109-1118.
46. Medicine JH. Cervical Myelopathy. Johns Hopkins Medicine. Cervical Myelopathy. Accessed November 14, 2023.
47. Ranawat CS, O'Leary P, Pellicci P, Tsairis P, Marchisello P, Dorr L. Cervical spine fusion in rheumatoid arthritis. *J Bone Joint Surg Am.* 1979;61(7):1003-1010.
48. Gillick JL, Wainwright J, Das K. Rheumatoid arthritis and the cervical spine: a review on the role of surgery. *International journal of rheumatology.* 2015;2015.
49. Nunez JH, Escudero B, Omiste I, et al. Outcomes of cervical arthroplasty versus anterior cervical arthrodesis: a systematic review and meta-analysis of randomized clinical trials with a minimum follow-up of 7-year. *Eur J Orthop Surg Traumatol.* 2022.
50. Peng Z, Hong Y, Meng Y, Liu H. A meta-analysis comparing the short- and mid- to long-term outcomes of artificial cervical disc replacement(ACDR) with anterior cervical discectomy and fusion (ACDF) for the treatment of cervical degenerative disc disease. *Int Orthop.* 2022;46(7):1609-1625.
51. Xing D, Ma XL, Ma JX, Wang J, Ma T, Chen Y. A meta-analysis of cervical arthroplasty compared to anterior cervical discectomy and fusion for single-level cervical disc disease. *J Clin Neurosci.* 2013;20(7):970-978.
52. Zhang Y, Lv N, He F, et al. Comparison of cervical disc arthroplasty and anterior cervical discectomy and fusion for the treatment of cervical disc degenerative diseases on the basis of more than 60 months of follow-up: a systematic review and meta-analysis. *BMC Neurol.* 2020;20(1):143.
53. Fehlings MG, Martin AR, Tetreault LA, et al. A Clinical Practice Guideline for the Management of Patients With Acute Spinal Cord Injury: Recommendations on the Role of Baseline Magnetic Resonance Imaging in Clinical Decision Making and Outcome Prediction. *Global Spine J.* 2017;7(3 Suppl):221S-230S.
54. Zileli M, Maheshwari S, Kale SS, Garg K, Menon SK, Parthiban J. Outcome Measures and Variables Affecting Prognosis of Cervical Spondylotic Myelopathy: WFNS Spine Committee Recommendations. *Neurospine.* 2019;16(3):435-447.
55. Costa F, Anania CD, Agrillo U, et al. Cervical Spondylotic Myelopathy: From the World Federation of Neurosurgical Societies (WFNS) to the Italian Neurosurgical Society (SINch) Recommendations. *Neurospine.* 2023;20(2):415-429.
56. Watanabe M, Chikuda H, Fujiwara Y, et al. Japanese Orthopaedic Association (JOA) Clinical practice guidelines on the Management of Cervical Spondylotic Myelopathy,2020 - Secondary publication. *J Orthop Sci.* 2023;28(1):1-45.

57. Youssef JA, Heiner AD, Montgomery JR, et al. Outcomes of posterior cervical fusion and decompression: a systematic review and meta-analysis. *Spine J.* 2019;19(10):1714-1729.
58. Mahmoud A, Shanmuganathan K, Montgomery A. Surgical Management of Hangman's Fracture: A Systematic Review. *Int J Spine Surg.* 2023.
59. Lee DY, Park YJ, Song MG, Kim KT, Kim DH. Comparison of anterior-only versus combined anterior and posterior fusion for unstable subaxial cervical injuries: a meta-analysis of biomechanical and clinical studies. *Eur Spine J.* 2021;30(6):1460-1473.
60. Yang JS, Liu P, Liu TJ, et al. When is the circumferential stabilization necessary for subaxial cervical fracture dislocations? The posterior ligament-bone injury classification and severity score: a novel treatment algorithm. *Eur Spine J.* 2021;30(2):524-533.
61. Madan A, Thakur M, Sud S, Jain V, Singh Thakur RP, Negi V. Subaxial Cervical Spine Injuries: Outcomes after Anterior Corpectomy and Instrumentation. *Asian J Neurosurg.* 2019;14(3):843-847.
62. Ailon T, Smith JS, Shaffrey CI, et al. Outcomes of operative treatment for adult cervical deformity: a prospective multicenter assessment with 1-year follow-up. *Neurosurgery.* 2018;83(5):1031-1039.
63. Zheng HL, Li B, Song SK, Chen PB, Jiang LS, Jiang SD. Anterior cervical discectomy and fusion to treat cervical instability with vertigo and dizziness: A single center, retrospective, observational study. *Front Surg.* 2022;9:1047504.
64. Yang H, Wang H, Zhang B, Sun Y, Wang L, Lu X. Cervical spine fracture-dislocation in patients with ankylosing spondylitis and severe thoracic kyphosis: Application of halo vest before and during surgical management. *Clin Neurol Neurosurg.* 2021;207:106744.
65. Wang L, Wang H, Wang C, Zhang B, Yang H, Lu X. Comparative study of halo-vest reduction and skull traction reduction in the treatment of cervical fracture dislocation in patients with ankylosing spondylitis. *Front Surg.* 2023;10:1129809.
66. Skeppholm M, Svedmark P, Noz ME, Maguire GQ, Jr., Olivecrona H, Olerud C. Evaluation of mobility and stability in the Discover artificial disc: an in vivo motion study using high-accuracy 3D CT data. *J Neurosurg Spine.* 2015;23(3):383-389.
67. Rustagi T, Mashaly H, Mendel E. Posterior occiput-cervical fixation for metastasis to upper cervical spine. *J Craniovertebr Junction Spine.* 2019;10(2):119-126.
68. Luksanapraksa P, Millhouse PW, Carlson V, Ariyawatkul T, Heller J, Kepler CK. Comparison of Surgical Outcomes of the Posterior and Combined Approaches for Repair of Cervical Fractures in Ankylosing Spondylitis. *Asian Spine J.* 2019;13(3):432-440.
69. Li Z, Li F, Hou S, et al. Anterior discectomy/corpectomy and fusion with internal fixation for the treatment of unstable hangman's fractures: a retrospective study of 38 cases. *J Neurosurg Spine.* 2015;22(4):387-393.
70. Lee JS, Son DW, Lee SH, Ki SS, Lee SW, Song GS. Comparative Analysis of Surgical Outcomes of C1-2 Fusion Spine Surgery between Intraoperative Computed Tomography Image Based Navigation-Guided Operation and Fluoroscopy-Guided Operation. *J Korean Neurosurg Soc.* 2020;63(2):237-247.
71. Lang S, Neumann C, Fiedler L, Alt V, Loibl M, Kerschbaum M. Does Dynamic Anterior Plate Fixation Provide Adequate Stability for Traumatic Subaxial Cervical Spine Fractures at Mid-Term Follow-Up? *J Clin Med.* 2021;10(6).
72. Kong W, Yang X, Li Z, Hu B, Song Y. Analysis of the Cervical Sagittal Alignment in Patients with Unstable Hangman Fracture Under C2 approximately 3 Anterior Discectomy and Fusion. *World Neurosurg.* 2020;137:e1-e8.
73. Kim HS, Cloney MB, Koski TR, Smith ZA, Dahdaleh NS. Management of Isolated Atlas Fractures: A Retrospective Study of 65 Patients. *World Neurosurg.* 2018;111:e316-e322.
74. Bakhsheshian J, Sizardkhani S, Ohiorhenuan I, Buchanan IA, Strickland B, Pham MH. Transpedicular lag screw placement in traumatic cervical spondylolisthesis: Case report and systematic review of the literature. *J Clin Neurosci.* 2019;63:256-262.

75. Jin C, Xie N, Ren Y, et al. How Does Cervical Sagittal Balance Change After Hangman Fracture Treated with Anterior or Posterior Approach Surgery? *World Neurosurg*. 2020;138:e767-e777.
76. Garrido BJ, Myo GK, Sasso RC. Rigid versus nonrigid occipitocervical fusion: a clinical comparison of short-term outcomes. *J Spinal Disord Tech*. 2011;24(1):20-23.
77. Dagtekin A, Avci E, Hamzaoglu V, et al. Management of occipitocervical junction and upper cervical trauma. *J Craniovertebr Junction Spine*. 2018;9(3):148-155.
78. Clark S, Nash A, Shasti M, et al. Mortality Rates After Posterior C1-2 Fusion for Displaced Type II Odontoid Fractures in Octogenarians. *Spine (Phila Pa 1976)*. 2018;43(18):E1077-E1081.
79. Candura D, Perna A, Velluto C, et al. Conservative management of Anderson Type II odontoid fractures in octogenarians: is radiological union what we are searching for? *Eur Rev Med Pharmacol Sci*. 2022;26(1 Suppl):33-42.
80. Aldrian S, Erhart J, Schuster R, et al. Surgical vs nonoperative treatment of Hadley type IIA odontoid fractures. *Neurosurgery*. 2012;70(3):676-682; discussion 682-673.
81. Ghogawala Z, Terrin N, Dunbar MR, et al. Effect of ventral vs dorsal spinal surgery on patient-reported physical functioning in patients with cervical spondylotic myelopathy: a randomized clinical trial. *Jama*. 2021;325(10):942-951.
82. de Dios Perez E. Degenerative cervical myelopathy: Surgical treatment, imaging evaluation, and outcome. 2023.
83. Sattari SA, Ghanavatian M, Feghali J, et al. Anterior cervical discectomy and fusion versus posterior decompression in patients with degenerative cervical myelopathy: a systematic review and meta-analysis. *J Neurosurg Spine*. 2023:1-13.
84. Selph SS SA, Jungbauer RM, Brodt E, Blazina I, Philipp TC, Mauer KM, Dettori J, Atchison C, Riopelle D, Stabler-Morris S, Fu R, Yu Y, Chou R. . Cervical Degenerative Disease Treatment: A Systematic Review. Comparative Effectiveness Review No. 266. (Prepared by the Pacific Northwest Evidence-based Practice Center under Contract No. 75Q80120D00006.). AHRQ Publication No. 24-EHC001. Rockville, MD: Agency for Healthcare Research and Quality;. <https://effectivehealthcare.ahrq.gov/products/cervical-degenerative-disease/research>. Accessed November 28, 2023.
85. Industries. WSDoL. Labor and Industries' Industrial Insurance Medical Advisory Committee (IIMAC). Guideline for diagnosis and treatment of cervical radiculopathy and myelopathy. <https://www.lni.wa.gov/patient-care/treating-patients/treatment-guidelines-and-resources/docs/2014CervicalGuideline-FINAL.pdf> [lni.wa.gov]. Updated Effective December 2014, Hyperlinks and minor corrections June 2023 . Accessed November 28, 2023.
86. Cohen SP. Epidemiology, diagnosis, and treatment of neck pain. *Mayo Clin Proc*. 2015;90(2):284-299.
87. Ohnari H, Sasai K, Akagi S, Iida H, Takanori S, Kato I. Investigation of axial symptoms after cervical laminoplasty, using questionnaire survey. *Spine J*. 2006;6(3):221-227.
88. (NASS) NASS. Appropriate Use Criteria: Cervical Fusion (2013) North American Spine Society (NASS). North American Spine Society: Appropriate Use Criteria for Cervical Fusion Web site. <https://www.spine.org/Portals/0/assets/downloads/ResearchClinicalCare/CervicalFusionAUC.pdf>. Published 2013. Accessed 11/14/, 2023.
89. van Middelkoop M, Rubinstein SM, Ostelo R, et al. No additional value of fusion techniques on anterior discectomy for neck pain: a systematic review. *Pain*. 2012;153(11):2167-2173.
90. Riew KD, Ecker E, Dettori JR. Anterior cervical discectomy and fusion for the management of axial neck pain in the absence of radiculopathy or myelopathy. *Evid Based Spine Care J*. 2010;1(3):45-50.
91. Carragee EJ, Hurwitz EL, Cheng I, et al. Treatment of neck pain: injections and surgical interventions: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. *Spine (Phila Pa 1976)*. 2008;33(4 Suppl):S153-169.
92. Palit M, Schofferman J, Goldthwaite N, et al. Anterior discectomy and fusion for the management of neck

- pain. *Spine (Phila Pa 1976)*. 1999;24(21):2224-2228.
93. Garvey TA, Transfeldt EE, Malcolm JR, Kos P. Outcome of anterior cervical discectomy and fusion as perceived by patients treated for dominant axial-mechanical cervical spine pain. *Spine (Phila Pa 1976)*. 2002;27(17):1887-1895; discussion 1895.
 94. Whitecloud TS, 3rd, Seago RA. Cervical discogenic syndrome. Results of operative intervention in patients with positive discography. *Spine (Phila Pa 1976)*. 1987;12(4):313-316.
 95. Simmons EH, Bhalla SK. Anterior cervical discectomy and fusion. A clinical and biomechanical study with eight-year follow-up. *J Bone Joint Surg Br*. 1969;51(2):225-237.
 96. Carragee EJ, Hurwitz EL, Cheng I, et al. Treatment of neck pain: injections and surgical interventions: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. *J Manipulative Physiol Ther*. 2009;32(2 Suppl):S176-193.
 97. Nystrom B, Svensson E, Larsson S, Schillberg B, Mork A, Taube A. A small group Whiplash-Associated-Disorders (WAD) patients with central neck pain and movement induced stabbing pain, the painful segment determined by mechanical provocation: Fusion surgery was superior to multimodal rehabilitation in a randomized trial. *Scand J Pain*. 2016;12:33-42.
 98. Kreiner DS, Shaffer WO, Baisden JL, et al. An evidence-based clinical guideline for the diagnosis and treatment of degenerative lumbar spinal stenosis (update). *Spine J*. 2013;13(7):734-743.
 99. Isaac Z, Atlas SJ, K L. Management of non-radicular neck pain in adults. UpToDate. www.uptodate.com. Published 2023. Updated October 4, 2023. Accessed October 30, 2023.
 100. Local Coverage Determination (LCD) L39788, Cervical Fusion, 7/13/2024, <https://www.cms.gov/medicare-coverage-database/view/lcd.aspx?lcdid=39788&ver=7&>