17th Annual Spine Academic Day

SPINEFEST

University of Toronto Spine Program

Surgery
UNIVERSITY OF TORONTO
Spine Program

Monday June 9, 2025
BMO EDU & Conf Centre
Hybrid

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About SpineFEST

This year marks the 17th anniversary of SpineFEST in our University of Toronto Department of Surgery Spine Program. SpineFEST is our Annual Academic Spine Day and the key academic spine event at the University of Toronto (U of T). SpineFEST brings together the spine community to disseminate knowledge of advances in spine surgery, spine care management, related research and education. The day serves as a unique continuing education platform for clinicians, researchers, and educators from a broad spectrum of disciplines including neurosurgery, orthopaedic surgery, chiropractic, physiatry, physical therapy, nursing, family medicine, pain medicine, biomedical engineering, and basic/clinical translational science.

Previous Visiting Professors

2024	Professor Serena Hu, Stanford Medicine, Stanford University, California
2023	Professor Shekar Kurpad, Medical College of Wisconsin, Milwaukee, Wisconsin
2022	Professor Lawrence Lenke, Colombia University, New York
2021	Professor Richard Fessler, Rush University Medical Center, Chicago, Illinois
2020	Professor Marcus Stoodley, Macquarie University, Sydney, Australia
2019	Professor Praveen Mummaneni, The University of California, San Francisco
2018	Professor Sanford Emery, West Virginia University
2017	Professor Zoher Ghogawala, Tufts University School of Medicine
2016	Professor Daniel Riew, Columbia University Medical Center
2015	Professor Wilco Peul, Leiden University Medical Centre
2014	Professor Kenneth Cheung, University of Hong Kong
2013	Professor Alexander Richard Vaccaro, Thomas Jefferson University
2012	Professor Jean Dubousset, The University of Paris
2011	Professor Jens Chapman, University of Washington

2010	Professor Edward Benzel, Cleveland Clinic
2009	Professor Jeffrey Wang, University of California

Time and location:

- **Location**: BMO Education & Conference Centre, 60 Leonard Avenue, Toronto, Ontario.
- **Date/Time**: June 9, 2025, 8:00 AM to 3:00 PM (EST)
- Alumni and Remote participants log-in by registration

About the University of Toronto Spine Program

Vision

Innovation and excellence in the delivery of spine care with a unique collaborative program of clinical expertise, research, teaching, and education.

Integration

The University of Toronto Spine Program is a multidisciplinary collaborative unit which combines neurosurgery and orthopaedic surgery and the broad spectrum of non-operative clinical and research disciplines which are engaged in spine health. The U of T Spine Program is integrated across citywide clinical and research programs at the affiliated teaching hospitals; Toronto Western Hospital (TWH) at University Health Network (UHN), Sunnybrook Health Sciences Centre (SHSC), Hospital for Sick Children (HSC), St. Michael's Hospital (SMH) at Unity Health Toronto (UHT), and Mount Sinai Hospital (MSH) at Sinai Health System.

Faculty Members

Toronto Western Hospital @ UHN	**St. Michael's Hospital @ UHT**
Michael Fehlings MD PhD FRCSC **(Co-Chair)**	Henry Ahn MD PhD
Christopher Nielsen MD FRCSC	Howard Ginsberg MD PhD FRCSC
Stephen Lewis MD MSc FRCSC	Jefferson Wilson MD PhD FRCSC
Eric Massicotte MD MBA FRCSC	Christopher Witiw MD PhD FRCSC
Y Raja Rampersaud MD FRCSC	**Hospital for Sick Children**
Suganth Suppiah MD PhD	David Lebel MD PhD FRCSC
Karlo Pedro MD	
Sunnybrook Health Sciences Centre	Reinhard Zeller MD FRCSC (retired)
Jetan Badhiwala MD PhD FRCSC	Mark Camp MD FRCSC
Leo da Costa MD	**University of Toronto**
Joel Finkelstein MD MSc FRCSC	Margarete Akens Dr med vet PhD
Michael Hardisty PhD	Carlo Ammendolia DC PhD CCRF
Jeremie Larouche MD MSc FRCSC	Mark Erwin PhD DC
Meaghan O'Reilly PhD	Sukhvinder Kalsi-Ryan PhD
Farhad Pirouzmand MD MSc FRCSC	Cindi Morshead BSc PhD
Arjun Sahgal BSc MD FRCPC	Molly Shoichet PhD FRCS
Cari Whyne PhD	Karl Zabjek BSc MSc PhD
Albert Yee MD MSc FRCSC **(Co-Chair)**	

Message from the Co-Directors

Colleagues,

As we approach the end of our academic year, we would like to celebrate our successes for 2024/2025. The U of T Spine Program continues to foster city-wide collaborations within the University and the affiliated hospitals while taking the lead in several key initiatives and garnering a respected academic footprint locally, nationally, and globally. Collaboration and inter-professional multi-disciplinary knowledge exchange remain key elements to our success. The Program has continued to provide a full and rich calendar of academic activities in both online and in-person formats. This has enabled continued participation from alumni and the spinal community throughout Canada and across the globe.

On Monday, June 9th, our Program proudly celebrates the 17th Annual Spine Academic Day—**SpineFEST** 2025—a signature event where our spinal community gathers to showcase achievements and share the latest in clinical, scientific, and educational advancements. We are thrilled to welcome this year's Tator-Hall Keynote Lecturer, Professor Michael Y. Wang, MD, MBA, FAANS, Chief of Neurosurgery and Spine Neurosurgery Fellowship Director at the University of Miami Miller School of Medicine. A globally recognized leader in neurosurgery and spine surgery, Dr. Wang has held prominent roles in AANS, CNS, NASS, ISASS, SMISS, and ERAS. With over 800 publications, 15 edited textbooks, and more than 1,000 lectures to his name, his pioneering research spans minimally invasive surgery, spinal deformity, robotics, and spinal cord injury. We eagerly anticipate his keynote address, "Ultra-MIS Spinal Surgery."

Following the keynote, a focused symposium on **Minimally Invasive vs. Open Surgery**, chaired by Dr. Stephen Lewis, will feature expert faculty presenting updates on clinical and research innovations in spine care. The day will conclude with invited trainee presentations, showcasing exceptional clinical and basic science research by the next generation of spine specialists.

Join us in celebrating this milestone event and in welcoming Dr. Michael Wang to SpineFEST 2025!

We extend our sincere thanks to our dedicated program **judges**—Drs. Joel Finkelstein, Jeremie Larouche, Chris Nielsen, Meaghan O'Reilly, Carlo Ammendolia, Michael Hardisty, David Lebel, Chris Witiw, Cari Whyne, Jay Detsky, Jetan Badhiwala, and Mark Camp—for generously contributing their time and expertise in evaluating a large number of abstracts. While we received many outstanding abstracts, only a select few could be recognized as Best Abstracts for Oral Presentations. The remaining excellent

submissions will be showcased during the Elevator Pitch sessions, highlighting the breadth of innovative research within our community.

The U of T Spine Program continues to leverage our foundational education platform to help create and support a national spine surgery **fellowship training** curriculum for cognitive and procedural competencies. Apart from tracking fellowship training experience, our efforts have enhanced cross-institutional and collaborative Neurosurgery and Orthopaedic Surgery spinal training across Toronto Academic Health Sciences Network (TAHSN) teaching hospitals, including Toronto Western Hospital (TWH-UHN), Sunnybrook Health Sciences Centre (SHSC), Unity Health Toronto (UHT), and the Hospital for Sick Children (HSC). We support an academic hub that competitively attracts around 16 national and international clinical fellows including many additional traveling surgeons each year. For several years now, our program has continued to offer both a one-year core fellowship training experience as well as two-year fellowship opportunities with a more advanced second year focus on areas of subspecialty interest including research. While the fellowships remain primarily based at one of the TAHSN hospitals, opportunities exist and have been supported for city-wide experience. Many thanks to Drs. Albert Yee, Michael Fehlings, Stephen Lewis, Eric Massicotte, Jeremie Larouche, Chris Nielsen, Joel Finkelstein, Howard Ginsberg, Henry Ahn, and Reinhard Zeller for their valued help in shaping our citywide fellowship training opportunities. Building upon our Canadian Spine Society (CSS) national fellowship curriculum, our Program also continues with supporting and growing a **surgical case log** initiative for our citywide spine fellows. There are over 16,600 cases and procedures recorded since 2015. We thank Drs. Jeremie Larouche, Tony Bateman, and Ms. Nadia Jaber for creating a successful foundational case log tracking program for our citywide fellows.

To formally recognize Spine Surgery as a distinct discipline within the Royal College of Physicians and Surgeons of Canada (RCPSC), we have collaborated with national colleagues to develop an **Area of Focused Competence (AFC) in spine surgery**. The AFC application was approved for national development in November 2021. Since then, a Royal College working group—including leadership and representation from the University of Toronto—has drafted three foundational documents: a Trainee Portfolio outlining core training requirements, a Clinical Training Requirements (CTR) document representing the national curriculum, and Standards of Accreditation for university training centres. These documents are in final review, being translated with English and French versions, and will soon be distributed to Canadian university Postgraduate Medical Education (PGME) offices. Programs can then apply for accreditation, with adult and pediatric training streams available, and a future stream planned for practicing surgeons. Our program is well-positioned to apply and lead this initiative. Special thanks to Drs. Albert Yee, Jeremie Larouche, Michael Fehlings, Scott Paquette, Hamilton Hall, and Ms. Nadia

Jaber for spearheading national engagement with academic spine programs and fellowship directors. This competency-based diploma will enhance surgical education and foster new international collaborations, as several global specialty organizations have already expressed interest in our model.

This year, we launched our academic calendar of events on September 17th with a welcome dinner for our incoming fellows and provided an updated on our citywide research opportunities. Many thanks to Drs. Carlo Ammendolia and Cari Whyne for taking the lead in keeping our spinal community informed related to the progress of spine research being conducted in our program.

On November 1st, Dr. Stephen Lewis once again led our highly anticipated **Annual Fellow Surgical Skills** Course, delivering an immersive experience in advanced spine surgery. Fellows had the opportunity to perform both anterior and posterior approaches using state-of-the-art instrumentation, gaining hands-on expertise in cutting-edge techniques. Over the years, Dr. Lewis, and joined recently by Dr. Chris Nielson also, have elevated this course to include complex procedures such as deformity osteotomy, minimally invasive techniques, and trauma-focused surgery. The day featured a dynamic blend of image-guided wet lab sessions and interactive faculty lectures enriched by current - case discussions.

This year, we were excited to welcome fellows from London and Hamilton, reflecting the growing reach of the course. Special thanks to Dr. Chris Nielsen for co-chairing the event and to Ms. Nadia Jaber for her expert coordination of logistics. We also gratefully acknowledge the continued support of our valued industry partners—Medtronic, Stryker, DePuy Synthes, and Bioventus. Looking ahead, we are thrilled to announce a new collaboration with the Canadian Spine Society that will expand this course nationally, offering training in the fall to all incoming spine fellows across Canada—marking a major milestone in our commitment to surgical education and excellence.

The **Traumatic Spinal Cord Injury Management and Classification** Course was held on January 20th, continuing with a dynamic hybrid learning model. The program integrated pre-recorded lectures, online instructional modules, and an in-person practicum, followed by interactive, case-based discussions. This comprehensive format provided an excellent platform for teaching both clinical and research expertise in TSCI care. Special thanks to Dr. Sukhvinder Kalsi-Ryan and Ms. Nadia Jaber for their outstanding coordination and vision in delivering a successful hybrid educational experience. We also gratefully acknowledge the course faculty—Drs. Michael Fehlings, Jeremie Larouche, Jeff Wilson, and Julio Furlan—whose roles as dedicated educators greatly enriched the program through their deep clinical and research knowledge.

On March 17th, we continued to enrich our residents' surgical education with the annual Royal College **Mock Oral** Course, designed to prepare senior neurosurgery and orthopedic surgery residents for their national Royal College exit examinations. This year, five neurosurgery and ten orthopedic surgery residents participated. Drs. Jeremie Larouche and Jetan Badhiwala once again co-chaired the course, providing outstanding leadership in adapting and advancing the program to align with the evolving structure of the Royal College specialty exams. We extend our sincere thanks to fellow educators Drs. Samuel Yoon, Tiffany Lung, and alumnus Dr. Luke Reda for their invaluable contributions in guiding residents through case-based scenarios and helping them excel in their oral exam preparation.

We are pleased to have continued the annual **Pediatric Spine Deformity Surgery** course for the 3rd year on April 7th . Thanks to Dr. David Lebel for chairing and organizing this well received educational course. Many thanks also to SickKids educators Mike Vandenberk (RNT), Ms. Jennifer Dermott, and Dr. Mark Camp for their outstanding teaching including case-based lectures.

Our academic calendar of events continues to grow with new educational initiatives being added regularly. The new course on **Non-Operative Treatment of Spine Disorder** was launched on December 9th with a successful hybrid model with a combination of lectures on-demand, hands-on session of non-operative treatment, and case-based presentations and discussion. Thanks to Dr. Ammendolia for his leadership in establishing this course, and Dr. Josh Plener for his valued contribution and teaching role.

Throughout the academic year, our Program hosts several world-renowned professors through our well-established Hospital-Based **Visiting Professorship** Series, as well as in collaboration with affiliated hospitals and University programs. In partnership with the Collaborative Program in Neuroscience, we were honored to welcome Dr. Ona Bloom as a Neuroscience Distinguished Lecturer on August 24th. Dr. Bloom delivered an engaging presentation on immunological changes following traumatic spinal cord injury, showcasing her groundbreaking research. Dr. Bloom serves as Director of the Laboratory of Spinal Cord Injury Research at The Feinstein Institutes for Medical Research, Northwell Health, New York.

At the provincial level, under the leadership of Dr. Raj Rampersaud and Dr. Jeremie Larouche, our program—working in collaboration with city-wide surgical colleagues—is actively advancing initiatives to improve **spinal care triage** in response to growing population needs and prolonged wait times for specialist consultation. Key efforts include expanding centralized intake systems and optimizing the role of Advanced Practice Providers (APPs) to address current gaps in clinical care, thereby complementing ongoing enhancements to the provincial Degenerative Spine Quality-Based Procedures (QBP) program. Additionally, the Provincial Neurosurgery Ontario Expert Panel has secured new funding to support accelerated access for urgent cranial and spinal assessments. Broader provincial priorities

remain centered on regionalized care models, streamlined central intake processes, and strategies targeting wait time management, alongside ongoing efforts to bolster workforce recruitment, retention, system capacity, and operational efficiency.

We are proud to celebrate the **graduation** of our **2024–2025 citywide spine fellows**, who will complete their fellowship training in July or later in December. Congratulations to Drs. Muhammad Ali Akbar, Samuel Yoon, Ran Ankory, Shachar Vider, Wassim Mazarieb, Faisal Almatrafi, Ahmed Al-Ahmari, Chloe Cadieux, Tiffany Lung, Abdullah Eissa, Celina Nahanni, Jed Lazarus, Karim Aboelmagd, Ariel Zohar, Abdul Albassam, and Annemarie Versteeg. We extend our warmest wishes for continued success in their professional journeys and look forward to their ongoing involvement in our Program as esteemed alumni.

As we close another remarkable academic year, we extend our heartfelt **gratitude** to the University of Toronto Department of Surgery Spine Program Council, our dedicated educators, and trainees for their unwavering commitment and exceptional contributions to the ongoing success of our Program. We are privileged to draw on the specialized and diverse expertise of our members, and we deeply value the enduring support from the Department of Surgery and the Divisions of Neurosurgery and Orthopedic Surgery. In particular, we thank Dr. Carol Swallow (Chair, Department of Surgery), Dr. Peter Ferguson (Chair, Orthopedic Surgery), and Dr. Jim Rutka (Interim Chair, Neurosurgery) for their steadfast leadership and advocacy for our University-Wide Program.

We also gratefully **acknowledge** the continued partnership of our industry collaborators—Medtronic, DePuy Synthes, Stryker, and Bioventus—whose support has been crucial, particularly during the challenging pandemic years, and continues to enable our academic mission.

Special thanks to Ms. Nadia Jaber, our Program Manager, whose outstanding expertise in technology and communication is integral to the growth and innovation of our Program. Her leadership has been instrumental in implementing new models for delivering academic content, ensuring we remain adaptable in a post-pandemic environment. We also thank our dedicated volunteer, Ms. Jane Lee, for her valuable assistance with fellow case log management and Program coordination.

With sincere appreciation, we celebrate another outstanding year in the U of T Spine Program and wish everyone a safe, restful summer and a successful start to the 2025–2026 academic year.

Sincerely,

Michael Fehlings & Albert Yee

Co-Directors, U of T Spine Program

Agenda

8:00- :8:30 AM	Breakfast	
8:30 - 8:45	Opening Remarks	Dr. Michael Fehlings & Dr. Albert Yee
	Greetings from the U of T	Dr. Peter Ferguson, Dr. Jim Rutka, Dr. Carol Swallow
SESSION I: THE TATOR-HALL VISITING PROFESSOR LECTURE | Chair: Dr Michael Fehlings		
8:45 - 8:55	Remarks from Tator & Hall	Dr. Charles Tator & Dr. Hamilton Hall
8:55 - 9:00	Introduction to Keynote speaker Professor Michael Y. Wang	Dr. Michael Fehlings
9:00 - 9:45	Keynote: "Ultra-MIS Spinal Surgery"	Visiting Professor: Professor Michael Y. Wang, MD, MBA, FAANS
9:45 - 10:00	Discussion	
10:00 - 10:15	Research Projects (Elevator Pitch)	Research Trainees
10:15 - 10:30 AM	Coffee Break	
SESSION II: MIS VS Open | Chair Dr. Stephen Lewis (10 Min Presentation)		
10:30 - 10:40	Incorporating Minimally Invasive Techniques into the Surgical Management of Spine Metastases	Dr. Chris Witiw
10:40 - 10:50	Primary Spine Tumors: m/MIS surgical approaches	Dr. Raj Rampersaud
10:50 - 11:00	Panel discussion	
11:00 - 11:10	Trauma MIS vs Open	Dr. Jeremie Larouche
11:10 - 11:20	Spinal Surgery in Trauma: Open Approach or Risky Business?	Dr. Henry Ahn
11:20 - 11:30	Panel discussion	
11:30 - 11:40	Instrumenting to the pelvis: Do we need to fuse the SI joints?	Dr. Stephen Lewis
11:40 - 11:50	Optimizing intra-operative workflow in scoliosis surgery	Dr. Mark Camp
11:50 - 12:00	Panel discussion	
12:00 - 12:15	Research Projects (Elevator Pitch)	Research Trainees
12:15 - 1:00 PM	Lunch	

SESSION III: RESEARCH TRAINEE PRESENTATIONS | Chair: Dr Albert Yee (10 Min Presentation & 5 Min Discussions)		
a. Invited Trainees		
1:00 - 1:15	Making Sense of Data: Data-Driven Approaches to Clustering 1,2 and 3-Dimensional Clinical Data	Dr. Karlo Pedro (SSTP)
1:15 - 1:30	Natural Progression of Musculoskeletal Imaging-Based Biomarkers in Metastatic Prostate Cancer	Dr. Tayler Declan Ross (SSTP)
1:30 - 1:45	Leveraging real-world data to understand spinal cord injury treatment and outcomes in children and adolescents	Dr. Armaan Malhotra (SSTP)
1:45 - 2:00	A multi-modal approach to track endogenous stem cells in the adult spinal cord: Implications for regenerative medicine	Dr. Laureen Hachem (TWH)
b. Best Abstracts | Oral Presentations		
2:00 - 2:15	Best Abstract, Basic Science Research (1st Place) Transvertebral Passive Imaging of Microbubble Activity in the Ex Vivo Human Spinal Canal	Andrew Frizado, PhD Candidate
2:15 - 2:30	Best Abstract, Clinical Research (1st Place-Tie)Home time and Survival after Surgery for Spinal Metastases: Development and Validation of the Home time and Overall survival after Metastatic spine surgery Estimator (HOME score)	Dr. Husain Shakil, MD MsC, PGY 4 Neurosurgery
2:30 - 2:45	Best Abstract, Clinical Research (1st Place-Tie) Surgical Intervention Enhances Social Function in Older Adult Spinal Deformity Patients: A PEEDS Database Study	Lauren Daunt, HBSc
AWARD PRESENTATIONS | Fehlings & Yee		
2:45	Award Presentation & Closing Remarks	
3:00 PM	Wrap up	

Bios

Tator & Hall

Dr. Charles Tator is a Professor in the Department of Surgery, at the University of Toronto, and a neurosurgeon at the Toronto Western Hospital. He is the former Chair of Neurosurgery at the University of Toronto. He started the first Acute Spinal Cord Injury Unit in Canada in 1974, and has reported on the epidemiology, prevention and treatment of spinal cord injury. He has undertaken seminal translational and clinical research in spinal cord injury. In 1992, he founded ThinkFirst, Canada, a national brain and spinal cord injury foundation whose mission is to reduce the incidence of catastrophic injuries in Canada. In 2012, ThinkFirst merged with three other charities to form Parachute Canada, the country's foremost injury prevention agency, of which he is a founding Director. In 2008, the University of Toronto Press published his book "Catastrophic Injuries in Sports and Recreation, Causes and Prevention-a Canadian Study." He has held two research chairs at the University of Toronto, the Dan Family Chair in Neurosurgery and the Campeau Family-Charles Tator Chair in Brain and Spinal Cord Research. In 2000, he received the Order of Canada, and in 2009 he was inducted into the Canadian Medical Hall of Fame. In 2017, he was promoted to Officer within the Order of Canada, and was also inducted into Canada's Sports Hall of Fame for his work on prevention of sports injuries. In 2025, he was awarded the King Charles Medal for his work in spinal cord and concussion injuries

Dr. Hamilton Hall is a Professor Emeritus in the Department of Surgery at the University of Toronto. He completed his medical degree at the University of Toronto then joined CARE and was stationed at a rural hospital in Malaysia. Dr. Hall returned to Toronto for his orthopaedic residency which concluded with a fellowship in medical education at the University of Dundee, Scotland. In 1974, because of his interest in patient education and rehabilitation, Dr. Hall founded the Canadian Back Institute which expanded into the CBI Health, now the largest home care and rehabilitation company in Canada. He is co-founder and Executive Director of the Canadian Spine Society and has served on the editorial boards of Spine, The Spine Journal and The

BackLetter. Dr. Hamilton Hall has worked as a team physician for the NBA Toronto Raptors and doctor for the National Ballet of Canada.

Dr. Hall has received Outstanding Paper and Poster awards from the North American Spine Society and the International Society for the Study of the Lumbar Spine. He is a recipient of the Laurie Chute Award for Best Undergraduate Clinical Lecturer Award at the University of Toronto, the NASS Henry Farfan Award for outstanding contributions to the field of spine care and two Lifetime Achievement Awards, one from Stryker Spine and the other from the Canadian Spine Society. In 2019 he was inducted into the Toronto Orthopaedic Hall of Fame.

Dr. Hall's concept of a syndrome approach to classifying mechanical back pain is an essential component of several Canadian provincial initiatives to improve spine care. In addition to over 140 published articles and book chapters and over 1200 invited presentations, many as Visiting Professor, to universities in North America, Europe and Asia, he is author of the best-selling Back Doctor series of books for the lay public.

U of T Spine Program | Co-Chairs

Dr. Fehlings is the Vice Chair Research for the Department of Surgery at the University of Toronto and a Neurosurgeon at Toronto Western Hospital, University Health Network. Dr. Fehlings is a Professor of Neurosurgery at the University of Toronto, holds the Robert Campeau Family Foundation / Dr. C.H. Tator Chair in Brain and Spinal Cord Research at UHN, is a Senior Scientist at the Krembil Brain Institute and is Editor-in-Chief of Spinal Cord. In the fall of 2008, Dr. Fehlings was appointed the inaugural Director of the University of Toronto Neuroscience Program (which he held until June 2012) and is currently Co-Director of the University of Toronto Spine Program. Dr. Fehlings combines an active clinical practice in complex spinal surgery with a translationally oriented research program focused on discovering novel treatments to improve functional outcomes following spinal cord injury (SCI). He has published over 1,100 peer-reviewed articles (h-index 133; cited over 70,000 times) chiefly in the area of central nervous system injury and complex spinal surgery. His seminal 1991 paper, cited over 2,000 times, outlined the severe and lasting consequences of SCI due to a cascade of secondary injury mechanisms following the initial trauma. His research on secondary injury mechanisms ultimately led to the commencement of the multicenter, international Surgical Timing in Acute Spinal Cord Injury Study (STASCIS), aimed at establishing the

need for early surgical decompression to prevent the negative effects of the secondary injury cascade. His work examining the use of regenerative approaches including neural stem cells to repair the injured nervous system has led to numerous international awards and has helped lead the field toward clinical translation in this area. Dr. Fehlings has published in prominent journals such as Nature, Nature Neuroscience, Lancet Neurology, and Science Translational Medicine.

Dr. Michael Fehlings has received numerous prestigious awards including the Gold Medal in Surgery from the Royal College of Physicians and Surgeons (1996), nomination to the Who's Who list of the 1000 most influential scientists of the 21st century (2001), the Lister Award in Surgical Research (2006), the Leon Wiltse Award from the North American Spine Society for excellence in leadership and/or clinical research in spine care (2009), the Olivecrona Award (2009) -- the top award internationally for neurosurgeons and neuroscientists awarded by the Nobel Institute at the Karolinska Institute in Stockholm for his important contributions in CNS injury repair and regeneration, the Reeve-Irvine Research Medal in Spinal Cord Injury (2012), the Golden Axon Leadership Award (2012), the Mac Keith Basic Science Lectureship Award for significant contributions to the basic science of cerebral palsy and childhood onset disabilities (2012), and was the Mayfield Lecturer (2012). In 2012, Dr. Fehlings served as the 40th President of the Cervical Spine Research Society (CSRS) -- the only Canadian to do so -- and was honoured with the CSRS Presidential Medallion for outstanding leadership and contributions to cervical spine research. In 2013, Dr. Fehlings was honoured with the Queen Elizabeth II Diamond Jubilee Medal presented to him by the Honourable Stephen Harper, the H. Richard Winn Prize from the Society of Neurological Surgeons, the Jonas Salk Award for Scientific Achievements from the March of Dimes Canada and the Henry Farfan Award from the North American Spine Society. In 2014, Dr. Fehlings was elected to the Fellowship of the Royal Society of Canada and to the Canadian Academy of Health Sciences, and in 2016 won the Royal College of Physicians and Surgeons Mentor of the Year Award. In 2019, the Right Honourable Jacinda Ardern, Prime Minister of New Zealand, presented him with the Ryman Prize for his work enhancing the quality of life for older people. He also received the Vilhelm Magnus Medal (2019) for his contributions to the neurosurgery field and the American Spinal Injury Association Apple Award (2016 & 2022) for excellence in spinal cord injury research publishing. In 2025 Dr. Fehlings was awarded the King Charles III Coronation Medal.

Dr. Albert Yee is the Holland Bone and Joint Program Chief and the Head of the Division of Orthopaedic Surgery at Sunnybrook Health Sciences Centre, where he holds the Marvin Tile Chair in Orthopaedic Surgery. Dr. Yee is an Orthopaedic Spine Surgeon at Sunnybrook Health Sciences Centre, an Associate Scientist (Physical Sciences Platform) at Sunnybrook Research Institute and a Consultant in Surgical Oncology, Bone Metastasis Clinic, Odette Cancer Centre. He is a Professor in the University of Toronto Department of Surgery, Temerty Faculty of Medicine and Co-Director of the Department's Spine Program. Dr. Yee has been a Past President of the Canadian Orthopaedic Research Society and the Canadian Spine Society as well as a Past Co-Chair of Bone & Joint Canada. He has received the American British Canadian (ABC) International Travelling Fellowship distinction (American Orthopaedic Association / Canadian Orthopaedic Association, 2013), the Charles H. Tator Surgeon-Scientist Mentoring Award (2012), and the Canadian Orthopaedic Foundation J. Edouard Samson Award (2011). Dr. Yee has focused translational orthopaedic research utilizing pre-clinical surgical models to evaluate novel minimally invasive vertebral metastatic therapies (e.g., Photodynamic Therapy, Radiofrequency Ablation). His work has led to first in human clinical trials and FDA approval with commercialization of new minimally invasive spine technology. More recently he has been working with colleagues around the country towards establishing and implementing an Area of Focused Competence AFC Diploma in recognition of Canadian spine surgical fellowship training.

Keynote Speaker | Tator - Hall Lectureship

Dr. Michael Wang was born in Scottsdale, Arizona and spent his childhood in Atlanta, Georgia. He attended Stanford University in Palo Alto, California where received both his BS and MD degrees. He completed his residency at the University of Southern California/LA County General Hospital and a Fellowship at the University of Miami under Drs. Barth Green and Allan Levi. He then went on to become the Spine Program Director and Spine Fellowship Director at the USC. In 2007 he moved to South Florida and currently serves as a Professor in the Departments of Neurological Surgery and Rehabilitation Medicine at the University of Miami, Miller School of Medicine. He is the Director of Neurosurgery at University of Miami Hospital and the Spine Fellowship Director.

Dr. Wang has been an advocate for neurosurgeons and spinal surgeons. He was elected to the AANS Young Neurosurgeons Executive Committee in 2003, and in the AANS he served as Local Host for the 2010 Annual Meeting, Chair of NREF Development, member of the Committee on Diversity, Scientific Program Chair in 2022, and Annual Meeting Chair in 2023. In the AANS/CNS Joint Section on Disorders of the Spine & Peripheral Nerves (DSPN) he has served as Chair of the Section, Treasurer, and SPC/AMC. In the CNS he has served as the Membership Chair and Public Relations Chair. He has been Secretary/Treasurer, Vice President, and President of the Society of University Neurosurgeons (SUNS). Within the North American Spine Society (NASS) he served as the Chair of the MIP (minimally invasive procedures) and Scientific Program Chair. He has served in numerous other leadership roles, including President of the International Society for the Advancement of Spinal Surgery (ISASS), President of the Society for Minimally Invasive Spine Surgery (SMISS), and President of the Spine Division of the USA Enhanced Recovery After Surgery (ERAS) Society.

Dr. Wang sat on several editorial review boards, including Neurosurgery, The Journal of Spinal Disorders & Techniques, World Neurosurgery, Acta Neurochirurgica, Spinal Cord, the Journal of Spinal Cord Medicine, Neurosurgical Focus, Contemporary Spine Surgery, and the Journal of Neurosurgery: Spine. His research and clinical interests include minimally invasive spinal surgery, spinal deformity, new technologies, ERAS, robotics, and spinal cord injury biomarkers. Dr. Wang has given over 1,000 lectures

and presentations. He has edited 15 medical textbooks and authored over 800 publications in the medical literature, over 350 of which are peer-reviewed.

Invited Speakers

Dr. Christopher Witiw is a staff neurosurgeon at St. Michael's Hospital in Toronto and an Assistant Professor in the Division of Neurosurgery at the University of Toronto. His clinical practice focuses on complex and minimally invasive spine surgery with a particular focus on minimally invasive surgery for spinal oncology. His academic interests are in Health Economics and Health Services delivery with much of his attention directed toward the applications of artificial intelligence to facilitate the optimization of surgical care in neurotrauma.

Dr. Y. Raja Rampersaud is a national and international leader in musculoskeletal advocacy and research. His research is particularly aimed at improvements in the delivery, prognostication, and outcomes of patient centered spine and musculoskeletal care. He is an advocate for primary-to-tertiary interprofessional models of care and has developed an Inter-professional Spine Assessment and Education Clinic (ISAEC) program which has been provincially implemented as the Rapid Access Clinics – Low Back Pain Pathway. He has over 2 decades of experience working collaboratively with interprofessional health care stakeholders including patients, health quality Ontario, and the ministry of health. He is a past president of the Canadian Spine Society. He is also a founding member and current Chair for the Canadian Spine Outcomes and Research Network (CSORN). From a translation perspective he is a leader in prognostic research focusing on biopsychosocial phenotyping and molecular endotyping patients' with chronic pain from musculoskeletal disorders.

Dr. Jeremie Larouche first completed a fellowship in Orthopaedic Trauma at the University of British Columbia, before returning to Toronto to complete a Spine surgery fellowship at Sunnybrook Health Sciences Centre. Dr. Larouche began his academic career at the University of California San Francisco, where he was hired as an Assistant Professor of Clinical Orthopaedics. There, he worked at the Zuckerberg San Francisco General Hospital & Trauma Center, where he specialized in providing care to poly- traumatized patients with complex orthopaedic and spine injuries. Dr. Larouche is now working out of Sunnybrook Health Sciences Centre. He is recently completed a Master of Science degree in Quality Improvement and Patient Safety. His clinical interest focuses on orthopaedic trauma, spine trauma, and spinal oncology.

Dr. Henry Ahn practices at St Michael's Hospital a level 1 trauma centre with a clinical focus on the management of spinal column trauma, spinal cord injury in patients with multiple system injuries along with the surgical management of adult spinal disorders. Dr. Ahn is cross appointed as an associate scientist in the Li Ka Shing Knowledge Institute with a focus in the clinical epidemiology of spinal cord injury and spine trauma.

Dr. Stephen Lewis is a spine orthopaedic surgeon and the Spine Program Lead at the Toronto Western Hospital (TWH). He is Associate Professor of Orthopaedic Surgery at the University of Toronto (U of T) Department of Surgery. Dr. Lewis' clinical practice focused on spinal deformities at TWH. He has held a number of key leadership roles. He is the current Chairman of the AO Spine Knowledge Forum Deformity, and past Chair of the Scoliosis Research Society (SRS) Adult Deformity Committee and Awards committee. He is also sitting on a numerous spine committee including Worldwide Course committee, and U of T Spine Program Council and education and research committee. Dr. Lewis serves as abstract reviewer for international meetings including SRS, IMAST, and NA Spine Society. Dr Lewis is a researcher and clinical investigator at the Krembil Research Institute with research focus on spine deformity. He has led several multi-centre international prospective studies through AO Spine, including the elderly spinal deformity surgery study, and the study of interpretation and management of intra-operative multi-modality neuromonitoring. Dr

Lewis' has a longstanding and active leading role, locally and internationally, in education and teaching, particularly in spine deformity surgery. He has trained over 200 surgeons in-training and hosted a number of international surgeons in-practice. He is active in designing several complex spine surgery instrumentations, including osteotomy set. Dr Lewis is on editorial board and reviewing committee for the Spinal Deformity Journal and the Spine Journal. He has received numerous international awards for outstanding research papers including Whitecloud Award, Russell S. Hibbs Clinical Award, NASS Award, and CSS Deborah Scarlett Award. He also has received several awards for excellence in teaching including Best Teacher Award from U of T Spine Program, and Individual Teaching Excellence Award from the Department of Surgery, and the Centre of Excellence Award from the AO Spine.

Dr. Mark Camp's clinical and academic program focuses on paediatric spinal deformity and paediatric orthopaedic trauma. He completed his Bachelor of Science at the Western University and completed medical school at Queen's University. During residency at the University of Toronto, he completed a Master of Science degree through the Surgeon Scientist Program and Royal College Clinician Investigator Program. Following his residency, he sub-specialized with a fellowship in paediatric orthopaedic surgery focusing on cerebral palsy and spine surgery under Professor Kerr Graham and Mr. Ian Torode at the Royal Children's Hospital in Melbourne, Australia. He is a highly regarded educator, with invited lectureships given nationally and internationally, and is a recipient multiple teaching awards for his contributions to surgical education.

Invited Research Trainees Presentations

Dr. Karlo Pedro currently serves as a clinical and research fellow at Toronto Western Hospital. Following his medical degree (cum laude) and neurosurgery training at the University of the Philippines, he pursued a spine fellowship at Toronto Western Hospital in 2021. He then further specialized in neurotrauma and critical care at Montreal General Hospital & Montreal Neurological Institute -McGill University. Karlo has garnered multiple local and international awards including the 2025 CSRS-Europe Mario Boni Award, CNS Fessler Award, Charlie Kuntz Scholarship, and the UHN Sopman Humanitarian Award. He aspires to make significant contributions as an academic spinal neurosurgeon and is currently pursuing a PhD degree from University of Toronto

through the Surgeon-Scientist Training Program under the mentorship of Dr. Michael Fehlings. Karlo's research interest focuses on the application of innovative statistical and modeling techniques to comprehensively analyze the multidimensional clinical signatures and outcomes of spine patients.

Dr. Declan Ross is an orthopaedic surgery resident at the University of Toronto. He is currently pursuing an MSc in Medical Sciences under the mentorship of Dr. Cari Whyne and Dr. Michael Hardisty through the Clinician Investigator and Surgeon Scientist Training Programs. His research focuses on utilizing musculoskeletal imaging-based biomarkers to assess patient outcomes. Specifically, his MSc research investigates the natural progression of imaging-based biomarkers in metastatic prostate cancer.

Dr. Armaan Malhotra is a fourth-year neurosurgery resident who is completing PhD studies at the Institute for Health Policy, Management and Evaluation at the University of Toronto focused on neurotrauma outcome assessment. He is interested in applying observational methods and artificial intelligence to better characterize the impact of brain and spinal trauma. He will pursue future pediatric neurosurgery fellowship training and aspires to a surgeon scientist career.

Dr. Laureen Hachem is a senior neurosurgery resident at the University of Toronto. She completed her medical training at the University of Toronto, after beginning her undergraduate studies in neurosciences there, as well. During residency, she completed a PhD through the Surgeon-Scientist Program studying regenerative strategies to enhance plasticity in the injured central nervous system with a specific focus on the mechanisms of endogenous neural stem cell activation after traumatic spinal cord injury. Her research is supported by grants from the Canadian Institutes of Health Research (CIHR), American Academy of Neurological Surgeons/Neurosurgery Research & Education Foundation, and Physicians Services Incorporated Foundation. Laureen has received numerous recognitions including a Vanier Scholarship (CIHR), AANS/CNS Neurotrauma/Critical Care Section Research Award, the Starr Medal (UofT), Kuntz Scholar Award (AANS/CNS Spine/Peripheral Nerve Section), the Charles Tator Spinal Cord Injury Resident

Research Award (AANS/CNS Neurotrauma/Critical Care Section) and the K.G. McKenzie 1st Place Basic Science Research Prize (Canadian Neurosurgical Society). She will be pursuing fellowship training in complex/minimally invasive spinal surgery at the University of Miami in 2026-2027.

Best Abstracts | Oral Presentations

Best Abstract (1st Place, Basic Science)

Andrew Frizado is currently a PhD candidate in the Department of Medical Biophysics at University of Toronto. He earned his undergraduate degree in Engineering Physics from Queen's University in 2019. Under the supervision of Dr. Meaghan O'Reilly in the Focused Ultrasound Laboratory at the Sunnybrook Research Institute, his research focuses on developing ultrasound-based image-guidance for focused ultrasound therapy of the spinal cord. His work involves a combination of computational modeling, studies using ex vivo human tissue, and in vivo experiments in large animal models.

Best Abstract (1st Place, Tie Clinical)

Dr. Husain Shakil is a neurosurgery resident and surgeon scientist trainee at the University of Toronto. He is currently completing a PhD in Clinical Epidemiology and Health Care Research at the Institute of Health Policy, Management and Evaluation. His research interests include health outcome evaluation and prediction using population health data, and care delivery optimization using a combination of economic and machine learning methods. His clinical interests are in spine oncology.

Best Abstract (1st Place, Tie Clinical)

Lauren Daunt is a third-year undergraduate student at the University of Toronto pursuing an Honours Bachelor of Science in Human Biology, Physiology, and Immunology. Under the supervision of Dr. Stephen Lewis at Toronto Western Hospital, her research focuses on social function outcomes in older adult patients undergoing surgical correction for adult spinal deformity (ASD). In addition, Lauren is a Research Assistant at the Banting and Best Centre for Diabetes, where she investigates the use of sodium-glucose cotransporter 2 (SGLT2) inhibitors in kidney transplant recipients. She was recently awarded the Charles Hollenberg Summer Studentship for her contributions. Lauren is passionate about bridging clinical research with patient-centered outcomes and hopes to further pursue these interests throughout her undergraduate studies.

Organizing Team

Nadia Jaber serves as the Manager of the University of Toronto Spine Program, overseeing operations, communications, fundraising, and the coordination of educational and knowledge translation platforms. She holds a BA in English Literature from Philadelphia University (Amman, 1997) and a Master of Information Studies from the University of Toronto (2010). In 2022–2023, she furthered her professional development with training in Entrepreneurship and Leadership from Harvard Business School Online. Nadia brings a unique blend of academic, organizational, and strategic expertise to continuously enrich the spine fellowship training experience.

Jane Lee is a valued volunteer at the University of Toronto Spine Program. Jane is completing her Honours Bachelor of Science in Biology and Immunology at the University of Toronto. Jane started volunteering in 2024 to gain exposure to spine care and learn more about research and education initiatives in the Program. Jane has enjoyed her time helping Nadia plan and organize activities and events, and she is grateful for the knowledge and experience she gained.

Scientific Abstracts

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1	Christopher S Lozano, Vishwathsen Karthikeyan, Armaan K Malhotra, Husain Shakil, Abdullah Ishaque, Jasleen Saini, Yingshi He, Eva Y Yuan, Jetan H Badhiwala, Michael G Fehlings, Jefferson R Wilson, Christopher D Witiw	Laminoplasty compared to laminectomy and fusion for degenerative cervical myelopathy: a cost-utility analysis
2	Christopher S Lozano, Husain Shakil, Vishwathsen Karthikeyan, Armaan K Malhotra, Jefferson R Wilson	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
3	Mehraein Roointan, Andrea Mothe, and Charles Tator	The Effect of Roflumilast on Regeneration and Functional Recovery in a Rat Model of Cervical Spinal Cord Injury
4	Vishwathsen Karthikeyan, Christopher S. Lozano, Husain Shakil, Armaan K. Malhotra, Jetan H. Badhiwala, Ahmad, Essa, Jefferson R. Wilson, Christopher D. Witiw	Insurance-Related Disparities in Post-Discharge Disposition and Hospital Length of Stay Following Spinal Cord Injury: A Retrospective Cohort Study
5	Andrew Frizado, Meaghan O'Reilly	Transvertebral Passive Imaging of Microbubble Activity in the Ex Vivo Human Spinal Canal
6	Dawit Gulta, Geoff Klein, Tayler D Ross, Matthew Rezkalla, Daniel M- Palhare, Laura Burgess, Jay Detsky, Arjun Sahgal, Stephen Chen, Cari M. Whyne, Michael Hardisty	Vertebral Fracture Risk in Spinal Metastases Patients Following Stereotactic Body Radiotherapy Using Quantitative Imaging Data and Machine Learning
7	Mahsa Mokhlesabadi, Danielle M Charron, Cynthia Hawkins, Meaghan A O'Reilly	Assessing the Sensitivity Variations between Healthy Spinal Cord and Intramedullary F98 Glioma to treatment with Focused Ultrasound and Microbubbles
8	Husain Shakil, Armaan K. Malhotra, Vishwathsen Karthikeyan, Christopher S. Lozano, Jetan H. Badhiwala, Arjun Sahgal, Nicolas Dea, Michael G. Fehlings, Alexander Kiss, Christopher D. Witiw, Donald A. Redelmeier, Jefferson R. Wilson	Home time and Survival after Surgery for Spinal Metastases: Development and Validation of the Home time and Overall survival after Metastatic spine surgery Estimator (HOME score)
9	Daniel Moore-Palhares, K Liang Zeng, Chia-Lin Tseng, Hanbo Chen, Sten Myrehaug, Hany Soliman, Pejman Maralani, Jeremie Larouche, Mark Ruschin, Beibei Zhang, Eshetu G Atenafu, Jay Detsky, Arjun Sahgal	Stereotactic body radiotherapy (SBRT) for Sacral Metastases: a detailed patterns-of-failure analysis
10	Yessica Castano, Saleh Tabatabaei, Tayler D. Ross, Geoff Klein, Stephen Chen, Cari M. Whyne, Jay Detsky, Arjun Sahgal, Michael Hardisty	Characterization of Osteosarcopenia in Spinal Metastases Patients to Be Treated With Stereotactic Body Radiotherapy Using Quantitative Image-Based AI-Derived Biomarkers
11	Omar I. Hassan, Soichiro Takamiya, Azam Asgarihafshejani, Mohammad Zavvarian, Akshat Modi, Tetsuhiko Mimura, James Hong, Michael G. Fehlings	Torsemide Enhances Functional Recovery After Cervical Spinal Cord Injury by Modulating NKCC1-Mediated Hyperexcitability

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13	Karim Aboelmagd, Anne Versteeg, Mark Camp, Reinhard Zeller, David Lebel	High-grade Paediatric Spondylolisthesis: Pelvic Retroversion Corrects Spontaneously After In-situ Posterior Spinal Fusion
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21	Abdullah Eissa, So Kato, Lawrence Lenke, Kristen Jones, Sigurd Berven, Christopher J. Nielsen , Saumyajit Basu, Michael Kelly, Justin Smith, Samuel Strantzas, Yong Qiu, Ferran Pellise, Ahmet Alanay, Nasir Quraishi, Randolph Gray, Go Yoshida, Amer Aziz, Stephen Lewis	Role of Somatosensory Evoked Potential (SSEP) in Enhancing Intraoperative Neuromonitoring for Spinal Deformity Surgery - Results from a Prospective Multicenter Study
22	Abdullah Eissa, So Kato, Lawrence Lenke, Kristen Jones, Sigurd Berven, Christopher J. Nielsen, Saumyajit Basu, Michael Kelly, Justin Smith, Samuel Strantzas, Yong Qiu, Ferran Pellise, Ahmet Alanay, Nasir Quraishi, Randolph Gray, Go Yoshida, Amer Aziz, Stephen Lewis	Is a 50% Loss in IONM signal the appropriate threshold in spinal deformity surgery?
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27	Tiffany Lung, Chloe Cadieux, Jed Lazarus, Jin Tong Du, Norah Matthies, Christopher Nielsen, Raja Rampersaud	Elevated preoperative HbA1c is associated with perioperative glucose dysregulation in spine surgery patients.

Abstract # 1

Title: Laminoplasty compared to laminectomy and fusion for degenerative cervical myelopathy: a cost-utility analysis

Authors and Affiliations: Christopher S Lozano[a,b,c], Vishwathsen Karthikeyan[a,b,c], Armaan K Malhotra [a,b,c] Husain Shakil[a,b,c], Abdullah Ishaque[a], Jasleen Saini[a,b,c], Yingshi He[a], Eva Y Yuan[a], Jetan H Badhiwala [a,d], Michael G Fehlings[a,e], Jefferson R Wilson[a,b,c], Christopher D Witiw[a,b,c]

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Purpose: Degenerative cervical myelopathy (DCM) often necessitates surgical intervention to decompress the spinal cord and prevent deterioration. This study evaluates the cost-utility of laminoplasty (LP) versus laminectomy with fusion (LF) from a healthcare payer perspective, aiming to guide clinical and economic decision-making.

Methods: A time-homogeneous Markov state transition model with a lifelong horizon was developed, incorporating data from three multicenter, prospective DCM studies (368 patients total: 120 receiving LP, 248 receiving LF). Patients had complete baseline and one-year data, including SF-36 measures converted to SF-6D utilities. Direct costs, assessed in 2022 USD, captured index surgery, hospitalization, complications, and revisions. We calculated incremental cost-utility ratios (ICURs) and net monetary benefits (NMBs) using a $100,000 willingness-to-pay (WTP) threshold. Sensitivity analyses encompassed deterministic one-way and two-way variations, along with Monte Carlo microsimulations.

Results: A total of 378 patients met inclusion criteria, with 120 undergoing LP and 248 undergoing LF. The distribution of myelopathy severity was comparable between groups (p=0.5), although patients in the LF cohort had a higher overall comorbidity burden (p=0.001). At one-year follow-up, 70% of LP recipients

and 60% of LF recipients met responder criteria (p=0.075). In the base-case, LP had a mean lifetime cost of $28,510 and yielded 1.68 QALYs, whereas LF cost $43,630 with 1.74 QALYs gained for an incremental cost of $15,120 for 0.06 additional QALYs gained. This resulted in an ICUR of $269,561 per QALY, above the $100,000 willingness-to-pay threshold, favoring LP. Probabilistic sensitivity analysis indicated LP was the optimal strategy in 62% of simulations. The net monetary benefit also favored LP by $9,458, though small variations in cost or utility inputs shifted the preferred approach in sensitivity analyses.

Conclusions: Both LP and LF offer substantial clinical benefit for DCM, but LP emerged more frequently as the more economic approach, within the assumptions of our model. These findings should be interpreted with caution given that important patient-level factors such as alignment were not modeled and small variations in model inputs could influence the outcome. Consequently, surgical decisions should account for individual patient characteristics, and future research with more detailed, extended follow-up and robust cost data is needed to refine these conclusions and guide optimal management for DCM.

Abstract # 2

Title: 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

Authors and Affiliations: Christopher S Lozano [a,b,c], Husain Shakil[a,b,] Vishwathsen Karthikeyan[a,b,c], Armaan K Malhotra[a,b,c], Jefferson R Wilson[a,b,c]

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Purpose: Degenerative cervical myelopathy (DCM) is the leading cause of non-traumatic spinal cord dysfunction in adults worldwide, and surgical decompression is the standard treatment in moderate, severe, or progressive cases. Minimal Clinically Important Differences (MCIDs) aid in interpreting meaningful changes in patient-reported outcomes (PROs). However, the influence of baseline myelopathy severity on MCIDs in DCM remains unclear. This study aimed to determine MCIDs for the Short Form-12 Physical Component Summary (SF-12 PCS), Short Form-12 Mental Component Summary (SF-12 MCS), and Neck Disability Index (NDI) in surgically treated DCM patients and to assess whether MCIDs differ by baseline disease severity.

Methods: We retrospectively analyzed prospectively collected data from the Canadian Spine Outcomes and Research Network (CSORN) on patients undergoing surgery for DCM between 2015 and 2023. Baseline modified Japanese Orthopaedic Association (mJOA) scores and complete 3- or 12-month follow-up data, including PRO measures and domain-specific anchor question responses, were required. Baseline myelopathy severity was categorized as mild (mJOA ≥15), moderate (mJOA 12–14), or severe (mJOA <12). MCIDs were derived using an anchor-based receiver operating characteristic (ROC) curve approach, defining responders by comparing those who reported "completely" improved to those indicating "somewhat" improved to domain-specific anchoring questions. The area under the curve (AUC) evaluated discriminative ability, and bootstrapping provided 95% confidence intervals (CIs).

Results: A total of 290 patients met inclusion criteria: 77 (26.6%) were mild, 120 (41.4%) moderate, and 93 (32.1%) severe. In the overall cohort, the MCID was 8.89 (95% CI: 7.49–10.90) for SF-12 PCS, 4.32 (95% CI: 2.33–5.58) for SF-12 MCS, and 13.5 (95% CI: 11.5–15.5) for NDI. When stratified by severity, MCIDs for SF-12 PCS rose from 4.77 (mild) to 8.43 (moderate) and 14.8 (severe), while NDI MCIDs increased from 10.5 (mild) to 15.0 (moderate) and 17.5 (severe). SF-12 MCS thresholds showed no significant variation across severity groups.

Conclusions: MCID values for SF-12 PCS and NDI in DCM patients appear to increase with baseline disease severity, whereas SF-12 MCS remained relatively stable. These findings demonstrate the need to account for baseline severity when applying MCIDs to surgical DCM patients, thereby enhancing the accuracy of outcome interpretation and facilitating more personalized treatment goals.

Abstract # 3

Title: The Effect of Roflumilast on Regeneration and Functional Recovery in a Rat Model of Cervical Spinal Cord Injury

Authors and Affiliations: Mehraein Roointan[1,2], Andrea Mothe[1], and Charles Tator[1,2,3].

[1] Krembil Research Institute, University Health Network, Toronto ON;
[2] Institute of Medical Science, University of Toronto, Toronto, ON, Canada;
[3] Department of Surgery, Division of Neurosurgery, University of Toronto ON, Canada.

Purpose: Spinal cord injury (SCI) is a life-altering condition with limited recovery prospects. Cervical SCIs (CSCIs) result in severe impairments and death. Secondary injury events, including neuroinflammation, cell death, and glial scar formation, inhibit repair and regeneration. Stimulating

endogenous ependymal neural stem/progenitor cells (epNSPCs) in the spinal cord to differentiate into neurons is a promising therapeutic strategy. Cyclic adenosine monophosphate (cAMP) regulates inflammation and repair processes. Post-SCI, phosphodiesterase-4 (PDE4) enzymes hydrolyze cAMP, impeding recovery. Roflumilast, an FDA-approved PDE4 inhibitor, prevents cAMP degradation. In models of brain injury and thoracic SCI, Roflumilast has shown anti-inflammatory effects and improved outcomes. However, its efficacy in CSCI models and its effect on epNSPCs remain unexplored. To assess the effect of Roflumilast on cultured and endogenous epNSPCS and functional recovery in a CSCI rat model. The **purpose** is to assess the effect of Roflumilast on cultured and endogenous epNSPCS and functional recovery in a CSCI rat model. **Hypothesis**: We hypothesize that Roflumilast will enhance epNSPC proliferation and promote functional recovery.

Results: Both in-vitro and in-vivo experiments showed increased epNSPC proliferation with Roflumilast. By 1-week post- SCI, the Roflumilast group had a significantly higher BBB score of 8, indicating plantar paw placement with no weight support, compared to the control group's score of 5, indicating slight hindlimb movement. This improvement highlights Roflumilast's potential in enhancing functional recovery. In the following weeks the rats treated with Roflumilast continued to have a better performance compared to the control group.

Conclusions: Our findings support the hypothesis that Roflumilast activates and enhances epNSPC proliferation, potentially contributing to recovery. This study suggests that Roflumilast, an FDA-approved drug, could be repurposed for SCI treatment to improve functional recovery and expedite clinical trials.

Abstract # 4

Title: Insurance-Related Disparities in Post-Discharge Disposition and Hospital Length of Stay Following Spinal Cord Injury: A Retrospective Cohort Study

Authors and Affiliations: Vishwathsen Karthikeyan, MD[1,2,3], Christopher S. Lozano, MD[1,2,3], Husain Shakil, MD, MSc[1,2,3], Armaan K. Malhotra, MD[1,2,3], Jetan H. Badhiwala, MD, PhD[1,4], Ahmad, Essa, MD, MPH [5,6], Jefferson R. Wilson, MD, PhD[1,2,3], MD [9,10,11], Christopher D. Witiw, MD, MS [1,2,3]

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[6.] Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

Purpose: Traumatic spinal cord injury (SCI) has been estimated to affect 1.3 million individuals in North America and imposes a significant economic and health burden. Patients with SCI often require specialized care and rehabilitation to optimize long-term recovery. Insurance status is a well-documented modifiable determinant of healthcare access, influencing both the ability to receive timely rehabilitation and the financial strain associated with prolonged hospital stays. This study aimed to examine the association between insurance status and both post-discharge disposition and hospital length of stay (LOS) in patients with SCI.

Methods: A retrospective cohort study was conducted using the American College of Surgeons Trauma Quality Improvement Program (TQIP) data from 2010-2020. Adult patients (≥16 years) with SCI were included. Insurance status was categorized as private, public, or uninsured. The primary outcome was post-discharge disposition, classified as home, healthcare facility, hospice, long-term care/rehabilitation, or other. The secondary outcome was LOS. Multilevel logistic regression was used to evaluate the association between insurance status and the likelihood of discharge home, while linear mixed-effects regression assessed LOS, adjusting for patient demographics, injury characteristics, and hospital factors.

Results: Among 46,764 patients, 20,722 (44%) had private insurance, 20,818 (44%) had public insurance, and 5,224 (11%) were uninsured. In total, 9,644 (21%) were discharged home, 28,294 (61%) to long-term care/rehabilitation, and 7,637 (16%) to other healthcare facilities. Uninsured patients had the highest likelihood of home discharge compared to those with private insurance (OR 2.46, 95% CI 1.36-4.43, $p = 0.003$), followed by publicly insured patients (OR 1.51, 95% CI 1.04-2.18, $p = 0.029$). LOS was significantly longer for both uninsured ($\beta = 2.95$ days, 95% CI 2.49-3.41, $p < 0.001$) and publicly insured ($\beta = 2.96$ days, 95% CI 2.65-3.26, $p < 0.001$) patients compared to privately insured individuals.

Conclusions: Insurance status is associated with discharge disposition and LOS in patients with traumatic SCI. Uninsured and publicly insured patients were more likely to be discharged home and experienced longer hospitalizations, which may reflect barriers to accessing post-acute care. These findings highlight the need for policies aimed at improving equitable access to rehabilitation services and reducing disparities in care transitions.

Abstract # 5

Title: Transvertebral Passive Imaging of Microbubble Activity in the Ex Vivo Human Spinal Canal

Authors and Affiliations: Andrew Frizado (Physical Sciences Platform - Sunnybrook Research Institute, Department of Medical Biophysics – University of Toronto), Meaghan O'Reilly, PhD (Physical Sciences Platform - Sunnybrook Research Institute, Department of Medical Biophysics – University of Toronto)

Purpose: Focused ultrasound (FUS), in combination with ultrasound contrast agents (i.e. microbubbles), has been shown to temporarily alter the permeability of the blood-spinal cord barrier via bubble-mediated effects. Microbubbles stimulated by ultrasound re-radiate sound with unique acoustic signatures (so-called 'cavitation emissions') that can be used to map the bubble activity in vivo and guide the application of FUS. In this work we experimentally demonstrate, in the ex vivo human spine, passive cavitation imaging (PCI) in the spinal canal during FUS sonications for cavitation localization.

Methods: Using a spine-specific transmit-receive array prototype (transmit=400kHz/receive=800kHz, 96-element transmit/52 element receive) and Verasonics control system, transvertebral FUS exposures were applied to microbubble-containing phantoms in the spinal canal of ex vivo human thoracic spine segments (3 vertebrae). To further model the soft tissue anatomy of the paraspinal region, additional microbubble-containing phantoms were placed prelaminar to the vertebrae for a subset of acquisitions. The performance of three different image reconstruction algorithms (Delay and Sum[DAS], Delay Multiply and Sum[DMAS], Delay Multiply and Sum with Non-Linear Compounding[DMASNL]) in mapping bubble activity in the spinal canal was compared.

Results: Three-dimensional PCI with the sparse 52-element receiver array produced images with peak-side-lobe ratios (PSRs) and signal-to-noise ratios (SNRs) of 0.85+/-0.09, 0.62+/-0.14, 0.36 +/-0.22 and 11.2+/-1.5, 48.5+/-8.3, 32.8+/-8.3 for the DAS, DMAS, and DMASNL beamformers, respectively, in a homogeneous medium (270 acquisitions). Through stacked human vertebrae (720 acquisitions), images suffer from bone-induced aberration leading to degradation in PSR to 0.93+/-0.05, 0.86+/-0.10, 0.72+/-0.19, and SNR to 8.5+/-0.8, 27.0+/-6.1,18.0+/-4.2. Phase-based aberration correction provided some improvement in PSR, lowering values to 0.86+/-0.08, 0.68+/-0.18, 0.62+/-0.20. Prelaminar bubble populations compromise the ability to reliably localize cavitation in the canal without more refined image processing techniques such as time-gating and/or dynamic range alterations.

Conclusions: The experiments demonstrate initial feasibility of transvertebral PCI through the human spine, even with a limited, 52-element prototype. Further, considerations for prefocal cavitation and the

use of the PCI platform as feedback for FUS exposure level control constitute the future work required prior to clinical translation.

Abstract # 6

Title: Vertebral Fracture Risk in Spinal Metastases Patients Following Stereotactic Body Radiotherapy Using Quantitative Imaging Data and Machine Learning

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Purpose: Vertebral compression fractures (VCFs) affect approximately 14% of patients with spinal metastases treated with Stereotactic Body Radiotherapy (SBRT). This study aims to assess the vertebral fracture risk using quantitative computed tomography (CT) based biomarkers, and combine these with clinical features in prediction models, and to compare the predictive performance of these models with Spinal Instability Neoplastic Score (SINS).

Methods: We analyzed 300 vertebral segments from 179 patients (median age: 65 years) with spinal metastases (T4-L5) who underwent SBRT. Fractures occurred in 18.3% of vertebrae at a median of 570 days post-treatment. The VertDetect deep learning model was used for vertebral segmentation, providing reliable vertebral instance labels and structural delineations. Seven machine learning algorithms were developed using key features extracted from CT scans and clinical dataset including vertebral alignment metrics, bone lesion characteristics, and vertebral collapse percentage. Synthetic Minority Over-sampling Technique was implemented to address class imbalance. Model performance was evaluated using accuracy, sensitivity, specificity, and balanced accuracy through 5-fold cross-validation.

Results: Forest demonstrated the best-balanced performance with 73.0% accuracy, 64.0% sensitivity, and 76.0% specificity, showing a 36% improvement in balanced accuracy over SINS (72.0% vs. 51.7%). Neural Network achieved the highest sensitivity (73.0%) but with lower specificity (49.0%). The feature importance analysis revealed spinal alignment (coronal: 22.7%, sagittal: 18.5%) and tumor composition (lytic percentage: 21.9%) as the strongest predictors, outperforming traditional SINS parameters. Five-

fold cross-validation confirmed model stability with Neural Network achieving the highest mean accuracy (71.7% ± 9.4%) followed by Gradient Boosting (70.3% ± 3.6%).

Conclusions: ML models using quantitative imaging biomarkers outperform conventional SINS assessment for predicting post-SBRT vertebral fracture risk. Random Forest showed a 36% improvement in balanced accuracy with a 75% increase in sensitivity. This method can ultimately guide clinical decisions by pinpointing patients who are most likely to benefit from mechanical stabilization before or shortly after SBRT.

Abstract # 7

Title: Assessing the Sensitivity Variations between Healthy Spinal Cord and Intramedullary F98 Glioma to treatment with Focused Ultrasound and Microbubbles

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Purpose: The main goal of this study was to compare the differential sensitivity of spinal cord glioma tumors and adjacent healthy spinal cord tissue to treatment with focused ultrasound (FUS) and microbubbles. This study is essential because while non-CNS tumors are preferentially more sensitive to the anti-vascular effects of this treatment, the response of spinal cord gliomas and adjacent healthy tissue remains poorly understood.

Methods: Twenty-six F334 rats underwent intramedullary spinal cord tumor inoculation, with F98 glioma cells injected into the midplane of the spinal cord. After 7–10 days, once tumors had developed, MR-guided FUS treatment (580 kHz, 10 ms bursts, 1 Hz pulse repetition frequency, 40 s) was administered to both tumor and adjacent healthy tissue following a bolus injection of house-made microbubbles (1.00 ± 0.85 μm; 2.4×10^7 microbubbles/100 g). To assess differential tissue responses, experimental groups received varying ultrasound pressures of 0, 0.4, 0.8, and 1.2 MPa. Tissue was harvested 24 hours post-treatment and processed for histological analysis.

Results: Healthy tissue exhibited increasing damage with higher pressure: minimal red blood cell extravasation at 0.4 MPa, the appearance of hemorrhagic pools at 0.8 MPa, and more extensive bleeding and tissue disintegration at 1.2 MPa. In contrast, the tumor showed consistent histopathological features across all pressure levels, indicating intrinsic pathological processes without any treatment-induced damage. These findings suggest that F98 glioma tumors are less responsive to FUS and microbubble treatment than healthy tissue, likely due to their lower vascularity and reliance on vascular co-option for blood supply.

Conclusions: The findings of this study demonstrate that to effectively harness the anti-tumor effects of FUS and microbubbles, additional targeting strategies are necessary, as FUS localizability alone seems to be insufficient. Furthermore, it highlights the importance of safety considerations in treatments with lower FUS exposures to protect healthy tissue.

Abstract # 8

Title: Home time and Survival after Surgery for Spinal Metastases: Development and Validation of the Home time and Overall survival after Metastatic spine surgery Estimator (HOME score)

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Purpose: Patient counselling and selection around surgery for metastatic spinal tumours is a significant challenge. This study aimed to develop and validate a clinical prediction model for home time and survival after surgery for a spinal metastasis, termed the Home time and Overall survival after Metastatic spine surgery Estimator (HOME score).

Methods: A retrospective population-based cohort study was conducted including adult patients with spine metastases treated with surgery in Ontario Canada between 2005 and 2020. Primary model predictions were likelihood of home time of 3 months or less. Overall survival after surgery at 6-months,

1-year, and 1.5 years. Model performance was estimated using the area under the receiver operating characteristic (AUC) for home time predictions, and the concordance index (C-index) for survival. Time dependent AUCs were also used to evaluate survival predictions at pre-specified follow-ups.

Results: There were 2348 patients eligible for inclusion. Mean age was 62.4 years (SD 12.6) and the most common primary cancers were lung (N=513, 21.9%) and breast (N=295, 12.6). Most patients were treated for thoracolumbar metastases (N = 1598, 68.1%) using mostly a posterior surgical approach (N=1713, 73.0%). Patients treated between 2005-2018 were allocated to the training cohort, and those treated in 2019-2020 were used as a temporally distinct hold-out test set. Ten-fold cross validation of the training cohort found the most parsimonious architecture to be a linear least absolute shrinkage and selection operator home time (AUC 0.72, 95% CI 0.70 – 0.73) and survival model (C-index 0.69, 95% CI 0.67 – 0.70). The final model included 17 items for home time prediction, and 24 items for survival prediction including demographic, comorbid, cancer related, and presentation related features. Hold out testing found equivalent performance of the home time model (AUC 0.70), and survival model (C-index 0.70, 6-month AUC 0.73, 1-year AUC 0.75, 1.5-year AUC 0.76).

Conclusions: The HOME score achieved reliable estimation of home time and survival. This represents a significant advancement to patient centred pre-operative risk stratification and may enhance shared decision-making.

Abstract # 9

Title: Stereotactic body radiotherapy (SBRT) for Sacral Metastases: a detailed patterns-of-failure analysis

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Purpose: We previously reported the largest sacrum SBRT cohort and identified that non-adherence to consensus guidelines for target volume delineation is associated with an increased risk of local failure.

In the current study, we aim to detail the patterns of failure following sacrum SBRT, with a specific focus on assessing the influence of deviations from target volume guideline recommendations on the site of failure.

Methods: This study is a subanalysis of an original cohort of 112 patients who underwent SBRT for 215 sacral segments between 2010-2021 at a single institution. Among the 215 segments, 50 experienced magnetic resonance imaging-based local failure, and their patterns of failure were assessed. Within this subgroup, we excluded 2 segments due to the unavailability of radiation oncology contouring and treatment plans, resulting in a final cohort of 25 patients and 48 sacral segments.

Results: A total of 33 failures occurred in adherent and 15 in non-adherent segments. The majority of failures in guideline-adherent segments (91%, n=30/33) occurred as isolated failures within the treated sectors. In contrast, most failures in non-adherent segments (73%, n=11/15) occurred in sectors that were recommended but inadequately treated. Within this subgroup, 3 cases (20%, n=3/15) were isolated failures in the non-adherent sectors, while 8 cases (53%, n=8/15) had simultaneous failures in both adherent and non-adherent sectors. In 3 cases (20%, n=3/15), the failure was confined to the adherent sector, and in 1 case, it occurred in a non-treated and non-recommended sector. Most sectors with extraosseous disease progressed with an extraosseous component plus or minus bone progression (82%, n=28/34), whereas bone-confined lesions rarely exhibited progression outside the bone (7%, n=1/14). Non-adherent sectors received statistically lower radiation doses compared to the contoured CTV, revealing that under-contouring led to under-dosing, which may explain the increased risk of failure in these segments.

Conclusions: This detailed pattern-of-failure analysis reveals that only a minority (9%) of failures within guideline-adherent contours occurred outside the contoured volume. In contrast, the majority (73%) of failures in non-adherent segments involved non-treated but recommended compartments. These findings support that adherence to contouring guidelines is strongly recommended to ensure comprehensive coverage of areas at risk for subclinical disease.

Abstract # 10

Title: Characterization of Osteosarcopenia in Spinal Metastases Patients to Be Treated With Stereotactic Body Radiotherapy Using Quantitative Image-Based AI-Derived Biomarkers

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Purpose: This study aims to quantify musculoskeletal (MSK) health using AI-derived imaging biomarkers in spinal metastases patients treated with spine stereotactic body radiotherapy (SBRT). We assess the prevalence of osteosarcopenia, the co-occurrence sarcopenia and osteoporosis, and explore associations with vertebral compression fracture (VCF) risk post-SBRT.

Methods: A retrospective analysis was conducted using a prospectively maintained database of patients treated with spine SBRT at Sunnybrook Health Sciences Centre (2008–2022). Patients with lumbar spine treatment planning CTs (L1–L5) were included. Musculoskeletal biomarkers were extracted using an automated AI pipeline that combined a number of deep learning networks (ResNet, nnunet, TotalSegmentator). Osteoporosis was assessed by calculating mean Hounsfield Units (HU) in non-metastatic vertebral bodies; vertebrae with HU standard deviation >75 were excluded, and a threshold of <135 HU defined osteoporosis. Sarcopenia was quantified using a volumetric Psoas Muscle Index (vPMI), defined as psoas muscle volume normalized by the square root of L3 vertebral body volume. Psoas segmentations were cropped between L2/L3 and L4/L5 disc levels to standardize measurement. Associations between imaging biomarkers and post-treatment vertebral compression fractures were analysed.

Results: A total of 143 patients (78 male, 65 female; mean age = 64 years [range: 28–90]) were analyzed. Osteosarcopenia was the most common MSK condition, affecting 39.2% of patients. Sarcopenia alone was observed in 23% and osteoporosis alone in 18.9%. Among males, the ratio of psoas muscle volume to L3 vertebral body volume (PMV/VV(L3)) was significantly lower in those who experienced VCFs ($p = 0.0084$). While not statistically significant, lower psoas density and bone density were associated with fracture risk ($p = 0.0745$ and $p = 0.0699$, respectively), suggesting their potential clinical relevance and the need for further validation in larger cohorts.

Conclusions: Osteosarcopenia was observed in 39.2% of patients receiving spine SBRT, making it the most prevalent musculoskeletal condition in the cohort. AI-derived imaging biomarkers offer an

automated and objective means of assessing bone and muscle health and show potential for identifying patients at elevated risk of vertebral compression fractures. Incorporating these biomarkers into clinical workflows could support more personalized treatment planning, including timely consideration of mechanical stabilization or rehabilitation strategies.

Abstract # 11

Title: Enhances Functional Recovery After Cervical Spinal Cord Injury by Modulating NKCC1-Mediated Hyperexcitability

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Purpose: Traumatic spinal cord injury (SCI) is a debilitating condition that compromises motor, sensory, and autonomic function, with lasting impacts on the physical, social, and vocational well-being of patients. SCI disrupts chloride homeostasis by upregulating Na-K-2Cl cotransporter 1 (NKCC1), which shifts GABAergic signaling towards excitation. This pathological shift exacerbates neuronal hyperexcitability, contributing to persistent neurological dysfunction. Although NKCC1 inhibitors such as bumetanide have shown preclinical promise, their poor blood-spinal cord barrier (BSCB) permeability necessitates invasive intrathecal administration.

Methods: This study investigates torsemide, an FDA-approved NKCC1 inhibitor with pharmacokinetic advantages over bumetanide for treating SCI including improved BSCB permeability, high bioavailability, and longer half-life. We hypothesized that systemic torsemide administration would attenuate hyperexcitability and enhance functional recovery after cervical SCI.

Results: Female rats underwent clip-compression SCI and received bidaily intraperitoneal injections of torsemide (0, 2, 4, or 6mg/kg) for eight weeks before transcardial perfusion. Neurobehavioural recovery was assessed weekly through Basso, Beattie and Bresnahan scoring, grip strength, and inclined plane with terminal walking analysis conducted via CatWalk XT. Motor evoked potentials (MEP) and immunohistochemistry evaluated neuronal excitability and membrane NKCC1 expression. Torsemide improved forelimb and hindlimb function in a dose-dependent manner, significantly enhancing grip

strength and inclined plane performance. The 6 mg/kg group showed reduced NKCC1 expression and attenuated hyperexcitability in the ventral horn as evidenced by reduced Vglut2 expression and decreased MEP amplitude as well as area under the curve – closely resembling sham data.

Conclusion: Our findings suggest that torsemide can penetrate the injured spinal cord to reduce pathological hyperexcitability, promoting functional recovery and potentially a more homeostatic excitatory/inhibitory balance. Building on its established clinical use and safety profile, this study highlights torsemide as a promising and feasible candidate for repurposing as a pharmacological therapy in SCI.

Abstract # 12

Title: The association between baseline patient recovery expectations and improved walking distance at 6-months in lumbar spinal stenosis patients receiving a comprehensive rehabilitation program: A secondary analysis

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Purpose Lumbar spinal stenosis is a leading cause of disability among older adults, significantly impacting one's walking capacity. Within surgical settings, expectations of recovery have shown to influence patient reported outcomes following lumbar spinal stenosis surgery. However, the relationship between patient expectations and treatment outcomes in a non-surgical setting have not been assessed.

Methods: A secondary analysis of a comprehensive rehabilitation program (n=51) within a randomized controlled trial was conducted. The primary outcome was change in walking distance at 6-months, measured through self-paced walk test (SPWT), with recovery expectations as the key predictor. Expectations of recovery was dichotomized into 'expect to recover soon' vs 'expect to not recover soon'. Potential confounders were identified using theory and empirical evidence. Confounders that changed the key predictor parameter estimate by 10% or greater were included in the model. A generalized linear model was used.

Results: Data from 37 participants who completed baseline and 6-month SPWT were included in the analysis. Of the 37 participants, 9 expected to recover soon and 28 expected to not recover soon. Our findings show that those who expect to recover soon had an average increase in walking distance of 653.09 metres (b=653.09, 95% CI [76.11, 1230.06], p=0.03) compared to those who did not expect to recover soon, after adjusting for baseline Oswestry Disability Index (b= -17.52 95% CI [-32.20, -2.84], p=0.02), back pain duration (b= -234.39, 95% CI [-871.89, 403.11 p=0.47), baseline Falls Efficacy Scale (b= -0.29, 95% CI [-9.56, 8.99], p=0.95), and leg dominant pain (b=120.53, 95% CI [-214.62, 455.67], p=0.48).

Conclusions: Our results suggest that baseline patient recovery expectation is associated with improved walking distance at 6 months in patients with lumbar spinal stenosis receiving a comprehensive rehabilitation program. Further research is required to examine this relationship and potential ways to modify patient expectations should be explored.

Abstract # 13

Title: High-grade Paediatric Spondylolisthesis: Pelvic Retroversion Corrects Spontaneously After In-situ Posterior Spinal Fusion

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Purpose: Debate exists regarding in-situ fusion vs reduction and fusion in patients with high grade L5/S1 spondylolisthesis. Proponents of reduction highlight the improvement in global sagittal alignment, most obvious in patients with preoperative pelvic retroversion.

The purpose of this study is to assess the radiographic sagittal alignment of patients with high grade (>50%) spondylolisthesis treated with in-situ fusion using the Jackson technique.

Methods: Retrospective review of all patients treated for high grade spondylolisthesis at a single centre between 2009 and 2022 with at least two years post-operative follow up. Patient demographic data collected included age, sex, age at time of operation and weight. Radiographic data collection was

undertaken on pre-operative, post-operative and two-year post-operative xrays. Radiographic parameters measured included Pelvic Incidence (PI), Sacral Slope (SS), Pelvic Tilt (PT), L5 Incidence (L5I), L4 Incidence (L4I), Lumbar Sacral Angle (LSA), Meyerding grade, SDSG grade of spondylolisthesis, lordosis and number of vertebra included in the lordosis.

Patients were excluded if the radiographs were unsuitable for measuring (e.g. did not include whole spine, hips covered by radiation guards etc).

Results: Of the 54 patients treated surgically for high grade spondylolisthesis 20 underwent a Jackson procedure and had a complete xray set for the study, (14 female, 6 male, average age 13.6 range 10-16). Spontaneous alignment in a prone position was secured with a Jackson type fixation with no further attempt of correction. 8 patients improved on average by one Meyerding grade. A solid fusion was obtained in all patients. 9 patients presented with a vertical sacrum (sacral slope below 35°), which remained unchanged on the first standing X-ray. Follow-up within this subgroup showed an increase in sacral slope at 2 years by an average of 14.9o (3.1-32.1°). There were no post-operative complications or revisions.

Conclusions: In-situ fusion with the Jackson technique did not lead to a worsening of sagittal alignment. All patients with a sacral slope below 35° managed with an in-situ fusion showed an increase in sacral slope at 2 years follow-up to greater that 35°.

Abstract # 14

Title: Influence of pelvic parameters on disc degenerative patterns and pathology; is there a difference between patients with lumbar disc herniations compared to spinal stenosis?

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Purpose: The innate relationship of the pelvis to the load bearing axis of the lumbar spine, may be the mechanical driver behind different degenerative patterns. The objective of this study was to assess if there is a difference in the pelvic parameters and disc degeneration patterns in surgical patients with lumbar disc herniations (LDH) compared to lumbar spinal stenosis (LSS).condition, which may allow for

prophylactic interventions. We aimed to develop a machine learning (ML) tool able to predict the development of VCF following spine SBRT.

Methods: One hundred patients who underwent discectomy for LDH were reviewed and compared to 87 patients with who underwent decompression alone for LSS. Primary parameters of interest included pelvic incidence (PI), intervertebral disc grade, and level of surgery. Pre- and post-operative radiographs were reviewed and parameters including pelvic incidence (PI) were measured. The intervertebral discs based on MRI images were graded based on the Pfirrmann grading system. Statistical significance was established at $p < .05$.

Results: The mean age was 41.68 ± 9 years in the LDH group and 68.66 ± 9 years in the LSS group. The most common operative level was L5-S1 in LDH group compared to L4-5 in the LSS group. The PI in the LDH group was significantly lower than the LSS group (50.5° vs. 57.8°, p = <0.001). Comparing the PI for males and females in the LDH group was 51.7° and 49.6°, compared to 57.9° and 57.7° in the LSS group, respectively (p=0.007, p=<0.001). The Pfirrmann disc grade was significantly higher at all levels, except for L5-S1, in the LSS group (L1-2, p<0.001; L2-3, p<0.001; L3-4, p<0.001; L4-5, p<0.048). However, the grade at the operative level was higher in the LDH group (4.30 vs. 4.13, p=0.040). Prior discectomy was rare in the LSS group (5/87, 5.7%).

Conclusions: Patients having surgery for disc herniation have a lower pelvic incidence compared to patients with stenosis. In addition to other factors such as injury, age, or systemic inflammation, our findings suggests that the lumbar load bearing axis imparted by innate pelvic parameters may play an important role in degenerative patterns and pathologies.

Abstract # 15

Title: Association Between Rod and Fusion Mass Fractures in Adult Spinal Deformity: A Retrospective Cohort Study

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Purpose: Rod fractures are a major issue in adult spinal deformity (ASD) surgery, which can have deleterious implications for patients. While pseudoarthrosis is the primary failure mode, fractures of the fusion mass can lead to rod fractures. This study aims to assess whether fusion mass fractures in a solid posterior fusion mass are a distinct cause of rod fractures.

Methods: A retrospective review of 200 consecutive ASD cases with thoracic-to-pelvis fusion was conducted, including full chart reviews and post-rod fracture CT scans. Collected demographics included age, BMI, and neurodegenerative disorders. Fusion mass fractures were defined as transverse fractures outside the facet joint area, while pseudarthrosis was identified by mass defects along the facet joint orientation. Disc height and interbody cage presence were recorded. Continuous variables were summarized with mean and standard deviation (SD), and categorical variables using counts (N) and percentages (%). Four trained observers reviewed radiographs and CT scans to determine rod fracture etiology by consensus opinion.

Results: The study included 161 patients, with 20 requiring revision for rod fractures. Fusion mass fractures were observed in 7 patients, while 13 had pseudarthrosis. Transverse rod fractures were common in patients with disc heights >10 mm at the fracture site (6/7), without interbody cages. In contrast, 92.3% of pseudarthrosis cases had disc heights <10 mm, with 23.1% containing cages. No correlation was found between fracture type and age, sex, or BMI. Cobalt chrome rods were more common in transverse fractures. Fusion mass fractures primarily occurred at L2-L4 (71%), while pseudarthrosis mainly involved L3-S1 (77%). All patients had single-stage posterior surgeries with two-rod constructs.

Conclusions: This study shows fusion mass fractures, distinct from pseudarthrosis, accounted for 35% of rod fracture cases in ASD patients. Notably, 6/7 occurred at levels with disc heights >10 mm without interbody cages. This suggests that motion in the anterior column can occur despite solid posterior fusion. As such, adding anterior support and multi-rod constructs may help prevent these fractures.

Abstract # 16

Title: The Influence of Fracture Status in Determining the Effectiveness of Surgical Intervention in Central Cord Syndrome

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Purpose: The management of stable CCS (CCS-S resulting from spondylosis remains controversial. A common practice involves an initial non-operative intervention until spontaneous recovery occurs, or delaying surgery until a neurological plateau is reached. This conservative approach lacks robust evidence, with conflicting results from studies. This study aims to compare surgical and non-surgical interventions for both CCS-S and CCS-U (unstable CCS) patients, utilizing consistent diagnostic criteria and adjusted analyses from a large cohort of SCI patients.

Methods: This ambispective study analyzed 2,583 patients from five multicenter SCI studies. A propensity score-matched analysis between surgically and non-surgically treated patients was conducted, adjusting for age, injury mechanism, neurological level, total motor score, and ASIA grade. Neurological outcomes were assessed using ASIA motor scores while functional outcome was measured using the Functional Independence Measure (FIM). Outcome differences at one year, including the proportion of patients achieving the minimum clinically important difference (MCID) was compared between CCS-S and CCS-U patients.

Results: A total of 291 CCS patients were included, of which 205 (70%) underwent surgery, while 86 (30%) received non-operative treatment. A significantly higher proportion of patients in the surgical group achieved the FIM-Motor MCID (57.1%) at one year ($p=0.018$). Stratified analysis showed that surgery was mainly beneficial for CCS-S patients, with 66.7% achieving MCID versus 34.2% in the non-surgical subgroup ($p<0.001$). In the propensity-matched cohort, CCS-S patients demonstrated greater benefit from surgery than CCS-U patients. The presence of fracture significantly reduced the odds of favorable functional outcomes at one year (p value for interaction = 0.04, OR 0.32, 95% CI, 0.11-0.98).

Conclusions: Surgical intervention significantly improved functional outcome at one-year compared to conservative management in CCS patients, with particularly pronounced benefits in the CCS-S subgroup. This underscores the need for individualized treatment strategies tailored to specific patient characteristics in managing CCS.

Abstract # 17

Title: The Impact of Neck Pain on Functional and Quality of Life Outcomes in Cervical Myelopathy

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Purpose: The economic burden of neck pain is substantial, encompassing direct healthcare costs, reduced productivity, and work-related economic losses. Among patients with degenerative cervical myelopathy (DCM), neck pain affects up to 80% of patients, and is frequently cited as the top recovery priority following surgical intervention. Despite, evidence linking neck pain with poorer health-related quality of life (HRQoL), predictors of HRQoL remain inconsistent across studies with no direct comparison between DCM patients with neck pain (NP) and those without neck pain (NNP). This study aims to address this gap by evaluating and comparing HRQoL outcomes between these two patient groups.

Methods: Data were aggregated and harmonized from three large multicenter, international DCM studies resulting in a final cohort of moderate and severe DCM patients requiring surgical intervention. Baseline and 1-year neurological status and patient reported HRQoL using SF-36 PCS and MCS scores were compared between NNP and NP groups using mean differences. One-year HRQoL scores were modeled using multivariable regression analysis adjusted for confounders.

Results: A total of 1047 patients with a mean age of 56.80(±11.39), and 411 (39%) females were included. Baseline demographic, smoking status, comorbidities, and mJOA scores (12.39±2.56) were comparable between NNP (n=194) and NP (n=853) groups. At baseline, NNP patients had significantly higher baseline SF36 PCS scores (MD:4.84; 95% CI: 3.28-6.41, p<0.001) and SF36 MCS (MD: 5.05, 95% CI 3.07-7.03, p<0.001) compared to NP cohort. At 6 months, both groups showed significant and clinically meaningful improvement in SF-36 MCS score (p=0.03). At one year, HRQoL differences remained consistent, with superior outcomes in the NNP group (SF-36 PCS MD:3.05, 95% CI: 1.50-4.59 and SF-36 MCS MD: 5.08, 95% CI: 3.34-6.82). In multivariable regression analysis neck pain scores at 1 year significantly predicted SF-36 PCS scores, while baseline and 1-year neck pain scores predicted SF-36 MCS score.

Conclusions: This study represent the first multicenter, international DCM cohort analysis to demonstrate consistently superior HRQoL outcomes in DCM patients without neck pain both at baseline

and at one year following surgical intervention. This highlights the importance of focused neck pain assessment and management in addition to neurological recovery in improving outcome in DCM patients.

Abstract # 18

Title: Integrating Neck Pain Scores Improves the mJOA for Predicting Quality of Life in Degenerative Cervical Myelopathy

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Purpose: The modified Japanese Orthopaedic Association score (mJOA) remains the most widely used tool in degenerative cervical myelopathy (DCM). However, it is constrained by a ceiling effect and a limited ability to capture multidimensional aspects of recovery. Recent evidence emphasize neck pain as a crucial determinant of outcome in DCM, underscoring the need for its integration into existing assessment tools. This study aims to develop a revised mJOA classification that incorporates neck pain severity and to evaluate whether this adjustment improves the prediction of health-related quality of life (HRQoL) outcome compared to standard mJOA categories.

Methods: We analyzed data from three large multicenter, international studies with complete baseline and one-year mJOA and SF-36 HRQoL scores. The dataset was partitioned into training and validation set using stratified sampling with 3:1 split. In the training cohort, a regression model was developed using mJOA scores and neck pain severity as independent predictors, with the achievement of minimal clinically important difference in NDI as the primary binary outcome. Conditional probabilities derived from the model were used to redefine mild, moderate, and severe mJOA categories. Model discrimination was assessed in the validation cohort using ROC analysis, and its performance in predicting HRQoL outcome was quantified using the AUC metric.

Results: A total of 1,047 DCM patients with a mean age of 56.79 (±11.39) were included in the final analysis. At baseline, 61.5% (n=644) reported mild neck pain, 19.7% (n=197) moderate neck pain, and 18.8% (n=197) severe neck pain. Incorporating neck pain scores significantly altered the distribution of patients across mJOA categories, resulting in a novel classification schema. Among patients with severe

neck pain, only 5.5% were classified in the mild category compared to 17% in the original mJOA system. The revised mJOA model demonstrated statistically superior discrimination in predicting SF-36 Physical Component Summary (AUC: 0.62 vs 0.56, $p<0.05$) and SF-36 Mental Component Summary (AUC:0.62 vs 0.56, $p=0.01$) compared with the standard mJOA scoring system.

Conclusions: Incorporating neck pain severity into the mJOA scoring system significantly enhances its predictive accuracy for HRQoL outcomes following surgery in patients with DCM.

Abstract # 19

Title: Enhancing Spinal Cord Regeneration Through Neural Stem Cell Transplantation Combined with Rehabilitation

Authors and Affiliations: Shanhang Jia, Aysu Kollu, Brett mcintyre, Asgarihsfshejani Azam, Jian Wang, Kouhzaei Sogolie, Bradshaw Paul, Khazaei Mohammad, Michael Fehlings

Purpose: This study investigates the therapeutic potential of human iPSC-derived neural stem cell (hiPSC-NSC) transplantation and rehabilitation in promoting functional recovery after spinal cord injury (SCI), using immunodeficient RNU rats to enable long-term graft survival. We aim to compare the effects of rehabilitation alone, NSC transplantation alone, and their combination, to determine the most effective approach for enhancing recovery.

Methods: Adult RNU rats will undergo cervical clip-compression SCI at the C6-C7 level and be randomly assigned into five groups: sham, SCI-only, NSC-only, rehabilitation-only, and NSC plus rehabilitation. Two weeks post-injury, hiPSC-NSCs will be transplanted around the lesion site in relevant groups. Rehabilitation will include a daytime Food-Tray Task and a nighttime Grid Box Task, leveraging natural foraging behavior for continuous, high-repetition training. Behavioral assessments (grip strength, inclined plane, von Frey, CatWalk) and motor-evoked potentials will be evaluated over 8 weeks, followed by histological analysis.

Results: RNU rats in the rehabilitation-only and NSC plus rehabilitation groups to show significantly better outcomes across all behavioral tests compared to SCI-only and NSC-only groups. The combination group is anticipated to demonstrate the highest recovery, with enhanced motor function, improved gait, and stronger forelimb performance.

Conclusions: By using RNU rats to support long-term human NSC graft survival, this study will elucidate the synergistic benefits of combining stem cell therapy with naturalistic rehabilitation. The results may guide future translational strategies for spinal cord repair that integrate cell transplantation with functional, behavior-based rehabilitation.

Abstract # 20

Title: Surgical Intervention Enhances Social Function in Older Adult Spinal Deformity Patients: A PEEDS Database Study

Authors and Affiliations: Lauren Daunt (1), Vanessa Vashishth (2), Eliana Seider (2), Aazad Abbas (3), Mauricio Campos Daziano (4), Anna C. Rienmüller (5), Christopher Ames (6), Stephen Lewis (7)

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Purpose: Adult spinal deformity (ASD) significantly impacts patients' lives, particularly their social functioning, which has been recognized as a domain of health-related quality of life. While research exists on ASD surgery outcomes, there is limited data on how ASD impacts social function in older adults. This study aims to examine the impact of ASD surgery on the social functioning of patients aged 60 years or older.

Methods: This is a prospective, multicenter, observational longitudinal cohort study performed on patients 60 years or older undergoing primary spinal fusion of 5 or more levels. Demographic variables, work status, and cognitive function via the Animal Fluency Test (AFT) were recorded. Patients were reviewed at baseline, 10 weeks, 12 months, and 24 months. Outcome measures of interest were questions 14 (Does your back condition affect your personal relationships?) and 18 (Does your back condition limit your going out with friends/family?) from the Scoliosis Research Society-22r questionnaire (SRS-22r), as well as question 9 of the Oswestry Disability Index (ODI) (impact of back pain on social life). Descriptive statistics (standard deviation and mean) were collated.

Results: 219 patients met the inclusion criteria, with a median age of 67.5. 80.4% were female. The mean BMI was 26.1. 60.3% were retired, and 25.7% exhibited cognitive impairment, as measured by the

AFT at baseline. More than 80% of the included patients underwent fusion including the pelvic level. For SRS-22r Q14, 40.1% of patients reported their back condition moderately or severely affected their relationships, compared to 15.4% at 2 years. For SRS-22r Q18, 47.7% of patients felt their back often or very often limited their going out, compared to 17.1% at 2 years. Of the 69 patients who were moderately or severely limited pre-operatively, 19 (28%) remained so at 2 years; 40 (58%) were rarely or never limited at 2 years. For ODI Q9, 8.7% of patients felt that their social function was normal pre-operatively, compared to 44.1% of patients at 2 years.

Conclusion: ASD surgery positively impacts patients' social functioning. The data supports expected outcomes following surgery and highlights the physical and mental benefits of these procedures. Future studies should examine these results' sustainability and include measurement instruments designed to capture the complex phenomenon of social functioning.

Abstract # 21

Title: Role of Somatosensory Evoked Potential (SSEP) in Enhancing Intraoperative Neuromonitoring for Spinal Deformity Surgery - Results from a Prospective Multicenter Study

Authors and Affiliations: Abdullah Eissa [1], So Kato [1, 2], Lawrence Lenke [2, 3], Kristen Jones [2, 4], Sigurd Berven [2, 5], Christopher J. Nielsen [2, 6], Saumyajit Basu [2, 7], Michael Kelly [2, 8], Justin Smith [2, 9], Samuel Strantzas [10], Yong Qiu [2, 11], Ferran Pellise [2, 12], Ahmet Alanay [2, 13], Nasir Quraishi [2, 14], Randolph Gray [2, 15], Go Yoshida [2, 16], Amer Aziz [2, 17], Stephen Lewis [2, 6]

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Purpose: The objective of the present study was to understand the sensitivity and specificity of SSEP in predicting neurological deficits following spinal deformity surgery, and to investigate the complementary performance of SSEP to MEP/EMG.

Methods: Twenty international centers prospectively documented IONM, demographic details, radiographic findings, and surgical events for complex spinal deformity surgery. Patients aged 10-80 yrs, with a coronal or sagittal major Cobb > 80°, or undergoing posterior column or 3-column osteotomy, were included. A total of 526 cases were analyzed, excluding the cases with multiple alerts during a single operation. SSEPs were predominantly recorded after stimulation of posterior tibial nerves (98.9%) and peroneal nerve was occasionally used (7.2%). An IONM alert was defined as a > 50% loss of amplitude in SSEP or MEP from baseline or sustained EMG activity > 10 secs. Neurological examinations were performed pre- and post-operatively, with the occurrence of new neurological deficits being meticulously recorded.

Results: SSEP alerts were identified in 16 out of 526 (3.0%), either alone (n = 4), or in combination with MEP/EMG (n = 12). Post-operative new sensory deficits were recorded in 13 (2.5%), of which 11 cases did not have intraoperative SSEP alerts (false negatives). Overall, the sensitivity of SSEP was 15.4%, and specificity was 97.3%. All false negative cases either did not have motor deficits or had deficits confined to only one or two muscle groups, implicating the root injuries. No neurological deficits were documented after 4 isolated SSEP alerts without MEP/EMG alerts and the addition of SSEP to MEP/EMG did not result in an enhancement of the sensitivity in predicting post-operative neurological deficits.

Conclusions: Although multimodal IONM has been deemed beneficial for predicting post-operative neurological deficits by comprehensively assessing spinal cord function, it was revealed that the current protocol with single nerve coverage of SSEP did not contribute to improved safety in complex spinal deformity surgery. Further studies are warranted to establish the optimal protocol for IONM

Abstract # 22

Title: Is a 50% Loss in IONM signal the appropriate threshold in spinal deformity surgery?

Authors and Affiliations: Abdullah Eissa [1], So Kato [1, 2], Lawrence Lenke [2, 3], Kristen Jones [2, 4], Sigurd Berven [2, 5], Christopher J. Nielsen [2, 6] , Saumyajit Basu [2, 7], Michael Kelly [2, 8], Justin Smith [2, 9], Samuel Strantzas [10], Yong Qiu [2, 11], Ferran Pellise [2, 12], Ahmet Alanay [2, 13], Nasir Quraishi [2, 14], Randolph Gray [2, 15], Go Yoshida [2, 16], Amer Aziz , Stephen Lewis [2,6]

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Purpose: To find out if a 50% Loss in IONM signal the appropriate threshold in spinal deformity surgery.

Methods: A prospective international multicenter study was conducted to better understand the strengths and weaknesses of IONM in spinal deformity surgery. 546 pediatric and adult patients in 20 centers undergoing complex spinal deformity surgery and multimodality IONM through standardized protocols were prospectively reviewed with data collected real-time through specially designed forms. An alert was defined as a minimum 50% loss of IONM signal amplitude in MEP or SSEP

Results: 2.4%of the 546 patients sustained a >50% to <75% IONM alert, 8.4%sustained a >75% to <100% alert and 3.7% sustained a 100% alert. The surgical team performed maneuvers in response to the alert that included systemic optimization, releasing correction, further decompression, implant removal. Despite maneuvers, neurological deficits occurred and were recorded in 8.1% (n=38) of patients with no alerts, 15.4% of those with >50% to <75% alerts, 23.9% with >75% to <100% alerts, and 45% of patients with 100% IONM loss. Out of the 79 patients who had minimum 50% loss, 46 had >75% loss and 20 had 100% loss. Raising the minimum threshold of signal loss alerts from >50% to >75% would lead to a similar proportion of false negatives from 8.1% to 8.3% as well as similar proportion of true positives from 27.8% to 30.3%

Conclusions: This series validates a 50% cut-off for IONM loss in complex spinal deformity surgery to provide the surgical team with sufficient opportunity to address the cause of the signal loss and prevent permanent neurological injury. The high rate (8.1%) of new neurological deficits in patients without IONM alerts is concerning and questions the accuracy of our current protocols.

Abstract # 23

Title: The Spinal Invasiveness Score (SIS) Can Better Quantify Surgical Waitlists Across Canada

Authors and Affiliations: Gurjovan Sahi [1], Jin Tong Du [2], Aazad Abbas [1], Sager Hanna [5], Neil Berrington [4], Alysa Almojuela [4], Michael Johnson [5], Stephen Lewis[3], Michael Goytan[5], Jay Toor[5]

Purpose: Canadian spine care delivery is in a crisis, largely due to inordinate patient wait times. Relying on the current method of a simple count of patients awaiting surgery leads to disproportionate wait time estimations depending on pathology; for example, patients with scoliosis wait disproportionately longer than those for simple discectomies. Using the Spinal Invasiveness Score (SIS) to categorize surgeries for organization purposes is a comprehensive solution; it is a validated scoring system that assigns points based on surgical invasiveness across six surgical parameters (anterior decompression, anterior fusion, anterior instrumentation, posterior decompression, posterior fusion and posterior instrumentation). Waitlists can then be calculated based on SIS score, with additional benefits such as subcategorization of wait times and subsequent initiatives to target certain subcategories of procedures. This study aims to evaluate spine surgeons' and hospital administrators' perceptions of adopting the SIS model for spine surgery waitlist management.

Methods: A qualitative descriptive study was conducted surveying spine surgeons and hospital administrators across Canada. Participants reviewed a case study comparing the current waitlist model with the SIS-based approach and were surveyed on their preferred method for wait time calculation. Responses were analyzed using thematic analysis to identify recurring themes around SIS's perceived benefits, limitations, and barriers to adoption.

Results: Of the 21 respondents, 17 (81%) preferred the SIS approach over the existing system, including 9 of 11 surgeons and 8 of 10 administrators. Thematic analysis revealed several key perceived benefits of SIS including ability to subcategorize waitlists (ie: multi-level vs single-level; instrumented vs non-instrumented), better triaging of cases and more accurate wait time calculation. Barriers identified included difficulty for the health system to capture SIS score for each surgery, cost of implementation and SIS not capturing full complexity of cases such as elevated BMI or revision status.

Conclusions: The SIS method was overwhelmingly well received with numerous benefits identified as well as potential barriers and room for improvement. The SIS score has shown early success in advocating for more tailored OR scheduling, such as longer OR days to accommodate complex surgeries. With careful implementation and adaptation, SIS could become a key part of nationwide waitlist management strategies.

Abstract # 24

Title: Timing of Thromboprophylaxis in Acute Spinal Cord Injury Patients: A TQIP Study

Authors and Affiliations: Aazad Abbas [1, 2], Jay Toor [3], Albert Yee [1, 4, 5], Robert Fowler [5, 6], Avery Nathens [5, 7], Cari Whyne [1, 2, 4, 5], Jetan Badhiwala [5, 7]

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Importance: The optimal timing of thromboprophylaxis for patients with acute spinal cord injury (SCI) is debated, with most guidelines recommending thromboprophylaxis be given within 72 hours. However, a majority of these are based on consensus group opinions, which are lacking in primary large scale clinical data.

Objective: To determine the ideal timeframe for delivery of thromboprophylaxis in the setting of acute SCI.

Design: Retrospective cohort study, 2017-2022.
Setting: Level I, II, and III North American trauma centers in the Trauma Quality Improvement Program.

Participants: Adults (≥ 16 years) with acute SCI secondary to blunt trauma who underwent operative treatment. Restricted cubic splines modeled the risk-adjusted probability of complications as a function of time to thromboprophylaxis. The point of inflection when complication risk started to increase was used to define early versus late thromboprophylaxis. Outcomes were then compared between propensity score-matched (nearest neighbor) early and late thromboprophylaxis groups.

Exposure: Hours from surgery until initiation of thromboprophylaxis.

Main Outcomes and Measures: Primary—in-hospital deep venous thrombosis or pulmonary embolism. Secondary—in-hospital return to the operating room, death during the same admission and hospital length of stay.

Results: A total of 15,951 patients across 511 trauma centres met inclusion criteria (mean age 48.6 ± 19.2, 23.9% female). With spline modeling, the risk of VTE increased after 48 hours. Propensity matching resulted in a total cohort of 13,062, resulting in 6,531 patients in each cohort of early thromboprophylaxis (≤ 48 hours) and late thromboprophylaxis (>48 hours). Risk of VTE was not reduced but not statistically significant in the early versus the early and late group (5% vs 5.7%), resulting in and absolute risk reduction (ARR) 0.72% (95% CI: -0.05%, 1.49%; P = 0.067) and odds ratio (OR) 1.15 (0.99, 1.34; P = 0.067). Compared to the late group, the early group had reduced return to the operating room (2.2% vs 2.9%; ARR 0.72% (0.17%, 1.24%; P = 0.011), OR 1.34 (1.07, 1.67; P = 0.011)), reduced mortality (4% vs 4.9%; ARR 0.83% (0.12%, 1.53%; P = 0.022), OR of 1.22 (1.03, 1.44); P = 0.022)), and reduced length of stay (15.9 vs 16.8 days; MD 0.9 days (0.30, 1.50; P = 0.003), OR 2.46 (1.35, 4.47; P = 0.003)).

Conclusions: In patients with acute SCI secondary to blunt trauma, delaying thromboprophylaxis to more than 48 hours was associated with a greater risk of DVT/PE, return to the operating room, death and increased length of stay. A 48-hour window may be an important clinical target for early administration of thromboprophylaxis.

Abstract # 25

Title: Direct Surgical Repair in the Management of Spontaneous Spinal Cerebrospinal Fluid Leak: A Six-Year Retrospective Canadian Cohort Study

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Purpose: Spinal cerebrospinal fluid (CSF) leaks may result in spontaneous intracranial hypotension (SIH), with a wide range of clinical presentations. Surgical repair remains the primary treatment for persistent CSF leaks, particularly those unresponsive to epidural blood patches. This study aims to describe the clinical profile and postoperative outcomes following primary dural repair.

Methods: A retrospective chart review was performed including consecutive patients who underwent surgery between June 2017 and December 2023. Data on patient demographics, clinical presentation, type of leak, surgical approach and outcome were retrieved. The preferred surgical technique for each type of CSF leak is described. We assessed both symptom and headache resolution for each patient at last clinical follow-up.

Results: A total of 40 patients were included, and the mean age at surgery was 50.47 years. The majority (72.5%) had type 1 leaks, followed by type 3 (20%) and type 2 (7.5%). The mean duration from symptom onset to surgery was 41 months, and the thoracic region was the most common leak location. Spinal longitudinal extradural collection (SLEC) and cranial stigmata of hypotension was identified in 70% and 75% of patients, respectively. Microscopic direct dural repair led to symptom improvement in 33 patients (82.5%), with headache improvement in 85.7% of cases. Only two patients experienced transient motor weakness.

Conclusions: Surgical management of spinal CSF leaks represents a reliable and efficient treatment option for spontaneous spinal CSF leaks, leading to significant symptom improvement after surgery. Accurate preoperative identification of leak location is crucial for optimal surgical planning.

Abstract # 26

Title: Will the Numbness in My Hands Improve After Surgery for Myelopathy? An Observational Study from the Canadian Spine Outcomes and Research Network (CSORN)

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Purpose: Sensory dysfunction is a hallmark feature of degenerative cervical myelopathy (DCM). However, sensory-related outcomes following surgical decompression remain unclear, with most studies having focused on global change in neurological status. We aimed to quantify and identify predictors of sensory recovery after surgery for DCM, as well as to investigate its association with post-operative health-related quality of life (HRQoL).

Methods: We analyzed data that were collected prospectively between 2015 and 2024 as part of an ongoing prospective observational study via the Canadian Spine Outcomes Research Network (CSORN). We included all patients with baseline sensory deficits according to the modified Japanese Orthopedic Association (mJOA) sensory subdomain. Patients were stratified into improved, stable, or worsened sensory function groups after surgical decompression based on score transitions. HRQoL was evaluated using SF-12 physical (PCS) and mental (MCS) component scores. Multivariable logistic regression was performed to identify factors associated with sensory improvement.

Results: We identified 682 patients who presented with baseline sensory deficits. Among 490 patients with 12-month follow-up data, 245 patients (50%) demonstrated sensory improvement after surgery, 226 (46%) had stable sensory scores, and 19 (4%) experienced sensory worsening ($p < 0.001$). Patients with improved sensory function showed significant increases in PCS (31.4 at baseline to 40.5 at 12 months, $p < 0.001$) and MCS (42.7 at baseline to 48.0 at 12 months, $p < 0.001$). Similarly, those with stable sensory function had significant PCS improvement (33.6 at baseline to 38.4 at 12 months, $p < 0.001$) and MCS (44.6 at baseline to 46.8 at 12 months, $p = 0.006$) change. Patients with worsened sensory function exhibited no significant changes in PCS or MCS. Baseline sensory score was the only significant predictor of sensory improvement, with higher baseline scores associated with lower odds of improvement (OR = 0.04, 95% CI [0.02, 0.07], $p < 0.001$).

Conclusions: Many patients experienced sensory improvement following surgery for DCM, and sensory improvement is strongly associated with HRQoL gains, which suggests substantial clinical relevance. Greater baseline sensory impairments were associated a greater of odds of postoperative sensory recovery. These findings will inform counselling and shared decision-making for patients considering surgical treatment of DCM.

Abstract # 27

Title: Elevated preoperative HbA1c is associated with perioperative glucose dysregulation in spine surgery patients.

Authors and Affiliations: Tiffany Lung MD[1], Chloe Cadieux MD, MSc[1], Jed Lazarus MD[1], Jin Tong Du MD[1], Norah Matthies MD[1], Christopher Nielsen MD[1], Raja Rampersaud MD[1]

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Purpose: In spine surgery patients, poorly controlled diabetes has been shown to be an independent risk factor for surgical site infections (SSI) and all-cause complications. Despite this being a modifiable risk factor, preoperative Hemoglobin A1c (HbA1c) is not routinely measured at our institution. The objectives of this quality improvement study are to: evaluate the proportion of spine surgery patients with undiagnosed prediabetes or diabetes, and assess the relationship between HbA1c and perioperative hyperglycemia.

Methods: This is a prospective study evaluating patients undergoing spine surgery at a single institution between June 2022 to May 2024 with a HbA1c measurement within 90 days of surgery. The primary outcomes of interest are the number of patients with elevated HbA1c levels without a preoperative diagnosis of prediabetes or diabetes, and the association of HbA1c levels and perioperative hyperglycemia.

Results: Four hundred thirty patients had a preoperative HbA1c measured. One hundred fifty patients (34.9%) had a preoperative HbA1c at or above 6.0. In patients without a prior diagnosis, 40 patients (9.3%) had a HbA1c level in a prediabetic range, and 5 patients (1.2%) had a HbA1c level in a diabetic range. On postoperative day 0 to 3, 326 patients had glucose levels measured. Of these patients, 118 (27.4%) had a glucose measurement above the recommended level of 10mmol/L. Higher HbA1c levels are associated with hyperglycemia perioperatively ($X2$ (2, N = 326) = 5.99, $p<.001$). There is a moderate correlation between preoperative HbA1c and hyperglycemia perioperatively ($r=.565$) with HbA1c explaining 31.9% of glucose level variance ($R2=.329$).

Conclusions: We found a 10.5% prevalence of abnormal preoperative HbA1c levels in patients without a prior diagnosis of prediabetes or diabetes. Furthermore, patients with higher HbA1c levels had more

glucose dysregulation perioperatively. As glycemic control is a modifiable risk factor, this study supports consideration for routine preoperative HbA1c screening and protocols for better glycemic control in the acute postoperative period in patients with and without a history of diabetes.

Acknowledgement

Make a Gift!

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