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CLINICAL RESEARCH ARTICLE

Healthcare Provider Perspectives of Various Signs and Symptoms for Diagnosing Degenerative Cervical Myelopathy: Results of an International, Multidisciplinary Survey

Lance A. Burn[1] | Tanzil Rujeedawa[1] | Abdul Lalkhen[2] | Allan R. Martin[3] | Anna MacDowall[4,5] | Brian K. Kwon[6] | Carl M. Zipser[7] | Caroline Treanor[8] | David B. Anderson[9] | Esther Martin-Moore[10] | James Guest[11] | James S. Harrop[12] | Jamie Milligan[13] | Julio C. Furlan[14,15] | Konstantinos Margetis[16] | Lianne Wood[17] | Ligia V. Onofrei[18] | Luiz R. Vialle[19] | Manabu Ito[20] | Mark Kotter[21] | Michael G. Fehlings[22,23] | Michael W. Y. Lee[24] | Mike Hutton[25,26] | Noam Y. Harel[27] | Ratko Yurac[28] | Rohil V. Chauhan[29,30,31] | Sheila Dugan[10] | Sukhvinder Kalsi-Ryan[32,33] | Sybil Stacpoole[34] | Tammy Blizzard[35] | Timothy F. Boerger[36] | Tore K. Solberg[37] | Justin M. Lantz[38] | Benjamin Davies[39] | Lindsay Tetreault[40] | AO Spine RECODE-DCM Diagnostic Criteria Incubator

Correspondence: Lindsay Tetreault (lindsay.tetreault89@gmail.com)

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ABSTRACT

Introduction/Aims: Diagnosis of degenerative cervical myelopathy (DCM) is frequently delayed. A lack of awareness and standardized screening criteria have been identified as major contributors. The objective of this study was to conduct a survey of international experts to determine the value of various signs and symptoms in diagnosing patients with DCM. This study forms part of a three-step initiative that aims to develop pragmatic screening criteria for DCM.

Methods: An open voluntary English-language Likert scale survey was disseminated among international networks of experts in DCM. Respondents were asked to rank each sign or symptom on a scale of 0 (*not important at all*) to 10 (*extremely important*); a mean value of $\geq$6.5 was set a priori as the threshold to consider a feature as having significant diagnostic value.

Results: Fifteen symptoms and 12 signs were ranked as having significant diagnostic value. The most highly ranked symptoms are primarily related to abnormalities of the upper limb, hand function, and gait. The top-rated signs included pathological reflexes as well as impairment of motor function, gait, and coordination. Features ranked as significant were largely consistent across professions, levels of experience, and continental regions.

Discussion: The integration of expert stakeholder opinion with evidence from existing literature strengthens the clinical framework for identifying key clinical features of DCM. These 27 features will be discussed at an international consensus meeting to establish a standardized clinical screening toolkit that can be used by frontline healthcare professionals to detect patients with DCM.

1 | Introduction

Degenerative cervical myelopathy (DCM) is caused by progressive spinal cord compression from degenerative changes of the spinal column, including spondylosis, ossification of the posterior longitudinal ligament, hypertrophy of the ligamentum flavum, and disc herniation [1–4]. The estimated prevalence of DCM is 2.3% among adults [5]. Unfortunately,

For affiliations, refer to page 7.

Abbreviations: DCM, degenerative cervical myelopathy; OHPs, other healthcare professionals; RECODE-DCM, Research Objectives and Common Data Elements for Degenerative Cervical Myelopathy.

diagnosis is often delayed 1–2 years after initial presentation of symptoms [6, 7] or may be missed entirely [8]. Early identification of DCM is paramount as failure to recognize the signs and symptoms delays specialist referral and surgical intervention, which subsequently contributes to suboptimal postoperative recovery [9], lifelong disability, and increased dependence [6, 10].

In current clinical practice, a diagnosis of DCM requires the combination of signs and/or symptoms of myelopathy as well as imaging evidence of cervical spinal cord compression [11, 12]. At present, formalized diagnostic criteria for DCM do not exist. In the case of frontline healthcare professionals, where awareness of DCM and confidence in neurological assessment are particularly low [13, 14], an absence of diagnostic criteria likely contributes to diagnostic delays of DCM [15]. A lack of standardized criteria also poses challenges in research settings, as variability in inclusion criteria may affect study reproducibility and validity. Given these factors, the AO Spine Research Objectives and Common Data Elements for DCM (RECODE-DCM) initiative identified developing diagnostic criteria as one of the top research priorities [16].

A diagnostic toolkit should incorporate features that demonstrate both moderate to high sensitivity and specificity to minimize false negatives and false positives. A scoping and systematic review were conducted to summarize the diagnostic accuracy of various signs and symptoms of DCM and provide insight into their specificity and sensitivity [17, 18]. Most of the clinical signs assessed in the review were either sensitive or specific, but not both. Additionally, patients with DCM exhibited a wide variety of symptoms [18], many of which can be seen in other neurological as well as musculoskeletal conditions. While the presence of individual signs and symptoms of DCM is helpful, examination findings may be absent entirely, and clinical presentations can be quite heterogeneous [17, 18]. These factors likely contribute to the difficulty of initial diagnosis and emphasize that clinicians must have a high index of suspicion in order to correctly identify patients with DCM [19]. These reviews provided a complete list of reported signs and symptoms suggestive of DCM in the literature and formulated the basis for the survey in this paper.

The objective of this study was to determine the value of various signs and symptoms in diagnosing patients with DCM by conducting a survey of international experts. This data will ultimately inform modified Delphi consensus processes (Figure S1) that aim to:

1. Develop a set of screening and diagnostic criteria to be used by specialists, primary care physicians, and other health professionals to identify patients with DCM at an earlier point in their disease course.
2. Establish a framework process that will serve as a generalized model to be adapted for use in other conditions.

These projects are part of several wider initiatives that share the overarching goal of accelerating the creation and translation of knowledge that can improve outcomes in DCM. Collectively referred to as RECODE-DCM 2.0—ACT NOW for DCM, these initiatives build on the partnerships formed as part of the AO Spine RECODE-DCM project.

2 | Methods

2.1 | Ethics

This study was approved by the University of Cambridge Human Biology Research Ethics Committee HBREC.2023.19.

2.2 | Survey Creation

An open voluntary English-language Likert scale survey was developed in accordance with CHERRIES guidance [20] to gather expert opinion on the value of various symptoms and signs for diagnosing DCM. Thirty-nine symptoms and 34 signs related to DCM were extracted from a previous scoping review and systematic review/meta-analysis [17, 18]. At the beginning of the survey, a summary of study objectives was explained as well as how anonymized survey data would be used. Data were collected on participant discipline, country of practice, experience with DCM, and demographic information. Participants were then presented with a list of symptoms (section 1) and signs (section 2) of DCM and asked to rank each feature on a scale of 0 (*not important at all*) to 10 (*extremely important*) based on importance for diagnosing DCM. If a symptom or sign was unfamiliar or not relevant to the participant's clinical assessments, the participant was instructed to leave the answer blank (NA). Respondents were given the option to add comments in a free-text box after each section for qualitative input. A summary of the survey is provided in Table S1. The wording for each symptom or sign was deliberately kept faithful to the original source, with no explanation given. This was intended not only to remove any bias, but also to appraise how well each term was recognized by participants.

2.3 | Survey Dissemination

Professional societies representing the key stakeholders involved in the diagnosis of DCM were approached to help disseminate the survey. Several organizations agreed to support this initiative, including AO Spine, American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM), Myelopathy.org, International Federation of Manual and Musculoskeletal Physical Therapists (IFOMPT), Academy of Orthopedic Physical Therapy of the American Physical Therapy Association (APTA), American Academy of Orthopedic Manual Physical Therapists (AAOMPT), World Spine Care and the Hong Kong Neurosurgical Society. Surveys were disseminated between May 15, 2024, and November 30, 2024. Recipients were given 1 month to respond before the survey collection period ended. Participants were eligible for inclusion if they were currently involved, or had previous involvement, in the care of patients with DCM. Participants without current or previous involvement in the care of patients with DCM (nonexperts) and those under the age of 18 years were not permitted to proceed with the survey and were excluded. Respondents were required to agree to a selection of consent statements prior to proceeding with the survey questions.

2.4 | Statistical Analysis

Survey results were summarized using means, ranges, and number of responses. A mean value of ≥ 6.5 was set a priori as the threshold to consider a sign or symptom as having significant diagnostic value. Subgroup analyses were performed on survey responses. Mann–Whitney *U*-tests were used to compare continuous variables with non-normal distribution between two groups. Kruskal–Wallis tests were used to analyze three or more groups. A p value < 0.05 was considered statistically significant. Data were analyzed using Tidyverse and Meta packages in R Studio (Version 2024.09.1+394). All relevant code is available in the GitHub repository: https://github.com/LanceBn/DCM_survey_criteria.git.

3 | Results

3.1 | Survey Responses

The survey introduction homepage was opened by 860 individuals. Nonexperts ($n = 52$) and those under 18 years old ($n = 6$) were excluded from participation at this stage. A total of 802 experts remained eligible for survey participation. A large proportion of experts did not advance beyond the introductory page of the survey ($n = 412$). The remaining participants started the survey ($n = 390$; response rate = 48.6%). Complete responses for signs and symptoms were obtained from 355 experts; 35 experts submitted partial responses for the symptom questions only (dropout rate = 9.0%).

3.2 | Responder Demographics

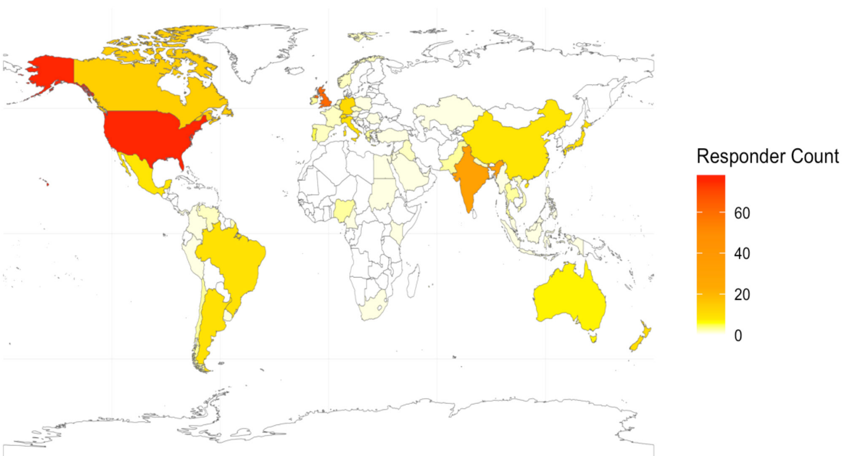
The survey cohort consisted of surgeons ($n = 227$; 58.2%), neurologists ($n = 23$; 5.9%), and other healthcare professionals (OHPs; $n = 101$; 25.9%), including physiotherapists, rehabilitation specialists, chiropractors, and primary care practitioners. Surgical respondents identified as a spinal surgeon ($n = 204$; 89.9%), orthopedic surgeon ($n = 12$; 5.3%), neurosurgeon ($n = 10$; 4.4%), or plastic surgeon ($n = 1$; 0.4%). Respondents were from 57 different countries in 6 continents (Figure 1). The mean clinical experience of responders was 15.9 years (SD 11.3 years; range 0–50 years), with 286 (73.3%) participants reporting a minimum of 5 years of experience. Our cohort consisted predominantly of male participants ($n = 272$; 69.7%). Thirty-nine (10.0%) survey respondents did not provide any demographic information for professional occupation, clinical experience, sex, or country of practice.

3.3 | Symptoms

Survey participants were asked to rank a total of 39 symptoms. Mean responses are summarized in Table 1. Fifteen symptoms scored a mean rank ≥ 6.5 and were classified as having significant diagnostic value for identifying patients with DCM. Of these, 10 (67%) involved either the upper extremity or hand. All surveyed hand symptoms were deemed to be important by experts, with loss of hand function or fine motor disturbance and hand clumsiness scoring the highest. Gait dysfunction was also among the top three ranked symptoms. Pain symptoms were not considered important for diagnosing DCM as rankings were subthreshold for upper limb pain, neck and/or shoulder pain, radicular pain, axial pain, back pain, and headache. Similarly, symptoms related to autonomic function (bladder, bowel, and sexual dysfunction) were ranked less than 6.5.

3.4 | Signs

Survey respondents were also asked to rank a total of 34 signs (Table 2). Of these, 12 were ranked as having significant diagnostic value (mean rank ≥ 6.5) for identifying DCM. Six (50%) of these signs were specifically related to the upper limb. Signs with the highest mean rankings were gait abnormalities, Hoffmann sign, and hyperreflexia of the extremities. Most signs that scored above 6.5 were related to pathological reflexes, motor function, gait, and coordination. Mean rankings for sensory impairment (proprioception and touch, pain and temperature,



Continent	*N*	*%*
Africa	8	2.1
Asia	78	20.1
Europe	118	30.3
North America	101	26.0
Oceania	17	4.4
South America	26	6.7
unspecified	41	10.5

FIGURE 1 | Geographical distribution of survey respondents. A heatmap depicting the number of respondents by color intensity for each country. A corresponding table presents the number and percentage of respondents from each continent. The map was generated using the rnaturalearth package in R [21].

TABLE 1 | Expert opinion on the importance of various symptoms for diagnosing DCM.

Symptom	Mean	SD	*N*
Loss of hand function or fine motor disturbance	8.63	1.71	389
Hand clumsiness	8.47	1.72	387
Gait dysfunction	8.46	1.86	388
Upper extremity clumsiness	8.33	1.64	389
Hand weakness	8.10	1.89	389
Imbalance	7.95	2.00	387
Upper extremity paresthesia	7.93	1.75	85[a]
Hand numbness	7.76	2.05	85[a]
Upper extremity weakness	7.59	1.97	388
Hand paresthesia	7.57	1.96	388
Upper extremity numbness	7.46	1.86	389
Lower extremity clumsiness	7.10	2.34	389
Falls	6.70	2.49	389
Heaviness or stiffness of the extremities	6.67	2.45	387
Lhermitte phenomena	6.66	2.64	381
Bladder dysfunction	6.43	2.75	84[a]
Lower extremity weakness	6.04	2.57	381
Difficulty climbing stairs	5.99	2.66	383
Walking fatigue	5.84	2.57	383
Upper limb pain	5.80	2.49	384
Lower extremity paresthesia	5.78	2.56	382
Lower extremity numbness	5.68	2.36	84[a]
Neck and/or shoulder pain	5.67	2.63	384
Radicular or radiating pain	5.61	2.63	380
Bowel dysfunction	5.21	3.04	375
Foot weakness	5.16	2.86	382
Muscle spasms	4.92	2.59	377
Trunk numbness	4.76	2.83	379
Sexual dysfunction	4.65	2.78	377
Knee buckling	4.51	2.59	373
Tightness or discomfort of the chest, trunk, or legs	4.30	2.74	379
Axial pain	4.25	2.36	85[a]
Difficulty eating	4.01	2.96	367
Lower limb pain	3.93	2.57	377
Dizziness	3.83	2.76	373
Great toe numbness	3.55	2.65	368
Respiratory difficulty	3.51	2.66	367
Back pain	3.22	2.56	364
Headache	2.85	2.52	361

Note: N = number of survey responses received for item.
[a]Symptoms erroneously omitted from some versions of the survey upon dissemination among different expert networks.

hyperesthesia, vibration) did not reach the threshold for diagnostic value among experts.

Signs and symptoms with a mean rank ≥ 6.5 were collated into a list of potential diagnostic criteria. This list will be carried forward to an international expert consensus meeting to develop concise screening criteria for DCM.

3.5 | Subgroup Analysis

All statistical subgroup analyses are synthesized into a comprehensive master table (Table S2).

Symptom rankings according to professional occupation are summarized in Table S3. Mean symptom rankings ≥ 6.5 for surgeons remained largely unchanged from the whole cohort. Neurologists ranked bladder dysfunction and neck and/or shoulder pain above the threshold for diagnostic value in contrast to surgeons and OHPs. A Kruskal–Wallis test indicated a statistically significant difference in scores for neck and/or shoulder pain across these occupational groups ($p = 0.031$; Table S2A), but not for bladder dysfunction ($p = 0.801$). For OHPs, lower extremity weakness was ranked as important in contrast to whole-group consensus and was found to be significantly different across the three professional groups ($p < 0.001$).

Sign rankings stratified by professional occupation are displayed in Table S4. Surgeons, neurologists, and OHPs all ranked gait abnormalities as the most important sign for diagnosing DCM. Surgeons ranked the grip and release test above threshold for diagnostic value; a Kruskal-Wallis test demonstrated significant differences in ranking across occupational groups ($p < 0.001$; Table S2B), with neurologists and OHPs not agreeing on the value of this test. Neurologists ranked the cross adductor reflex to be of significant diagnostic value in contrast to other groups ($p = 0.004$). Neurologists also ranked impaired pain and temperature and impaired proprioception and touch to be above threshold; however, these rankings were not statistically different across groups ($p = 0.29$ and $p = 0.86$, respectively). OHPs ranked the inverted radial reflex/inverted supinator sign higher than surgeons and neurologists; rankings differed significantly across groups for this sign ($p < 0.001$). OHPs also ranked muscular atrophy/wasting and Romberg sign to be above threshold, although these rankings did not differ significantly among occupations ($p = 0.068$ and $p = 0.15$, respectively).

TABLE 2 | Expert opinion on the importance of various signs for diagnosing DCM.

Sign	Mean	SD	*N*
Gait abnormalities	8.17	1.96	355
Hoffmann sign	8.01	2.36	354
Hyperreflexia of upper limbs	7.95	2.29	355
Hyperreflexia of lower limbs	7.93	2.18	355
Clonus	7.87	2.25	355
Motor deficit hand intrinsics	7.72	2.19	353
Spasticity or hypertonia	7.44	2.52	354
Babinski sign	7.44	2.62	354
Myelopathic hand sign	7.44	2.84	334
Ataxia	7.26	2.61	355
Motor deficit upper limbs	7.16	2.45	355
Atrophy of intrinsic hand muscles	7.00	2.57	354
Romberg sign	6.40	2.71	353
Impaired proprioception and touch	6.40	2.55	352
Muscular atrophy/wasting	6.34	2.86	355
Inverted radial reflex/inverted supinator sign	6.33	3.01	350
Grip and release test	6.27	3.09	335
Motor deficit lower limbs	6.05	2.76	355
Finger escape sign	5.52	3.34	335
Tromner sign	5.50	3.50	335
Impaired pain and temperature	5.27	2.84	77[a]
Wazir sign	5.18	3.24	33[a]
Suprapatellar reflex	5.06	3.10	329
Hyperesthesia	4.78	2.86	351
Impaired vibration	4.72	2.98	342
Hand withdrawal reflex	4.72	3.29	318
Dyskinesias	4.54	3.09	347
Spurling sign	4.44	3.13	347
Cross adductor reflex	4.34	3.23	319
Fasciculations lower limb	4.29	3.10	350
Scapulohumeral reflex	3.63	2.98	315
Hypoactive or absent deep tendon reflexes	3.45	3.12	346
Spinal tenderness	3.09	2.75	349
Orthostatic hypotension	2.68	2.46	334

Note: *N* = number of survey responses received for item.
[a]Signs erroneously omitted from some versions of the survey upon dissemination among different expert networks.

Stratifying responses by occupational experience showed that symptoms (Table S5) and signs (Table S6) ranked above the diagnostic value threshold were largely similar between professionals with ≥ 5 years of practice (mean experience = 18.75 years) in their field and those with less than 5 years (mean experience = 2.76). The more experienced professionals scored falls, Lhermitte phenomena, and heaviness/stiffness of the extremities above the diagnostic value threshold in contrast to respondents with less experience. Of these three symptoms, only the rank for falls ($p = 0.049$, Mann–Whitney *U*-test, Table S2A) differed statistically. The more experienced professionals also ranked three additional signs above the threshold, which were statistically different from the respective rankings by those less experienced: Babinski sign ($p = 0.001$, Table S2B), impaired proprioception and touch ($p = 0.007$) and Romberg sign ($p = 0.047$).

Similarly, survey responses stratified by continent (Table S7) revealed that symptoms and signs ranked as having significant diagnostic value were largely similar across continents.

4 | Discussion

4.1 | Main Findings

The main findings of the survey are as follows:

1. Fifteen symptoms were deemed to have significant diagnostic value by healthcare professionals and predominantly included those related to upper limb function and gait.
2. Twelve signs were deemed to have significant diagnostic value by healthcare professionals and included a variety of pathological reflexes as well as impaired motor function, gait, and coordination.
3. The selection of symptoms and signs with significant diagnostic value was consistent across professions, level of experience, and continental regions.
4. Whole-group rankings for autonomic symptoms, pain, and sensory findings were subthreshold but exhibited some variation in value ranking among survey subgroups.

4.2 | Symptoms

All symptoms involving the hand were ranked as being diagnostically significant. These findings are consistent with the results of the scoping review that demonstrated moderate to high sensitivity of several symptoms related to motor and sensory function of the hands [18]. Accordingly, approximately 85% of patients managed surgically for DCM reported at least one hand symptom [22]. While often a prominent and common symptom in DCM, a portion of patients may either not experience hand symptoms or fail to report them unless specifically prompted. As such, it is important to ask direct questions about loss of manual dexterity and grip strength. Furthermore, given that patients with carpal tunnel syndrome may report similar symptoms, it is critical to elicit the distribution of hand numbness and paresthesias, determine whether there is significant hand or wrist pain, and ask whether symptoms are worse at night.

Gait dysfunction was ranked as the third most important symptom for diagnosing DCM. Patients with DCM often report imbalance, walking fatigue, and gait instability. Given that DCM often occurs in an older population, changes in gait may initially be attributed to age, frailty, or other comorbidities such as inflammatory and degenerative joint disease, obesity, and vascular disease. Gait dysfunction can also be reported in several other neurological conditions, as well as disorders of the musculoskeletal system. Clinicians must therefore have a high index of suspicion for DCM in patients who report gait impairment and must be able to identify and localize different gait patterns on clinical examination. This is further emphasized by the fact that gait abnormality was also ranked as the number one sign for diagnosing DCM. Patients with DCM develop upper motor neuron dysfunction as well as impaired proprioception, and often have a broad-based, unsteady, or spastic gait.

Imbalance and falls were also recognized as having diagnostic significance. Poor balance is a common symptom in patients with DCM, with a reported prevalence of 84.2%, and may even be the presenting symptom in some cases [23]. Although falls are also frequently reported by patients with DCM, this symptom has not been commonly discussed in the literature [23]. Falls occur due to motor and sensory tract dysfunction and may be a later symptom of DCM or occur due to the presence of other comorbidities. Interestingly, one study demonstrated that patients who fell and sustained a hip fracture exhibited a higher incidence of DCM [24]. Although imbalance and falls may have limited value in the early diagnosis of DCM, these symptoms should trigger concern and be further explored.

Participants agreed that the presence of neck and/or shoulder pain is not as important for diagnosing DCM. Although neck and/or shoulder pain is commonly reported as an initial symptom of DCM, it is only 51% sensitive [18, 23, 25, 26]. Moreover, the specificity of neck pain is very low as approximately 30%–50% of adults experience this symptom in a given year [27]. However, despite the prevalence of neck pain in the general population, it is still recommended that these patients be assessed for other signs and symptoms of DCM [18]. Similarly, bladder dysfunction did not rank above the threshold in our survey. Urinary symptoms are present in approximately 38% of cases with DCM [18, 28] and therefore may be less important to include in a diagnostic toolkit. However, symptoms of bladder, bowel, or sexual dysfunction may be underreported due to embarrassment or the perception that these symptoms are related to other medical conditions (e.g., bladder prolapse, benign prostatic hypertrophy) or natural parts of aging. As such, it is crucial to ask specific questions related to these autonomic functions in patients with suspected cervical myelopathy.

4.3 | Signs

Several signs indicating upper motor neuron dysfunction were ranked above threshold for diagnostic value, including Hoffmann sign, Babinski sign, clonus, hyperreflexia of upper and lower extremities, and spasticity. Based on the literature, hyperreflexia has a sensitivity of 78% and 85% for the upper and lower extremities, respectively, indicating that assessment of reflexes is an important screening tool for DCM [17]. Of note, hyperreflexia can be masked in some patients if there is concomitant peripheral neuropathy, lumbar spinal stenosis, radiculopathy, or even a history of joint replacement surgery. In contrast, sensitivities for the Babinski sign (42%) and clonus (31%) are much lower; however, these signs are very specific for DCM in the right clinic context and may reflect more severe disease [17]. Hoffmann sign ranked higher than Tromner sign, even though the Tromner sign has a higher reported sensitivity in the literature (93%–94% vs. 31%–89%) [17]. This is likely because many healthcare providers are not aware of the Tromner sign or the differences in technique required to elicit one or the other. These pathological reflexes, when combined with relevant symptoms of myelopathy, may help raise suspicion for DCM but should not be relied upon as the sole screening tool.

Signs related to hand and upper extremity function scored higher than signs related to lower extremity function. These rankings corroborate the findings that loss of dexterity, hand clumsiness, and hand weakness are helpful symptoms for identifying patients with DCM. Indeed, weakness of the hand intrinsic muscles has been shown to be more sensitive for DCM than motor deficits in other muscles of the upper and lower extremities [17]. Differentiating the etiology of hand weakness and clumsiness, however, can be clinically challenging, particularly between myotomal weakness, weakness from corticospinal tract involvement, and clumsiness from proprioceptive defects.

Sensory examination findings did not reach the threshold for diagnostic value in this survey. Objective loss of sensation to a variety of sensory modalities can be seen with normal aging or peripheral neuropathy and is not sensitive or specific to myelopathy. Furthermore, the sensory examination is often less reliable than the motor, reflex, or gait examination as it depends on the patient's perception of the sensory stimulus and is more difficult to standardize.

5 | Limitations

The survey response rate was lower than expected. In particular, greater participation from neurologists would have been valuable given their role as frontline specialists in the evaluation of potential DCM cases. Regarding survey design, the use of “how important” proved to be ambiguous for some respondents, and some participants expressed difficulty with ranking each sign and symptom in isolation rather than in combination. Lastly, some respondents felt that the diagnostic value of certain features may vary with disease progression.

6 | Conclusion

Fifteen symptoms and 12 signs were ranked by international experts as having significant diagnostic value for DCM. Symptoms deemed to be most important were those related to upper limb and hand function as well as gait disturbances. Signs with high diagnostic value tended to include abnormalities of reflexes, as well as impairment of motor function, gait, and coordination. The findings were relatively consistent across professional groups, experience levels, and continental regions. These 27 features demonstrate areas of overlap and will be further refined at a multidisciplinary international consensus meeting as part of AO Spine RECODE-DCM in order to develop a concise and clinically applicable set of screening criteria.

Author Contributions

Lance A. Burn: methodology, data curation, investigation, formal analysis, writing – original draft, writing – review and editing, visualization, and supervision. **Benjamin Davies:** conceptualization, methodology, data curation, investigation, formal analysis, writing – original draft, writing – review and editing, visualization, and supervision. **Lindsay Tetreault:** conceptualization, methodology, data curation, investigation, formal analysis, writing – original draft, writing – review and editing, visualization, and supervision. **Tanzil Rujeedawa, Abdul Lalkhen, Allan R. Martin, Anna MacDowall, Brian K. Kwon, Carl M. Zipser, Caroline Treanor, David B. Anderson, Esther Martin-Moore, James Guest, James S. Harrop, Jamie Milligan, Julio C. Furlan, Konstantinos Margetis, Lianne Wood, Ligia V. Onofrei, Luiz R. Vialle, Manabu Ito, Mark Kotter, Michael G. Fehlings, Michael W. Y. Lee, Mike Hutton, Noam Y. Harel, Ratko Yurac, Rohil V. Chauhan, Sheila Dugan, Sukhvinder Kalsi-Ryan, Sybil Stacpoole, Tammy Blizzard, Timothy F. Boerger, Tore K. Solberg,** and **Justin M. Lantz:** data curation, writing – review and editing.

Affiliations

[1]Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust, Cambridge Biomedical Campus, Cambridge, UK | [2]The Manchester and Salford Pain Centre, Salford, UK | [3]Department of Neurological Surgery, University of California, Davis, California, USA | [4]Department of Surgical Sciences, Uppsala University, Uppsala, Sweden | [5]Uppsala University Hospital, Uppsala, Sweden | [6]Department of Orthopaedics, International Collaboration on Repair Discoveries (ICORD), University of British Columbia, Vancouver, British Columbia, Canada | [7]Spinal Cord Injury Center, Balgrist University Hospital, Zurich, Switzerland | [8]Department of Physiotherapy & Neurosurgery, Beaumont Hospital, Dublin, Ireland | [9]Faculty of Medicine and Health, School of Health Sciences, University of Sydney, Sydney, New South Wales, Australia | [10]Myelopathy.org, Cambridge, UK | [11]Neurological Surgery, University of Miami, Miami, Florida, USA | [12]Department of Neurological Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, USA | [13]Department of Family Medicine, McMaster University, Hamilton, Ontario, Canada | [14]KITE Research Institute and Lyndhurst Centre, Toronto Rehabilitation Institute, University Health Network, Toronto, Ontario, Canada | [15]Department of Medicine, Division of Physical Medicine and Rehabilitation, University of Toronto, Toronto, Ontario, Canada | [16]Department of Neurosurgery, Icahn School of Medicine at Mount Sinai, New York, New York, USA | [17]Department of Public Health and Sports Sciences, University of Exeter, Exeter, UK | [18]Department of Neurology, University of Utah, Salt Lake City, Utah, USA | [19]School of Medicine, Pontifical Catholic University, Curitiba, Brazil | [20]NHO Hokkaido Medical Center, Sapporo, Japan | [21]Division of Neurosurgery, Department of Clinical Neurosciences, University of Cambridge, Cambridge, UK | [22]Division of Neurosurgery and Spine Program, Department of Surgery, University of Toronto, Toronto, Ontario, Canada | [23]Division of Neurosurgery, Krembil Neuroscience Centre, Toronto Western Hospital, University Health Network, Toronto, Ontario, Canada | [24]The Hong Kong Neurosurgical Society, Department of Neurosurgery, Pamela Youde Nethersole Eastern Hospital, Chai Wan, Hong Kong | [25]Consultant Spine Surgeon, New Hall Hospital, Salisbury, UK | [26]National Clinical Lead Spine Services, NHS, London, UK | [27]James J. Peters Veterans Affairs Medical Center and Icahn School of Medicine at Mount Sinai, New York, New York, USA | [28]Department of Orthopedics and Traumatology, University del Desarrollo, Clinica Alemana de Santiago, Santiago de Chile, Chile | [29]Auckland Spine Surgery Centre, Auckland, New Zealand | [30]Active Living and Rehabilitation: Aotearoa, Auckland, New Zealand | [31]Health and Rehabilitation Research Institute, Faculty of Health and Environmental Sciences, Auckland University of Technology, Auckland, New Zealand | [32]KITE Research Institute, University Health Network, University of Toronto, Toronto, Ontario, Canada | [33]Department of Physical Therapy, Temerty Faculty of Medicine, Toronto, Ontario, Canada | [34]University of Cambridge, Cambridge, UK | [35]Independent Contributor With Lived Experience of DCM, Pennsylvania, USA | [36]Department of Neurosurgery, Medical College of Wisconsin, Milwaukee, Wisconsin, USA | [37]Institute of Clinical Medicine, The Arctic University of Norway, Tromsø, Norway | [38]Division of Biokinesiology and Physical Therapy, University of Southern California, Los Angeles, California, USA | [39]Academic Neurosurgery Unit, Department of Clinical Neurosurgery, University of Cambridge, Cambridge, UK | [40]Department of Neurology, Massachusetts General Brigham, Boston, Massachusetts, USA

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Ethics Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

Consent

The authors give their consent for the publication of this work.

Conflicts of Interest

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Figure S1:** Flowchart showing the four-step RECODE-DCM Diagnostic Incubator Group approach to formulating the diagnostic criteria for DCM. **Table S1:** Overview of questions from DCM diagnostic criteria survey. **Table S2A:** Symptoms of DCM and statistical analysis of diagnostic importance rank differences among survey subgroups. **Table 2B:** Signs of DCM and statistical analysis of diagnostic importance rank differences among survey subgroups.

Table S3A: Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by professional occupation: *surgeons* only. **Table S3B:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by professional occupation: *neurologists* only. **Table S3C:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by professional occupation: *allied healthcare professionals* only. **Table S4A:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by professional occupation: *surgeons* only. **Table S4B:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by professional occupation: *neurologists* only. **Table S4C:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by professional occupation: *allied healthcare professionals* only. **Table S5A:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by experience: *≥5years' experience* only. **Table S5B:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by experience: *<5years' experience* only. **Table S6A:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by experience: *≥5years' experience* only. **Table S6B:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by experience: *<5years' experience* only. **Table S7.1A:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Europe*. **Table S7.1B:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *North America*. **Table S7.1C:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *South America*. **Table S7.1D:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Asia*. **Table S7.1E:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Oceana*. **Table S7.1F:** Symptoms of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Africa*. **Table S7.2A:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Europe*. **Table S7.2B:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *North America*. **Table S7.2C:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *South America*. **Table S7.2D:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Asia*. **Table S7.2E:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Oceana*. **Table S7.2F:** Signs of DCM and survey results of expert opinion on diagnostic importance, stratified by continent: *Africa*.