

| Code | Uncertainty | Original Uncertainty | Current Evidence and Reason for Uncertainty | Source of Uncertainty |
|------|--|--|---|---|
| D1 | What is the diagnostic criteria of DCM? When should imaging be used in the assessment of DCM? | What are the practical versus theoretical definitions of DCM? How can we diagnosis? What are the evidence-informed clinical tests for the diagnosis of DCM? What are the typical presentations? What is at the moment the gold standard for the diagnosis of DCM? Is it possible to make some diagnostic criteria for DCM? | No formal diagnostic criteria published for DCM. No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 35 Other healthcare professionals: 34 People with DCM and their supporters: 14 |
| D2 | What are the possible effects of DCM on sufferers? What is their aetiology and how do they impact on quality of life? | A clearer understanding of what symptoms a sufferer of DCM can have. What is consequences due to DCM? What symptom(s) are most disabling? Possible effects on eyesight? What are the signs and symptoms of DCM patients? How painful is DCM? What is/are the most disabling features or symptoms of DCM in a patient's perspective? | Primary studies have evaluated the most common signs and symptoms in DCM patients. However, no systematic reviews, scoping reviews or guidelines have been conducted to answer this question. | Spinal Surgeons: 14 Other healthcare professionals: 15 People with DCM and their supporters: 20 |
| D3 | What are the main signs and symptoms that a patient with DCM presents with? What are the frequency, sensitivity, specificity and positive predictive value of symptoms and signs (clinical assessments) for DCM? | What are the main symptoms that patients present with? Most common symptom? At what point would Babinski or ankle clonus be present? What symptom(s) are most reflective of DCM? What is the prevalence of each commonly reported symptom; which symptom is most sensitive and specific? What physical exam has the highest specificity and sensitivity in detecting early DCM? What the signs and symptoms of DCM with the greatest sensitivity and specificity? | Primary studies have evaluated the sensitivity and specificity of signs and symptoms in DCM patients. However, no systematic reviews, scoping reviews or guidelines have been conducted to answer this question. | Spinal Surgeons: 22 Other healthcare professionals: 24 People with DCM and their supporters: 5 |
| D4 | What is the role of dynamic imaging and novel, unconventional or advanced techniques in the assessment of DCM? | Why isn't Dynamic MRI with the neck positioned in flexion and then extension more common when research shows that intermittent and dynamic compression causes progression of DCM? Is dynamic cervical MRI a mandatory tool in diagnosing cervical myelopathy? Are dynamic MRI scans valuable? Is MRI tractography useful in diagnosis of CSM? What is the role of DTI in imaging DCM? | No guidelines identified. Martin AR, Aleksanderek I, Cohen-Adad J, Tarmohamed Z, Tetreault L, Smith N, Cadotte DW, Crawley A, Ginsberg H, Mikulis DJ, Fehlings MG. Translating state-of-the-art spinal cord MRI techniques to clinical use: A systematic review of clinical studies utilizing DTI, MT, MWF, MRS, and fMRI. Neuroimage Clin. 2015 Dec 4;10:192-238. Ellingson BM, Salamon N, Holly LT. Advances in MR imaging for cervical spondylotic myelopathy. Eur Spine J. 2015 Apr;24 Suppl 2:197-208. | Spinal Surgeons: 39 Other healthcare professionals: 6 People with DCM and their supporters: 2 |
| D5 | What is the role of electrophysiology in the assessment and diagnosis of DCM? | What is the role of electrophysiology in diagnosing DCM? Does EMG/ neurophysiology make the diagnosis more accurate Quantitative assessment of myelopathy patients using motor evoked potentials or other measures other than neurological examination and MRI. Is there any early neurophysiology finding that precedes MRI and clinical symptoms that can be done in high risk patients? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 23 Other healthcare professionals: 7 People with DCM and their supporters: 1 |
| D6 | What is the relationship between clinical and imaging findings of DCM? Can findings on imaging help to grade the severity of myelopathy? | What imaging modalities or findings are most predictive or correlative with significant disability? Why are some patients very symptomatic with mild compression, but others asymptomatic with severe compression? Is there a clear correlation of spinal canal diameter or MR-myelopathy rating to function? The correlation between radiographic findings and symptoms. Accurate radiological diagnosis that correlates with neurological function and prognosis. | No guidelines identified. Current systematic reviews are limited with respect to imaging features/modalities assessed. Wei L, Wei Y, Tian Y, Cao P, Yuan W. Does three-grade classification of T2-weighted increased signal intensity reflect the severity of myelopathy and surgical outcomes in patients with cervical compressive myelopathy? A systematic review and meta-analysis. Neurosurg Rev. 2019 May 3. Rindler RS, Chokshi FH, Malcolm JG, Eshraghi SR, Mossa-Basha M, Chu JK, Kurpad SN, Ahmad FU. Spinal Diffusion Tensor Imaging in Evaluation of Preoperative and Postoperative Severity of Cervical Spondylotic Myelopathy: Systematic Review of Literature. World Neurosurg. 2017 Mar;99:150-158. | Spinal Surgeons: 15 Other healthcare professionals: 7 People with DCM and their supporters: 2 |
| D7 | Can CSF or serum biomarkers be identified to support early diagnosis of DCM, and/or predict treatment outcomes? | Bio markers for early diagnosis? Could we get any clues about DCM from analysing the CSF? Is it possible to find a serum biomarker that predict the prognosis of DCM? What is the role of biomarkers in the diagnosis and follow-up of patients with DCM? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 11 Other healthcare professionals: 1 People with DCM and their supporters: 1 |
| D8 | What clinical and/or imaging features are predictive of neurologic deterioration in patients with DCM? Are there certain features that indicate irreversibility of the disease? | What factors influence DCM progression? What factors can be used to predict progression in early DCM? What lifestyle factors are associated with poorer DCM prognosis or disease progression? Who is at risk of deteriorating? Are there some biological markers which can predict evolution? What patient will evolve? and require surgery Are there radiologic predictors to symptomatic progression? | Karadimas SK, Erwin WM, Ely CG, Dettori JR, Fehlings MG. Pathophysiology and natural history of cervical spondylotic myelopathy. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S21-36. | Spinal Surgeons: 50 Other healthcare professionals: 23 People with DCM and their supporters: 4 |
| D9 | What is the average time to diagnosis? What are the barriers to obtaining a diagnosis of DCM? Can these be modified to improve timely diagnosis and management? | How long is it taking to diagnose DCM in a patient? How often is DCM misdiagnosed? Why do doctors seem to be so quick to dismiss patients' symptoms? How can we diagnose DCM sooner? What is the referral pathway for suspected DCM? How can we improve healthcare pathways? Why does it take so long to be listened to and a referral for scans etc? How and what can assist with early detection of disease? What are the earliest features of DCM and are the majority of primary care healthcare workers well aware of these? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 38 Other healthcare professionals: 29 People with DCM and their supporters: 55 |
| D10 | What strategies can be used to increase awareness and understanding of DCM amongst healthcare professionals and the general public? Can these strategies help improve timely diagnosis and management of DCM? | Why are so many GPs and physiotherapist unaware of myelopathy? Can precise examination of GP after education course help with early diagnose DCM? How do we educate primary care physicians/allied health to detect DCM early? What will the medical schools do to educate current medical doctors and future medical doctors as well therapists about DCM / diagnosis? Do variations in GP awareness of DCM affect outcomes?" What is being done to raise awareness of the seriousness of the condition? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 21 Other healthcare professionals: 14 People with DCM and their supporters: 52 |
| D11 | What are the common differentials or mimics of DCM? What is the appropriate work-up to distinguish between DCM and common differentials? | Are there any signs on various imaging modalities which can accurately distinguish DCM from other neurological diseases, including ALS, MS, or sarcoidosis and so on? How can we distinguish between different kind of myelopathy? Best way to differentiate DCM from other conditions with similar presentation. | No systematic reviews, scoping reviews or guidelines identified. Literature review was identified: Kim HJ, Tetreault LA, Massicotte EM, Arnold PM, Skelly AC, Brodt ED, Riew KD. Differential diagnosis for cervical spondylotic myelopathy: literature review. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S78-88. | Spinal Surgeons: 11 Other healthcare professionals: 3 People with DCM and their supporters: 7 |

| | | | | |
|-----|---|---|---|---|
| D12 | Can clinical assessments be used or developed to identify early signs and symptoms of DCM or individuals at risk of DCM? | The role of objective measurement tools (gait velocity, step length, gait smoothness) in the detection of DCM Can GPs / MSK screen for DCM ? Is there an algorithm of signs to enable confidence in our allied health team to then suspect DCM? Are there early screening tests to identify persons at risk? What is the relationship between measures of variability of gait temporal-spatial parameters and early neurological symptoms and signs in pre-diagnostic DCM? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 14 Other healthcare professionals: 8 People with DCM and their supporters: 5 |
| D13 | When should a referral to spinal surgery or other specialists be made? | What stage is referral urgent? When is it appropriate to refer to spine surgery? When is the preferred time for referral of patient with suspected diagnosis of DCM? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 3 Other healthcare professionals: 8 People with DCM and their supporters: 1 |
| D14 | Can features of DCM distinguish the length of time affected? Are there specific early or late features of DCM? | What are the earliest manifestations of DCM? What are the earliest signs? What are the earliest symptoms? What are the first symptoms that appear in a patient with myelopathy? | No systematic reviews, scoping reviews or guidelines identified. | Spinal Surgeons: 16 Other healthcare professionals: 6 People with DCM and their supporters: 7 |
| D15 | What is the natural history of DCM? What is the relationship between DCM and asymptomatic spinal cord compression or canal stenosis? What factors influence the natural history of the disease? | What is the natural history of DCM without surgical intervention? Is it reversible? What proportion with asymptomatic cervical cord compression develops DCM? Why do some asymptomatic cervical cord compressions never develop DCM? What are the outcomes of asymptomatic stenosis? How long is the neurological plateau after an exacerbation of DCM? What is the rate of deterioration with patients with DCM? | Systematic reviews on the topic rated the level of evidence as low to moderate. Tetreault LA, Karadimas S, Wilson JR, Arnold PM, Kurpad S, Dettori JR, Fehlings MG. The Natural History of Degenerative Cervical Myelopathy and the Rate of Hospitalization Following Spinal Cord Injury: An Updated Systematic Review. Global Spine J. 2017 Sep;7(3 Suppl):28S-34S. Karadimas SK, Erwin WM, Ely CG, Dettori JR, Fehlings MG. Pathophysiology and natural history of cervical spondylotic myelopathy. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S21-36. Wilson JR, Barry S, Fischer DJ, Skelly AC, Arnold PM, Riew KD, Shaffrey CI, Traynelis VC, Fehlings MG. Frequency, timing, and predictors of neurological dysfunction in the nonmyelopathic patient with cervical spinal cord compression, canal stenosis, and/or ossification of the posterior longitudinal ligament. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S37-54. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Currence S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. Global Spine J. 2017 Sep;7(3 Suppl):70S-83S. | Spinal Surgeons: 44 Other healthcare professionals: 15 People with DCM and their supporters: 11 |
| D16 | Is it possible to use imaging and/or other patient factors to calculate the risk of catastrophic acute cervical spinal cord injury in patients with spinal cord compression but no myelopathy? | What is the risk of clinical deterioration after minor trauma in patients with DCM? Which clinical and imaging factors signal the patient is more likely to sustain a SCI? | No systematic reviews, scoping reviews or guidelines identified that specifically calculate risk of spinal cord injury using patient and/or imaging factors. | Spinal Surgeons: 3 Other healthcare professionals: 2 People with DCM and their supporters: 0 |
| D17 | What are the factors that predict the development of myelopathy in patients with evidence of spinal cord compression and no symptoms? | Which is the single most important finding to consider in MRI when counselling asymptomatic patients with spinal cord compression? Are there any clinical or radiological biomarkers that may predict which patients with cervical spondylosis may progress to DCM? Is the presence of hyperintensity signal in the spinal cord of an asymptomatic patient predictive of future developing of DCM? In a patient is cervical stenosis and no symptoms or signs of DCM, are there subtle features that can predict a future deterioration or onset of DCM? | A systematic review on the topic rated the level of evidence as insufficient to moderate. Wilson JR, Barry S, Fischer DJ, Skelly AC, Arnold PM, Riew KD, Shaffrey CI, Traynelis VC, Fehlings MG. Frequency, timing, and predictors of neurological dysfunction in the nonmyelopathic patient with cervical spinal cord compression, canal stenosis, and/or ossification of the posterior longitudinal ligament. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S37-54. | Spinal Surgeons: 14 Other healthcare professionals: 3 People with DCM and their supporters: 1 |
| D18 | What is the prevalence and impact of instability or deformity on the onset or progression of DCM? | How does the cervical alignment influence the progression of myelopathy? Does DCM alone cause sagittal imbalance or flexion curvature in cervical area? Clinical impact of preoperative SVA, C2,3 angle, T1 slope. Is spinal imbalance a cause or a symptom of DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 13 Other healthcare professionals: 1 People with DCM and their supporters: 2 |
| D19 | Is there a genetic basis to the development and/or progression of DCM? | Which genetic traits predispose to DCM ? Is there a familial tendency? Given the potential role of genetic factors, can we identify genetic factors more likely to contribute to DCM progression? What are the genetic determinants that predispose patients to developing DCM? What are the genetic determinants that result in early development and/or rapid progression of DCM? | A systematic review on the topic rated the level of evidence as low. No systematic reviews, scoping reviews or guidelines identified exploring the association between genetics and disease progression. Wilson JR, Patel AA, Brodt ED, Dettori JR, Brodke DS, Fehlings MG. Genetics and heritability of cervical spondylotic myelopathy and ossification of the posterior longitudinal ligament: results of a systematic review. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S123-46. | Spinal Surgeons: 27 Other healthcare professionals: 12 People with DCM and their supporters: 11 |
| D20 | What are the risk factors for the development or progression of DCM, including but not limited to, lifestyle, diet, exercise, posture, occupation, history of trauma and co-existent disease? Does their modification have a role in prevention or treatment? | What activities or occupations contribute to the development of DCM? What role does sleep position, choice of pillow or mattress play in the development of DCM? Are there lifestyles linked to the risk of DCM development? When is congenital stenosis a problem? How can we confirm that it is the symptom generator? Do all people with Klippel-Feil have DCM? To what extent do work injuries precipitate symptomatic degenerative cervical myelopathy? What are the risk factors for development of DCM? Are there any modifiable risk factors for DCM? | Singh A, Tetreault L, Fehlings MG, Fischer DJ, Skelly AC. Risk factors for development of cervical spondylotic myelopathy: results of a systematic review. Evid Based Spine Care J. 2012 Aug;3(3):35-42. | Spinal Surgeons: 59 Other healthcare professionals: 42 People with DCM and their supporters: 27 |
| D21 | What is the incidence and prevalence of DCM, and its subtypes? What is the likely incidence and prevalence of DCM in the future? | How common is Myelo-Radiculopathy? What is the prevalence? What is the incidence of DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 2 Other healthcare professionals: 2 People with DCM and their supporters: 3 |
| D22 | What is the pathophysiology of DCM? What are the mechanisms of neurologic injury and the molecular and anatomical consequences? | What is the aetiology? Why does DCM cause neurological impairment? What are the exact structures and neural pathways that are affected? What spinal cord pathological changes underlie motor and sensory deficits in CSM? What causes DCM? | No systematic reviews, scoping reviews or guidelines identified. Several literature reviews identified on the topic, including Karadimas SK, Erwin WM, Ely CG, Dettori JR, Fehlings MG. Pathophysiology and natural history of cervical spondylotic myelopathy. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S21-36. | Spinal Surgeons: 12 Other healthcare professionals: 6 People with DCM and their supporters: 3 |

| | | | | |
|----|--|---|---|---|
| T1 | What is the efficacy and safety of non-operative treatment in the management of DCM compared with surgical treatment? Can non-operative treatment avoid the need for surgery long-term? When can a "watch and wait" approach be adopted? | Any effective conservative treatment? When is conservative treatment in patients with DCM an option? To what extent can non-operative treatment improve or slow progression of DCM? Is conservative treatment acceptable in early stages? Is it acceptable in late stages? Which treatment modalities are safe? Traction? When is it appropriate to manage a DCM non-operatively? What factors predict a patient that should be treated non-operatively (medically)? What are patient perceptions about operative and non operative treatment? | Systematic reviews on the topic rated the level of evidence as very low. Tetreault LA, Rhee J, Prather H, Kwon BK, Wilson JR, Martin AR, Andersson IB, Dembek AH, Pagarigan KT, Dettori JR, Fehlings MG. Change in Function, Pain, and Quality of Life Following Structured Nonoperative Treatment in Patients With Degenerative Cervical Myelopathy: A Systematic Review. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):42S-52S Rhee J, Tetreault LA, Chapman JR, Wilson JR, Smith JS, Martin AR, Dettori JR, Fehlings MG. Nonoperative Versus Operative Management for the Treatment Degenerative Cervical Myelopathy: An Updated Systematic Review. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):35S-41S. Rhee JM, Shamji MF, Erwin WM, Bransford RJ, Yoon ST, Smith JS, Kim HJ, Ely CG, Dettori JR, Patel AA, Kalsi-Ryan S. Nonoperative management of cervical myelopathy: a systematic review. <i>Spine (Phila Pa 1976).</i> 2013 Oct 15;38(22 Suppl1):S55-67. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):70S-83S. | Spinal Surgeons: 66 Other healthcare professionals: 27 People with DCM and their supporters: 23 |
| T2 | What is the optimal content, structure and duration of non-operative treatment? Which non-operative techniques are most effective and whom should they be delivered by? | What is the best medical treatment? What are the best exercise regimes for prevention and management of DCM? What physiotherapy is effective for these patients? What are the best conservative interventions for managing patients with DCM? What role does exercise have in the management of DCM? What is the most impactful self-management tool? What nonsurgical methods are most effective at symptom reduction? What type of rehabilitation/physiotherapy is most effective for management of DCM? Aqua therapy, myofascial therapy, craniofacial therapy. | Systematic reviews on the topic rated the level of evidence as very low. Limited evidence on the efficacy and safety of different nonoperative modalities and on the optimal duration of treatment. Tetreault LA, Rhee J, Prather H, Kwon BK, Wilson JR, Martin AR, Andersson IB, Dembek AH, Pagarigan KT, Dettori JR, Fehlings MG. Change in Function, Pain, and Quality of Life Following Structured Nonoperative Treatment in Patients With Degenerative Cervical Myelopathy: A Systematic Review. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):42S-52S | Spinal Surgeons: 35 Other healthcare professionals: 57 People with DCM and their supporters: 27 |
| T3 | What is the role of surgery in the management of non-myelopathic patients with imaging evidence of cord compression? Is this decision impacted by signal change on T2-weighted MRI images or the presence of neck pain? | Is there any benefit of surgically treating patients with cord compression but no/mild signs/symptoms of myelopathy? Is surgery indicated in asymptomatic DCM (MRI showing compressive changes)? Role of surgery in patients with radiologically severe cervical spinal stenosis with MR signs of myelopathy, but without clinical evident myelopathy What is the risk of an asymptomatic patient with severe stenosis to deteriorate in comparison to prophylactic decompression? Is surgery warranted in (neurological) asymptomatic stenosis and neck pain? | A systematic review on the topic rated the level of evidence as insufficient to moderate. Strength was weak for all recommendations developed in the clinical practice guideline. Wilson JR, Barry S, Fischer DJ, Skelly AC, Arnold PM, Riew KD, Shaffrey CI, Traynelis VC, Fehlings MG. Frequency, timing, and predictors of neurological dysfunction in the nonmyelopathic patient with cervical spinal cord compression, canal stenosis, and/or ossification of the posterior longitudinal ligament. <i>Spine (Phila Pa 1976).</i> 2013 Oct 15;38(22 Suppl 1):S37-54. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):70S-83S. | Spinal Surgeons: 27 Other healthcare professionals: 7 People with DCM and their supporters: 1 |
| T4 | What is the efficacy of surgical interventions for DCM? What is the impact of surgery on functional impairment, disability, pain and quality of life in patients with DCM? What are the most common residual symptoms following surgical decompression? | Do surgical treatment restore function or stop the progression of disease? Outcome and recovery after decompression of DCM. What symptom relief can you expect after decompressive surgery for cervical myelopathy? What are reasonable expectations for restoration of normal gait in patients with DCM following surgical decompression? How effective is surgery in pain reduction? How effective is surgery on symptoms and quality of life? | No uncertainty. A systematic review and meta-analysis, along with guidelines, were identified. | Spinal Surgeons: 38 Other healthcare professionals: 8 People with DCM and their supporters: 10 |
| T5 | What is the optimal surgical approach? What clinical and imaging factors can help a surgeon decide what approach to use? | What is the best surgical option for DCM? What type of neurosurgery treatment is the best? Is there a preferred surgical approach: anterior v posterior, laminoplasty v laminectomy +/- stabilization? Can we deliver clear guidelines for anterior v posterior v combined/360? What is the ideal operation? Are there objective predictors to choosing which operation? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 42 Other healthcare professionals: 4 People with DCM and their supporters: 1 |
| T6 | What are the complications associated with DCM surgery and how often do they occur? Can strategies be developed to minimize the occurrence of complications? Are there important clinical, imaging and surgical predictors of complications following surgery for DCM? | What are the complications of surgical management of DCM? Are post surgical dysphagia or dysphonia transient or permanent? Are how are these possible problems evaluated and treated? How can we reduce post op complications? What are the possible complications? | A systematic review on the topic rated the level of evidence as very low to low. Not all surgical complications were included in this review. No standardized system for reporting surgical complications has been developed. A systematic review evaluating important predictors of complications rated the level of evidence as insufficient to moderate. Fehlings MG, Tetreault LA, Kurpad S, Brodke DS, Wilson JR, Smith JS, Arnold PM, Brodt ED, Dettori JR. Change in Functional Impairment, Disability, and Quality of Life Following Operative Treatment for Degenerative Cervical Myelopathy: A Systematic Review and Meta-Analysis. <i>Global Spine J.</i> 2017 Sep;7(3Suppl):53S-69S. Tetreault L, Ibrahim A, Côté P, Singh A, Fehlings MG. A systematic review of clinical and surgical predictors of complications following surgery for degenerative cervical myelopathy. <i>J Neurosurg Spine.</i> 2016 Jan;24(1):77-99. | Spinal Surgeons: 10 Other healthcare professionals: 8 People with DCM and their supporters: 4 |
| T7 | What is the aetiology of C5 palsy? Are there any strategies that can prevent its occurrence? | What is the true etiology of "C5 palsy"? Incidence of C5 palsy postoperatively. How to prevent C5 palsy? Does prophylactic C5 foraminotomy prevent C5 palsy following posterior cervical decompression for DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 9 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T8 | Are there clinical and imaging factors that can help a surgeon select who should undergo surgical decompression in the setting of DCM? At what stage of the disease is surgery the preferred management strategy? | Who are eligible for surgical treatment for DCM? What are the clear indications for surgical intervention? What are the contraindications for surgery? How degree of clinical severity is appropriate to consider surgical indication for DCM? At what stage does it become clear that surgical intervention is the preferred/desired treatment? Which symptoms and/or signs and/or imaging features should trigger surgical treatment? Can we use neurophysiology (SSEP, CMAP) to prognosticate and help in treatment decision analysis? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 49 Other healthcare professionals: 13 People with DCM and their supporters: 4 |
| T9 | What is the efficacy and safety of anterior versus posterior surgery in patients with DCM? Are there any baseline patient or imaging characteristics that should guide decision making? | Anterior or posterior surgical approach: Which has better outcome? Is there a preferred surgical approach: anterior v posterior Which are the most important criteria to approach from anterior to posterior? Are there any long term surgical outcome difference between anterior vs posterior surgeries for moderate to severe symptomatic DCM? Anterior vs posterior treatment in multilevel DCM? | No uncertainty. Systematic reviews on this topic were identified. A clinical trial is currently underway to evaluate the efficacy of anterior versus posterior surgery in patients who could be safely treated with either approach. | Spinal Surgeons: 54 Other healthcare professionals: 1 People with DCM and their supporters: 2 |

| | | | | |
|-----|---|---|--|---|
| T10 | What is the preferred management strategy for patients with mild DCM? What is the most cost-effective management strategy in this cohort of patients? Are there clinical and imaging features that predict who should undergo surgical decompression and/or when? | When should patients with mild symptoms and signs of DCM (that are seen in the initial assessment) be referred for a surgical consultation? Are there clear indications for surgery in oligosymptomatic DCM patients? Is early surgery for mild myelopathy of potential clinical benefit? When does an individual with mild myelopathy need an operation? Cost analysis for early operations versus late operations in patients with newly diagnosed symptomatic cervical degenerative myelopathy. | Systematic reviews evaluating the efficacy of surgery and nonoperative treatment did not differentiate among patients with mild, moderate or severe preoperative disease. The strength of the guideline developed for the management of mild myelopathy was weak and was based on very low to low level of evidence. Furthermore, the recommendation suggested either surgical intervention or a supervised trial of structured rehabilitation. Fehlings MG, Tetreault LA, Kurpad S, Brodke DS, Wilson JR, Smith JS, Arnold PM, Brodt ED, Dettori JR. Change in Functional Impairment, Disability, and Quality of Life Following Operative Treatment for Degenerative Cervical Myelopathy: A Systematic Review and Meta-Analysis. Global Spine J. 2017 Sep;7(3Suppl):53S-69S. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. Global Spine J. 2017 Sep;7(3 Suppl):70S-83S. | Spinal Surgeons: 27 Other healthcare professionals: 3 People with DCM and their supporters: 1 |
| T11 | What are the most important determinants of functional outcomes, quality of life and patient satisfaction following surgical or non-operative treatment for DCM? | Does patient's age influence the surgical treatment? Are there factors which can predict the outcome of surgery? What are the imaging features that predict outcome? Are there specific physical findings that are linked to better or worse outcomes? Are there specific bio markers that predict outcome? What is a predictor for poor surgical outcome? Are there any predictive factors on imaging related to surgical outcome? What is the effect of duration of symptoms and degree of neurological deficit on prognosis after surgical management of DCM? Does myelomalacia predict irreversible DCM? Do patients with myelomalacia continue to deteriorate despite adequate decompression in DCM? What factors predict improved patient outcomes with non-surgical management? | Tetreault L, Palubiski LM, Kryshchak M, Idler RK, Martin AR, Ganau M, Wilson JR, Kotter M, Fehlings MG. Significant Predictors of Outcome Following Surgery for the Treatment of Degenerative Cervical Myelopathy: A Systematic Review of the Literature. Neurosurg Clin N Am. 2018 Jan;29(1):115-127.e35. | Spinal Surgeons: 103 Other healthcare professionals: 21 People with DCM and their supporters: 8 |
| T12 | What is the ideal timing for surgical intervention? | What is the ideal time (or indicators) for intervention? When is the correct time to intervene definitively with surgery? Is there a timeframe beyond which intervention is futile? When should we consider decompression surgery? At which point of time should DCM be treated? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 69 Other healthcare professionals: 25 People with DCM and their supporters: 16 |
| T13 | What information should be given to patients diagnosed with DCM? What information should be given to patients undergoing surgery for DCM? How should it be delivered? | How can we most accurately advise our patients with DCM of their prognosis/expected outcome after surgery or conservative management? What role does education play in managing DCM symptoms? How can sufferers make people aware of the severity of their 'hidden condition'? Do you have a pamphlet? Like Parkinson's, MS & ALS do, outside in the brochure rack? Do people with DCM feel there is sufficient information and support available? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 4 Other healthcare professionals: 7 People with DCM and their supporters: 32 |
| T14 | Could the provision of standardized treatment algorithms and/or tools to estimate individualized risk and prognosis, support informed decision making and improve outcomes for DCM sufferers? | What is the best treatment? Can there be more generalized treatment protocol developed and shared world wide so that patients with DCM are not put through unnecessary and expensive treatments that are not effective for DCM? Is their a superior (most beneficial-with regards to time and cost) treatment protocol for DCM? How to stop/prevent further degeneration of neck. What treatment approaches could recover more neurological function? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 23 Other healthcare professionals: 31 People with DCM and their supporters: 22 |
| T15 | What strategies can be implemented to increase rates of fusion? What is their impact on outcomes? | In patients with multilevel cases, how could we manage the pseudoarthrosis, in special in osteoporotic patients? What patient factors best predict failure of anterior and posterior arthrodesis? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 4 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T16 | What are the indications for intraoperative neurologic monitoring during DCM surgery? | Need for intra-op neuromonitoring? What is the role of IONM in surgery for DCM? | A single systematic review was identified that evaluated the impact of intraoperative monitoring on reducing neurological complications. This review did not rate the quality of evidence of the individual studies or the overall body of evidence. No guidelines were identified. Thirumala PD, Muralidharan A, Loke YK, Habeych M, Crammond D, Balzer J. Value of intraoperative neurophysiological monitoring to reduce neurological complications in patients undergoing anterior cervical spine procedures for cervical spondylotic myelopathy. J Clin Neurosci. 2016 Mar;25:27-35. | Spinal Surgeons: 7 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T17 | For multilevel DCM treated anteriorly, does the surgical strategy influence outcomes? Is there a superiority to corpectomy and fusion, or plate fixation over discectomy and fusion alone? | What are the differences in outcome between doing multilevel corpectomy vs multilevel ACDF in multilevel DCM? ACCF vs multilevel ACDF vs hybrid in multilevel DCM? What is the role of corpectomy? When is an anterior plate needed after multilevel ACDF? | No guidelines identified. Wang T, Wang H, Liu S, An HD, Liu H, Ding WY. Anterior cervical discectomy and fusion versus anterior cervical corpectomy and fusion in multilevel cervical spondylotic myelopathy: A meta-analysis. Medicine (Baltimore). 2016 Dec;95(49):e5437. Guan L, Hai Y, Yang JC, Zhou LJ, Chen XL. Anterior cervical discectomy and fusion may be more effective than anterior cervical corpectomy and fusion for the treatment of cervical spondylotic myelopathy. BMC Musculoskelet Disord. 2015 Feb 13;16:29. Wen ZQ, Du JY, Ling ZH, Xu HD, Lin XJ. Anterior cervical discectomy and fusion versus anterior cervical corpectomy and fusion in the treatment of multilevel cervical spondylotic myelopathy: systematic review and a meta-analysis. Ther Clin Risk Manag. 2015 Jan 29;11:161-70. Xiao SW, Jiang H, Yang LJ, Xiao ZM. Anterior cervical discectomy versus corpectomy for multilevel cervical spondylotic myelopathy: a meta-analysis. Eur Spine J. 2015 Jan;24(1):31-9. | Spinal Surgeons: 8 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T18 | For DCM treated via a posterior approach, what is the most effective surgical strategy: laminectomy, laminoplasty or laminectomy with instrumented fusion? Are there clinical or imaging factors that can help a surgeon decide which technique to use? | What is more effective: laminoplasty or laminectomy and fusion for DCM? For those patients treated via a posterior approach, what are the factors that predict which patients are best treated with laminoplasty versus laminectomy and posterior instrumented fusion? Are there any real disadvantages of cervical laminectomy over laminoplasty in selected cases? What are the cases when posterior decompression only has better results than posterior decompression + arthrodesis and vice versa? When is fusion necessary after laminectomy? | No systematic reviews identified that compare laminectomy without fusion to laminectomy with fusion or laminoplasty. No guidelines identified. Luo W, Li Y, Zhao J, Zou Y, Gu R, Li H. Skip Laminectomy Compared with Laminoplasty for Cervical Compressive Myelopathy: A Systematic Review and Meta-Analysis. World Neurosurg. 2018 Dec;120:296-301. Phan K, Scherman DB, Xu J, Leung V, Virk S, Mobbs RJ. Laminectomy and fusion vs laminoplasty for multi-level cervical myelopathy: a systematic review and meta-analysis. Eur Spine J. 2017 Jan;26(1):94-103. Liu FY, Yang SD, Huo LS, Wang T, Yang DL, Ding WY. Laminoplasty versus laminectomy and fusion for multilevel cervical compressive myelopathy: A meta-analysis. Medicine (Baltimore). 2016 Jun;95(23):e3588. Lee CH, Lee J, Kang JD, Hyun SJ, Kim KJ, Jahng TA, Kim HJ. Laminoplasty versus laminectomy and fusion for multilevel cervical myelopathy: a meta-analysis of clinical and radiological outcomes. J Neurosurg Spine. 2015 Jun;22(6):589-95. Bartels RH, van Tulder MW, Moojen WA, Arts MP, Peul WC. Laminoplasty and laminectomy for cervical spondylotic myelopathy: a systematic review. Eur Spine J. 2015 Apr;24 Suppl 2:160-7. | Spinal Surgeons: 19 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T19 | Does the use of motion-preserving (e.g. arthroplasty) or motion-reducing (e.g fusion and/or fixation) techniques influence outcomes for patients with DCM as compared to simple decompression alone? In what circumstances are they indicated? | What is the group of patients in which fixation is mandatory in DCM? Indications for fusion? Do multilevel disc replacements work in DCM? Fusion or disc prosthesis? When is disc replacement indicated in the treatment of DCM? Does fusion and decompression lead to better or worse outcome compared to fusion only? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 38 Other healthcare professionals: 4 People with DCM and their supporters: 2 |

| | | | | |
|-----|---|--|---|---|
| T20 | Does the correction of deformity associated with DCM, or acquired secondary to intervention, improve outcomes? | What percentage of spinal surgeons rule out instability prior to undertaking fusion procedures in patients with DCM? Deformity correction in DCM. What are the indications and outcomes? When is it necessary to correct cervical deformity? How much cervical lordosis is necessary to potentiate neurological recovery? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 14 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T21 | Should treatment strategies be adapted in the context of advanced age or frailty? | How can we manage in elderly patients? (>80 years). Is there a maximum age for surgery? How do we manage with DCM patient who are too old to be treated with surgery? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 11 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| T22 | What is the role of spinal immobilization (e.g. the use of a cervical collar) before and after surgery for DCM? | Is there any proof that wearing a collar post ACDF reduces risk? Do we need to use a collar after surgery for DCM? What is the utility of collar after surgery? | No systematic reviews on the impact of spinal immobilization before and after spine surgery for DCM. No guidelines identified. Zhu MP, Tetreault LA, Sorefan-Mangou F, Garwood P, Wilson JR. Efficacy, safety, and economics of bracing after spine surgery: a systematic review of the literature. Spine J. 2018 Sep;18(9):1513-1525. | Spinal Surgeons: 11 Other healthcare professionals: 5 People with DCM and their supporters: 6 |
| T23 | What is the optimal treatment strategy for myelopathy in the context of multi-level degenerative stenosis on MRI? Are there clinical factors that can help select the level(s) requiring treatment? What extent of decompression is adequate? | How much decompression is necessary via laminoplasty? Are surgeons unnecessarily creating larger canals with no clinical benefit? For patients undergoing laminectomy and instrumentation what is the recommended lower level of instrumentation? (C7,T1 or T2) Optimal size for cervical canal to indicate sufficient decompression e.g. partial removal of internal surface of lamina without laminotomy? Is there a correlation between extent of decompression and neurologic recovery? | No guidelines identified. Several systematic reviews have compared the efficacy and safety of various surgical techniques for the treatment of multilevel disease (e.g. anterior decompression and fusion versus laminoplasty; anterior corpectomy versus laminoplasty; laminectomy with fusion versus laminoplasty; anterior versus posterior) | Spinal Surgeons: 19 Other healthcare professionals: 1 People with DCM and their supporters: 1 |
| T24 | Is there a role for minimally invasive techniques in DCM? | What is the role of minimally invasive procedures in DCM | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 6 Other healthcare professionals: 1 People with DCM and their supporters: 0 |
| T25 | What is the role of rehabilitation following surgery for DCM? Can a structured postoperative rehabilitation improve outcome following surgery for DCM? What are the most effective strategies? | Can physiotherapy improve function after surgical intervention? Does a structured post surgical rehabilitation plan improve outcomes? What are the most effective physical modalities and exercise programs in management of DCM after surgical treatment? Which patients benefit from postoperative rehabilitation? What is the optimum rehabilitation programme (frequency and length) for patients with DCM post operatively? | A systematic review on the role of postoperative physiotherapy concluded there was insufficient evidence to make any recommendations. No other systematic reviews, scoping reviews or guidelines were identified. Badran A, Davies BM, Bailey HM, Kalsi-Ryan S, Kotter MR. Is there a role for postoperative physiotherapy in degenerative cervical myelopathy? A systematic review. Clin Rehabil. 2018 Sep;32(9):1169-1174. | Spinal Surgeons: 13 Other healthcare professionals: 10 People with DCM and their supporters: 4 |
| T26 | What are the most effective therapies for treating pain in patients with DCM? | What are the most effective medication regimes to manage pain? What is the best pharmacological management for chronic pain associated with DCM? What can be done to minimise pain? How to address chronic pain? Are opioids helpful for DCM patients with severe pain? What is the best 'treatment' for sufferers of pain associated with the condition? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 12 Other healthcare professionals: 12 People with DCM and their supporters: 47 |
| T27 | What are the most effective therapies for treatment of specific symptoms of DCM and the prevention of associated complications in DCM, including spasticity, imbalance and sensory, bladder or bowel dysfunction? | What are the therapeutic solutions regarding urinary function? Which therapy interventions are more helpful with gait balance? What are best treatments for residual symptoms after a successful decompression? Specifically I have a few patients with uncontrollable muscle spasms following decompression. How can we improve care of spasticity? Does Botox have a role in improving spasticity after decompressive surgery? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 22 Other healthcare professionals: 7 People with DCM and their supporters: 13 |
| T28 | Can novel therapies, including stem-cell, gene, pharmacological and neuroprotective therapies, be identified to improve the health and wellbeing of people living with DCM and slow down disease progression? | What novel treatments are currently in the works for DCM? Are these likely to replace the gold standard treatments? What treatments from the spinal cord injury literature are effective in patients with DCM? What medicines or supplements are best? What is the future of DCM treatment. Preventive treatment feasible? Is stem cell therapy ever going to be introduced to counteract the damage done by this type of degeneration? Which spinal cord pathways are preserved, and what is their capacity to restore function? Can electrical stimulation of the spinal cord/brain be used to restore function? How to improve the outcome after surgery? What is the role of THC and CBD in the treatment of DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 59 Other healthcare professionals: 15 People with DCM and their supporters: 29 |
| T29 | What is the impact of surgical expertise on the management strategies used in DCM, and outcome after surgery? Is it influenced by training specialty or case load for example? | Is there any evidence for DCM outcome according to surgeon with more operations? For centers with more DCM admission annually? Is DCM more commonly managed by orthopedics or neurosurgery? Is there any discrepancy in the treatment received and the long term outcomes between the two groups? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 3 Other healthcare professionals: 2 People with DCM and their supporters: 0 |
| LT1 | What is the impact of surgical and non-operative treatments on long-term function, quality of life, spinal mechanics and life expectancy? | Trajectory of neurological improvement/stasis following decompression surgery? What are the long term outcomes? Regarding surgery: How long should you wait after a treatment before it is decided it has not worked and should be attempted again? What is the 5 year/10 year prognosis after surgical intervention compared to non-operative treatment? What is the long term impact on quality of life in patients with surgical management versus conservative management? Am I going to die? What are the long term outcomes after decompressive surgery and does early and aggressive physiotherapy improve outcomes? Does DCM patients have shorter life expectancy? | Systematic reviews that have been conducted on this topic have variable lengths of follow-up. No systematic reviews or guidelines were identified that evaluated the impact of nonoperative and surgical treatments on spinal mechanics or life expectancy. Fehlings MG, Tetreault LA, Kurpad S, Brodke DS, Wilson JR, Smith JS, Arnold PM, Brodt ED, Dettori JR. Change in Functional Impairment, Disability, and Quality of Life Following Operative Treatment for Degenerative Cervical Myelopathy: A Systematic Review and Meta-Analysis. Global Spine J. 2017 Sep;7(3Suppl):53S-69S. Tetreault LA, Rhee J, Prather H, Kwon BK, Wilson JR, Martin AR, Andersson IB, Dembek AH, Pagarigan KT, Dettori JR, Fehlings MG. Change in Function, Pain, and Quality of Life Following Structured Nonoperative Treatment in Patients With Degenerative Cervical Myelopathy: A Systematic Review. Global Spine J. 2017 Sep;7(3 Suppl):42S-52S Rhee J, Tetreault LA, Chapman JR, Wilson JR, Smith JS, Martin AR, Dettori JR, Fehlings MG. Nonoperative Versus Operative Management for the Treatment Degenerative Cervical Myelopathy: An Updated Systematic Review. Global Spine J. 2017 Sep;7(3 Suppl):35S-41S. Rhee JM, Shamji MF, Erwin WM, Bransford RJ, Yoon ST, Smith JS, Kim HJ, Ely CG, Dettori JR, Patel AA, Kalsi-Ryan S. Nonoperative management of cervical myelopathy: a systematic review. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl1):S55-67. | Spinal Surgeons: 47 Other healthcare professionals: 9 People with DCM and their supporters: 18 |
| LT2 | What are the important clinical, imaging and surgical predictors of long-term outcomes? | What factors determine the long term outcome in DCM? Do long term outcomes differ according to demographics? Which post operative radiologic finding (canal ratio, optimal sagittal balance) correlates with improved patient outcome measures? | No systematic reviews, scoping reviews or guidelines identified. Several systematic reviews have evaluated important predictors of outcomes; however, none were identified that distinguished between short and long term follow-up. Tetreault L, Palubiski LM, Kryshalskyj M, Idler RK, Martin AR, Ganau M, Wilson JR, Kotter M, Fehlings MG. Significant Predictors of Outcome Following Surgery for the Treatment of Degenerative Cervical Myelopathy: A Systematic Review of the Literature. Neurosurg Clin N Am. 2018 Jan;29(1):115-127.e35. | Spinal Surgeons: 7 Other healthcare professionals: 0 People with DCM and their supporters: 0 |

| | | | | |
|------|---|---|--|---|
| LT3 | What is the optimal follow-up for patients managed conservatively and surgically? What is the appropriate follow-up for patients with DCM or those with spinal cord compression but no myelopathy symptoms? Who should be responsible for following these patients? How often should new imaging be obtained? How should changes in neurologic status be documented or addressed? | Which is the best way to follow patients surgically treated for DCM? What is the appropriate follow-up/surveillance for patients with spinal cord compression but no myelopathy symptoms or mild myelopathy symptoms? If a patient has mild DCM on imaging studies, do we need to follow up with regular imaging studies to monitor the progression? How often? How can primary care be involved in this care? How long should follow up be performed? Should adjacent disc levels be monitored with MRI after surgical treatment of DCM? How often should the MRI be performed? What are the best time frames to monitor non operative patients? What are the imaging recommendations for monitoring DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 58 Other healthcare professionals: 29 People with DCM and their supporters: 26 |
| LT4 | How can the severity of DCM be evaluated? What assessment tools can be used to evaluate functional impairment, disability and quality of life in patients with DCM? What instruments, tools or methods can be used or developed to monitor DCM patients for disease progression or improvement either before or after surgical treatment? Is there a role for smart-technology? | What are the best PROMs for assessing DCM? What are the best outcome measures for this population? What is the best method of monitoring a person with DCM's response to treatments? What is the best method to monitor disease progression? What is the most reliable patient reported outcome measure in the management of DCM? How to precisely evaluate the severity of DCM? | No systematic reviews or guidelines identified. Kalsi-Ryan S, Singh A, Massicotte EM, Arnold PM, Brodke DS, Norvell DC, Hermsmeyer JT, Fehlings MG. Ancillary outcome measures for assessment of individuals with cervical spondylotic myelopathy. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S111-22. Singh A, Tetreault L, Casey A, Laing R, Statham P, Fehlings MG. A summary of assessment tools for patients suffering from cervical spondylotic myelopathy: a systematic review on validity, reliability and responsiveness. Eur Spine J. 2015 Apr;24 Suppl 2:209-28. | Spinal Surgeons: 36 Other healthcare professionals: 18 People with DCM and their supporters: 9 |
| LT5 | What is the incidence of adjacent segment degeneration following surgery for the treatment of DCM? Are there strategies that can be implemented to reduce the incidence of adjacent segment degeneration? | What is the incidence of repeat surgery because of ASD? Are patients treated for DCM at higher risk for recurrence of myelopathy secondary to adjacent segment degeneration with stenosis? | Systematic reviews on this topic have explored rates and risk of adjacent segment degeneration following cervical arthroplasty and anterior discectomy and fusion. No guidelines were identified. Shriver MF, Lubelski D, Sharma AM, Steinmetz MP, Benzel EC, Mroz TE. Adjacent segment degeneration and disease following cervical arthroplasty: a systematic review and meta-analysis. Spine J. 2016 Feb;16(2):168-81. Luo J, Gong M, Huang S, Yu T, Zou X. Incidence of adjacent segment degeneration in cervical disc arthroplasty versus anterior cervical decompression and fusion meta-analysis of prospective studies. Arch Orthop Trauma Surg. 2015 Feb;135(2):155-160. Lawrence BD, Hilibrand AS, Brodt ED, Dettori JR, Brodke DS. Predicting the risk of adjacent segment pathology in the cervical spine: a systematic review. Spine (Phila Pa 1976). 2012 Oct 15;37(22 Suppl):S52-64. Harrod CC, Hilibrand AS, Fischer DJ, Skelly AC. Adjacent segment pathology following cervical motion-sparing procedures or devices compared with fusion surgery: a systematic review. Spine (Phila Pa 1976). 2012 Oct 15;37(22 Suppl):S96-S112. | Spinal Surgeons: 8 Other healthcare professionals: 3 People with DCM and their supporters: 0 |
| LT6 | What is the incidence of residual spinal cord compression or damage in patients treated surgically for DCM? How should this be managed? | How many patients still have MRI evidence of persistent cord compression following surgery (particularly relevant in the population of patients with established myelopathy who are unlikely to improve significantly postop (is there a population who are not adequately decompressed? (which may be contributing to their poor outcome). | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 0 Other healthcare professionals: 1 People with DCM and their supporters: 0 |
| LT7 | What is the risk and rate of disease progression in patients treated for DCM? What is the rate of reoperation? | How can we minimise the risk of recurrence? (Neuroprotection) Risk of recurrence with different types of treatment? How many need secondary spinal procedures at other levels? Can symptoms return or aggravate after successful operative treatment? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 17 Other healthcare professionals: 4 People with DCM and their supporters: 7 |
| LT8 | What lifestyle modifications (such as physical activity or exercise) are required or should be recommended to patients with DCM to support recovery, avoid deterioration and improve quality of life? | What job changes should be advised to patients with DCM? Is there any diet that helps with DCM? When should activity restrictions be placed on the patient? Are there lifestyle factors that can accelerate/slow down the progression of DCM? Is there a chance for return to sport after cervical myelopathy surgery? List of do's and don'ts (physically) and a timeline of when certain physical activities can be resumed. What activities could further aggravate and/or accelerate the condition and therefore best avoided? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 35 Other healthcare professionals: 24 People with DCM and their supporters: 29 |
| LT9 | What aids or assistive technology is available, or can be developed, to help patients with DCM with their activities of daily living? | What level of equipment is needed to improve quality of life? What are the most useful mobility aids? High tech accessories to aid in mobility What assistive technology is being developed to support sufferers? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 10 Other healthcare professionals: 2 People with DCM and their supporters: 7 |
| LT10 | What is the impact of DCM on mental health? How can patients be best supported from this perspective? | How does cognitive behavioral therapy help patients cope with their condition? How to manage the patient's anxiety correctly. Is there a link between DCM and depression rates. What are the long term implications on mental health in patients with DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 16 Other healthcare professionals: 6 People with DCM and their supporters: 12 |
| LT11 | What is the impact of DCM, and its specific complications, on long-term quality of life? | How has your DCM affected your life style? What activities have you had to limit or give up entirely? Has it affected your ability to make a living? What are common functional limitations associated with DCM? Which function or physical ability is the most important to preserve in DCM patients when looking at quality of life? What is the effect on ADLs? What are the predictors of quality of life and participation in people living with DCM? Which of the lasting impairments matter most to people who are affected? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 32 Other healthcare professionals: 9 People with DCM and their supporters: 15 |
| LT12 | What resources, support and treatments are available in the community to support patients living with DCM? | What types of long term care resources are most beneficial to patients and their family and care givers? (individualized education/ programs, community based programs, etc) I also would like to know what, if any, support groups are in my area. Why is there no standardised aftercare and support for the patient considering this is such a life altering and disabling condition? Is there an on line support group for DCM sufferers? What are the best disability aids to make life easier - aids for the home. What type of care can I be offered? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 8 Other healthcare professionals: 11 People with DCM and their supporters: 26 |
| LT13 | What is the rate and risk of falls in patients with DCM? What measures can be implemented to prevent falls? | Should all patients be offered falls prevention interventions? Does regular physio reduce falls? Frequency of falls following surgical decompression? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 2 Other healthcare professionals: 7 People with DCM and their supporters: 2 |
| LT14 | What is the socio-economic impact of DCM? (The financial impact of living with DCM to the sufferer, their supporters and society as a whole) | How often does the disability caused by DCM result in loss of work? What are the health economic implications of DCM? What are the health economic impact of surgical management of DCM? What's the cost per QALY gained? What are the cost of rehabilitation in relation to DCM? Societal burden. | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 13 Other healthcare professionals: 4 People with DCM and their supporters: 2 |

| | | | | |
|------|--|---|---|---|
| LT15 | What treatments should be implemented following surgery and continued in the long-term? Is there a role for extended rehabilitation and exercise programs? What should be its frequency, content and duration, and whom should it be coordinated by? | What treatments are recommended after surgery for DCM? How well are Physiotherapists trained to deal with post surgery issues? What is the role of exercise programs in long term? What physiotherapy and GP management is required? What role does inflammation control, active and passive therapy have in the long term management of DCM? What is the Long term effects of rehabilitation? Clinical prediction rule for physical therapy? What is the best way to regain strength after surgery? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 19 Other healthcare professionals: 12 People with DCM and their supporters: 15 |
| O1 | What are the national or regional variations in DCM care and management? What are implications of resource scarcity on access to treatment and outcomes? | Does patient location determine positive or negative outcomes as not all health boards have immediate access to the correct care path? In countries where MRI is not available, what is the most effective way for primary care doctors and specialists to screen and manage DCM? What is the most effective, practical, and applicable way of monitoring and follow up for patients with DCM who live in resource limited countries/ developing countries? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 3 Other healthcare professionals: 4 People with DCM and their supporters: 2 |
| O2 | What is the impact of DCM on the carers and supporters of those living with and helping people with DCM? | What strategies are available to reduce burnout for caregivers? What are the greatest challenges faced by caregivers for those with DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 4 Other healthcare professionals: 2 People with DCM and their supporters: 1 |
| O3 | How can we promote interdisciplinary research in DCM? | How to promote inter-disciplinary research for DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 1 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| O4 | Is DCM related to any other disease or disease processes? What is their individual impact and can their optimisation improve the health and well-being of people with DCM? | Is there a relation between DCM and other neurodegenerative disorders like Parkinson's disease? What other comorbidities are common? What co-existing diseases are typically present and at what rate? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 8 Other healthcare professionals: 1 People with DCM and their supporters: 3 |
| O5 | What is the perspective of DCM from the people with DCM; its symptoms and disability, and the prospect and experience of treatment? What are the factors that influence this? | What are the treatment priorities of persons with DCM? What are patients perceptions at the time of diagnosis and subsequently? What do people who have DCM say about what helps them the most? What are the reasons according to patients of ineffective therapy for mild, moderate and severe DCM? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 5 Other healthcare professionals: 5 People with DCM and their supporters: 1 |
| O6 | What is the incidence of coexistent stenosis at other levels of the spine? When should it be investigated and how should it be managed? | How commons is simultaneous lumbar spinal stenosis and DCM? Should they be treated in the same surgery? When a patient has DCM, what are the chances that they will also have degenerative disease in the Lumbar spine? Does presence of concomitant degenerative Lumbar canal stenosis affect the course? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 10 Other healthcare professionals: 0 People with DCM and their supporters: 0 |
| O7 | People with DCM can report a transient deterioration in their symptoms. What is the aetiology of this? Does it represent disease progression? How should it be monitored and/or managed? | Why does myelopathy 'flare up'? Why can you have several days/weeks without pain followed by days/weeks with pain ? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 0 Other healthcare professionals: 0 People with DCM and their supporters: 4 |
| O8 | What changes occur in the spinal cord following decompressive surgery? | How does the spinal cord neurophysiology change following treatment for CSM? Repair processes of the spinal cord after surgery? | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons: 5 Other healthcare professionals: 1 People with DCM and their supporters: 0 |
| O9 | What is the optimal strategy for management of weight gain in people with DCM? | | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons Other healthcare professionals People with DCM and their supporters |
| O10 | What are the barriers for accessing social/welfare support for people with DCM, and how can these be overcome? | | No systematic reviews, scoping reviews or guidelines identified | Spinal Surgeons Other healthcare professionals People with DCM and their supporters |
| | | | | |
| | | | | |
| | | | | |

| PSP Unique Identifier | Record ID | PSP Name | PSP Question ID | Total Number of Verified Uncertainties | The Uncertainty | Explanatory Note | Date of the Priority Setting Workshop | Rank of the Uncertainty at the Final Workshop | Evidence | Health Research Classification System |
|-----------------------|-----------|----------------------------------|-----------------|--|---|---|---------------------------------------|---|--|---------------------------------------|
| | | Degenerative cervical myelopathy | D10 | 76 | What strategies can be used to increase awareness and understanding of DCM amongst healthcare professionals and the general public? Can these strategies help improve timely diagnosis and management of DCM? | A study by Behrbalk et al (2013) evaluated the time to diagnosis in patients with typical signs and symptoms of DCM and analyzed what factors contributed to a delay. In this study, the mean time to diagnosis was 2.2 years. The most common diagnoses given to these patients were carpal tunnel syndrome and cervical disc radiculopathy without neurological deficit. The typical workup included upper limb EMG, cervical spine CT and bone scan. Furthermore, very few patients were immediately referred to neurosurgery or orthopedic surgery. No other studies were identified that explored the awareness and understanding of DCM amongst healthcare professionals and the general public. It is critical to improve education at the medical school level and during post-graduate training in order to ensure timely diagnosis of this condition. | 20-Nov-19 | 1 | No systematic reviews, scoping reviews or guidelines identified. | |
| | | Degenerative cervical myelopathy | D15 | 76 | What is the natural history of DCM? What is the relationship between DCM and asymptomatic spinal cord compression or canal stenosis? What factors influence the natural history of the disease? | The pattern of progression in DCM is highly variable and not well defined. In a systematic review by Karadimas et al (2013), moderate evidence suggested that 20% to 62% of patients deteriorate by at least 1 point on the Japanese Orthopedic Association scale at 3 to 6 years after initial assessment. This conclusion was largely based on longitudinal nonsurgical cohorts and studies comparing operative versus nonoperative management. This systematic review also evaluated risk factors associated with disease progression. There was low to insufficient evidence on this topic, preventing the development of meaningful recommendations. In a systematic review by Wilson et al (2013), low evidence suggested that, in non-myelopathic patients with cervical canal stenosis and cord compression, approximately 8% at 1-year and 23% at a 44-months will develop clinical evidence of myelopathy. Important predictors of the onset of DCM included presence of symptomatic radiculopathy, prolonged SEPs and MEPs and EMG signs of anterior horn cell lesion (low to moderate evidence). There was no consensus with respect to the presence of T2 signal changes on magnetic resonance imaging. Further studies are required to better define the natural history of DCM and relevant predictors of disease development and progression. | 20-Nov-19 | 2 | Systematic reviews on the topic rated the level of evidence as low to moderate. Tetreault LA, Karadimas S, Wilson JR, Arnold PM, Kurpad S, Dettori JR, Fehlings MG. The Natural History of Degenerative Cervical Myelopathy and the Rate of Hospitalization Following Spinal Cord Injury: An Updated Systematic Review. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):28S-34S. Karadimas SK, Erwin WM, Ely CG, Dettori JR, Fehlings MG. Pathophysiology and natural history of cervical spondylotic myelopathy. <i>Spine (Phila Pa 1976).</i> 2013 Oct 15;38(22 Suppl 1):S21-36. Wilson JR, Barry S, Fischer DJ, Skelly AC, Arnold PM, Riew KD, Shaffrey CI, Traynelis VC, Fehlings MG. Frequency, timing, and predictors of neurological dysfunction in the nonmyelopathic patient with cervical spinal cord compression, canal stenosis, and/or ossification of the posterior longitudinal ligament. <i>Spine (Phila Pa 1976).</i> 2013 Oct 15;38(22 Suppl 1):S37-54. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. <i>Global Spine J.</i> 2017 Sep;7(3 Suppl):70S-83S. | |
| | | Degenerative cervical myelopathy | D1 | 76 | What is the diagnostic criteria of DCM? When should imaging be used in the assessment of DCM? | The diagnosis of many diseases requires a combination of certain signs and symptoms, laboratory findings and imaging evidence. Specific criteria have been developed for a number of conditions to help family practitioners and specialists confirm various diagnoses. Furthermore, several treatment algorithms have been devised to guide clinicians in the next steps of patient management. There are no diagnostic criteria for DCM or guidelines that outline when and what to image, what further tests to order and when to refer to spine surgery. | 20-Nov-19 | 3 | No formal diagnostic criteria published for DCM. No systematic reviews, scoping reviews or guidelines identified. | |
| | | Degenerative cervical myelopathy | LT4 | 76 | How can the severity of DCM be evaluated? What assessment tools can be used to evaluate functional impairment, disability and quality of life in patients with DCM? What instruments, tools or methods can be used or developed to monitor DCM patients for disease progression or improvement either before or after surgical treatment? Is there a role for smart-technology? | Quantitative tools are valuable in the clinical setting because they can be used to objectively describe disease severity, assess the effective of interventions, predict outcome and provide decision support to clinicians. Several tools have developed to evaluate neurological impairment, functional status and health-related quality of life in patients with DCM. The current gold standard for the assessment of patients with DCM is the modified Japanese Orthopedic Association (mJOA) scale. This scale is a clinician-administered tool that separately addresses the motor function of the upper and lower extremities, sensory function and bladder function. The disadvantages of this score are (i) it exhibits a ceiling effect making it difficult to detect minor improvements in patients with mild myelopathy; (ii) it does not include pain which is a relevant symptom in many patients with DCM; (iii) the four categories are not equally weighted; and (iv) its reliability has not been established. Further research is required to develop an "easy to use" and relevant tool that can detect small improvements in functional status or disease progression. No studies have evaluated the role for smart-technology. | 20-Nov-19 | 4 | No systematic reviews or guidelines identified. Kalsi-Ryan S, Singh A, Massicotte EM, Arnold PM, Brodke DS, Norvell DC, Hermesmeyer JT, Fehlings MG. Ancillary outcome measures for assessment of individuals with cervical spondylotic myelopathy. <i>Spine (Phila Pa 1976).</i> 2013 Oct 15;38(22 Suppl 1):S111-22. Singh A, Tetreault L, Casey A, Laing R, Statham P, Fehlings MG. A summary of assessment tools for patients suffering from cervical spondylotic myelopathy: a systematic review on validity, reliability and responsiveness. <i>Eur Spine J.</i> 2015 Apr;24 Suppl 2:209-28. | |
| | | Degenerative cervical myelopathy | D22 | 76 | What is the pathophysiology of DCM? What are the mechanisms of neurologic injury and the molecular and anatomical consequences? | DCM is a progressive disease caused by age-related degeneration of the facet joints, intervertebral disks, or vertebral bodies; hypertrophy of the ligamentum flavum; ossification of the posterior longitudinal ligament; and/or progressive cervical kyphosis. These changes ultimately narrow the spinal canal and reduce the space available for the spinal cord. Mechanical compression of the cord can result in a cascade of pathophysiological events, including ischemia, endothelial cell impairment, disruption of the blood-spinal cord barrier, neuroinflammation and apoptosis. Longstanding compression of the cord can lead to axonal demyelination, gliosis, scarring, degeneration of the corticospinal tracts, interneuronal loss and atrophy of the anterior horn cells. Despite this knowledge, further work is required to fully elucidate the pathophysiology of DCM and determine important therapeutic targets that might enhance recovery. | 20-Nov-19 | 5 | No systematic reviews, scoping reviews or guidelines identified. Several literature reviews identified on the topic, including Karadimas SK, Erwin WM, Ely CG, Dettori JR, Fehlings MG. Pathophysiology and natural history of cervical spondylotic myelopathy. <i>Spine (Phila Pa 1976).</i> 2013 Oct 15;38(22 Suppl 1):S21-36. | |
| | | Degenerative cervical myelopathy | T25 | 76 | What is the role of rehabilitation following surgery for DCM? Can a structured postoperative rehabilitation improve outcome following surgery for DCM? What are the most effective strategies? | A systematic review by Badran et al (2018) was conducted to evaluate the role of postoperative physiotherapy in patients with DCM. This review identified one small, retrospective study that met inclusion criteria. Yap et al (1993) concluded that patients can improve their postoperative functional status through rehabilitation. Furthermore, there are two registered randomized controlled trials that aim to investigate the efficacy of postoperative rehabilitation (physiotherapy and occupational therapy) in DCM (NCT02842775 and NCT03320759). There is no current standard for postoperative care in DCM or guidelines as to the appropriate frequency, content and duration of rehabilitation. | 20-Nov-19 | 6 | A systematic review on the role of postoperative physiotherapy concluded there was insufficient evidence to make any recommendations. No other systematic reviews, scoping reviews or guidelines were identified. Badran A, Davies BM, Bailey HM, Kalsi-Ryan S, Kotter MR. Is there a role for postoperative physiotherapy in degenerative cervical myelopathy? A systematic review. <i>Clin Rehabil.</i> 2018 Sep;32(9):1169-1174. | |

| | | | | | | | | | |
|--|----------------------------------|------|----|---|--|-----------|----|---|--|
| | Degenerative cervical myelopathy | T28 | 76 | Can novel therapies, including stem-cell, gene, pharmacological and neuroprotective therapies, be identified to improve the health and wellbeing of people living with DCM and slow down disease progression? | In patients with DCM, surgery is effective at halting neurological deterioration and improving functional impairment, disability and quality of life. Despite meaningful improvements, however, some patients experience residual neurological deficits and suffer postoperative complications such as new radiculopathy or disease progression. Given these residual postoperative deficits, there is an opportunity to explore adjuvant treatments for the management of DCM, including pharmacological, neuroprotective, stem-cell or gene therapies. The CSM-Protect study, led by Dr. Michael Fehlings, aimed to assess whether riluzole can enhance functional outcomes and improve pain in patients undergoing surgery for DCM. The results of this study have yet to be published. No other studies were identified that evaluated the use of novel therapies in the management of DCM. | 20-Nov-19 | 7 | No systematic reviews, scoping reviews or guidelines identified | |
| | Degenerative cervical myelopathy | LT14 | 76 | What is the socio-economic impact of DCM? (The financial impact of living with DCM to the sufferer, their supporters and society as a whole) | Direct and indirect costs must be considered when evaluating the socio-economic impact of DCM. Direct costs refer to the expenditures made for medical services, including specialist consultations, diagnostic tests and hospitalization. In contrast, indirect costs are defined as the expenses incurred due to the cessation or reduction of work productivity. DCM has significant direct costs, as the mainstay treatment for patients with moderate to severe myelopathy is surgical decompression. DCM can also result in significant functional impairment and can impact a patient's ability to work, thus causing substantial indirect costs. No studies were identified that explored the socio-economic impact of DCM. | 20-Nov-19 | 8 | No systematic reviews, scoping reviews or guidelines identified | |
| | Degenerative cervical myelopathy | D4 | 76 | What is the role of dynamic imaging and novel, unconventional or advanced techniques in the assessment of DCM? | Spinal cord and nerve root compression can be aggravated by dynamic mechanisms. Specifically, the spinal cord can be compressed by ventral osteophytes during neck flexion and pinched between the vertebral body and the lamina or ligamentum flavum during neck extension. Dynamic cord compression may be missed if only a static MRI is performed. Dynamic imaging may be more sensitive at detecting cervical cord compression than routine MRIs done in a neutral position. Other novel imaging techniques may be better able to quantify axonal integrity, demyelination, neuronal atrophy and other aspects of spinal cord microstructure and tissue injury. This information may be beneficial in detecting early disease progression, selecting surgical candidates and accurately predicting treatment outcomes. | 20-Nov-19 | 9 | No guidelines identified. Martin AR, Aleksanderek I, Cohen-Adad J, Tarmohamed Z, Tetreault L, Smith N, Cadotte DW, Crawley A, Ginsberg H, Mikulis DJ, Fehlings MG. Translating state-of-the-art spinal cord MRI techniques to clinical use: A systematic review of clinical studies utilizing DTI, MT, MWF, MRS, and fMRI. Neuroimage Clin. 2015 Dec 4;10:192-238. Ellingson BM, Salamon N, Holly LT. Advances in MR imaging for cervical spondylotic myelopathy. Eur Spine J. 2015 Apr;24 Suppl 2:197-208. | |
| | Degenerative cervical myelopathy | T8 | 76 | Are there clinical and imaging factors that can help a surgeon select who should undergo surgical decompression in the setting of DCM? At what stage of the disease is surgery the preferred management strategy? | In a recent clinical practice guideline, surgery was recommended as the treatment of choice in patients with moderate to severe myelopathy. These recommendations were based on two systematic reviews that concluded the following: (i) surgery results in significant improvements in mJOA, Neck Disability Index and Nurick scores at short-, medium- and long-term follow-up; (ii) the cumulative incidence of complications is low for patients treated surgically; and (iii) response to nonoperative treatment is minimal. In patients with mild myelopathy, the guideline suggested offering either surgical intervention or a supervised trial of structured rehabilitation. No clinical or imaging factors were outlined to help a surgeon select which mild patients should undergo surgical decompression. | 20-Nov-19 | 10 | No systematic reviews, scoping reviews or guidelines identified | |
| | Degenerative cervical myelopathy | D3 | 76 | What are the main signs and symptoms that a patient with DCM presents with? What are the frequency, sensitivity, specificity and positive predictive value of symptoms and signs (clinical assessments) for DCM? | The spinal cord carries neurons that are responsible for motor, sensory and autonomic function. The cervical spinal cord contains nerves that innervate the upper limb as well as descending and ascending tracts to and from the trunk and lower extremities. As such, compression of the cervical spinal cord can result in motor and sensory dysfunction of upper and lower extremities and bladder and bowel issues. Common symptoms include numb and clumsy hands, bilateral arm paresthesia, Lhermitte's phenomena, impaired gait, weakness and urge incontinence. Objective signs of myelopathy include hyperreflexia, clonus, positive Hoffman sign, up-going plantar responses, lower-limb spasticity, corticospinal distribution motor deficits, atrophy of intrinsic hand muscles, broad-based unstable gait and sensory loss. Previous studies have reported the frequency, sensitivity and specificity of various clinical assessments for DCM. However, no systematic reviews or guidelines were identified that summarized the most common signs and symptoms of DCM. This information would be useful to help primary care physicians and other specialists effectively diagnose patients with myelopathy. | 20-Nov-19 | 11 | Primary studies have evaluated the sensitivity and specificity of signs and symptoms in DCM patients. However, no systematic reviews, scoping reviews or guidelines have been conducted to answer this question. | |
| | Degenerative cervical myelopathy | LT3 | 76 | What is the optimal follow-up for patients managed conservatively and surgically? What is the appropriate follow-up for patients with DCM or those with spinal cord compression but no myelopathy symptoms? Who should be responsible for following these patients? How often should new imaging be obtained? How should changes in neurologic status be documented or addressed? | It is important that patients with DCM be followed up appropriately and assessed at regular intervals for any change in neurological status. There is no treatment protocol that outlines the optimal follow-up for patients managed conservatively and surgically. An algorithm is needed to define the appropriate timing of follow-up, who should be responsible for assessing these patients and how often new imaging should be obtained. | 20-Nov-19 | 12 | No systematic reviews, scoping reviews or guidelines identified | |
| | Degenerative cervical myelopathy | T27 | 76 | What are the most effective therapies for treatment of specific symptoms of DCM and the prevention of associated complications in DCM, including spasticity, imbalance and sensory, bladder or bowel dysfunction? | Several ascending and descending spinal tracts can be affected by degenerative changes in the cervical spinal cord. DCM results in sensory and motor impairment in the upper and lower extremities, bladder and bowel dysfunction and a combined upper and lower motor neuron picture. As a result, patients may have debilitating hand weakness, lower limb spasticity, gait disturbances, incontinence and proprioception deficits. Treatment protocols must be established to manage and prevent some of the associated complications of DCM that can be present both before and after surgery. | 20-Nov-19 | 13 | No systematic reviews, scoping reviews or guidelines identified | |
| | Degenerative cervical myelopathy | D17 | 76 | What are the factors that predict the development of myelopathy in patients with evidence of spinal cord compression and no symptoms? | In a systematic review by Wilson et al (2013), low level evidence suggested that, in non-myelopathic patients with cervical canal stenosis and cord compression, approximately 8% at 1-year and 23% at 44-months will develop clinical evidence of myelopathy. Important predictors of disease development included presence of symptomatic radiculopathy, prolonged SEPs and MEPs and EMG signs of anterior horn cell lesion (low to moderate evidence). There was no consensus with respect to whether the presence of T2 signal change impacts the development of myelopathy. Further studies are required to better identify relevant clinical and imaging predictors of disease development in nonmyelopathic patients with evidence of cervical canal stenosis and cord compression. | 20-Nov-19 | 14 | A systematic review on the topic rated the level of evidence as insufficient to moderate. Wilson JR, Barry S, Fischer DJ, Skelly AC, Arnold PM, Riew KD, Shaffrey CI, Traynelis VC, Fehlings MG. Frequency, timing, and predictors of neurological dysfunction in the nonmyelopathic patient with cervical spinal cord compression, canal stenosis, and/or ossification of the posterior longitudinal ligament. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S37-54. | |

| | | | | | | | | | | |
|--|--|----------------------------------|-----|----|---|--|-----------|----|--|--|
| | | Degenerative cervical myelopathy | T11 | 76 | What are the most important determinants of functional outcomes, quality of life and patient satisfaction following surgical or non-operative treatment for DCM? | Several systematic reviews have been conducted to evaluate important clinical and imaging predictors of outcomes in patients undergoing surgery for DCM. The most frequently studied predictors are preoperative myelopathy severity, duration of symptoms and age. Based on the results of these reviews, patients with a longer duration of symptoms and more severe myelopathy are likely to have worse surgical outcomes. With respect to age, several studies have indicated that elderly patients may not be able to translate neurological recovery into functional improvements as well as younger patients. However, other studies have failed to identify a significant relationship between age and surgical outcomes. Others predictors studied include gender, co-morbidities, smoking status, various signs and symptoms, pathology, race, body mass index and imaging parameters. In contrast, very few studies have assessed important predictors of outcomes in patients treated nonoperatively for DCM. | 20-Nov-19 | 15 | Tetreault L, Palubiski LM, Kryshalskyj M, Idler RK, Martin AR, Ganau M, Wilson JR, Kotter M, Fehlings MG. Significant Predictors of Outcome Following Surgery for the Treatment of Degenerative Cervical Myelopathy: A Systematic Review of the Literature. Neurosurg Clin N Am. 2018 Jan;29(1):115-127.e35. | |
| | | Degenerative cervical myelopathy | D8 | 76 | What clinical and/or imaging features are predictive of neurologic deterioration in patients with DCM? Are there certain features that indicate irreversibility of the disease? | A systematic review by Karadimas et al (2013) aimed to evaluate important predictors of neurologic deterioration in patients with DCM. There was insufficient evidence to conclude whether disease progression is influenced by age at diagnosis, sex, developmental and dynamic cervical canal factors, T2 hyperintensity, and neck and head range of motion. There was low level evidence suggesting that circumferential spinal cord compression (compared with only partial cord compression) is associated with neurologic deterioration. Finally, there was insufficient evidence to evaluate the association between conversion to surgery and age, cervical range of motion, segmental lordotic angle, local slip, C2-7 alignment, spinal cord diameter, presence of developmental canal stenosis and segmental range of motion. An update of this systematic review in 2017 did not change these conclusions. Further studies are required to identify reliable clinical and imaging predictors of neurologic deterioration and determine which features indicate irreversibility of the disease. | 20-Nov-19 | 16 | Karadimas SK, Erwin WM, Ely CG, Dettori JR, Fehlings MG. Pathophysiology and natural history of cervical spondylotic myelopathy. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S21-36. | |
| | | Degenerative cervical myelopathy | D20 | 76 | What are the risk factors for the development or progression of DCM, including but not limited to, lifestyle, diet, exercise, posture, occupation, history of trauma and co-existent disease? Does their modification have a role in prevention or treatment? | A systematic review was conducted by Singh et al (2012) to determine important risk factors for the development of DCM. Important findings from this review included (i) a congenitally narrow spinal canal can be associated with the development of DCM; (ii) DCM may have a genetic component; and (iii) gender, working years and extension-strain occupation are not risk factors for a diagnosis of DCM. Unfortunately, these conclusions were based on very low level of evidence. Future studies are required to further explore the impact of lifestyle, diet, exercise, posture, occupation, history of trauma and co-morbidities on the development and progression of DCM. | 20-Nov-19 | 17 | Singh A, Tetreault L, Fehlings MG, Fischer DJ, Skelly AC. Risk factors for development of cervical spondylotic myelopathy: results of a systematic review. Evid Based Spine Care J. 2012 Aug;3(3):35-42. | |
| | | Degenerative cervical myelopathy | T12 | 76 | What is the ideal timing for surgical intervention? | Several studies have concluded that a longer duration of symptoms and more severe functional impairment are associated with worse surgical outcomes in patients with DCM. Based on these results, it is important that DCM is diagnosed in a timely fashion and that patients are evaluated early to see if they are surgical candidates. Some patients may have milder signs and symptoms of myelopathy and may remain stable for many years. In these cases, surgery may pose a greater risk than benefit. It is important to distinguish between patients who are likely to remain mild for years and those who may rapidly progress to more moderate and severe forms of DCM. Many factors influence the ideal timing for surgical intervention. A treatment algorithm would be helpful to guide referrals and management decisions. | 20-Nov-19 | 18 | development of cervical spondylotic myelopathy: results of a systematic review. | |
| | | Degenerative cervical myelopathy | T1 | 76 | What is the efficacy and safety of non-operative treatment in the management of DCM compared with surgical treatment? Can non-operative treatment avoid the need for surgery long-term? When can a "watch and wait" approach be adopted? | Two systematic reviews have been conducted to (i) evaluate the efficacy and safety of nonoperative versus surgical treatment; and (ii) assess the change in function, pain, and quality of life following nonoperative management. Based on a small randomized control trial by Kadanka et al, there is no difference in mJOA or patient-reported daily activity scores between patients with DCM (mJOA ≥ 12) treated conservatively versus surgically. Furthermore, this trial concluded that surgical patients had a slower 10-meter walk test than those treated nonoperatively. Finally, a single retrospective cohort study indicated that the incidence of hospitalization for spinal cord injury is higher in DCM patients treated conservatively compared to those managed surgically. The main conclusion from the second systematic review was based on very low evidence: there were no clinically meaningful or statistically significant differences between mJOA scores at baseline and follow-up following structured nonoperative treatment. The role of nonoperative treatment in patients with DCM is largely unknown, especially for individuals with milder forms of myelopathy. | 20-Nov-19 | 19 | Evid Based Spine Care J. 2012 Aug;3(3):35-42. | |
| | | Degenerative cervical myelopathy | T26 | 76 | What are the most effective therapies for treating pain in patients with DCM? | Pain may be a significant complaint in patients with DCM and may negatively impact quality of life. Unfortunately, there is a paucity of high-quality studies that evaluate (i) the incidence and severity of preoperative pain; (ii) the impact of surgery on pain outcomes; (iii) important clinical, imaging and surgical predictors of pain outcomes; and (iv) appropriate management strategies for pain. Further research is required to address these important knowledge gaps. | 20-Nov-19 | 20 | No systematic reviews, scoping reviews or guidelines identified | |
| | | Degenerative cervical myelopathy | T10 | 76 | What is the preferred management strategy for patients with mild DCM? What is the most cost-effective management strategy in this cohort of patients? Are there clinical and imaging features that predict who should undergo surgical decompression and/or when? | A recent clinical practice guideline aimed to address whether nonoperative or operative management should be used to treat patients with mild DCM. Although several studies have assessed the efficacy of surgery, only a single study stratified their sample based on preoperative myelopathy severity. Based on the results from Fehlings et al (2013), patients with mild DCM demonstrate significant improvements in functional impairment, disability and quality of life following surgical intervention. Unfortunately, there were no studies that focused solely on mild patients when addressing disease natural history, important predictors of treatment outcomes, efficacy and safety of nonoperative management and rates of traumatic spinal cord injury. As a result of limited evidence, it was suggested that either surgical intervention or a supervised trial of structured rehabilitation be offered to patients with mild DCM. The strength of this recommendation was weak. This topic remains to be an important knowledge gap in the field. | 20-Nov-19 | 21 | Systematic reviews evaluating the efficacy of surgery and nonoperative treatment did not differentiate among patients with mild, moderate or severe preoperative disease. The strength of the guideline developed for the management of mild myelopathy was weak and was based on very low to low level of evidence. Furthermore, the recommendation suggested either surgical intervention or a supervised trial of structured rehabilitation. Fehlings MG, Tetreault LA, Kurpad S, Brodke DS, Wilson JR, Smith JS, Arnold PM, Brodt ED, Dettori JR. Change in Functional Impairment, Disability, and Quality of Life Following Operative Treatment for Degenerative Cervical Myelopathy: A Systematic Review and Meta-Analysis. Global Spine J. 2017 Sep;7(3Suppl):53S-69S. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. Global Spine J. 2017 Sep;7(3 Suppl):70S-83S. | |

| | | | | | | | | | | |
|--|--|----------------------------------|------|----|--|--|-----------|----|--|--|
| | | Degenerative cervical myelopathy | D7 | 76 | Can CSF or serum biomarkers be identified to support early diagnosis of DCM, and/or predict treatment outcomes? | There is limited evidence to suggest that routinely-collected clinical and imaging factors can predict the onset of DCM and detect early neurological deterioration. Recent studies have attempted to use various imaging biomarkers to quantify axonal/myelin injury, cellular inflammation, neuronal loss and white matter changes. These approaches may have the potential to improve diagnosis, monitor progression and predict treatment outcomes. A pilot study by Jenis et al (2011) identified important differences in the cerebrospinal fluid between normal controls and patients with DCM. Proteomic analysis of the cerebrospinal fluid revealed that patients with DCM have decreased human brain-derived neurotrophic factor and pigment epithelium derived factor and elevated apolipoprotein A-1 and vascular endothelial growth factor. | 20-Nov-19 | 22 | No systematic reviews, scoping reviews or guidelines identified | |
| | | Degenerative cervical myelopathy | LT8 | 76 | What lifestyle modifications (such as physical activity or exercise) are required or should be recommended to patients with DCM to support recovery, avoid deterioration and improve quality of life? | Patients with DCM are interested in what lifestyle modifications they should make in order to support recovery, avoid deterioration and improve quality of life. Some recommendations include avoiding forward bending and rotation of the neck, prolonged extension of the neck and prolonged sitting or standing. Furthermore, workplace modifications and ergonomics may be valuable in reducing strenuous neck positions during work. It is unclear whether these suggestions are based on scientific evidence. Further research is required to evaluate what lifestyle modifications, such as physical activity or exercise, should be recommended to patients with DCM to support recovery, avoid deterioration and improve quality of life. | 20-Nov-19 | 23 | No systematic reviews, scoping reviews or guidelines identified | |
| | | Degenerative cervical myelopathy | T3 | 76 | What is the role of surgery in the management of non-myelopathic patients with imaging evidence of cord compression? Is this decision impacted by signal change on T2-weighted MRI images or the presence of neck pain? | In a systematic review by Wilson et al (2013), low level evidence suggested that, in non-myelopathic patients with cervical canal stenosis and cord compression, approximately 8% at 1-year and 23% at 44-months will develop clinical evidence of myelopathy. Important predictors of disease development included presence of symptomatic radiculopathy, prolonged SEPs and MEPs and EMG signs of anterior horn cell lesion (low to moderate evidence). There was no consensus with respect to whether the presence of T2 signal changes impacts development of myelopathy. A recent clinical practice guideline aimed to address the following questions: should operative management be used to treat non-myelopathic patients with evidence of cord compression (i) without signs or symptoms of radiculopathy or (ii) and clinically/electrophysiological diagnosed radiculopathy. Two recommendations were developed; however, both were based on low quality evidence and were considered weak. Further research is required in order to better address these questions. | 20-Nov-19 | 24 | A systematic review on the topic rated the level of evidence as insufficient to moderate. Strength was weak for all recommendations developed in the clinical practice guideline. Wilson JR, Barry S, Fischer DJ, Skelly AC, Arnold PM, Riew KD, Shaffrey CI, Traynelis VC, Fehlings MG. Frequency, timing, and predictors of neurological dysfunction in the nonmyelopathic patient with cervical spinal cord compression, canal stenosis, and/or ossification of the posterior longitudinal ligament. Spine (Phila Pa 1976). 2013 Oct 15;38(22 Suppl 1):S37-54. Fehlings MG, Tetreault LA, Riew KD, Middleton JW, Aarabi B, Arnold PM, Brodke DS, Burns AS, Carette S, Chen R, Chiba K, Dettori JR, Furlan JC, Harrop JS, Holly LT, Kalsi-Ryan S, Kotter M, Kwon BK, Martin AR, Milligan J, Nakashima H, Nagoshi N, Rhee J, Singh A, Skelly AC, Sodhi S, Wilson JR, Yee A, Wang JC. A Clinical Practice Guideline for the Management of Patients With Degenerative Cervical Myelopathy: Recommendations for Patients With Mild, Moderate, and Severe Disease and Nonmyelopathic Patients With Evidence of Cord Compression. Global Spine J. 2017 Sep;7(3 Suppl):70S-83S. | |
| | | Degenerative cervical myelopathy | LT15 | 76 | What treatments should be implemented following surgery and continued in the long-term? Is there a role for extended rehabilitation and exercise programs? What should be its frequency, content and duration, and whom should it be coordinated by? | Surgery is often recommended as the preferred management strategy for patients with DCM as it can halt neurological deterioration and improve functional impairment, disability and quality of life. Following surgery, patients are typically motivated to participate in rehabilitation in order to maximize their outcomes. A systematic review by Badran et al (2018) was conducted to evaluate the role of postoperative physiotherapy in patients with DCM. This review identified one small, retrospective study that met inclusion criteria. Yap et al (1993) concluded that patients can improve their postoperative functional status through rehabilitation. Furthermore, there are two registered randomized controlled trials that aim to investigate the efficacy of postoperative rehabilitation (physiotherapy and occupational therapy) in DCM (NCT02842775 and NCT03320759). Unfortunately, there is no current standard for postoperative care in DCM and no recommendations as to the frequency, content and duration of rehabilitation. | 20-Nov-19 | 25 | No systematic reviews, scoping reviews or guidelines identified | |
| | | Degenerative cervical myelopathy | LT5 | 76 | What is the incidence of adjacent segment degeneration following surgery for the treatment of DCM? Are there strategies that can be implemented to reduce the incidence of adjacent segment degeneration? | Fusion of the cervical spine can result in degeneration of adjacent levels and the development of new symptoms. In a systematic review by Lawrence et al (2012), low level evidence concluded that the prevalence of clinical adjacent segment degeneration (ASD) ranges from 11% to 12% at 5 years, 16% to 38% at 10 years and 33% at 17 years. Important predictors of ASD included age greater than 60 years, fusion of ≤ 3 levels, fusing adjacent to the C5-6 and/or C6-C7 levels, a pre-existing disc herniation, and dura mater indentation. The level of evidence for these findings was moderate to insufficient, emphasizing the need for further research. Furthermore, the indications for motion-sparing surgical procedures have not been thoroughly outlined. | 20-Nov-19 | 26 | Systematic reviews on this topic have explored rates and risk of adjacent segment degeneration following cervical arthroplasty and anterior discectomy and fusion. No guidelines were identified. Shriver MF, Lubelski D, Sharma AM, Steinmetz MP, Benz EC, Mroz TE. Adjacent segment degeneration and disease following cervical arthroplasty: a systematic review and meta-analysis. Spine J. 2016 Feb;16(2):168-81. Luo J, Gong M, Huang S, Yu T, Zou X. Incidence of adjacent segment degeneration in cervical disc arthroplasty versus anterior cervical decompression and fusion meta-analysis of prospective studies. Arch Orthop Trauma Surg. 2015 Feb;135(2):155-160. Lawrence BD, Hilibrand AS, Brodt ED, Dettori JR, Brodke DS. Predicting the risk of adjacent segment pathology in the cervical spine: a systematic review. Spine (Phila Pa 1976). 2012 Oct 15;37(22 Suppl):S52-64. Harrod CC, Hilibrand AS, Fischer DJ, Skelly AC. Adjacent segment pathology following cervical motion-sparing procedures or devices compared with fusion surgery: a systematic review. Spine (Phila Pa 1976). 2012 | |