The Canadian Spine Society is a collaborative organization of spine surgeons and health care professionals from across Canada with a primary interest in advancing excellence in spine patient care, research & education.

Canadian Spine Outcomes and Research Network (CSORN):

2025 Annual Report

The Canadian Spine Research & Education Fund (CSREF) is a charitable organization whose mandate is to promote spine research and education in Canada.

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On behalf of the Steering Committee and the investigators and research coordinators whose dedication underpins the Canadian Spine Outcomes & Research Network (CSORN), we present the 2025 Annual Report.

CSORN continues to serve as a comprehensive national registry documenting the indications, techniques, complications, and outcomes of spine surgery across Canada. More than a repository of data, CSORN is a collaborative platform designed to advance evidence-based care and improve outcomes for patients with spinal disorders.

The success of CSORN rests on the commitment of four essential groups. First and foremost are our patients, who generously contribute their time and experiences by completing detailed assessments at multiple stages of care. Our surgeon investigators demonstrate remarkable dedication by completing extensive surgical documentation despite the demands of busy clinical and operative schedules, while simultaneously generating high-quality research questions and analyses. Our research coordinators remain the backbone of the network, tirelessly ensuring data completeness and quality through patient follow-up, surgeon engagement, and data entry. Finally, sustained financial support is critical to the viability of a national registry. We are deeply grateful for the ongoing support provided through the Canadian Spine Research & Education Fund and by our industry partners Stryker, Johnson & Johnson MedTech and Medtronic whose contributions make CSORN possible.

This past year marked continued growth in registry participation, data quality, and research productivity. CSORN investigators have maintained a strong record of translating registry data into peer-reviewed publications, ensuring that collected data leads to meaningful knowledge transfer and tangible impact within the spine community. The effort required to transform complex datasets into publishable research is substantial, and we commend our authors for their perseverance and scholarly contributions.

This Annual Report highlights the collective accomplishments of the CSORN community and presents key insights derived from patients enrolled during the year. Together, these efforts reflect CSORN's ongoing commitment to collaboration, scientific rigor, and continuous improvement in spine care across Canada. The Annual Report summarizes accomplishments of the CSORN investigators and offers a variety of key data points for the 1769 patients enrolled in 2025.

Jennifer Urquhart
CSORN Director of Research Operations
December 31, 2025

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Executive Summary

The information presented here represents all entries made in the registry as of December 31, 2025. The Canadian Spine Outcomes and Research Network (CSORN) now contains 18948 enrolled patients across 23 sites; n=1769 were added in 2025.

Our five continuing prospective studies added a total of 407 patients. Our degenerative cervical myelopathy study remains the largest single DCM dataset in the world.

The most common principal pathology was stenosis for both cervical and thoracolumbar (TL) patients. For elective surgery cases, fusion (in combination with other operations) was the most common procedure. Approximately 72% of patients had symptoms for one-year or more prior to surgery.

From baseline to 3-month follow up, pain ratings and disability scores improved for cervical and TL patients. Based on pathological diagnosis, patients with stenosis experienced the greatest reductions in neck pain (-3.2 points) and back pain (-3.9 points). Arm pain improved most in patients with stenosis (-4.0), while leg pain showed the greatest improvement in patients with stenosis and spondylolisthesis (both -4.5). Neck Disability Index (NDI) (-12.2) improved the most in patients with stenosis and Disability scores improved the most in patients with disc herniation (-24.8). Three months after surgery, 84% of cervical and 88% of thoracolumbar patients stated they were satisfied with their outcome.

The CSORN website continues to see modest online traffic and can be accessed at: csorncss.ca

CSORN research initiatives, including abstracts and presentations at scientific conferences, were again prolific; 18 study abstracts were presented at the 2025 CSS Scientific Conference in Charlevoix, QC and 20 abstracts have been submitted to the 2026 Conference.

There were 12 studies published in peer-review medical journals this year plus 5 manuscripts have been accepted and are in-press. In total, we have produced 91 in-print/in-press publications.

Key future endeavours over the the next 12-18 months include:

- Transition from the Global Research Platform (GRP) to Praxis Connect, a registry technology that will improve data collection/entry and reporting

- Implementation of awarded large team grants to support prospective studies, while continuing to pursue additional team grants, and regional grants and bursaries.

- Launch of a new prospective study comparing single-level lumbar decompression and discectomy techniques including open, minimally invasive, and endoscopic techniques to generate robust evidence for surgical decision-making.

Introduction

The Canadian Spine Society (CSS) is a collaborative organization of spine surgeons and health care professionals from across Canada. The CSS mission is to advance excellence in spine patient care, research and education. To help further this mission, the CSS established the Canadian Spine Registry pilot study in 2012; this initiative progressed to a full-scale research project in 2015, becoming the Canadian Spine Outcomes & Research Network (CSORN).

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CSORN Mission Statement

"We are Canadian spine surgeons and rehabilitation specialists with an interest in multi-centre research that evaluates operative techniques and their impact on patient outcomes in order to enhance quality of spine practice and patient care in Canada and demonstrate surgical leadership on a global scale."

Objectives

CSORN's objective is compiling a national registry of indications, techniques, complications and outcomes for spine surgery. Utilizing both prospective trials and retrospective studies, we publish our findings in peer-reviewed medical journals.

Patient Enrolment

Participating academic hospital sites consecutively enrol all eligible patients with cervical, thoracic or lumbar, pathology requiring treatment. Patient enrolment in the CSORN registry does not change clinical management or require additional tests or procedures.

Inclusion / Exclusion Criteria

Eligibility for enrollment requires:

- Male or Female ≥ 18
- Spinal diagnosis with an emphasis on degenerative conditions (deformity, degenerative disc disease, disc herniation, spondylolisthesis or stenosis)
- Able to communicate in English or French and provide informed consent.

Patients who do not complete the Initial Patient Assessment or Consent form prior to surgery are excluded.

Informed Consent

Patients are given ample time to decide if they wish to be enrolled in the registry. Written, informed consent is obtained prior to any data collection. All informed consent processes and documentation follow both national regulations/guidelines and local institutional policies.

Data Collection Process

Following consent, patients provide baseline demographic information, medical history, employment status, previous medical treatment and current medication usage; they complete standardized health questionnaires on pain, function, disability and quality-of-life. Treating surgeons collect clinical assessment, principal pathology, radiographic evaluation, previous medical treatment information and surgical details.

Follow Up

The first post-surgical visits and/or data collection time points are scheduled to coincide with standard clinical follow-up appointments at approximately 6-18 weeks. Further information is collected at one and two years post treatment. Depending on the procedure, some patients may be followed for up to ten years. Data collection focuses on complications related to clinical treatment, current health status, satisfaction with surgery, radiographic outcomes and the same standardized patient questionnaires administered at baseline.

Ethics Approval

The principal investigator at each CSORN site is responsible for submitting the CSORN protocol to their local Research Ethics Board (REB) for approval

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or annual renewal; no patient enrolments are performed until after this step is completed. Each local REB is informed whenever the CSORN Steering Committee makes any protocol amendments, in accordance with International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) E6 Good Clinical Practices (GCP), local procedures and Canadian regulatory requirements.

Global Research Platform

CSORN uses the Global Research Platform (GRP) system, developed by the Praxis Spinal Cord Institute, for the collection and storage of all data. GRP is a user-friendly, web-based, secure data collection and research management structure that has been designed specifically for the collection of clinical and outcome information on spinal cord injury and spinal pathology. Praxis Spinal Cord Institute Praxis is a Canadian-based not-for-profit organization that leads global collaboration in spinal cord injury and spinal pathology research, innovation and care.

Privacy

Praxis adheres to a 'gold standard' of data protection through compliance with Canadian legislative requirements, international data protection standards and privacy best practices. Praxis is subject to British Columbia's Freedom of Information and Protection of Privacy Act (FIPPA) for any data they receive from participating CSORN sites. As a privacy best practice, Praxis complies with the federal Personal Information and Protection of Electronic Documents Act (PIPEDA) and all provincial and territorial privacy laws for its' information handling practices. Praxis has implemented a national privacy and security framework for information handling practices by national CSORN staff that is independent from, but complimentary to, the existing local privacy infrastructure already in place at participating CSORN sites.

Data Security

GRP is hosted in a top-tier, secure data centre in Canada and meets global privacy and security requirements. The GRP database and servers are held at a secure location in the Toronto area. KPMG evaluated the security of the system and it passed all of their requirements. On two occasions, ethical hackers were hired to attempt to break into the system from outside and within using valid GRP credentials. They were unsuccessful and commented that they had never encountered such strong security. The database is encrypted so that only GRP can read the contents. Encrypted database back-ups are performed nightly to a secondary site. If the database crashes or there is data loss, only data entered on that day will be affected.

Funding

The Canadian Spine Education and Research Fund, a registered charitable organization, provides financial support for CSORN. Donations to the Fund come from the public, members of the Canadian Spine Society and from the generous contributions of our industry sponsors: Stryker, Johnson & Johnson MedTech and Medtronic.

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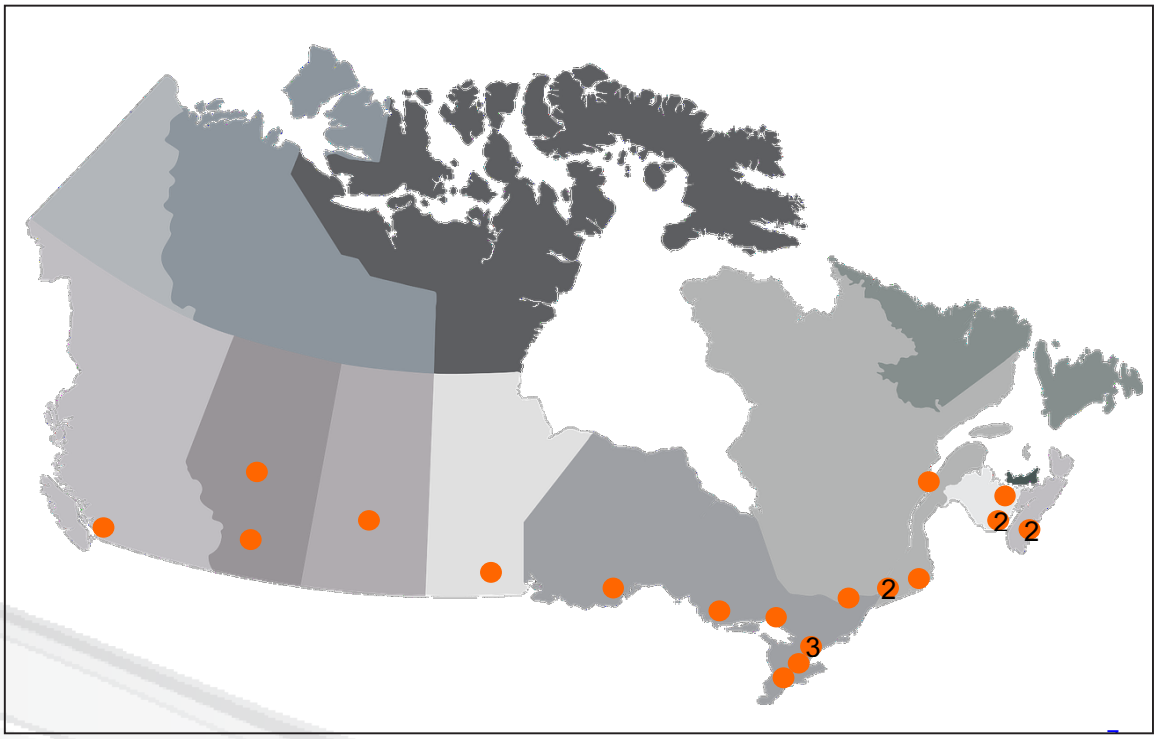
2025 CSORN Profile in Numbers

1425 Thoracolumbar patients enrolled	**344** Cervical patients enrolled	**1002** Patients who had spine surgery
23 Sites/hospitals	**75** Active participating surgeons	**40** Research coordinators
18 Abstract presentations	**12** In-print publications	**5** In-press publications

CSORN Site Locations

The Network spans eight provinces.



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Website

The CSORN website was launched in 2021 to help improve dissemination of results and provide comprehensive background information on the CSORN initiative. All full-length versions of published manuscripts are available on the website. Please visit csorncss.ca for more details.

Numbers at a Glance

Patient Demographics

60.8 average age (standard deviation=14.3, range 18-98)

29.2 average Body Mass Index (standard deviation 6.3, range 13.9-66.4)

51% males

34% high school education or less

16% nicotine users

40% greater than 2-year symptom duration

61% exercising regularly

82% >1 comorbidity

Surgical Statistics

2.9 days: average length of hospital stay (standard deviation 6.5)

22% with previous spine surgery

4.5% with intra operative adverse event; 6.8% with a peri-op adverse event

1.1% with tumour diagnosis

Registry numbers

25051 patients enrolled since study inception (including pilot phase)

17179 patients enrolled from January 2015 to the end of 2024

1769 patients enrolled in 2025

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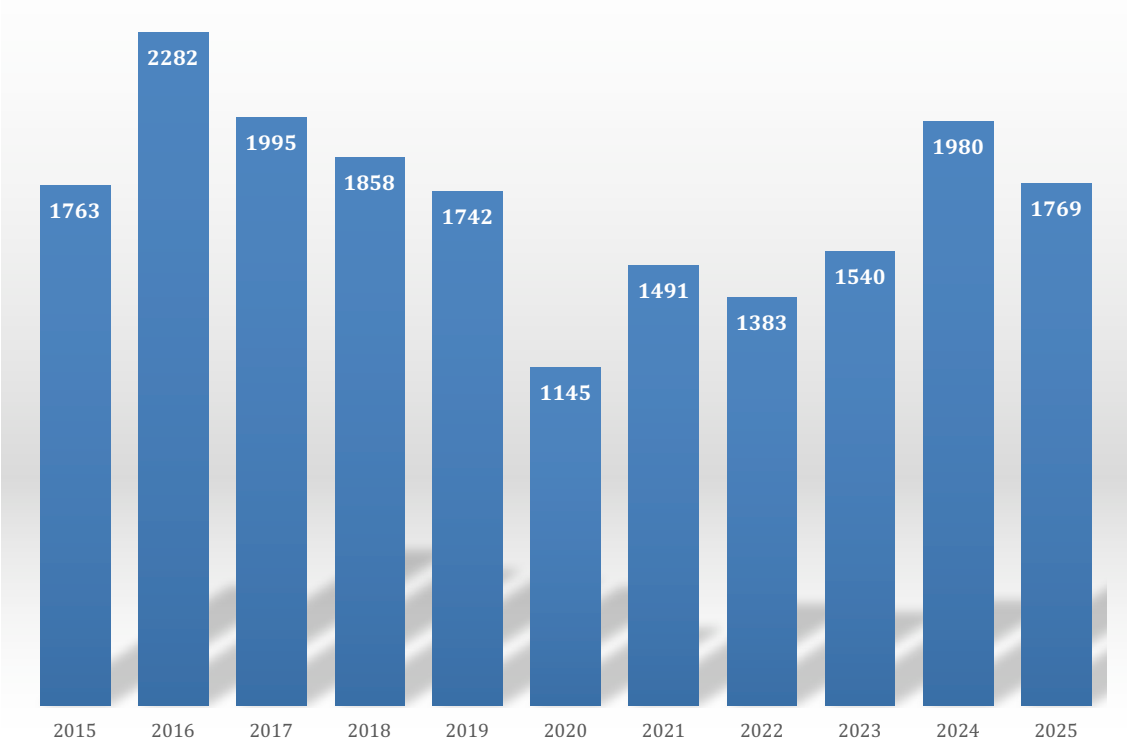
Enrollments by Year

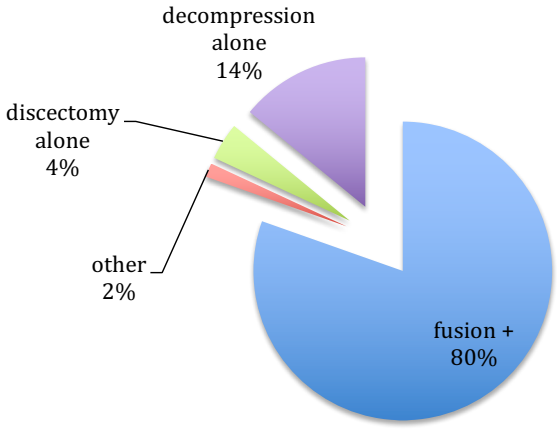


Surgical Data

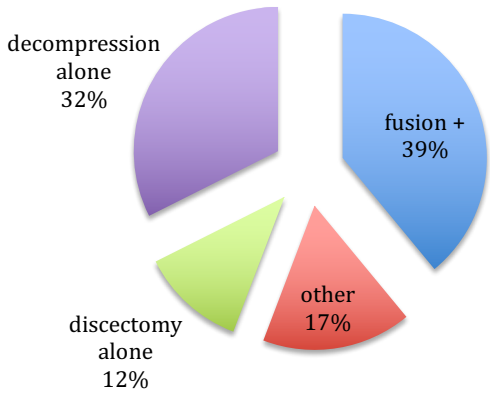
Types of Surgery

For elective surgery cases, fusion (in combination with other operations) was the most frequently performed procedure in both the cervical and thoracolumbar (TL) spine.

Types of Cervical Surgery



Types of TL Surgery



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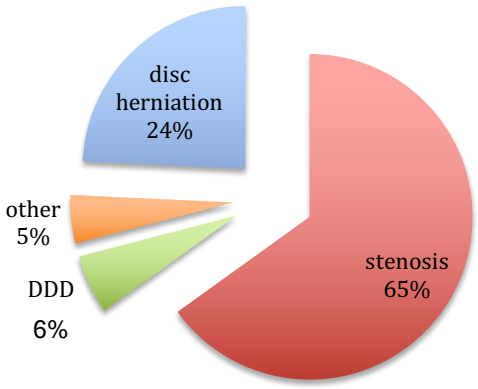
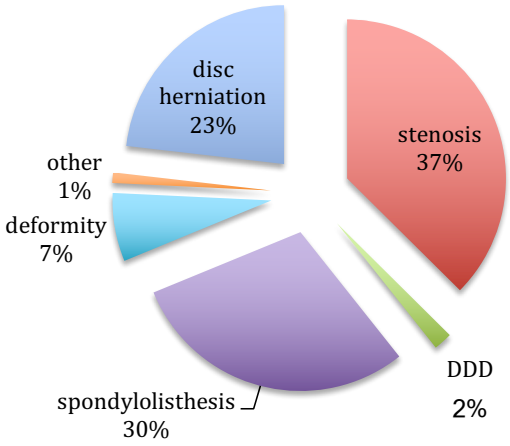
Principal Pathology

The most common principal pathology was spinal stenosis for both cervical and thoracolumbar (TL) patients.

Principal Pathology (Cervical Diagnosis)



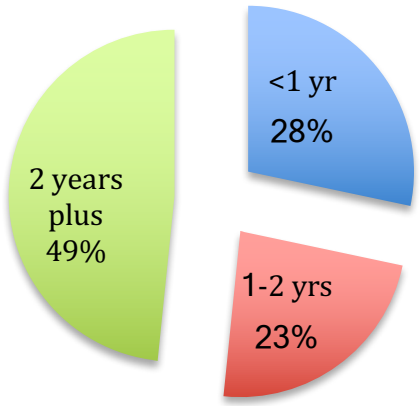
Principal Pathology (TL Diagnosis)



Symptom Duration

Approximately 72% of patients had symptoms for one-year or more prior to surgery.

Symptom Duration



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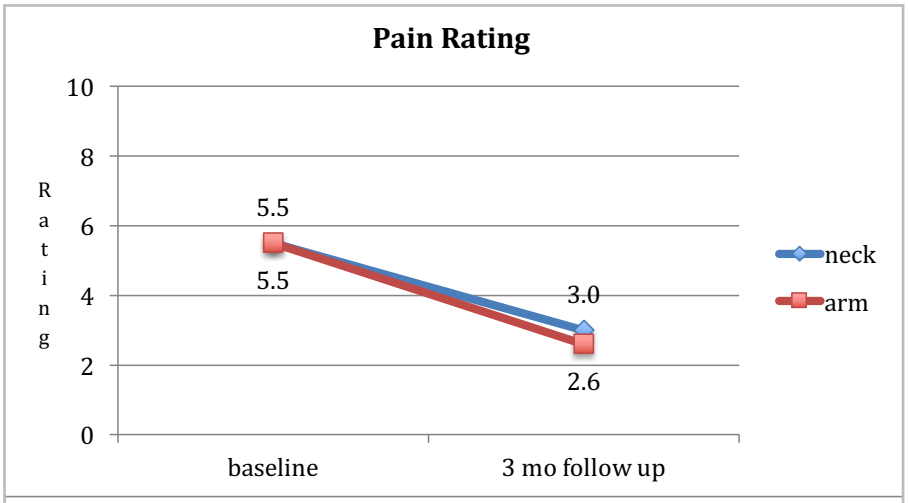
Selected Patient Reported Outcomes

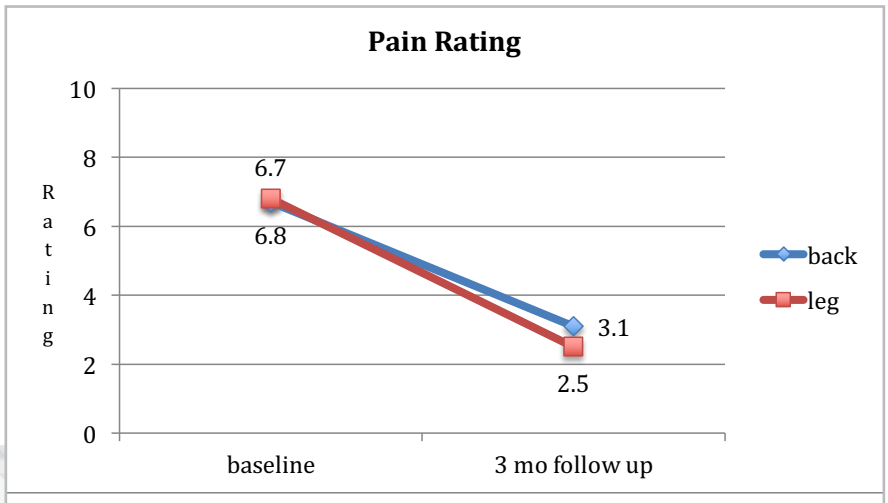
Numeric Pain Rating

Overall mean improvements in cervical pain rating were 2.5 points for neck pain and 2.9 points for arm pain at 3 month follow up. By pathology, those with stenosis had the most improvement in neck pain (-3.2) and arm pain (-4.0).



	Deformity	DDD	Disc Herniation	Spondy	Stenosis
Neck pain change	-	-0.3	-2.8	-	-3.2
Arm pain change	-	-1.0	-3.9	-	-4.0

Overall mean improvements in thoracolumbar pain rating were 3.6 points for back pain and 4.3 points for leg pain at 3 month follow up. Those with stenosis had the largest reduction in back pain (-3.9); leg pain showed the greatest improvement in patients with stenosis and spondylolisthesis (both -4.5).



	Deformity	DDD	Disc Herniation	Spondy	Stenosis
Back pain change	-2.9	-1.2	-3.3	-3.7	-3.9
Leg pain change	-2.4	-2.7	-4.2	-4.5	-4.5

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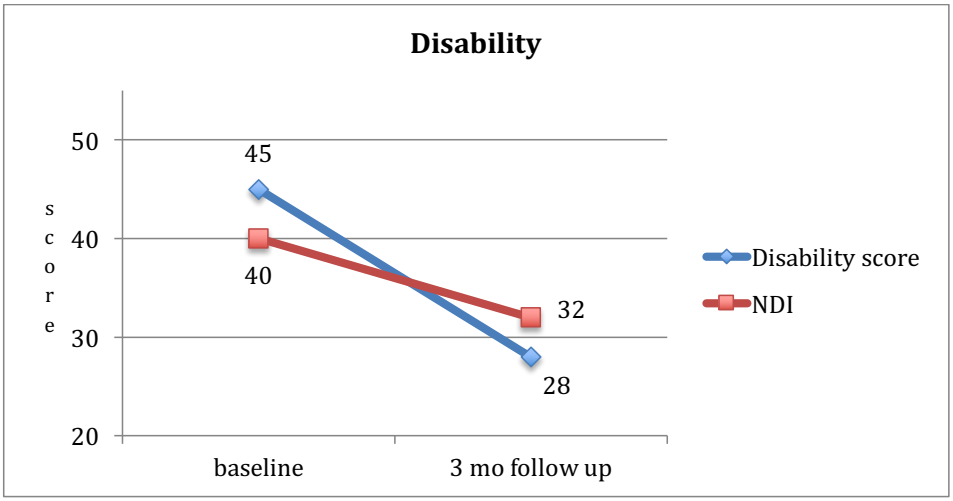
Disability Questionnaires

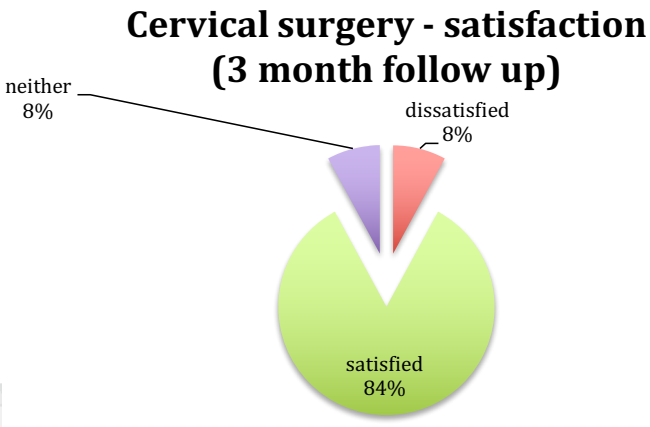
Measured by standard disability questionnaires at 3 month follow up, overall mean improvements were 8 points for cervical patients and 17 points for thoracolumbar. By pathology, those with disc herniation had the largest improvement in Disability score (-24.8); those with stenosis had largest improvement in Neck Disability Index (NDI) (-12.2).

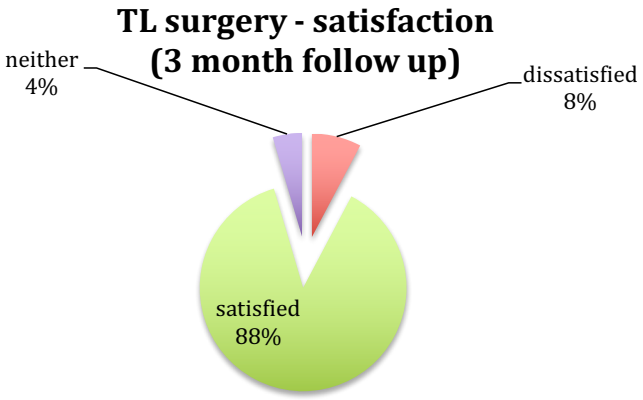


	Deformity	DDD	Disc Herniation	Spondy	Stenosis
Disability Score change	-18.9	-6.8	-24.8	-21.4	-20.1
Neck Disability change	-	5.3	-10.7	-	-12.2

Patient Satisfaction

Approximately 84% stated that they were satisfied three months after cervical surgery; 88% stated that they were satisfied three months after thoracolumbar surgery.





	Deformity	DDD	Disc Herniation	Spondy	Stenosis
Dissatisfied (%)	-	0	3	-	11
Satisfied (%)	-	100	91	-	82
Neither (%)	-	0	6	-	8

	Deformity	DDD	Disc Herniation	Spondy	Stenosis
Dissatisfied (%)	14	0	10	4	8
Satisfied (%)	79	90	86	92	87
Neither (%)	7	10	4	4	5

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Research Activities

Prospective Studies

Ongoing in 2025:

Surgical treatment of degenerative spondylolisthesis: a standardized clinical assessment and management plan: CSS multicenter prospective cohort study (71 enrolled; total n=718)

Management and outcome of degenerative cervical myelopathy: a standardized clinical assessment and management plan (171 enrolled; total n=1426)

Surgical treatment of adult spinal deformity (99 enrolled; total n=401)

Anterior vs posterior surgery for lumbar isthmic spondylolisthesis: multicenter prospective cohort study (56 enrolled; total n=145)

Indirect decompression in the Surgical Treatment of Degenerative Spondylolisthesis: a multicenter prospective matched cohort study: A standardized clinical assessment and management plan (10 enrolled; total n=21)

Completed:

Decompression alone vs. decompression and instrumented fusion for the management of lumbar spinal stenosis associated with stable degenerative spondylolisthesis: a pragmatic randomized clinical pilot trial (total n=61)

General Registry Studies

Projects initiated and abstracts written in 2025:

1. Reframing Mild Degenerative Cervical Myelopathy: Insights from a Latent Profile Analysis

2. Mental Health Recovery After Surgery for Degenerative Cervical Myelopathy: A Group-Based Trajectory Modelling Analysis

3. Re-assessing the Minimal Clinically Important Differences of Patient Reported Outcomes in Cervical Myelopathy: A Patient-Centered Approach from the Canadian Spine Outcomes and Research Network

4. Predictive Algorithm for Treatment Recommendation between Operative and Nonoperative Management in Mild Degenerative Cervical Myelopathy

5. Determinants of Surgical Outcomes in Degenerative Cervical Myelopathy: A Comprehensive Thematic Review of 16 Prospective CSORN Studies

6. What Patients Expect and What They Experience: Symptom-Specific Expectation Fulfillment and Functional Recovery in Degenerative Cervical Myelopathy: A retrospective analysis of prospectively collected data from the multicenter Canadian Surgical Spine Registry (CSORN)

7. Machine Learning Classification of Patients with Degenerative Cervical Myelopathy into Clinically Relevant Clusters and Development of an Adoptable Clinical Algorithm

8. National Trends in Surgical Approach for Degenerative Cervical Myelopathy and Associated Inpatient Costs

9. Longitudinal Finite Mixture Models for Mining Complex Prognostic Phenotypes of Degenerative Cervical Myelopathy

10. Decompressions alone in patients with Adult Spinal Deformity have variable outcomes – pilot data from the CSORN ASD registry

11. Patient Reported Outcome in Lumbar Degenerative Spondylolisthesis: Outcome analysis after posterolateral Decompression and Surgery.

12. The effects of class III obesity among patients undergoing surgery for degenerative lumbar conditions: An observational study from the Canadian Spine Outcomes and Research Network (CSORN)

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13. Post-operative outcomes in primary versus revision lumbar decompressive surgery: a propensity-matched analysis

14. Multimodal analgesia after surgery for thoracolumbar spinal stenosis

15. Supervised and Unsupervised Machine Learning Reveals Distinct Clinical Phenotypes Across Degenerative Lumbar Conditions: Sex-Specific Clustering for Personalized Surgical Care

16. Postoperative Changes in Patient-reported Outcome Measures reflect Expectation Fulfillment Following Elective Lumbar Spine Surgery

17. Predictors of Functional Recovery Following Perioperative Adverse Events in Lumbar Spine Surgery

18. Factors Associated with Perioperative Adverse Events in Patients with Degenerative Lumbar Spondylolisthesis

19. Longitudinal changes in comprehensive radiographic parameters following short segment surgery (1-2 level) for degenerative lumbar spondylolisthesis

20. Does comorbidity count, the ASA score, or Quan-CCI better predict morbidity after elective spinal surgery

Presentations

National presentations made in 2025:

1. Patient's characteristics and outcomes associated with severe neck pain presentation in Degenerative Cervical Myelopathy

2. Anterior versus posterior surgery for degenerative cervical myelopathy: a cost-utility analysis

3. Treatment modality and outcomes in patients with mild DCM

4. Decompression versus decompression plus fusion for stable degenerative lumbar spondylolisthesis: comparing outcomes using propensity-score matched data

5. Delayed surgical treatment for patients with degenerative cervical myelopathy is associated with inferior outcomes for disability and health-related quality of life

6. Assessing construct validity of spine adverse events severity system (SAVES-V2): Impact of adverse event severity grade on longitudinal patient-reported outcomes

7. Anterior versus posterior surgery for two or three level compression in degenerative cervical myelopathy

8. Machine learning-driven clinical and imaging clustering of degenerative lumbar spondylolisthesis: Implications for stratified surgical care

9. Comprehensive analysis of the prognostic factors associated with reaching minimally clinically important differences across degenerative lumbar conditions

10. Reoperation rates for decompression and fusion versus decompression alone for degenerative spondylolisthesis: A comparative analysis

11. Laminoplasty for patients with degenerative cervical myelopathy: An observational and comparative study of posterior cervical approaches

12. Physician Prediction of Ambulation Outcomes from Degenerative Cervical Myelopathy Surgery Improves with Machine Learning Clinical Tool

13. Microbial colonization of orthopedic and spinal implants (poster)

14. Examining the impact of successive revision spine surgeries on pain, disability, mental health, satisfaction, and length of stay (poster)

15. Research priorities for patients with adult spinal deformity – a modified Delphi approach (poster)

16. Impact of age and preoperative myelopathy severity on surgical outcomes in degenerative cervical myelopathy (poster)

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17. The effects of preoperative psychological health on the outcomes of lumbar discectomy for radiculopathy due to disc herniation (poster)

18. Comparison of primary versus revision lumbar spine surgery patients' pre-operative expectations (poster)

Publications

All CSORN published studies (in press/in-print) up to the end of 2025:

1. Tripp DA et al. Biopsychosocial factors predict quality of life in thoracolumbar spine surgery. Quality of Life Research Journal 2017; 26(11): 3099-3110.

2. Morcos MW et al. Predictors of blood transfusion in posterior lumbar spinal fusion. Spine 2018; 43(1): E35-39.

3. Eastwood D et al. Improving post-operative patient reported benefits and satisfaction following spinal fusion with a single pre-operative education session. The Spine Journal 2019; 19(5): 840-45.

4. Ayling O et al. Clinical outcomes research in spine surgery: What are appropriate follow-up times? Journal of Neurosurgery: Spine 2019; 30(3): 397-404.

5. Morcos MW et al. Predictive factors for discharge destination following posterior lumbar spinal fusion. Global Spine Journal. 2019; 9 (4): 403-08.

6. Ailon T et al. Patient reported outcomes following surgery for degenerative spondylolisthesis: Comparison of a universal and multi-tier health care system. The Spine Journal 2019; 19(1):24-33.

7. Srinivas S et al. Effect of spinal decompression on back pain in lumbar spinal stenosis. The Spine Journal 2019; 19(6):1001-08.

8. Thomas K et al. Decompression alone vs. decompression plus fusion for claudication secondary to lumbar spinal stenosis. The Spine Journal 2019; 19(10):1633-39.

9. Sharifi B et al. Consultation and surgical wait times in cervical spondylotic myelopathy. Canadian Journal of Neurological Science 2019; 46(4):430-35.

10. Cushnie D et al. Effect of preoperative symptom duration on outcome in lumbar spinal stenosis. The Spine Journal 2019; 19(9):1470-77.

11. Hebert J et al. Patients undergoing surgery for lumbar spinal stenosis experience unique courses of pain and disability: a group-based trajectory analysis. PLoS ONE [Electronic Resource]. 14(11):e0224200, 2019.

12. Bond M et al. Treatment of mild cervical myelopathy: Factors associated with decision for surgical intervention. Spine 2019; 44(22):1606-12.

13. Canizares M et al. Patients' expectations of spine surgery for degenerative conditions. The Spine Journal 2020; 20(3):399-408.

14. Stratton A et al. Opioid use trends in patients undergoing elective thoracic and lumbar spine surgery. Canadian Journal of Surgery 2020; 63(3):E306-12.

15. Evaniew N et al. Clinical predictors of achieving the minimal clinically important difference after surgery for cervical spondylotic myelopathy: An external validation study. Journal of Neurosurgery: Spine 2020; 33(2): 129-37.

16.Hebert JJ et al. Preoperative factors predict postoperative trajectories of pain and disability following surgery for degenerative lumbar spinal stenosis. Spine 2020; 45(21): E1421-30.

17. McIntosh G et al. Development and implementation of a national Canadian spine surgery registry. Journal of Current Clinical Care 2020; 10(2): 21-31.

18. Bond M et al. Back pain in surgically treated degenerative lumbar spondylolisthesis: What can we tell our patients? The Spine Journal 2020; 20(12): 1940-47.

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19. Yang MMH et al. Development and validation of a clinical prediction score for poor postoperative pain control following elective spine surgery. Journal of Neurosurgery: Spine 2020; 1-10.

20. Rowe E et al. Predicting recovery after lumbar spinal stenosis surgery: A protocol for a historical cohort study using data from the Canadian Spine Outcomes Research Network. Canadian Journal of Pain 2020; 4(4): 19-25.

21. Ayling OGS et al. The effect of peri-operative adverse events on long-term patient reported outcomes after lumbar spine surgery. Neurosurgery 2021; 88(2): 420-27.

22. Chan V et al. Comparison of clinical outcomes between posterior instrumented fusion with and without interbody fusion for isthmic spondylolisthesis. Clinical Spine Surgery: A Spine Publication 2021; 34(1): E13-18.

23. Aoude A et al. A comparison of patient and surgeon expectations of spine surgical outcomes. Global Spine Journal 2021; 11(3): 331-37.

24. Schneider N et al. Lumbar degenerative spondylolisthesis: Factors associated with the decision to fuse. The Spine Journal 2021; 21(5): 821-28.

25. Glennie RA et al. The impact of pathoanatomical diagnosis on patients' expectations undergoing elective spine surgery. Journal of Neurosurgery: Spine 2021; 35(1): 34-41.

26. Iorio-Morin C et al. Low back pain after lumbar discectomy for disc herniation: What can you tell your patient? Journal of Neurosurgery: Spine 2021; 35(6): 715-721.

27. Ayling OAS et al. National AE profile for lumbar degenerative disease and complication rates between hospitals. Journal of Neurosurgery: Spine 2021; 35(6): 698-703.

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Future Endeavours

The Steering Committee and select investigator working groups have definitive goals for the next 12-18 months:

• Transition from the Global Research Platform (GRP) to Praxis Connect, a registry technology that will improve data collection/entry and reporting

• Implementation of awarded large team grants to support prospective studies, while continuing to pursue additional team grants, and regional grants and bursaries.

• Launch of a new prospective study comparing single-level lumbar decompression and discectomy techniques including open, minimally invasive, and endoscopic techniques to generate robust evidence for surgical decision-making.

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