SPINE SUMMIT 2022 IS JOINTLY PROVIDED BY THE CONGRESS OF NEUROLOGICAL SURGEONS AND THE AANS/CNS SECTION ON DISORDERS OF THE SPINE AND PERIPHERAL NERVES.
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Graft material inside of Cannula shown for visualization

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Please refer to product indication manual/package insert for instructions, warnings, precautions, and contraindications.

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GET CONNECTED!
SPINE SUMMIT 2022
Annual Meeting App

Conveniently manage your schedule, browse program content, and keep up with what’s going on.
Log in with event code:
SPINE2022

Complimentary Wi-Fi is available to all attendees throughout Caesars Palace meeting space.
No password needed

NETWORK NAME:
Caesars Resorts
On behalf of the Joint Section on Disorders of the Spine and Peripheral Nerves Executive Committee, welcome to Spine Summit 2022 at Caesars Palace. This year’s meeting promises to be informative and thought provoking, as we explore “Transformative Technologies”.

We are proud to welcome our 2022 International Guest Societies, European Association of Neurosurgical Societies (EANS) and AO Spine North America, as well as our honored guests Todd J. Albert, John J. Knightly, Allan D. Levi, and Mark E. Shaffrey. Along with numerous other guest lecturers, they will be sharing their knowledge during educational courses, specialized breakout sessions, award presentations, Happy Hour Debates, and the Cahill Controversies over the next several days.

We look forward to seeing you all at the Opening Reception on Wednesday night at the Caesars Palace Temple Pool to hear incredible live music, share stories, and enjoy the camaraderie of your peers.

Thank you for taking time out of your busy schedules to join us at Spine Summit 2022. We wish you an inspiring and enjoyable meeting.

Table of Contents

Chairman’s Biography 5
General Information 6
Program At-a-Glance 8
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Program 22
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Domagoj Coric practices neurosurgery at Carolina Neurosurgery and Spine Associates (CNSA) in Charlotte, North Carolina. He is the Executive Medical Director of SpineFirst, a joint venture between CNSA and Atrium Health to deliver spine care to the Charlotte region. He is a Professor in the Department of Orthopedic Surgery at Atrium Health and has served as Chief of the Department of Neurosurgery at Carolinas Medical Center from 2005 to 2019. He was elected to Phi Beta Kappa and graduated *cum laude* with a B.S. from Duke University. He received an M.D. from Wake Forest University and was elected Alpha Omega Alpha. He completed his general surgery internship and neurological surgery residency at Wake Forest University Baptist Medical Center.

His professional interests lie in acquiring expertise in and conducting research on spinal motion preserving techniques, including cervical total disc replacement and lumbar arthroplasty as well as spinal trauma, spinal cord injury and interbody fusion for degenerative diseases. He has served as a Principal Investigator in over twenty IDE/IND trials and was national Lead, or co-Lead, Investigator in ten IDE/IND trials. He has contributed more than one hundred peer-reviewed articles and book chapters to the scientific literature. He is a prolific speaker, having delivered hundreds of lectures both nationally and internationally across Europe, Asia and Australia.

Dr. Coric is actively involved in various neurosurgical and orthopedic spine societies. He is past-President of the Southern Neurosurgical Society, past-President of the North Carolina Spine Society, and is the current President of the International Society for the Advancement of Spine Surgery (ISASS).
**Speaker Ready Room**
The Speaker Ready Room is located in Patrician on the pool level. The hours are:

<table>
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<th>Day</th>
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<tr>
<td>Wednesday, February 23</td>
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All speakers and abstract presenters should visit the Speaker Ready Room at least one hour prior to their presentation.

**Exhibit Hall**

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**Registration**

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**No Smoking Policy**
Smoking is not permitted at any official Section on Disorders of the Spine and Peripheral Nerves Spine Summit 2022 event. Smoking is allowed at Caesars Palace in designated areas only.

**Attire**
Professional attire is appropriate for the meeting and for the Exhibit Hall. Professional/Dressy attire is appropriate for the evening social events.

**Disclaimer**
The material presented at the DSPN 2022 Annual Meeting has been made available by the Section on Disorders of the Spine and Peripheral Nerves and the CNS for educational purposes only. These materials are not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather are intended to present an approach, view, statement or opinion of the faculty, which may be helpful to others who face similar situations. All drugs and medical devices used in the United States are administered in accordance with the Food and Drug Administration (FDA) regulations. These regulations vary depending on the risks associated with the drug or medical devices compared to products already on the market, and the scope of the clinical data available.
Some drugs and medical devices demonstrated or described within the print publications of the Section of Disorders of the Spine and Peripheral Nerves jointly sponsored by the CNS have FDA clearance for use for specific purposes or for use only in restricted research settings. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each drug or device he or she wants to use in compliance with applicable laws.

Neither the content (written or oral) of any course, seminar or other presentation in the program, nor the use of a specific product in conjunction therewith, nor the exhibition of any materials by any parties coincident with the program, should be construed as indicating endorsement or approval of the views presented, the products used or the materials exhibited by the Section on Disorders of the Spine and Peripheral Nerves jointly sponsored by the CNS, or by its committees, commissions or affiliates.

Health and Safety
For the health and safety of all meeting participants, please wear your mask at all times except when presenting, eating, or drinking.
PROGRAM AT-A-GLANCE

WEDNESDAY

11:00 am-5:30 pm Registration
12:00-1:00 pm Non-CME Pre-Meeting Sponsored Lunch Symposia
1:30-4:30 pm SPECIAL COURSE 1 NEW! Cervical Spinal Trauma: What Every Spine Surgeon Needs to Know

1:30-5:30 pm SPECIAL COURSE 2 Spinal Deformity: Applying Current Deformity Concepts to Your Practice, a Case-Based Approach in collaboration with AOSNA

SPECIAL COURSE 3 Introduction to Spinal Coding: From Decompression to Deformity

THURSDAY

6:30 am-6:30 pm Registration
6:30-7:30 am Continental Breakfast
7:00-7:45 am CHALLENGING CASES 1 Oral Board-style Challenging Cases: Cervical
7:45-8:00 am Opening Remarks
8:00-9:30 am SCIENTIFIC SESSION 1 Evaluating Technological Advancement

9:30 am-4:30 pm Exhibit Hall Open
9:30-10:15 am Beverage Break and What's New Sessions in the Exhibit Hall
10:15 am-12:00 pm SCIENTIFIC SESSION 2 Lessons Learned

FRIDAY

6:30 am-4:45 pm Registration
6:30-7:30 am Continental Breakfast
7:00-8:00 am CHALLENGING CASES 2 Oral Board-style Challenging Cases: Lumbar
8:00-9:30 am SCIENTIFIC SESSION 4 Future Directions

9:30 am-2:00 pm Exhibit Hall Open
9:30-10:15 am Beverage Break and What's New Sessions in the Exhibit Hall
10:15 am-12:15 pm THE CAHILL CONTROVERSIES

SATURDAY

6:30 am-12:30 pm Registration
6:30-7:30 am Continental Breakfast
7:00-7:30 am CHALLENGING CASES 3 Oral Board-style Challenging Cases: Peripheral Nerve

7:30-9:30 am General Spine Surgery 1/ Trauma/Spinal Cord Injury Abstract Breakout Session

General Spine Surgery 2/ Tumor/Opioids Abstract Breakout Session
SPECIAL COURSE 4
Novel and Emerging Technologies in Spine Surgery
3:00-5:00 pm
Seminar for APRNs and PAs
6:30-9:00 pm
OPENING RECEPTION

1:00-2:30 pm
SCIENTIFIC SESSION 3
Innovative Technology Special Session: Operative Video Segments

2:30-3:15 pm
Beverage Break and What's New Sessions in the Exhibit Hall

2:30-4:30 pm
Case-based Approaches to Peripheral Nerve Trauma and Other Conditions

3:15-4:25 pm
• Kuntz Scholar Abstracts Concurrent Session 1
• Kuntz Scholar Abstracts Concurrent Session 2
• Kuntz Scholar Abstracts Concurrent Session 3
• Minimally Invasive/Motion Preservation Abstract Breakout Session

4:30-6:30 pm
Crossfire: Finesse or Brute Force (Happy Hour Debates with Beer and Wine)

1:45-4:45 pm
SPECIAL COURSE 5
Treatment and Complication Avoidance in the Management of Spinal Tumors

SPECIAL COURSE 6
Spine Summit Grand Rounds: Difficult Cases—The Decision-Making Dilemma

SPECIAL COURSE 7
Starting Your Career: Practical Tips for Success

SPECIAL COURSE 8
Practical Matters: Hands-on Operating Room Preparation for the APP

5:00-6:00 pm
RECEPTION WITH WINS

6:00-8:00 pm
YOUNG SPINE SURGEONS’ RECEPTION AND DINNER

• General Spine Surgery 3/Peripheral Nerve/Basic Science Abstract Breakout Session
• Spinal Deformity Abstract Breakout Session

9:30-11:15 am
SCIENTIFIC SESSION 5
Spine Workforce of Tomorrow

11:15 am-12:10 pm
SPECIAL SESSION: BUSINESS OF NEUROSURGERY
in collaboration with CSNS

12:10-12:30 pm
DSPN Business Meeting

12:30 pm
Meeting Adjourns

9:00-11:00 pm
DINNER SEMINAR
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of Congress of Neurological Surgeons and the Section on Disorders of the Spine and Peripheral Nerves. The Congress of Neurological Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA Credit Designation Statement
The CNS designates this live activity for a maximum of 28 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

A maximum of 19.50 AMA PRA Category 1 Credits™ may be earned for Scientific Sessions only.

Additional CME Credits can be earned by attending the following:

Special Courses
• Attendees will receive a maximum of 3.75 AMA PRA Category 1 Credits™ for an eligible half-day Special Course.
• Attendees will receive a maximum of 2.75 AMA PRA Category 1 Credits™ for an eligible Friday afternoon Special Course.
• Attendees will earn an additional 2.00 AMA PRA Category 1 Credits™ for attending the Wednesday evening Dinner Seminar.
Nursing Credit
The American Board of Neuroscience Nursing (ABNN) accepts attendance at educational activities approved for CME credit for CNRN or SCRN recertification. The educational activity must be specific to neuroscience or stroke and a course agenda may be required for any sessions that do not explicitly indicate neuroscience content. One CME credit hour equals one (1) CE hour.

For more information regarding recertification requirements, please contact the ABNN directly at 847-375-4733. Check the following websites for additional requirements: CNRN and SCRN.

Physician’s Assistant Credit
The American Academy of Physicians Assistants (AAPA) and The National Commission on Certification of Physician Assistant (NCCPA) accepts attendance at educational activities from an ACCME accredited provider. One CME credit hour equals one (1) AAPA Category 1 CME credit. Education credits can be submitted by logging into the online submission system for both organizations.
John J. Knightly, a practicing neurosurgeon with a subspecialty interest in minimally invasive and complex spine surgery, currently serves as President, Atlantic Neurosurgical Specialists and Altair Health as well as Vice Chairman, Atlantic Neuroscience Institute. Outside of his clinical work, his other areas of specialty interest and research include health care policy, outcomes and registry science, and quality improvement. He has served as Chair of the Joint Section on Disorders of Spine and Peripheral Nerves for the American Association of Neurological Surgeons (AANS)/Congress of Neurological Surgeons (CNS) as well as chair of the of the Quality Improvement Workforce of the AANS/CNS and past AANS representative to the AANS/CNS Washington Committee.

On a national basis, Dr. Knightly is currently Chairman, Board of Directors, for NeuroPoint Alliance and was appointed a founding member of the executive committee of the newly created American Spinal Registry (ASR). A Director on the American Board of Neurological Surgeons (ABNS), he also has appointments on several committees within the AANS, American College of Surgeons as well as the National Quality Forum.
Todd J. Albert was Surgeon-in-Chief at the Hospital for Special Surgery from 2014 to 2019 and is currently Surgeon-in-Chief Emeritus. Formerly Chairman of the Department of Orthopaedics and President of The Rothman Institute at Thomas Jefferson University Hospital in Philadelphia, he is renowned as one of the nation’s leading orthopedic surgeons specializing in cervical spine conditions.

Dr. Albert graduated magna cum laude from Amherst College, received his doctorate of medicine from the University of Virginia School of Medicine, completed his residency in orthopaedic surgery at Thomas Jefferson University Hospital where he was named outstanding chief resident, and performed a fellowship in spinal surgery at the Minnesota Spine Center.

He is a Professor of Orthopaedic Surgery at Weill Cornell Medical College and serves on the boards of several scholarly journals. He is Past President of the Scoliosis Research Society, Past President of the Cervical Spine Research Society, Past Chair of The International Meeting of Advanced Spinal Techniques (IMAST) for the Scoliosis Research Society, and Past Chair of Development for the American Orthopaedic Association.

Dr. Albert has published over 400 scientific articles, authored over 80 book chapters, presented his research both nationally and internationally, and served as chairman at numerous courses. He has published seven textbooks on Spinal Surgery.
Allan D. Levi is Professor and Chairman, Department of Neurological Surgery; Professor, Departments of Orthopedics and Rehabilitation Medicine; Chief of Neurosurgery, Jackson Memorial Hospital; and Robert M. Buck Distinguished Chair in Neurological Surgery at University of Miami Miller School of Medicine/Jackson Memorial Hospital. Dr. Levi graduated from the University of Ottawa Medical School. He completed his residency at the University of Toronto Hospitals, as well as a spine fellowship at the Barrow Neurological Institute in Phoenix, AZ. In addition, he received a PhD in neurosciences at the University of Miami Miller School of Medicine. Dr. Levi, holding both a MD and PhD, leverages both his time spent in the laboratory as a researcher obtaining his PhD and his extensive experience as a neurosurgeon to create and direct his research staff to conduct studies that apply to humans in real world situations.

Dr. Levi’s research interests include cellular transplantation strategies after spinal cord and peripheral nerve injury. He has focused on developing cellular transplantation strategies to repair injuries within both the human central and peripheral nervous system. Schwann cells are the principal support cells with the peripheral nervous system and have the capacity to promote regeneration of central nervous system neurons as well as remyelinate central axons which have lost their insulation. Dr. Levi has focused much of his previous research efforts in furthering our understanding of the biology of human Schwann cells which have been isolated using cell culture techniques. The results of these studies have demonstrated that human Schwann cells have the capacity to form myelin after transplantation within immune deficient rodent models and that their numbers can be significantly increased with addition of growth factors.

One of Dr. Levi’s current clinical research trials involves the clinical development and characterization of the use of autologous human Schwann cells for peripheral nerve injuries with a lengthy gap to promote peripheral nerve regeneration. Since 2007, Dr. Levi has been the Course Director of the AANS Goodman Oral Board Preparation Course.
Mark Edwin Shaffrey, graduated magna cum laude from Virginia Tech with a B.S. in Biochemistry and Biology. In 1987, Dr. Shaffrey received his MD from the University of Virginia, where he was elected to AOA. He completed his neurosurgical training at the University of Virginia in 1994. During residency, he completed an NIH postdoctoral fellowship in microvascular physiology. Following his postgraduate training, Dr. Shaffrey completed a scholarship obligation to the USAF where he served as the Chief of Neurosurgery at Keesler Medical Center and was decorated with the Meritorious Service Medal in 1997. After returning to the University of Virginia, he was promoted to Professor of Neurosurgery in 2003. In 2006, he was appointed as David Weaver Professor and Chairman of the Department of Neurosurgery. In 2010, he co-founded the UVA-NIH Residency Program in collaboration with intramural Surgical Neurology Branch at the NIH.

Dr. Shaffrey is currently selected as an ABNS Scholar by the American Board of Neurological Surgeons and serves on the Leadership Identification and Development Initiative and Academy Award Committee for the American Academy of Neurological Surgery. He has served as the Member Benefits Chair for the American Association of Neurological Surgeons, Practical Courses Chair for the Congress of Neurological Surgeons Annual Meeting and Membership Chair for the Society of Neurological Surgeons. Dr. Shaffrey is currently serving as a Member-at-Large of the Neurosurgery PAC Board of Directors and is a member of the Neurosurgery Quality Council. He is the AANS representative to the Stakeholder’s Council of the American Board of Medical Specialties. He has been appointed as the AANS representative to the Board of Governors of the American College of Surgeons.

Dr. Shaffrey has over 200 publications and has been principal investigator in over 50 grants and clinical trials. He has served as an Associate Editor for Neurosurgery, Book Review Editor for JNS, and serves on three additional Editorial Boards. During his career in medicine, Dr. Shaffrey has won numerous awards for laboratory investigation and clinical medicine. He was awarded a Traveling Fellowship by the Royal College of Surgeons. He has been named or elected to America’s Top Doctors, Best Doctors, the Raven Society, the Society of Neurological Surgeons, the American Academy of Neurological Surgery, and America’s Top Surgeons.
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| AMBASSADOR |
NETWORKING EVENTS

Opening Reception  Temple Pool
WEDNESDAY 6:30-9:00 pm
Enjoy a lavish array of food and beverages and listen to live entertainment as you network with old friends and new colleagues at the Opening Reception. Each medical attendee and spouse/guest registered for the meeting will receive one complimentary ticket. Resort casual attire is recommended.

Reception with WINS  Roman Ballroom III
FRIDAY 5:00-6:00 pm
Reconnect with friends and colleagues from WINS and forge new connections during this hour-long reception and networking event.

Young Spine Surgeons’ Reception and Dinner  Roman Ballroom I
FRIDAY 6:00-8:00 pm
All residents, fellows and young neurosurgeons are invited to enjoy a delicious dinner with the Spine Summit 2022 Honored guests. RSVP required, Please email meetings@cns.org no later than Wednesday, February 23, to attend.
CONGRATULATIONS TO THE 2022 AWARD RECIPIENTS!

- **Jacob Goldberg**  
  J.A.N.E. AWARD

- **James Caruso**  
  BRANCH AWARD

- **Andrew K. Chan**  
  MAYFIELD CLINICAL SCIENCE AWARD

- **Whitney Muhlestein**  
  KLINE PERIPHERAL NERVE TOP ABSTRACT

- **Andrew S. Jack**  
  KLINE PERIPHERAL NERVE RESEARCH AWARD

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<th>CHARLES KUNTZ IV SCHOLARS</th>
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<tr>
<td>Hasan S. Ahmad</td>
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<td>Ahmed Albayar</td>
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<td>Ammar Alsalahi</td>
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<td>Vikram Chakravarthy</td>
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<td>Andrew K. Chan</td>
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| AMBASSADOR |
THANK YOU
for your support of Spine Summit 2022
12:00–1:00 pm
Pre-meeting Non-CME Sponsored Lunch Symposia
See page 98 for detailed information and locations.

SPECIAL COURSE 1
Cervical Spinal Trauma: What Every Spine Surgeon Needs to Know
JULIUS 3–4
$200

1:30-4:30 pm
Course Directors: R. John Hurlbert, Eve C. Tsai

Course Description: This course is targeted for the practicing spine surgeon at a trauma center. We will review current guidelines and strategies on treating spine trauma and spinal cord injury as well as discuss novel and future therapies for spinal cord injury.

Learning Objectives:
- Discuss the various scoring systems for spinal stability in trauma
- Describe optimal timing of surgery
- Discuss current spine clearance protocols
- Describe novel therapeutics for SCI

1:30-1:39 pm
Introduction
R. John Hurlbert, Eve C. Tsai

1:40-2:04 pm
What is the Best Scoring System for Cervical Spine Stability
Alexander E. Ropper

2:05-2:29 pm
Update on Cervical Spine Clearance Following Trauma
David S. Xu

2:30-2:54 pm
Timing of Surgery in Traumatic SCI
Sanjay S. Dhall

2:55-3:15 pm
Break

3:16-3:40 pm
Central Cord Syndrome
R. John Hurlbert

3:41-4:05 pm
Hypothermia for SCI
Allan D. Levi
Future Therapies for SCI
Michael G. Fehlings

SPECIAL COURSE 2 JULIUS 15-17
Spinal Deformity: Applying Current Deformity Concepts to Your Practice: A Case-Based Approach in collaboration with AOSNA

1:30-5:30 pm
Course Directors: Dean Chou, Kai-Ming G. Fu, Eric Klineberg
Speakers: Darrel S. Brodke, Dean Chou, John C. France, Kai-Ming G. Fu, Kristen E. Jones, Eric Klineberg, Rakesh Patel, Daniel M. Sciubba, Michael S. Virk

Course Description: Through an interactive case-based format, this course will address deformity concerns commonly encountered by the practicing spine surgeon.

Learning Objectives:
- Identify deformity principles in regards to degenerative pathology
- Analyze the current state of less invasive techniques and deformity
- Explain the limitations of less invasive techniques in advanced deformity cases

1:30-1:35 pm
Welcome and Explanation of Course Format
Dean Chou, Kai-Ming G. Fu, Eric Klineberg

1:36-2:00 pm
Avoiding the Next Surgery, Alignment and ASD
Kristen E. Jones

2:01-2:25 pm
Indications for MIS versus Open Deformity Surgery: MISDEF2 Algorithm
Michael S. Virk

2:26-2:50 pm
How to Approach Deformity in Young Adults
Rakesh Patel

2:51-3:15 pm
Sacro-pelvic Considerations in Deformity Surgery

3:16-3:30 pm
Break

3:31-3:55 pm
Using Robotics in Spinal Deformity
Daniel M. Sciubba

3:56-4:20 pm
Tools for Lumbar Deformity Correction: Interbody to Osteotomy
John C. France
4:21-4:45 pm  
**PROMS in Deformity Surgery: What Matters**  
Darrel S. Brodke

4:46 pm-5:10 pm  
**Complication Management in Open Adult Deformity Surgery**  
Eric Klineberg

5:11-5:30 pm  
**Discussion and Participant Cases**  
Dean Chou

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**SPECIAL COURSE 3**  
**JULIUS 6-8**  
$200

1:30-5:30 pm

**Course Directors:** Mark E. Oppenlander, John K. Ratliff

**Speakers:** Mohamad Bydon, Kurt M. Eichholz, Oren N. Gottfried, Jeffrey P. Mullin, Mark E. Oppenlander, John K. Ratliff, Gabriel A. Smith, Khoi D. Than, Cheerag D. Upadhyaya, Anand Veeravagu, Robert G. Whitmore

**Course Description:** What every graduating resident, spine fellow or young attending needs to know about coding spinal procedures in the first few years of practice. Origins of CPT and RVU will be presented along with the fundamentals of spinal coding. The course then transitions to case-based coding. The entire spectrum of spine cases from decompression to complex deformity will be presented and the correct coding reviewed.

**Learning Objectives:**
1. Identify the origins of CPT, RVU and the RUC process
2. Demonstrate knowledge in the correct application of CPT codes for a variety of spinal procedures
3. Identify elements of practice management with an emphasis on spine

1:30-1:35 pm  
**Introduction**  
Mark E. Oppenlander, John K. Ratliff

1:36-1:50 pm  
**Medicare, RVUs, CPT: How We Got Here?**  
Mohamad Bydon

1:51-2:05 pm  
**Basic Spine Coding: Cervical**  
Cheerag D. Upadhyaya

2:06-2:20 pm  
**Basic Spine Coding: Lumbar**  
Robert G. Whitmore
2:21-2:35 pm  
Gabriel A. Smith

2:36-2:50 pm  
Mark E. Oppenlander

2:51-3:05 pm  
Oren N. Gottfried

3:06-3:30 pm  
Jeffrey P. Mullin

3:31-3:45 pm  
Break

3:46-4:00 pm  
Case Based Spinal Deformity Coding  
Khoi D. Than

4:01-4:20 pm  
Case Based Cervical Trauma Coding  
Kurt M. Eichholz

4:21-4:40 pm  
Case Based Thoracolumbar Trauma Coding  
Anand Veeravagu

4:41-5:00 pm  
Obtaining an Authorization for Surgery and the Peer to Peer Process  
Kurt M. Eichholz

5:01-5:30 pm  
Questions and Course Conclusion
SPECIAL COURSE 4  JULIUS 19-22
Novel and Emerging Technologies in Spine Surgery  $200

1:30-5:30 pm
Course Directors: Paul Park, Juan S. Uribe
Speakers: Victor W. Chang, Jakub Godzik, Michael W. Groff, Frank La Marca, Mark E. Oppenlander, Paul Park, Martin H. Pham, Daniel M. Sciubba, John H. Shin, Kevin Swong, Khoi D. Than, Jay D. Turner, Juan S. Uribe, Michael Y. Wang, Hesham M. Zakaria

Course Description: This course will cover the latest technological advances in the field of spinal surgery including surface technology, new biologics for fusion, expandable cages, new applications for navigation, robotics, among others. Many of these innovations have the potential to improve surgical efficiency, safety, and outcomes. Attendees will gain a better understanding of the basis for the technology, its applications clinically, evidence for the technology, outcomes and costs.

Learning Objectives:
- Identify current evidence supporting the use of newer technologies such as expandable cages and surface technology
- Identify the role of robotics and its integration into spinal surgery
- Identify new applications for spinal navigation in minimally invasive and deformity surgery
- Evaluate the potential benefits of new imaging technology such as exoscopes.

1:30-1:35 pm
Introduction
Paul Park, Juan S. Uribe

1:36-1:45 pm
Navigation-assisted Spinal Deformity Surgery
John H. Shin

1:46-1:55 pm
Navigation-assisted Lateral Surgery
Mark E. Oppenlander

1:56-2:05 pm
Pitfalls and Complication Avoidance with Navigation
Frank La Marca

2:06-2:15 pm
Robot-assisted Interbody Fusion
Khoi D. Than

2:16-2:25 pm
Robot-assisted Deformity Surgery
Martin H. Pham

2:26-2:35 pm
Machine Learning and Spine Surgery
Hesham M. Zakaria
2:36-2:45 pm  
Radiation Reduction Technologies 
Jay D. Turner

2:46-2:49 pm  
Questions and Discussion

2:50-3:19 pm  
Hands-on Workshop (Navigation, AR, Robots)

3:20-3:40 pm  
Break

3:41-3:50 pm  
Expandable Cage Technology - Worth the Cost? 
Victor W. Chang

3:51-4:00 pm  
Surface Technology - Hype or Not? 
Kevin Swong

4:01-4:10 pm  
Facet Replacement Systems; Ready for Prime Time? 
Michael W. Groff

4:11-4:20 pm  
Novel Screw Technologies (One-step MIS Pedicle Screw, Fenestrated Screws, Etc.) 
Michael Y. Wang

4:21-4:30 pm  
Exoscopes and Augmented Reality: Moving Beyond Traditional Loupes and Microscope 
Daniel M. Sciubba

4:31-4:40 pm  
Jakub Godzik

4:41-4:50 pm  
Questions and Discussion

4:51-5:30 pm  
Hands-on Workshop (Robotics)

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Educational Grant provided by: DePuy Synthes

In-Kind Equipment provided by: DePuy Synthes and Synaptive Medical
SEMINAR FOR APRN AND PAS  ROMAN I

3:00-5:00 pm
Course Directors: Sara M. McEvoy, Eric A. Potts
Faculty: Megan Bellman, Kendra Clark, Claire Duffy, Andrea Fox, Angela M. Jolivette, Michael Lampman, Sara M. McEvoy, Gina Rizzo, Andrea L. Strayer
Course Description: Neurosurgery Advanced Practice Providers and Physician Assistants are the target audience for this course, which will cover the preoperative evaluation, perioperative management and postoperative management of neurosurgical spine patients. Special emphasis will be on teamwork, non-narcotic pain control, communication and use of order sets.

Learning Objectives:
- Generate a differential diagnosis for leg and arm pain
- Identify the impact of comorbidities on patient outcomes
- Describe the impact of preoperative and postoperative patient communication and setting expectation
- Identify the impact preoperative opioid use on postoperative pain control

3:00-3:12 pm
Importance of Preoperative Education for the Spine Patient
Megan Bellman

3:13-3:25 pm
From PA/NP to Neurosurgery Patient: The Value of an APP
Kendra Clark

3:26-3:38 pm
PA/NP and Social Worker: Approach to the Challenging Post-operative Spine Patient
Claire Duffy

3:39-3:51 pm
EMG Pearls: Case Based Evaluation of Challenging Differential Diagnoses
Sara M. McEvoy

3:52-4:04 pm
Essential Surgical Spine Anatomy for Advanced Providers: How to be the Ideal Surgical Assistant
Gina Rizzo

4:05-4:17 pm
Preoperative Optimization for Postoperative Success from a PT Perspective
Michael Lampman

4:18-4:30 pm
Preoperative Optimization Strategies in the Osteoporotic patient
Andrea Fox
4:31-4:43 pm  
**Common Inpatient Issues after Spine Surgery**  
Andrea L. Strayer

4:44-5:00 pm  
**APP Utilization**  
Angela M. Jolivette

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**DINNER SEMINAR  $200**

9:00-11:00 pm

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**Spine Summit Honored Guest Dinner Symposium:**
**The Future of Spine Surgery: Predictions About Technology, Healthcare and the Evolution of Tomorrow’s Spine Surgeon**

**Location:** Joe’s Seafood, Prime Steak & Stone Crab  
Caesars Forum Shops  
3500 S. Las Vegas Blvd.

**Speakers:** Todd J. Albert, Domagoj Coric, John J. Knightly, Allan D. Levi, Mark E. Shaffrey

**Course Description:** An opportunity to interact with the 2022 Spine Summit Honored Guests, Allan D. Levi, John J. Knightly, Todd J. Albert, as well as Meritorious Award Recipient Mark E. Shaffrey to learn their perspectives on the future of spine surgery. The DSPN Chair Domagoj Coric will discuss the evolution of private practice and future trends and directions.

**Learning Objectives:**
- Identify with the various trajectories that technology may lead the future of spinal surgery  
- Recognize how the future of healthcare will affect the practice of spinal surgery in years to come  
- Identify those characteristics needed to remain relevant in the future world of spine care

**Educational Grant provided by:** Medtronic
CHALLENGING CASES 1 JULIUS 12-14, 24
Oral Board-style Challenging Cases: Cervical
7:00-7:45 am
Moderators: Yi Lu, W. H. Andrew Ryu

OPENING REMARKS JULIUS 12-14, 24
7:45-7:54 am
Welcome
Scott A. Meyer
7:55-8:00 am
Introduction
Domagoj Coric

SCIENTIFIC SESSION 1 JULIUS 12-14, 24
Evaluating Technological Advancement
8:00-9:30 am
Moderators: Charles A. Sansur, Laura A. Snyder
Speakers: Tim E. Adamson, Adam S. Kanter, Rick Sasso, Michael P. Steinmetz, William R. Taylor

Learning Objectives:
- Describe the future direction of MIS deformity surgery
- Demonstrate understanding of the evolution of technology has changed the current management of single level spondylolisthesis
- Identify future directions of motion preservation surgery

8:00-8:10 am
MIS Deformity: How Far We Have Come and What’s Next
Adam S. Kanter
8:11-8:16 am
Discussion

8:17-8:27 am
Prone Single Position Lateral: Early results, Does it Live Up to the Hype?
William R. Taylor
8:28-8:33 am
Discussion

8:34-8:44 am
How Has Technology Changed the Management of Single Level Spondylolisthesis?
Michael P. Steinmetz
8:45-8:50 am
Discussion
8:51-9:01 am
Cervical Motion Preservation in the Future: Arthroplasty
Rick Sasso

9:02-9:07 am
Discussion

9:08-9:18 am
Cervical Motion Preservation in the future: Micro-Endoscopic Laminoforaminotomy
Tim E. Adamson

9:19-9:30 am
Discussion and Summary of the Session

9:30-10:15 am
Beverage Break and What’s New Session 1 in the Exhibit Hall
See page 97 for detailed information and schedule.

SCIENTIFIC SESSION 2 JULIUS 12-14, 24
Lessons Learned
10:15 am-12:00 pm
Moderators: Erica F. Bisson, Scott A. Meyer
Learning Objectives:
- Describe the evolution of private practice spine surgery
- Describe future trends of orthopedic spine surgery
- Recognize the role of PN surgery and how it has transformed over the last decade

10:15-10:18 am
Introduction of Neurosurgery Honored Guest
Scott A. Meyer

10:19-10:38 am
Neurosurgery Honored Guest Presentation
John J. Knightly

10:39-10:42 am
Introduction of Orthopedics Honored Guest
Sheeraz Qureshi

10:43-11:03 am
Orthopedics Honored Guest Presentation
Todd J. Albert

11:04-11:07 am
Introduction of Peripheral Nerve Honored Guest
Line G. Jacques
11:08-11:28 am  
Peripheral Nerve Honored Guest Presentation  
Allan D. Levi

11:29-11:34 am  
Introduction of DSPN Chair  
John A. Wilson

11:35 am- 12:00 pm  
DSPN Chair’s Address  
Domagoj Coric

12:00–1:00 pm  
Lunch with Exhibitors or Attend a Non-CME Sponsored Lunch  
See page 98 for detailed information and schedule.

SCIENTIFIC SESSION 3  JULIUS 12–14, 24  
Innovative Technology Special Session: Operative Video Segments  
1:00-2:30 pm  
Moderators: Regis W. Haid, R. John Hurlbert  
Speakers: Frank La Marca, Peter G. Passias, Praveen V. Mummaneni, Jian Shen, Juan S. Uribe, Jean-Paul Wolinsky  
Learning Objectives:  
- Recognize a variety of the nuances of minimally invasive transforaminal lumbar interbody fusions  
- Identify those patients who are ideal candidates and technical nuances for cervical endoscopic spine surgery  
- Discuss workflow in the use of robotics in deformity/surgery

1:00-1:08 pm  
Lateral Retropleural Approach for Thoracic Discectomy and Corpectomy  
Juan S. Uribe

1:09-1:14 pm  
Discussion

1:15-1:23 pm  
MIS TLIF: Nuances and Experience  
Praveen V. Mummaneni

1:24-1:29 pm  
Discussion

1:30-1:38 pm  
Cervical Endoscopy: How I Do It  
Jian Shen

1:39-1:44 pm  
Discussion

1:45-1:53 pm  
PSO: Technique and Pearls  
Peter G. Passias
1:54-1:59 pm
Discussion
2:00-2:08 pm
Tumors at the Occipitocervical Junction, Considerations for Spine Surgeons
Jean-Paul Wolinsky
2:09-2:14 pm
Discussion
2:15-2:23 pm
Robotics in Deformity: Workflow and Process
Frank La Marca
2:24-2:30 pm
Discussion and Summary of Session
2:30-3:15 pm
Beverage Break and What’s New Session 2 in the Exhibit Hall
See page 97 for detailed information and schedule.

PERIPHERAL JULIUS 21-22
NERVE SESSION
Case-based Approaches to Peripheral Nerve Trauma and Other Conditions
2:30-4:30 pm
Course Directors: Line G. Jacques, Robert J. Spinner
Course Description: This course will cover management of various peripheral nerve disorders. Using a case-based format, faculty will review indications, timing of intervention, and surgical approaches. Relevant anatomy, clinical presentation, and outcomes will be discussed. This course is an excellent review for oral board and maintenance of certification.
Learning Objectives:
- Describe a systematic approach to patients with a wide range of peripheral nerve disorders
- Develop a non-operative or operative management strategy for these conditions
- Discuss advantages and disadvantages and expected outcomes of various surgical approaches
2:30-2:37 pm
Localization of Peripheral Nerve Lesions
Robert J. Spinner
2:38-2:45 pm
Injury Types and Predicting Outcomes
Allan J. Belzberg
2:46-2:53 pm
Innovations for Nerve Regeneration
Rajiv Midha
2:54-3:01 pm
Principle of Nerve Repair: Techniques of Cooptations and Grafting
Allan D. Levi

3:02-3:09 pm
Principle of Nerve Repair: Techniques of Nerve Transfer
Wilson Z. Ray

3:10-3:39 pm
Case Based Discussion: Nerve Trauma

3:40-3:47 pm
Diagnosis and Treatment: UE Entrapment Syndromes
Eric L. Zager

3:48-3:53 pm
Diagnosis and Treatment: LE Entrapment Syndromes
Mark A. Mahan

3:54-3:59 pm
Principles of Management: Peripheral Nerve Tumors
Line G. Jacques

4:00-4:30 pm
Panel Discussion: Entrapments and Tumors
Allan J. Belzberg, Holly Gilmer, Marie-Noelle Hebert-Blouin, Andrew S. Jack, Rajiv Midha, Thomas J. Wilson, Christopher J. Winfree

ORAL ABSTRACT PRESENTATIONS
3:15-4:25 pm

Kuntz Scholar
Oral Abstract Presentations
Concurrent Session 1
Moderators: Alexander E. Ropper, Jay D. Turner

3:15-3:20 pm
100 Kline Top Peripheral Nerve Award: Natural History of Shoulder Recovery in Conservatively Managed Neonatal Brachial Plexus Palsy
Whitney Muhlestein, Kate Chang, Brandon Smith, Lynda Yang

3:20-3:25 pm
Discussant: Gabriel C. Tender

3:25-3:30 pm
101 ASD patient outcomes planned for a two-staged scoliosis correction: A case for standalone anterolateral MIS fusion
Alp Ozpinar, Nallammai Muthiah, Nima Alan, Nitin Agarwal, Adam S. Kanter, D. Kojo Hamilton, David Okonkwo

3:30-3:35 pm
Discussant: Marcus D. Mazur
3:35-3:40 pm
Jose Orenday, María José Cavagnaro, Mauricio Avila, Pedro Aguilar Salinas, Isabel Martha Strouse, Aaron Dowell, Naushaba Khan, Robert Andrew Ravinsky, Ali A. Baaj

3:40-3:45 pm
Discussant

3:45-3:50 pm
103 Improvement in Resident Performance for Minimally Invasive Lumbar Decompression Using a State-of-the-Art Simulator
Carolin Melcher, Ibrahim Hussain, Sertac Kirnaz, Jacob Goldberg, Fabian Sommer, Rodrigo Navarro-Ramirez, Branden Medary, Roger Hartl

3:50-3:55 pm
Discussant: Oren N. Gottfried

3:55-4:00 pm
104 Does Laminectomy Width Predict Postop C5 Palsy after Posterior Cervical Decompression Fusion: A Comparative Cohort Study
Ammar Alsalahi, Doris Tong, Jacob Jasinski, Connor Hanson, Prashant Kelkar, Peter Bono, Daniel Carr, Teck Soo, Boyd Richards

4:00-4:05 pm
Discussant: Sanjay S. Dhall

4:05-4:10 pm
105 Repairing the injured rodent spinal cord using sensory and motor micro-tissue engineered neural networks
Michael Spadola, Ahmed Albayar, Justin Burrell, Patricia Sullivan, D. Kacy Cullen, Ali Ozturk

4:10-4:15 pm
Discussant: Hoon Choi

4:15-4:20 pm
106 Lower Hounsfield Units are Associated with Proximal Junctional Kyphosis and Failure at the Upper Thoracic Spine
Anthony Mikula, Nikita Lakomkin, Zach Pennington, Zachariah Pinter, Ahmad Nassr, Brett Freedman, Arjun Sebastian, Kingsley Abode-Iyamah, Mohamad Bydon, Jeremy Fogelson, Benjamin D. Elder

4:20-4:25 pm
Discussant: Hasan A. Zaidi
Kuntz Scholar
Oral Abstract Presentations
Concurrent Session 2

Moderator: John H. Shin

3:15-3:20 pm
107 Timing of nerve transfer surgery for C5 palsy: does recovery at 6 months predict final recovery?
Yamaan S. Saadeh, Zoey Chopra, Katherine Holste, Eric Olsen, Osama Kashlan, Brandon Smith, Lynda Yang, Paul Park

3:20-3:25 pm
Discussant: Holly Gilmer

3:25-3:30 pm
108 Is the CMS Hierarchical Condition Category Risk Adjustment Model Satisfactory for Quantifying Spine Surgical Risk?
Andrew K. Chan, Shane Shahrestani, Alexander Ballatori, Katie Orrico, Geoffrey Manley, Phiroz Tarapore, Michael Y. Huang, Sanjoy S. Dhall, Dean Chou, Praveen V. Mummaneni, Anthony DiGiorgio

3:30-3:35 pm
Discussant: Gabriel A. Smith

3:35-3:40 pm

3:40-3:45 pm
Discussant: Mark E. Oppenlander

3:45-3:50 pm
110 Preventing Surgical Site Hematoma with Topical Tranexamic Acid in Lumbosacral Surgery: A Quality Improvement Project
Robert W. McCabe, Doris Tong, Boyd Richards, Prashant Kelkar, Peter Bono, Clifford Houseman, Daniel Carr, Teck Soo

3:50-3:55 pm
Discussant: Justin Slavin

3:55-4:00 pm
111 (Cost)Effectiveness of Full-endoscopic Discectomy vs. Microdiscectomy for Sciatica: a RCT with 24 month follow-up
Pravesh Gadjarad, Sidney Rubinstein, Wilco Peul, Maurits van Tulder, Biswadipjot Harhangi

4:00-4:05 pm
Discussant: Camilo A. Molina
Kuntz Scholar JULIUS 15-17
Oral Abstract Presentations
Concurrent Session 3
Moderator: Jeremy Steinberger

3:15-3:20 pm
114 Favorable Prognosis for Significant Preoperative Upper Extremity Weakness following ACDF
Zachariah Pinter, Arjun Sebastian, Scott Wagner, Patrick Morrissey, Ian Kaye, Alan Hilibrand, Alex Vaccaro, Christopher Kepler

3:20-3:25 pm
Discussant: Owoicho Adogwa

3:25-3:30 pm
115 Cognitive Impairment is Associated with Higher Rates of Postoperative Complications After Spine Surgery
Owoicho Adogwa, Sai Chilakapati, Syed Khalid, Cody Eldridge, Ravinderjit Singh, Michael Burton

3:30-3:35 pm
Discussant: Cheerag D. Upadhyaya

3:35-3:40 pm
116 Application of Machine Learning for a Prediction Model for Patient Reported Outcomes after lumbar surgery: A MSSIC study
Travis M. Hamilton, Ho Jun Yun, Tarek Mansour, Seokchun Lim, Mohamed Macki, Hsueh-Han Yeh, Kylie Springer, Lonni Schultz, David Nerenz, Muwaffak Abdulhak, Kevin Taliaferro, Jason Schwalb, Jad Khalil, Ilyas Aleem, Richard Easton, Mick Perez-Cruet, Paul Park, Victor W. Chang

3:40-3:45 pm
Discussant: Mohamad Bydon

3:45-3:50 pm
117 The rates of proximal junctional kyphosis after L4 versus L3 pedicle subtraction osteotomies
Saman Shabani, Joshua Rivera, Praveen V. Mummaneneni, Nitin Agarwal, Jeremy Huang, Shane Burch, Sigurd Berven, Dean Chou
3:50-3:55 pm
Discussant: Kai-Ming G. Fu

3:55-4:00 pm
118 Separation Surgery and Adjuvant Stereotactic Radiation for Non-Small Cell Lung Cancer: Analysis of 103 Cases
Vikram Chakravarthy, Benjamin Schnachner, Anubhav Amin, Jemma Villavieja, Anne Reiner, Yoshiya Josh Yamada, Adam Schmitt, Daniel Higginson, Ilya Laufer, Mark H. Bilsky, Ori Barzilai

4:00-4:05 pm
Discussant: Yi Lu

4:05-4:10 pm
119 Comparing posterior cervical foraminotomy with ACDF in radiculopathic patients: an analysis from the QOD

4:10-4:15 pm
Discussant: Andrew C. Vivas

4:15-4:20 pm
120 Creating a Spine Healthcare Resource Utilization Scale (SHRUS) to Complement PROMs in Assessing Surgical Success
Kevin T. Huang, Arpan Patel, Sebastian Salas-Vega, Swetha Sundar, Michael P. Steinmetz, Thomas Mroz, Ghaith Habboub

4:20-4:25 pm
Discussant: Corinna C. Zygourakis

Minimally Invasive/ Motion Preservation
Abstract Breakout Session
Moderators: Benjamin D. Elder, Paul Park
Learning Objectives:
- Analyze the findings of novel neurosurgical studies, critique the design and methodology of these studies
- List important areas for further knowledge development and research
- Discuss ongoing innovative clinical and basic science studies, and how they may impact current practice

3:15-3:17 pm
200 Prospective, Randomized Study of Lumbar Facet Replacement vs Lumbar TLIF Fusion for Spondylolisthesis
Jonathan Parish, Ahmad Nassr, Michael P. Steinmetz, William Welch, Domagoj Coric
3:17-3:19 pm
201 Two Level Full Endoscopic Posterior Cervical Foraminotomy: Short Term Results and Comparison with Open Surgery
Masahiko Akiyama, Hisashi Koga

3:19-3:21 pm
202 Differences in ACDF Outcomes: the Impact of Myelopathy at Presentation
Ansh Desai, Jeff Butke, Collin Labak, Eric Herring, Manish Kasliwal

3:21-3:23 pm
203 Cervical disc arthroplasty vs. ACDF in patients with spondylotic myelopathy: a QOD study

3:23-3:25 pm
204 Cervical Foraminotomy: Transcorporeal versus MIS Posterior Approach
Mohamad Bydon, Chiduziem Onyedimma, Abdul Karim Ghaith, Sulaman Durrani, Atiq Bhatti, Yagiz Yolcu, Kingsley Abode-Ifamah, Alfredo Quiñones-Hinojosa, Brett Freedman

3:25-3:27 pm
205 Predictors of Postoperative Segmental and Overall Lumbar Lordosis in MI-TLIF
Justin Zhang, Jacob Greenberg, Saad Javeed, Christopher Dibble, Jawad Khalifeh, Deeptee Jain, Ian Dorward, Paul Santiago, Camilo A. Molina, Brenton Pennicooke, Wilson Z. Ray

3:27-3:29 pm
206 Clinical and radiographic outcomes of curved lordotic expandable lumbar interbody cages in MIS TLIF: A 2 year follow-up
Travis Hamilton, Ho Jun Yun, Edwin Telemi, Seokchun Lim, Mohamed Macki, Hsueh-Han Yeh, Kylie Springer, Lonni Schultz, David Nerenz, Muwaffak Abdulhak, Kevin Taliaferro, Jason Schwalb, Jad Khalil, Ilyas Alem, Richard Easton, Mick Perez-Cruet, Paul Park, Victor W. Chang

3:29-3:31 pm
207 Minimally-Invasive Transforaminal Lumbar Interbody Fusion in the Ambulatory Surgery Center Setting
Steve Monk, Tyler Atkins, Vincent Rossi, Brandon Karimian, Tim E. Adamson, Mark Smith, Byron Branch, Paul Kim, Deborah Pfottermiller, Vinay Deshmukh
208 Effectiveness of a Bone-Anchored Implant to Prevent Recurrent Lumbar Disc Herniation: 5-Year Multicenter RCT Results

209 Evolution of ACD Surgery Clinical and Radiographic Outcomes: Are Behaviors and Outcomes Changing with Experience?

210 Percutaneous MIS Posterior Cervical Pedicle Instrumentation (C1 to C7) with Navigation Guidance
Steve Monk, Vincent Rossi, Domagoj Coric

211 Percutaneous Direct Pars Repair In The Young Athlete
Aria Jamshidi, Sauson Soldozy, Allan D. Levi

212 Comparison of Local and Regional Radiographic Outcomes in MI- vs. Open TLIF: A Propensity Score Matched Cohort
Christopher Dibble, Justin Zhang, Jacob Greenberg, Saad Javeed, Jawaad Khalijeh, Deepthi Jain, Ian Dorward, Paul Santiago, Camilo A. Molina, Brenton Pennicooke, Wilson Z. Ray

213 Development of a Cost-Effective Simulator for Microdiscectomy
Alexander Lopez, Joshua Kurtz, Nischal Acharya, Chen Yi Yang, Michael Oh

214 Predictors of Airway Complications Following Elective Anterior Cervical Discectomy and Fusion
Morgan Hardman, Archis Bhandarkar, Ryan Jarrah, Mohamad Bydon

215 Comparison of a Simultaneous Anterior and Posterior Approach (SAPA) for LLIF to Two-Stage Lumbar Interbody Fusion
Hasan Ahmad, Yohannes Ghenbot, Kyle McCloskey, Ryan Turlip, William Welch, Jang Yoon
216 Variation in cervical pedicle morphology: important considerations for minimally invasive posterior cervical procedures
Jacob Goldberg, Jimmy Xia, Joseph Carnevale, Fabian Sommer, Prawesh Gadpraj, Branden Medary, Rodrigo Navarro-Ramirez, K. Daniel Riew, Ibrahim Hussain, Roger Hartl

217 Single level awake transforaminal lumbar interbody fusion: a Mayo Clinic institutional experience and national analysis

218 Economic consequences of waiting for lumbar disc herniation surgery
Charlotte Dandurand, Greg McIntosh, Edward Abraham, Jerome Paquet, Christopher Bailey, Michael Weber, Michael Johnson, Andrew Nataraj, Andrew Glennie, Najmedden Attabib, Adrienne Kelly, Hamilton Hall, Raja Rampsaud, Neil Manson, Philippe Phan, Charles Fisher, Nicolas Dea

219 Decreased Disc Height is Associated with Increased Range of Motion Following 2-level Cervical Disc Arthroplasty
Nikita Lakomkin, Zach Pennington, Abdul Karim Ghaith, Anthony Mikula, William Mualem, Karim Nathani, Sulaman Durrani, Jeremy Fogelson, Benjamin D. Elder, Mohamad Bydon

220 Anterior lumbar interbody fusion at L5-S1 in lateral decubitus position: surgical outcomes and technical nuances
Kyle McCloskey, Hasan Ahmad, Jang Yoon, Ryan Turlip

221 General versus Local Anesthesia for Lumbar Microendoscopic Discectomy: A Systematic Review and Meta-Analysis
James Mooney, Nicholas Erickson, Arsalan Salehani, Nicholas Laskay, Anil Mahavadi, Adeel Ilyas, Bipul Mainali, Jakub Godzik

222 Cost Savings with Single-Position Prone Lateral Interbody Fusion: A Matched Case Analysis
Clinton Morgan, Stefan Koester, Jakub Godzik, Robert Dugan, Gennadiy Katsevman, Juan S. Uribe

223 Cervical Sagittal Alignment and Neck Pain Following 2-Level Cervical Disc Arthroplasty: Long-term Radiographic Outcomes
Nikita Lakomkin, Anthony Mikula, Abdul Karim Ghaith, Zach Pennington, William Mualem, Karim Nathani, Sulaman Durrani, Jeremy Fogelson, Benjamin D. Elder, Mohamad Bydon
4:03-4:05 pm
224 Preoperative Patient Expectations and Postoperative Patient Satisfaction Stratified by MIS Approach for Lumbar Fusion

4:05-4:07 pm
225 Factors Influencing the Restoration of Lumbar Lordosis Following Minimally Invasive Lumbar Interbody Fusion

4:07-4:09 pm
226 Which patient-reported outcome measures are most responsive to measure clinical success in lumbar discectomy?
Pravesh Gadjradj, Biswadjiet Harhangi

4:09-4:11 pm
227 Heterotopic Ossification in Cervical Disc Arthroplasty: A Finite Element Model Analysis
Ross Rybakowicz, Henkar Sharma, Jamie Baisden, Davidson Jebaseelan, Narayan Yoganandan

4:11-4:13 pm
228 Comparison between Cage Materials for Anterior Cervical Discectomy and Fusion with Stand-Alone Cages: A Meta-Analysis

4:13-4:15 pm
229 A Comparison of Spinal Robotic Systems and Pedicle Screw Accuracy Rates: Review of the Literature and Meta-analysis
Vera Ong, Ashley Swan, John Sheppard, Edwin Ng, Brian Faung, Luis Diaz-Aguilar, Martin H. Pham

4:15-4:17 pm
230 An Analysis of Interbody Placement for Lateral Lumbar Interbody Fusion: Anterior-to-Psoas Versus Transpsoas
Kyle McCloskey, Eric Multhersbaugh, Hasan Ahmad, Ryan Turlip, Shikha Singh, Jang Yoon

4:17-4:19 pm
231 Prone Versus Supine Lumbar Plexus Translation: Advancing Magnetic Resonance Imaging for Neural Element Capture
Lauren Stone, Marin McDonald, David Santiago-Dieppa, William R. Taylor

4:19-4:21 pm
232 Comparative outcomes of augmented reality-assisted and robotic-assisted techniques for spine surgery
Miguel Ruiz-Cardozo, Michael Olufowo, Som Singh, Samuel Brehm, Wilson Z. Ray, Brenton Penniscooke, Camilo A. Molina
4:21-4:23 pm
233 Minimally Invasive Cervical Pedicle Screw Fixation via a Posterolateral Approach
Seokchun Lim, Karam Asmaro, Mohamed Macki, Travis Hamilton, Mokbel Chedid

4:23-4:25 pm
234 Randomized, prospective study of adjacent-level degeneration and disease following lumbar total disc replacement
Jonathan Parish, Jack Zigler, Aaron Situ, Anton Jorgensen, Ernest Braxton, Glenn Buttermann, Kris Radcliff, Nicole Ferko, Peter Derman, Domagoj Coric

CROSSFIRE: FINESSE OR JULIUS 12-14, 24 BRUTE FORCE
Happy Hour Debates with Beer and Wine
4:30-6:30 pm
Moderators: Steven D. Glassman, Robert F. Heary
Speakers: Sigurd Berven, Robert Eastlack, Matthew Goodwin, James S. Harrop, Roger Hartl, Daniel J. Hoh, Maziyar A. Kalani, Steven C. Ludwig, Gregory M. Mundis, Martin H. Pham, Sheeraz Qureshi, Daniel M. Sciubba, Juan S. Uribe, Michael Y. Wang

Learning Objectives:
- Identify the difference between Orthopedic and Neurosurgical Spine Training
- Recognize anterior and posterior treatment paradigms for addressing sagittal imbalance
- Discuss treatment options for the use of robotics in spine surgery

4:30-4:59 pm
Topic 1: Training in Spine Surgery
4:30-4:38 pm
Training in Spine Surgery - PRO: Orthopedics Do It Right
Steven C. Ludwig
4:39-4:47 pm
Training in Spine Surgery - CON: Neurosurgery Spine is Superior
James S. Harrop
4:48-4:53 pm
Training in Spine Surgery - Summary of Points
Juan S. Uribe
4:54-4:59 pm
Questions from the Audience and Vote

5:00-5:29 pm
Topic 2: Robotics in Spine Surgery
5:00-5:08 pm
Sheeraz Qureshi
5:09-5:17 pm  
Robotics in Spine Surgery - CON: Adds to Cost with No Benefit  
Roger Hartl

5:18-5:23 pm  
Robotics in Spine Surgery - Summary of Points

5:24-5:29 pm  
Questions from the Audience and Vote

5:30-5:59 pm  
Topic 3: Correction of Sagittal Deformity

5:30-5:38 pm  
Correction of Sagittal Deformity - PRO: ACR and Anterior Lordosis is the Way to Go  
Michael Y. Wang

5:39-5:47 pm  
Correction of Sagittal Deformity - CON: PSO is the Way to Go  
Gregory M. Mundis

5:48-5:53 pm  
Topic 3: Correction of Sagittal Deformity - Summary of Points  
Daniel J. Hoh

5:54-5:59 pm  
Questions from the Audience and Vote

6:00-6:30 pm  
Topic 4: Carbon Fiber Instrumentation in Tumor Surgery

6:00-6:08 pm  
Carbon Fiber Instrumentation in Tumor Surgery - PRO: Standard of Care  
Maziyar A. Kalani

6:09-6:17 pm  
Carbon Fiber Instrumentation in Tumor Surgery - CON: Too Expensive and Not Worth the Additional Cost  
Matthew Goodwin

6:18-6:23 pm  
Carbon Fiber Instrumentation in Tumor Surgery - Summary of Points  
Daniel M. Scuibba

6:24-6:30 pm  
Questions from the Audience, Vote and Session Conclusion
CHALLENGING CASES 2 JULIUS 12-14, 24
Oral Board-style Challenging Cases: Lumbar Cases
7:00-8:00 am
Moderators: Lara W. Massie, Jeremy Steinberger

SCIENTIFIC SESSION 4 JULIUS 12-14, 24
Future Directions
8:00-9:30 am
Moderators: Zoher Ghogawala, Christopher E. Wolfia
Learning Objectives:
- Identify future directions of Deformity Surgery
- Identify future directions of MIS
- Apply future directions of the practice of spine surgery

8:00-8:07 am
Where Will Technology Take Us in 10 Years: Deformity
Serena Hu

8:08-8:13 am
Discussion

8:14-8:21 am
Where Will Technology Take Us in 10 Years: MIS
Praveen V. Mummaneni

8:22-8:27 am
Discussion

8:28-8:35 am
Where Will Technology Take Us in 10 Years: Spinal Oncology
Daniel M. Sciubba

8:36-8:41 am
Discussion

8:42-8:49 am
Where Will Spine Surgery be in 10 Years: Regulatory Challenges and Evolving Landscapes
Ann R. Stroink

8:50-8:55 am
Discussion

8:56-9:03 am
American Spine Registry and Predictive Analytics
Anthony L. Asher

9:04-9:09 am
Discussion
9:10-9:17 am
Digital Remote Patient Monitoring: Future Applications and Potential
Matthew J. McGirt

9:18-9:30 am
Questions and Session Conclusion

9:30-10:15 am
Beverage Break and What’s New Session 3 in the Exhibit Hall
See page 97 for detailed information and schedule.

THE CAHILL JULIUS 12-14, 24
CONTROVERSIES
Moderators: Nevan G. Baldwin, Richard G. Fessler

Learning Objectives:
- Discuss the management options for type II odontoid fracture
- Identify the role of augmented reality in spine surgery
- Analyze optimal treatment for patients with potential instability in metastatic spine disease

10:15-10:44 am
Topic 1: Type II Odontoid Fracture in the Elderly

10:15-10:22 am
Type II Odontoid Fracture in the Elderly - PRO: Surgical Treatment is the Best Option
R. John Hurlbert

10:23-10:30 am
Type II Odontoid Fracture in the Elderly - CON: Bracing Works Just Fine
R. John Hurlbert

10:31-10:36 am
Type II Odontoid Fracture in the Elderly - Summary of Points

10:37-10:44 am
Questions from the Audience and Vote
10:45-11:14 am

**Topic 2: Scoliosis with Normal SVA**

10:45-10:52 am
Scoliosis with Normal SVA - PRO: Deformity Begets Deformity, Fuse
Kristen E. Jones

10:53-11:00 am
Scoliosis with Normal SVA - CON: Decompression Alone is Adequate
Daniel K. Resnick

11:01-11:06 am
Scoliosis with Normal SVA - Summary of Points
Catherine Miller-Simington

11:07-11:14 am
Questions from the Audience and Vote

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11:15-11:44 am

**Topic 3: Augmented Reality**

11:15-11:22 am
Augmented Reality - PRO: Augmented Reality is the Future
Timothy F. Witham

11:23-11:30 am
Augmented Reality - CON: It’s a Video Game Looking for a Home
Luis M. Tumialan

11:31-11:36 am
Augmented Reality - Summary of Points
Alexander E. Ropper

11:37-11:44 am
Questions from the Audience and Vote

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11:45 am-12:15 pm

**Topic 4: Potential Spinal Instability in Metastatic Spinal Disease**

11:45 am-11:52 am
Potential Spinal Instability in Metastatic Spinal Disease - PRO: Stabilize then Radiate to Prevent Collapse
Laurence D. Rhines

11:53 am- 12:00 pm
Potential Spinal Instability in Metastatic Spinal Disease - CON: Don’t Delay, Brace and Radiate
John E. O’Toole

12:01-12:06 pm
Potential Spinal Instability in Metastatic Spinal Disease - Summary of Points
John H. Shin
12:07–12:15 pm
Questions from the Audience, Vote and Session Conclusion

12:15–1:15 pm
Lunch with Exhibitors or Attend a Non-CME Sponsored Lunch
See page 98 for detailed information and schedule.

SPECIAL COURSE 5  JULIUS 3-4
Treatment and Complication Avoidance in the Management of Spinal Tumors
1:45–4:45 pm  $150
Course Directors: Ilya Laufer, John H. Shin
Course Description: This seminar will review and highlight the multi-disciplinary management of spinal tumor for the practicing surgeon. Practical tips for managing common tumors and clinical scenarios with an emphasis on complication avoidance and surgical planning will be emphasized. Participants are encouraged to prepare and present cases for discussion.
Learning Objectives:
- Analyze various surgical techniques to address spinal pathologies
- Identify Applications of new technologies in spine tumor surgery
- Discuss complication avoidance strategies in tumor surgery

1:45–1:47 pm
Introduction
Ilya Laufer, John H. Shin

1:48–1:58 pm
Practical Tips for Treating Epidural Cord Compression
Nicolas Dea

1:59–2:09 pm
Minimally Invasive Approaches to Spine Tumors
John E. O’Toole

2:10–2:20 pm
When do Metastatic Spine Tumor Patients Require Stabilization
Hesham M. Soliman

2:21–2:31 pm
Integrating New Technologies in Surgery: Robotics, Endoscopy
Ori Barzilai

2:32–2:42 pm
Complication and How I Deal with Them
C. Rory Goodwin
2:43-2:53 pm
Frailty and Pre-operative Optimization Strategies
Raphaële R. Charest-Morin

2:54-3:04 pm
Patient Selection Considerations: When is En Bloc Resection Feasible?
Sheng-fu L. Lo

3:05-3:15 pm
Definitive Proton Therapy for Chordoma: State of the Art
Yen-Lin E. Chen

3:16-3:26 pm
Management of Benign Bone Tumors in the Spine
Michael A. Galgano

3:27-3:37 pm
Break

3:38-4:45 pm
Case Discussions with the Masters
Mark H. Bilsky, Dean Chou, Ziya L. Gokaslan, Laurence D. Rhines, Daniel M. Scuibba

SPECIAL COURSE 6
JULIUS 15-17
$150

Spine Summit Grand Rounds: Difficult Cases—The Decision-Making Dilemma

1:45-4:45 pm

Course Directors: Ali A. Baaj, Langston T. Holly

Faculty: Ali A. Baaj, Joel Beckett, Victor W. Chang, Dean Chou, James S. Harrop, Langston T. Holly, Gregory M. Mundis, Irene Say

Course Description: Spine Summit Grand Rounds is a course with the focus on Spine Section member participation. Intended for course participants to bring difficult cases they have managed or are currently managing, where they will seek an opinion from the panel of experts.

Learning Objectives:
- Describe a variety of decision-making approaches in the complex case
- Demonstrate knowledge base in complication management in cervical and lumbar operations
- Discuss complication avoidance strategies for management of complex lumbar and cervical conditions

1:45-1:50 pm
Introduction
Ali A. Baaj, Langston T. Holly

1:51-2:11 pm
The Difficult Anterior Cervical Case
James S. Harrop

2:12-3:32 pm
The Difficult Thoracic Case
Victor W. Chang
2:33-2:53 pm  
The Difficult Lumbar Case  
Gregory M. Mundis

2:54-3:14 pm  
The Difficult Tumor Case  
Dean Chou

3:15-4:34 pm  
Submitted Case Review and Discussion  
Joel Beckett, Irene Say

4:35-4:45 pm  
Questions and Course Conclusion  
Ali A. Baaj, Langston T. Holly

SPECIAL COURSE 7  
Starting Your Career:  
Practical Tips for Success  
1:45-4:45 pm

Course Directors: Owoicho Adogwa, Alexander E. Ropper  
Faculty: Owoicho Adogwa, Michael Bohl, Byron Branch, Line G. Jacques, Daniel C. Lu, Wilson Z. Ray, Daniel K. Resnick, Alexander E. Ropper, Laura A. Snyder

Course Description: This course addresses neurosurgery and neuroscience research across the continuum of scientific inquiry: clinical research, translational research, comparative effectiveness research, and bench/basic science research. In this comprehensive course, you will hear from scientific leaders in neurosurgery/neuroscience research, about surgeon- and institutional-level factors that enhance your success as an early career investigator. The course will be beneficial to neurosurgery residents and junior faculty interested in pursuing careers as surgeon-scientists/researchers.

Learning Objectives:
- Execute contract negotiation and your first job as a surgeon-researcher: key components that lead to increased likelihood of early career success
- Demonstrate knowledge of the different types of research methodologies and keys to success in each
- Identify the progression from hypothesis generation to a fundable project
- Describe your clinical and research interest for success as an early career investigator
- Demonstrate how to publish in high impact journals

1:45-1:54 pm  
Introduction  
Owoicho Adogwa, Alexander E. Ropper

1:55-2:09 pm  
Negotiating Your First Job: Components of Surgeon Scientist Contract  
Line G. Jacques
2:10-2:24 pm  
Things I Wish I Knew Before Signing My First Contract: Pearls and Pitfalls  
Owoicho Adogwa

2:25-2:39 pm  
From Ideas to Fundable Projects  
Wilson Z. Ray

2:40-2:54 pm  
Thinking Ahead - Structuring Your First 5 Years for Success  
Daniel K. Resnick

2:55-3:09 pm  
Tips for Success on the ABNS Oral Board Examination  
Alexander E. Ropper

3:10-3:29 pm  
Break

3:30-4:45 pm  
Survival Guide for Your First Year in Practice: ABNS, Running Clinic, Scheduling Surgery, Life Balance  
Michael Bohl, Byron Branch, Laura A. Snyder

Educational Grant provided by: DePuy Synthes

SPECIAL COURSE 8  JULIUS 19-22  
Practical Matters: Hands-On Operating Room Preparation for the APP

1:45-4:45 pm
Course Director: Nicole LeFevre, Corinna C. Zygourakis
Faculty: Nicole LeFevre, Eric A. Potts, Anand Veeravagu, Corinna C. Zygourakis

Course Description: This course will teach the must-have knowledge and skills to ensure success in the operating room for every Advanced Practice Provider.

Learning Objectives:
- Identify basic anatomy and screw placement from the occiput to the ilium
- Discuss procedure-specific patient positioning
- Demonstrate operative techniques including: suturing, drilling, and placing screws

1:45-1:50 pm
Introduction  
Corinna C. Zygourakis

1:51-2:05 pm
Spine Surgery Anatomy  
Eric A. Potts

2:06-2:20 pm
Basics of Screw Placement  
Corinna C. Zygourakis
2:21–2:30 pm
Pearls of Patient Positioning
Anand Veeravagu

2:31–2:45 pm
Suturing Tips and Tricks
Nicole LeFevre

2:46–3:55 pm
Hands-on Rotations
Nicole LeFevre, Eric A. Potts, Anand Veeravagu, Corinna C. Zygourakis

In-Kind Support provided by: MERI and Stryker

SPECIAL COURSE 8
SOCIAL HOUR (NON-CME)
3:56–4:45 pm

RECEPTION WITH WINS
5:00–6:00 pm

Thank you to DePuy Synthes and Medtronic for their support of this reception.

YOUNG SPINE SURGEONS’ RECEPTION AND DINNER
6:00–8:00 pm

All residents, fellows, and young neurosurgeons are invited to enjoy a delicious dinner with 2022 Spine Summit Honored Guests: Todd J. Albert, John J. Knightly, Allan D. Levi, Mark E. Shaffrey

RSVP is required. To RSVP, please email meetings@cns.org or stop by the registration desk by 12:00 pm on Wednesday, February 23.
CHALLENGING CASES 3
Oral Board Style Challenging Cases: Peripheral Nerve
7:00-7:30 am
Moderators: Zarina S Ali, Line G. Jacques

ABSTRACT BREAKOUT SESSIONS
7:30-9:30 am
Learning Objectives:
- Analyze the findings of novel neurosurgical studies, critique the design and methodology of these studies
- List important areas for further knowledge development and research
- Discuss ongoing innovative clinical and basic science studies, and how they may impact current practice

General Spine Surgery 1/Trauma/Spinal Cord Injury Abstract Breakout Session
Moderators: Khoi D. Than, Eve C. Tsai
7:30-7:32 am
Jose Orenday, Maria José Cavagnaro, Mauricio Avila, Pedro Aguilar Salinas, Isabel Martha Strouse, Aaron Dowell, Naushaba Khan, Robert Andrew Ravinsky, Ali A. Baaj

7:32-7:34 am
301 Risk factors for persistent pain after surgery for cervical spondylotic myelopathy: a Quality Outcomes Database study

7:34-7:36 am
302 Bone Morphogenetic Protein and Cancer in Spinal Fusion: A Propensity-Matched Analysis
Josiah Orina, Jung Yoo

7:36-7:38 am
303 Repairing the injured rodent spinal cord using sensory and motor micro-tissue engineered neural networks
Michael Spadola, Ahmed Albayar, Justin Burrell, Patricia Sullivan, D. Kacy Cullen, Ali Ozturk
7:38-7:40 am
304 Development and Validation of a Predictive Model for Failure of Medical Management in Spinal Epidural Abscesses
Paul Page, Garret Greeneway, Simon Ammanuel, Nathaniel Brooks

7:40-7:42 am
305 Prediction of Early Surgical Decompression after Acute Traumatic Spinal Cord Injury
Alex Beomju Bak, Ali Moghadamjou, Michael G. Fehlings

7:42-7:44 am
306 rHlgM22 Promotes Bladder Use Recovery In Animal Model of Traumatic Spinal Cord Injury
Seth C. Ransom, Samar Ikrar, Anqin Dong, Libo Liu, Cecile Riviere-Cazaux, Masum Rahman, Moses Rodriguez, Terry Burns, Arthur Warrington

7:44-7:46 am
307 Using Smartphone-Based Accelerometry to Assess Functional Decline in Lumbar Fusion and Decompression Patients
Shikha Singh, Hasan S. Ahmad, Kenneth Jiao, Gregory Basil, William Welch, Michael Y. Wang, Jang Won Yoon

7:46-7:48 am
308 Leveraging Machine Learning to Identify an Intraoperative Mean Arterial Pressure Threshold in Acute Spinal Cord Injury
Alexander Aabedi, Nitin Agarwal, Abel Torres, Austin Chou, Praween V. Mummaneni, Sanjay S. Dhall, Philip Weinstein, Xuan Duong Fernandez, Jonathan Pan, Vineeta Singh, Ferguson Adam, Debra Hemmerle, Nikolaos Kyritsis, Jason Talbott, William Whetstone, Jacqueline Bresnahan, Geoff Manley, Michael Beattie, Anthony DiGiorgio

7:48-7:50 am
309 SpineTrak: The First Randomized Controlled Trial Using the Apple Watch to Objectively Track Spine Surgical Patients
Christopher Leung, Parastou Fatemi, Ketan Yerneni, Atman Desai, Christy Tompkins-Lane, Corinna C. Zygourakis

7:50-7:52 am
310 Creating a Spine Healthcare Resource Utilization Scale (SHRUS) to Complement PROMs in Assessing Surgical Success
Kevin Huang, Arpan Patel, Sebastian Salas-Vega, Swetha Sundar, Michael P. Steinmetz, Thomas Mroz, Ghaiht Habboub

7:52-7:54 am
311 CT-to-Fluoroscopy Registration versus Scan-and-Plan Registration for Robot-Assisted Insertion of Lumbar Pedicle Screws
Mohamed Soliman, Asham Khan, Nathan Lee, Muhammad Waqas, Joseph Lombardi, Venkat Boddapati, Lauren Levy, Jennifer Mao, Paul Park, Justin Mathew, Ronald Lehman, Jeffrey P. Mullin, John Pollina
312 Psychological Distress in Patients Undergoing Cervical Spine Surgery: 2-Year Outcomes of a Randomized Controlled Trial
Peter G. Passias, Lara Passfall, Peter S. Tretiakow, Tyler Williamson, Rachel Joujon-Roche, Bailey Imbo, Oscar Krol, Nicholas Kummer, Shaleen Vira, Bassel Diebo, Stephane Owusu-Sarpong, Jordan Lebovic, Renaud Lafage, Virginie Lafage, Dean Chou, Praveen V. Mummaneni, Paul Park, Saman Shabani, Andrew Schoenfeld, Muhammad Janjua, Justin Smith

313 Automated robotic cervical traction: proof of concept
Brandon Sherrod, Trevor Schwer, Andrew Merryweather, Marcus D. Mazur

314 A Novel Classification System of Spinal Cord Injury Using Unsupervised Machine Learning
Anant Naik, Bailey MacInnis, Michael Pozin, Daniel Najafali, Paul Arnold

315 Impact of Social Deprivation on Physical and Mental Health Outcomes in Patients Following Cervical Spine Fusion Surgery
Justin Zhang, Jacob Greenberg, Saad Javeed, Jawad Khalifeh, Christopher Dibble, Deeptee Jain, Ian Dorward, Paul Santiago, Camilo A. Molina, Brenton Pennicooke, Wilson Z. Ray

316 Late Week Surgery Associated with Longer Length of Stay in Cervical Laminoplasty for Cervical Myelopathy
Vikram Chakravarthy, Nicholas Rabah, Sebastian Salas-Vega, Jason Savage, Thomas Mroz, Michael P. Steinmetz

317 Application of Machine Learning for a Prediction Model for Patient Reported Outcomes after lumbar surgery: A MSSIC study
Travis Hamilton, Ho Jun Yun, Tarek Mansour, Seokchun Lim, Mohamed Macki, Hsueh-Han Yeh, Kylie Springer, Lonni Schultz, David Nerenz, Muwaffak Abdulhak, Kevin Talentiero, Jason Schwab, Jad Khalil, Ilyas Alem, Richard Easton, Mick Perez-Cruet, Paul Park, Victor W. Chang

318 The completely virtual spine patient: a case series
James Malcolm, Alex Greven, Matthew Gary, Daniel Refai

319 Static vs. Expandable TLIF Cage: A Comparison of Predicted and Achieved Restoration of Intervertebral Disc Height
Joshua Woodward, Lacin Koro, Samuel Meza, Dominick Richards, Kevin Keegan, Maheen Khan, Nathan Pertsch, David Fessler, Richard G. Fessler
320 Cognitive Impairment is Associated with Higher Rates of Postoperative Complications After Spine Surgery
Owoicho Adogwa, Sai Chilakapati, Syed Khalid, Cody Eldridge, Ravinderjit Singh, Michael Burton

321 The Roll of Toll-like Receptor 4 in the Secondary Pathogenesis of Spinal Cord Injury
David Fessler, Brian David, Krishnan Dhandapani

322 The Cost-Effectiveness of I-Factor Compared to Local Autograft in Anterior Cervical Discectomy and Fusion Surgery
Jared Ament, Bart Thaci, Kee Kim, J. Patrick Johnson

323 Is Anterior or Posterior Approach Better for Neck Pain? A QOD Study of Cervical Myelopathy With Severe Neck Pain

324 3D-painted micro-scaffold materials reduce inflammation following spinal cord contusion
Jonah Moss, Richard D. Fessler, Quan Shen, Yarazleth Lopez-Ramirez, Dominique Tucker, Adam Jakus, Ramille Shah, Richard G. Fessler, Brian David

325 Cervical Alignment and Patient-Reported Outcomes in Posterior Cervical Fusion: A Longitudinal Comparative Cohort Study
Michael H. Lawless II, Gustavo Anton, Stacy Hatcher, Jacob Jasinski, Doris Tong, Connor Hanson, Clifford Houseman, Boyd Richards, Teck Soo, Daniel Carr

326 A natural language processing AI to extract thoracolumbar injury classification score features from radiology reports
Archis Bhandarkar, Chiduziem Onyedimma, Ryan Jarrah, Sunyang Fu, Hongfang Liu, Mohamad Bydon

327 Symptom duration in lumbar surgery is associated with worse outcomes, satisfaction and return-to-work: A MSSIC study
Travis Hamilton, Ho Jun Yun, Seokchun Lim, Mohamed Macki, Hsueh-Han Yeh, Kylie Springer, Lonni Schultz, David Nerenz, Muwaffak Abdulhak, Kevin Taliaferro, Jason Schwalb, Jad Khalil, Ilyas Aleem, Richard Easton, Mick Perez-Cruet, Paul Park, Victor W. Chang
8:26-8:28 am
328 Clinical efficacy of prophylactic paraspinal flap closures for posterior cervical and cervicothoracic spine surgery
Timothy Wang, Thomas Dvergsten, John Barr, Chester Yarbrough, Muhammad Abd-El-Barr, Khoi D. Than, David Brown

8:28-8:30 am
329 Years of Experience and Primary Specialty are Correlated with Total Cost of ACDF Surgeries for Medicare Beneficiaries
Matthew Sklar, Christopher Leung, Harsh Wadhwa, Corinna C. Zygourakis

8:30-8:32 am
330 Preventing Surgical Site Hematoma with Topical Tranexamic Acid in Lumbosacral Surgery: A Quality Improvement Project
Robert McCabe, Doris Tong, Boyd Richards, Prashant Kelkar, Peter Bono, Clifford Houseman, Daniel Carr, Teck Soo

8:32-8:34 am
331 Smartphone-Based Accelerometry for Classification of Peri-Operative Course and Outcomes in Spine Surgery
Hasan Ahmad, Andrew Yang, Gregory Basil, Michael Y. Wang, William Welch, Jang Yoon

8:34-8:36 am
332 ASIA Impairment Scale (AIS) of Veterans as Compared to Non-Veterans 1-Year Post-Spinal Cord Injury: An NSCIMS Study
Ali Shoushtari

8:36-8:38 am
333 Functional Outcomes after Surgery for Grade 1 Lumbar Spondylolisthesis: A 5-Year QOD Study

8:38-8:40 am
334 The Role of MRI to Inform Clinical Decision-Making in Acute Spinal Cord Injury: A Systematic Review and Meta-Analysis
Arash Ghaffari-Rafi, Catherine Peterson, Jose Leon-Rojas, Nobuaki Tadokoro, Stefan Lange, Mayank Kaushal, Lindsay Tetreault, Michael G. Fehlings, Allan Martin

8:40-8:42 am
335 Implementation of an Automated Text Message-Based System for Tracking Patient Reported Outcomes in Spine Surgery
Alexander Perdomo-Pantoja, Safuan Alomari, Daniel Lubelski, Ann Liu, Ali Bydon, Timothy F. Witham, Nicholas Theodore
336 Influence of Time of Discharge and Length of Stay on 30-day outcomes after Elective Anterior Cervical Spine Surgery
Rahul Sastry, Matthew Hagan, Joshua Feler, Elias Shaaya, Patricia Sullivan, Jose Fernandez Abinader, Joaquin Camara-Quintana, Tianyi Niu, Jared Fridley, Adetokunbo Oyelese, Prakash Sampath, Albert Telfeian, Ziya L. Gokaslan, Steven Toms, Robert Weil

337 Comparison of CT Hounsfield units to DXA scan in determining bone mineral density in the cervical spine
Scott Flynn, Ilyas Eli, Andrew Yew

338 Comparison of Complication outcomes after 360- Versus 540-degree Cervical Fusion
Adewale Bakare, Jesus Varela, Jonah Moss, Andrew Platt, John E. O’Toole, Vincent Traynelis, Ricardo Fontes

339 Patient Satisfaction Reviews for 967 Spine Neurosurgeons
Nitin Agarwal, Arjun Gupta, Radhika Gupta, Michael White, Vamsi Reddy, Yue-Fang Chang, Prateek Agarwal, Nima Alan

340 Early Mobilization Versus Prolonged (>24hrs) Bedrest in Patients with Non-Watertight Dural Closure
Ketan Verma, Anne Freeling, Kelsey Atkinson, William Broaddus, Robert Graham

341 Upregulation of Genetic Biomarkers of Cellular Response in a Porcine Model of Spinal Cord Injury
Andrew Hersh, Carly Weber-Levine, Tolulope Awasika, John Theodore, Stuart Bauer, Victor Quiros, Osamah M. Zmily, Yohannes Tsehay, Max Kerensky, Amir Manbachi, Nicholas Theodore, Joshua C. Doloff

342 Association between Neighborhood-Level Socioeconomic Disadvantage and Patient-Reported Outcomes in Lumbar Spine Surgery
Jacob Greenberg, Justin Zhang, Saad Javeed, Jawad Khalifeh, Christopher Dibble, Gabbie Johnson, Alex Wong, Deeptee Jain, Jacob Buchowski, Ian Dorward, Paul Santiago, Camilo A. Molina, Brenton Pennicooke, Wilson Z. Ray

343 Is the CMS Hierarchical Condition Category Risk Adjustment Model Satisfactory for Quantifying Spine Surgical Risk?
Andrew Chan, Shane Shahrestani, Alexander Ballatori, Katie Orrico, Geoffrey Manley, Phiroz Tarabpore, Michael Y. Huang, Sanjay S. Dhall, Dean Chou, Praveen V. Mummaneni, Anthony DiGiorgio
8:58-9:00 am
344 Inter-Hospital Transfer is Associated with Neurological and Functional Outcomes of Acute Traumatic Spinal Cord Injury
Alex Beomju Bak, Ali Moghaddamjou, Michael G. Fehlings

9:00-9:02 am
345 Affective disorders are associated with longer hospitalization and hospital charges after elective lumbar spinal fusion
Safwan Alomari, Nicholas Theodore, Timothy F. Witham, Ali Bydon

9:02-9:04 am
346 The Declining Incidence of Cervical Spine Surgery in Patients with Rheumatoid Arthritis
Roberto Perez-Roman, Vaidya Govindarajan, David Levi, Evan Luther, Allan D. Levi

9:04-9:06 am
347 Reimbursement and Trends in Utilization of Combined Anterior/Posterior Lumbar Arthrodesis during the Last Decade
Zach Pennington, Giorgos Michalopoulos, Waseem Wahood, Sally El Sammak, Mohamad Bydon

9:06-9:08 am
348 Enhanced recovery after surgery (ERAS) Improves Return of Physiological Function in 1-2 TLIF in Frail Patients
Ken Porche, Basma Mohamed, Sandra Yan, Matthew Decker, Adam Polifka, Christoph Seubert, Daniel J. Hoh

9:08-9:10 am
349 Age-related differences in inflammatory and behavioral responses following spinal cord contusion in rats
Brian David, Seok Yoon Oh, Quan Shen, Yarazleth Lopez-Ramirez, Dominique Tucker, Neal Woobel, Brittany Avonts, Jamie Alberts, Jonah Moss, Kristen Raue, Richard G. Fessler

9:10-9:12 am
350 Rates of Revision Surgery with Percutaneous Stabilization of Thoracolumbar Fractures
David Peters, Tripp Owen, Paul Kim

9:12-9:14 am
351 Predictors of Airway Complications Following Elective Anterior Cervical Discectomy and Fusion
Morgan Hardman, Archis Bhandarkar, Ryan Jarrah, Mohamad Bydon

9:14-9:16 am
352 “Code Spinal Cord Injury” – An Evidence-Based Protocol
Dylan Goodrich, Allan Martin, Kee Kim, Julius Ebinu, Eric Klineberg, Yashar Javidan, Rolando Roberto, Hai Le, Jennifer Chang, Matthew Bobinski

9:16-9:18 am
353 Outcomes of type 2 odontoid fracture union versus nonunion among the elderly treated conservatively: a meta-analysis
Jonathan Lee, Vitaliy Davidov, Sean Barber
9:18-9:20 am
354 Prospective, Multicenter Study of Two-Level Cervical Arthroplasty with a PEEK-on-Ceramic Artificial Disc
Steve Monk, Richard Gwyer, Hyun Bae, Pierce Nunley, Brandon Stenge, John Peloz, Margaret Boltes, Donna Ohnmeiss, Domagoj Coric

9:20-9:22 am
355 Reduction techniques for unilateral locked facet of the subaxial cervical spine: institutional experience, 2008-2021
Timothy Chryssikos, Abdul-Kareem Ahmed, Bradley Wilhelmy, Jesse Stokum, Phelan Shea, Nathan Pratt, Ashish Sharma, Joshua Olexa, Gregory Cannarsa, Kenneth M. Crandall, Gary Schwartzbauer, Steven C. Ludwig, Bizhan Aarabi, Charles A. Sansur

9:22-9:24 am
356 Predictors of Outcomes in Severe Cervical Spinal Cord Injury due to Cervical Fractures
Anant Naik, Isai Ortiz, Truong Do, Samuel Cramer

9:24-9:26 am
357 Automated Prediction of the Thoracolumbar Injury Classification and Severity Score Using a Novel Deep Learning Algorithm
Sophia Doerr, Carly Weber-Levine, Andrew Hersh, Tolulope Awasika, Brendan Judy, Yike Jin, Ann Liu, Daniel Lubelski, Craig Jones, Haris Sair, Nicholas Theodore

9:26-9:28 am
358 A radiographic analysis of 3D print materials and assessment of their fidelity within integrated vertebral models.
Michael Pullen, Robert Poole, James Kofler, Fidel Valero, W. Christopher Fox, Alfredo Quinones-Hinojosa, Ian Buchanan

9:28-9:30 am
359 Does Self-Reported Depression and Anxiety Influence Outcomes Following Surgery for Cervical Spondylotic Myelopathy?

General Spine Surgery 2/Tumor/Opioids Abstract Breakout Session
Moderator(s): Nima Allan, Victor W. Chang

7:30-7:32 am
400 Development and Validation of Metastatic Spine Tumor Through Deep Wavelet Autoencoder Based Deep Neural Network
Nida Fatima
7:32-7:34 am  
**401 Recovery Kinetics of Post-Operative Opioid Usage in Adult Spinal Deformity Corrective Surgery**  

7:34-7:36 am  
**402 Metastatic Spine Disease: Should Patients With Short Life Expectancy Be Denied Surgical Care?**  

7:36-7:38 am  
**403 Rate of Fusion Progression after Lumbar Laminectomy for Symptomatic Lumbar Stenosis**  
Ghani Haider, Kunal Varshneya, Vaibhavi Shah, Ivan Lopez, Anand Veeravagu

7:38-7:40 am  
**404 Targeted Microparticle Therapy for Secondary Spinal Tumors**  
Oluwaseun Akinduro, Paola Suarez-Meade, Rachel Sarabia-Estrada, Stephany Tzeng, Panagiotis Anastasiadis, Ziya L. Gokaslan, Jordan Green, Alfredo Quinones-Hinojosa

7:40-7:42 am  
**405 Is Corpectomy in Metastatic Spine Disease Obsolete? A Meta-Analysis and Systematic Review of Outcomes and Indications**  
Isabel Martha Strouse, Jose Orenday, Maria Jose Cavagnero, Mauricio Avila, Naushaba Khan, Aaron Dowell, Haroon Kisana, Robert Ravinsky, Ali A. Baaj

7:42-7:44 am  
**406 Opioid usage in lumbar disc herniation patients with nonsurgical, early, and late surgical treatments**  
Zeyi Zhou, Michael Jin, Michael Jensen, John K. Ratliff

7:44-7:46 am  
**407 Breast Cancer Hormone Receptor and Systemic Therapy Status Improves Outcome Risk Prediction in Spine Metastasis Surgery**  

7:46-7:48 am  
**408 Healthcare Disparities in Spinal Metastasis Patients: A Comparison Between Two Neighboring Institutions**  
Lily McLoughlin, Kimberly Ashayeri, Hammad Khan, David Kurland, William Shin, Julia Sales, Darryl Lau, Anthony Frempong-Boadu, Ilya Laufer, Donato Pacione
7:48-7:50 am  
**409 Survival Analysis of Patients with Metastatic Lung Tumors to the Spine**  
Andrew Hersh, Jaimin Patel, Zach Pennington, Bethany Hung, Andrew Schilling, Albert Antar, Aladine Elsamadicy, Daniel Lubelski, Sheng-fu L. Lo, Daniel M. Sciubba

7:50-7:52 am  
**410 The Ideal Threshold of Hemoglobin A1c in Diabetics Undergoing Elective Lumbar Decompression Surgery**  
Rishabh Gupta, Hani Chanbour, Steven Roth, Alex O’Brien, Claudia Davidson, Kristin Archer, Jacqelyn S. Pennings, Clinton Devin, Byron Stephens, Amir Aftahi, Scott L. Zuckerman

7:52-7:54 am  
**411 Influence of anterior column resection on local control of spine metastases treated with adjuvant radiotherapy**  
Zach Pennington, Sutipat Pairojboriboon, Xuguang Chen, Amanda Sacino, Aladine Elsamadicy, Rafael De la Garza Ramos, Jaimin Patel, Lawrence Kleinberg, Benjamin D. Elder, Daniel M. Sciubba, Kristin Redmond, Sheng-fu L. Lo

7:54-7:56 am  
**412 Using fluorescence spectral biomarkers to detect spinal sarcoma**  
Christine Park, Ashutosh Raman, Tanner Zachem, Matthew Lucayo, Weston Ross, Will Eward, Sarah Plumlee, C. Rory Goodwin, Patrick Codd

7:56-7:58 am  
**413 Trends in Bone Optimization Medication Usage and Associations with Outcomes in Spinal Fusion Patients with Osteoporosis**  
Guan Li, Harsh Wadhwa, Karen Malacon, Corinna C. Zygourakis

7:58-8:00 am  
**414 Antifibrinolytics during Surgery for Oncological spine diseases**  
Mauricio Avila, Jose Orenday, Maria Jose Cavagnaro, Isabel Martha Strouse, Aaron Dowell, Ali A. Baaj

8:00-8:02 am  
**415 Limb Morbidity in Patients with Intradural Intramedullary Tumors**  
Ansh Desai, Nicholas Rabah, Vikram Chakravarthy, Ajit Krishnaney

8:02-8:04 am  
**416 Gender of the patient does not correlate with early outcomes of elective lumbar fusions**  
Safwan Alomari, Ann Liu, Erick Westbroek, Ali Bydon, Sheng-Fu L. Lo, Timothy F. Witham

8:04-8:06 am  
**417 Independent Predictors of Vertebral Fracture following Radiation for Metastatic Spine Disease**  
Anthony Mikula, Zach Pennington, Nikita Lakonkin, Michelle Clarke, Peter Rose, Mohamad Bydon, Brett Friedman, Arjun Sebastian, Roman Kovalchuk, Kenneth Merrell, Jeremy Fogelson, Benjamin D. Elder
8:06-8:08 am
418 Denosumab vs Radiotherapy vs Selective Arterial Embolization in Inoperable Spine Giant Cell Tumors: A Meta-Analysis
Paolo Palmisciano, Navraj Sagoo, Andrew Chen, Kishore Balasubramanian, Othman Bin Alamer, Gianluca Scalia, Giuseppe E. Umana, Salah Aoun, Ali Haider

8:08-8:10 am
419 Systematic Review of Preoperative Embolization Techniques for Patients with Spinal Metastatic Renal Cell Carcinoma
Naushaba Khan, Aaron Dowell, María José Cavagnaro, Jose Orenday, Isabel Martha Strouse, Haroon Kisana, Mauricio Avila, Robert Andrew Ravinsky, Ali A. Baaj

8:10-8:12 am
420 Assessment of frailty indices and CCI for predicting outcomes in patients undergoing surgery for spine metastases
Aladine Elsamadicy, John Havlik, Benjamin Reeves, Josiah Sherman, Andrew Koo, Zach Pennington, Andrew Hersh, Luis Kolb, Sheng-fu L. Lo, John H. Shin, Ehud Mendel, Daniel M. Sciubba

8:12-8:14 am
421 Predictors of non-routine discharge and prolonged length of stay for patients with intramedullary spinal cord tumors
Andrew Hersh, Zach Pennington, Jaimin Patel, Albert Antar, Earl Goldsborough, Jose Porras, Aladine Elsamadicy, Daniel Lubelski, Sheng-fu L. Lo, Daniel M. Sciubba

8:14-8:16 am
422 Predictors of 30-day readmission and reoperation in patients with intramedullary spinal cord tumors
Andrew Hersh, Zach Pennington, Jaimin Patel, Earl Goldsborough, Albert Antar, Jose Porras, Aladine Elsamadicy, Daniel Lubelski, Sheng-fu L. Lo, Daniel M. Sciubba

8:16-8:18 am
423 Risk Factors Associated with Adverse Events after Spine Surgery for Symptomatic Metastatic Breast Cancer

8:18-8:20 am
424 Spine Metastasis Patients with Post-Operative Infections Have Longer Durations of Steroid Courses
Tara Dalton, Kelly Murphy, Timothy Wang, Luis Ramirez, James Herndon, Melissa Erickson, Muhammad Abd-El-Barr, Isaac O. Karikari, C. Rory Goodwin

8:20-8:22 am
425 How much blood loss is too much for a one-level open lumbar fusion?
Hani Chanbour, Jeffrey Chen, Steven Roth, Claudia Davidson, Jacquelyn S. Penningings, Clinton Devin, Byron Stephens, Amir Abtahi, Scott L. Zuckerman
8:22-8:24 am
426 Bone optimization for the perioperative spine patient: Results from a bone health clinic at a single institution
Karen Malacon, Christopher Leung, Matthew Sklar, Corinna C. Zygourakis

8:24-8:26 am
427 Racial Disparities in Ambulatory Status and Presenting Clinical Exam of Metastatic Spine Disease Patients
Rafael De la Garza Ramos, Joshua Benton, Yaroslav Gelfand, Vijay Yanamadala, Saikiran Murthy, Zach Pennington, Daniel M. Sciuumba, C. Rory Goodwin, Ziya L. Gokaslan, Reza Yassari

8:26-8:28 am
428 Transpedicular Vertebrectomy for Thoracic Spine Metastasis: A Consecutive Case Series
Ranjit Ganguly, Asad Akhter, Tarush Rustagi, Hazem Mashaly, Ehud Mendel

8:28-8:30 am
429 Affective Disorders and Healthcare Resource Utilization After Surgery for Metastatic Spinal Column Tumors
Aladine Elsamadicy, Andrew Koo, Margot Sarkozy, Benjamin Reeves, Zach Pennington, John Huvlik, Mani Ratnesh Sandhu, Andrew Hersh, Saarang Patel, Luis Kolb, Sheng-ju L. Lo, John H. Shin, Ehud Mendel, Daniel M. Sciubba

8:30-8:32 am
430 Sarcopenia is Significantly Associated with Pathologic Vertebral Compression Fractures in Cancer Patients
Rafael De la Garza Ramos, Joshua Benton, Oscar Krol, Peter G. Passias, Yaroslav Gelfand, Saikiran Murthy, Vijay Yanamadala, Daniel M. Sciuumba, Ziya L. Gokaslan, Reza Yassari

8:32-8:34 am
431 Failure of Conservatively Managed Traumatic Vertebral Compression Fractures: A Systematic Review
Jordan Petitt, Ansh Desai, Peter Ahorukomeye, Tamia Potter, Amber Stout, Ahmed Kashkoush, Michael Kelly

8:34-8:36 am
432 Changes in Spinal Pedicle Screw Accuracy by Modality: A Meta-Regression Analysis of 77360 Pedicle Screws
Anant Naik, Bailey MacInnis, Annabelle Shaffer, Alexander Smith, David Krist, Paul Arnold

8:36-8:38 am
433 In Opioid Naive Patients, Smoking Increases Risk of Opioid Use Disorder Following Thoracolumbar Spinal Fusion
Owoicho Adogwa, Sai Chilakapati, Syed Khalid, Cody Eldridge, Ravinderjit Singh, Michael Burton

8:38-8:40 am
434 Combination Use of Both Intrathecal Pump and Spinal Cord Stimulator for Oncologic Pain
Vikram Chakravarthy, Evgeny Bulat, Jason Crouther, Ilya Lauder, Mark H. Bilsky, Ori Barzdilai, Amitabh Gulati
8:40-8:42 am
435 Separation Surgery and Adjuvant Stereotactic Radiation for Non-Small Cell Lung Cancer: Analysis of 103 Cases
Vikram Chakravarthy, Benjamin Schnachner, Anubhav Amin, Jemma Villavieja, Anne Reiner, Yoshiya Josh Yamada, Adam Schmitt, Daniel Higginson, Ilya Laufer, Mark H. Bilsky, Ori Barzilai

8:42-8:44 am
436 Timed 10M Walk Test for Objective Measure of Gait Following Separation Surgery for Metastatic Epidural Disease
Kimberly Ashayeri, Cordelia Orillac, John Theodore, Sean Nejert, Darryl Lau, Donato Pacione, Ilya Laufer

8:44-8:46 am
437 Optimal Hemoglobin A1c Target in Diabetics Undergoing Elective Cervical Spine Surgery
Steven Roth, Hani Chanbour, Rishabh Gupta, Alex O’Brien, Claudia Davidson, Kristin Archer, Jacqulyn S. Pennings, Clinton Devin, Byron Stephens, Amir Abtahi, Scott L. Zuckerman

8:46-8:48 am
438 Blood Loss and Number of Levels Fused Predict Long-Term Lumbar Plexopathy Following Lateral Lumbar Interbody Fusion

8:48-8:50 am
439 Surgical Site Infection in Thoracolumbar Fractures: Incidence and Risk Factors in a Series of 9,848 Patients.
Josiah Orina, Jung Yoo

8:50-8:52 am
440 Adoption of Awake Spine Surgery –Trends from a National Registry Over 14 Years

8:52-8:54 am
441 Machine Learning for Predictive Modeling of Frailty on 30 and 90-day Readmission following Surgery for Spine Metastases
Aladine Elsamadicy, Andrew Koo, James Cross, Benjamin Reeves, Zach Pennington, Andrew Hersh, Luis Kolb, Sheng-fu L. Lo, John H. Shin, Ehud Mendel, Daniel M. Sciubba

8:54-8:56 am
442 Does Karnofsky performance score improve after surgery for metastatic spine tumors in patients with SINS 7-12?
Saman Shabani, Enrique Vargas, Alexander Aabedi, Alam Rechav Ben Nathan, Nitin Agarwal, Praveen V. Mummaneni, Dean Chou

8:56-8:58 am
443 Effect of Preoperative Education on Length of Stay after Elective Spinal fusion: A Prospective Comparative Cohort Study
Gustavo Anton, Elise Yoon, Dejan Slavnic, Doris Tong, Daniel Carr, Boyd Richards, Teck Soo
8:58-9:00 am
Rohin Singh, Hana Halak, M. Lane Moore, Jack Haglin, Jenna Meyer, Mohamad Bydon, Naresh Patel

9:00-9:02 am
445 Pre-operative risk-factors associated Opioid prescriptions after lumbar interbody fusion surgery at a single institution
Travis Hamilton, Ho Jun Yun, Edwin Telemi, Seokchun Lim, Mohamed Macki, Hsueh-Han Yeh, Kylie Springer, Lonni Schultz, David Nerenz, Muwaffak Abdulhak, Kevin Tadajferro, Jason Schwall, Jad Khalil, Ilyas Aleem, Richard Easton, Mick Perez-Cruet, Donald Seysfried, Mokbel Chedid, Paul Park, Victor W. Chang

9:02-9:04 am
446 Prophylactic Muscle Flaps in Patients with Oncologic Spine Disease Reduce Wound Complications

9:04-9:06 am
447 Regional Anesthetic Adjuncts in Multi-Level Lumbar Spine Surgery: Challenges in a Real-World Setting
Rakan Farouk Y. Bokhari, Rachad Aita, Michael Weber

9:06-9:08 am
448 Comparison of Prone Transpsoas LLIF and TLIF for Degenerative Lumbar Spine Disease: A Propensity Score-Matched Analysis
Mohamed Soliman, Alexander Aguirre, Nico Ruggiero, Cathleen Kuo, Brandon Mariotti, Slah Khan, Asham Khan, Jeffrey P. Mullin, John Pollina

9:08-9:10 am
449 Clinical accuracy of percutaneous pedicle screw placement in the thoracolumbar spine using augmented reality guidance
Alexander Yahanda, Miguel Ruiz-Cardozo, Som Singh, Wilson Z. Ray, Jack Jennings, Brenton Pennicook, Camilo A. Molina

9:10-9:12 am
450 Spine Surgeon Engagement in Social Media Platforms to Promote Meaningful and Educational Discussions and Debates
Jose Orenday, María José Cavagnaro, Mauricio Avila, Isabel Martha Strouse, Aaron Dowell, Naushaba Khan, Robert Ravinsky, Ali A. Baaj

9:12-9:14 am
451 Awake Spinal Anesthesia as an Effective Alternative to General Anesthesia for Surgical Treatment of Degenerative Spine
Nauman Chaudhry, David Sykes, Romarie Waguia Kouam, Timothy Wang, C. Rory Goodwin, Chakib Ayoub, Miles Berger, Muhammad Abd-El-Barr
WEDNESDAY

9:14-9:16 am
452 The Morbidity and Mortality Rate following Surgery in Metastatic Spine Disease Patients

9:16-9:18 am
453 Multilevel Standalone Lateral Interbody Fusion: Patient Selection and Outcomes
Gennadiy Katsevman, Robert Dugan, Clinton Morgan, Juan S. Uribe

9:18-9:20 am
454 A Predictive Modeling Approach for Anticipating Increased Opioid Use following Surgical Treatment of Spinal Metastases
Michael Jin, Michael Jensen, Zeyi Zhou, John K. Ratliff

9:20-9:22 am
Daniel Lubelski, Safuan Alomari, Sheng-Fu L. Lo, Daniel M. Sciubba, Nicholas Theodore, Timothy F. Witham, Ali Bydon

9:22-9:24 am
456 Can dynamic MRI imaging predict tethering and re-tethering in paediatric occult spinal dysraphism
Sanjay Behari, Suyash Singh, Vivek Singh, Kamlesh Bhaisora

9:24-9:26 am
457 Leveraging Machine Learning to Assess the Impact of BMI with Lumbar Spondylolisthesis: A Quality Outcomes Database Study

9:26-9:28 am
458 Reoperation rates for lumbar hemilaminectomy at levels with spondylolisthesis or adjacent to a prior fusion
Thomas Frank, Zoher Ghogawala, Melissa Dunbar, Subu Magge

9:28-9:30 am
459 Screening for Degenerative Cervical Myelopathy (SCREEN-DCM): Preliminary Results of an ongoing prospective study
Aria Nouri, Granit Molliqaj, Alexandre Lave, Gianpaolo Jannelli, Benjamin Davies, Mark Kotter, Allan Martin, Justin Virojanapa, Joseph S. Cheng, Teresa Somma, Paolo Cappabianca, Carmen L.A. Vlegger-Lankamp, Valerie ter Wengel, Karl Schalter, Enrico Tessitore
General Spine Surgery 3/
Peripheral Nerve/Basic Science
Abstract Breakout Session

Moderators: Holly Gilmer, Mark A. Mahan

7:30-7:32 am
500 Diffusion Basis Spectrum Imaging (DBSI) Prognosticates Outcomes for Cervical Spondylotic Myelopathy after Surgery
Justin Zhang, Dinal Jayasekera, Jacob Greenberg, Saad Javeed, Christopher Dibble, Jacob Blum, Rachel Jakes, Peng Sun, Sheng-Kwei Song, Wilson Z. Ray

7:32-7:34 am
501 Does Laminectomy Width Predict Postop C5 Palsy after Posterior Cervical Decompression Fusion: A Comparative Cohort Study
Ammar Alsadah, Doris Tong, Jacob Jasinski, Connor Hanson, Prashant Kelkar, Peter Bono, Daniel Carr, Teck Soo, Boyd Richards

7:34-7:36 am
502 Timing of nerve transfer surgery for C5 palsy: does recovery at 6 months predict final recovery?
Yamaan Saadeh, Zoey Chopra, Katherine Holste, Eric Olsen, Osama Kashlan, Brandon Smith, Lynda Yang, Paul Park

7:36-7:38 am
503 Radiation dose and image quality evaluation of intraoperative imaging systems at the cervicothoracic junction
Anna Reza, Sonja Hansson, Luke McCaffrey, Sandy Konerth, Joseph Mahoney, Nader Dahdaleh

7:38-7:40 am
504 Favorable Prognosis for Significant Preoperative Upper Extremity Weakness following ACDF
Zachariah Pinter, Arjun Sebastian, Scott Wagner, Patrick Morrissey, Ian Kaye, Alan Hilibrand, Alex Vaccaro, Christopher Kepler

7:40-7:42 am
505 Intradural AlloWrap for Treatment of Complex Tethered Cord Syndrome
David Peters, Scott Wait

7:42-7:44 am
506 Development of a Novel Prognostic Metric for Post-Corrective Spinal Surgery Care Requirements by Diagnosis
Peter G. Passias, Nicholas Kummer, Lara Passfall, Oscar Kroj, Peter S. Tretiakov, Rachel Joujon-Roche, Bailey Imbo, Shaleen Vira, Bassel Diebo, Stephane Owusu-Sarpong, Jordan Lebovic, Renaud Lafage, Virginie Lafage, Praveen V. Mummamani, Paul Park, Saman Shabani, Andrew Schoenfeld, Muhammad Janjua, Justin Smith

7:44-7:46 am
507 Natural History of Shoulder Recovery in Conservatively Managed Neonatal Brachial Plexus Palsy
Whitney Muhlestein, Kate Chang, Brandon Smith, Lynda Yang
7:46-7:48 am
508 Endoscopic MIS decompression for Chiari Malformation: an anatomical study
Raphael Bastianon Santiago, Mauricio Mandel, Badih Adada, Hoon Choi, Hamid Borghei-Razavi

7:48-7:50 am
509 Disc degeneration in instability and direct injury mouse models due to decreased lactate exportation
Mulati Mieradili, Shambhavi Bhogwat, Matthew Silva, Regis O’Keefe, Matthew Goodwin

7:50-7:52 am
510 Cost-effectiveness of porous Ti interbody cage vs PEEK after lateral lumbar interbody fusion

7:52-7:54 am
511 Paddle Lead Spinal Cord Stimulators in the Ambulatory Setting: An Initial Experience
Steve Monk, Matthew O’Brien, Paul Kim

7:54-7:56 am
512 Impact of Nerve Transfers in Restoring Upper Extremity Function following Cervical Spinal Cord Injury
Saad Javeed, Christopher Dibble, Justin Zhang, Jacob Greenberg, Jawad Khalijeh, Thomas J. Wilson, Eric L. Zager, Amir Faraji, Mark A. Mahan, Lynda Yang, Rajiv Midha, Naringa Juknis, Wilson Z. Ray

7:56-7:58 am
513 Defining the role of glutamate in modulating neural stem cells: implications for regenerative therapeutic translation
Laureen Hachem, James Hong, Alexander Velumian, Charles Tator, Michael G. Fehlings

7:58-8:00 am
514 Perioperative Gabapentin Use Associated with Increased Postoperative Pain Following Posterior Lumbar Fusion
Manny Ray, Eli Perez, Brian Park, Colin Gold, Royce Woodroffe

8:00-8:02 am
515 Predicting likelihood of surgery in early DCM presentation using quantitative MRI
Muhammad Akbar, Allan Martin, Jetan Badhiwala, Ali Moghaddamjou, Jefferson Wilson, Michael G. Fehlings

8:02-8:04 am
516 Risk Factors for Delirium in Elderly Lumbar Spinal Fusion Patients
Manny Ray, Colin Gold, David Christianson, Brian Park, Ioannis Kounoutas, Taimur Khan, Joel Berger, Katie Sander, Cassim Ignam, Andrew Pugely, Pei-fu Chen, Rashmi Mueller, Patrick Hitchon, Matthew Howard, Matthew Banks, Robert Sanders, Royce Woodroffe
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<th>Time</th>
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<td>8:04-8:06 am</td>
<td>517 Decreased Hounsfield Units Predict Cervical Interbody Subsidence</td>
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<td>Zachariah Pinter, Breydan Wright, Benjamin D. Elder, Brett Freedman,</td>
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<td>Ahmad Nassr, Bradford Currier, Scott Wagner, Arjun Sebastian</td>
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<td>8:06-8:08 am</td>
<td>518 Evaluation of fluoroscopically-guided dorsal ramus block for</td>
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<td>lumbosacral fusion: A retrospective cohort study</td>
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<td>Evan Joiner, Justin Neira, Wisdom Yevudza, Mark Weller, Peter Angevine,</td>
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<td>Christopher Mandigo</td>
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<td>8:08-8:10 am</td>
<td>519 Single level awake transforminal lumbar interbody fusion: a Mayo</td>
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<td>Clinic institutional experience and national analysis</td>
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<td>Mohamad Bydon, Abdul Karim Ghaith, Sulaman Durrani, Kingsley Abode-</td>
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<td>Iyamah, Archis Bhandarkar, Gaetano De Biase, Rami Rajjoub, Selby Chen,</td>
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<td>Alfredo Quinones-Hinojosa</td>
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<td>8:10-8:12 am</td>
<td>520 Obesity is Associated with a Lower Quality of Life</td>
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<td>Following Surgery for Lumbar Spondylolisthesis</td>
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<td>Abhijith Matur, Zachary Plummer, Juan Mejia Munne, Sanjit Shah,</td>
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<td>Joseph S. Cheng</td>
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<td>8:12-8:14 am</td>
<td>521 The Use of Mechanomyography in Quantifying Severity and Prognosis</td>
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<td>of Chronic Entrapment Neuropathy</td>
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<td>Saad Javeed, Christopher Dibble, Justin Zhang, Jacob Greenberg,</td>
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<td>Amir Faraji, Robert J. Spinner, Wilson Z. Ray</td>
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<td>8:14-8:16 am</td>
<td>522 Characterizing the cellular phenotype of AAV-mediated Pten knockout</td>
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<td>in the peripheral nervous system</td>
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<td>Alice Liu, Jennifer Hong</td>
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<td>8:16-8:18 am</td>
<td>523 Intraoperative Placement of Analgesic Calcium Sulfate Beads</td>
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<td>Improves Functional Outcomes in Thoracolumbar Spine Surgery</td>
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<td>Vignesh Kumar, Stephen Burks, Michael Y. Wang</td>
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<td>8:18-8:20 am</td>
<td>524 MIS experience using tubular retraction for IDEM spine pathology:</td>
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<td>Case series with systematic review and pooled analysis</td>
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<td>Aaron Burket, Mauricio Avila, Adam Moreno, Richard Chua</td>
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<td>8:20-8:22 am</td>
<td>525 Impact of Motor Recovery on Functional Independence in Tetraplegia:</td>
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<td>Implications for Upper Extremity Nerve Transfers</td>
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<td>Saad Javeed, Jacob Greenberg, Justin Zhang, Christopher Dibble,</td>
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<td>Jawad Khalifeh, Wilson Z. Ray</td>
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526 Significance of redundant nerve roots in patients with lumbar stenosis undergoing minimally invasive decompression
Jacob Goldberg, Christoph Wipplinger, Sertac Kirnaz, Jimmy Xia, Fabian Sommer, Alicia Meng, Pravesh Gadjradj, Branden Medary, Joseph Carnevale, A. John Tsiouris, Ibrahim Hussain, Roger Hartl

527 Evaluation of axonal injury with filtered diffusion weighted magnetic resonance imaging in CSM
Spencer Murphy, Shekar Kurpad, Robyn Furger, Matthew Budde, Saman Shabani

528 Diffusion Basis Spectrum Imaging (DBSI) for Tracking Axonal Regeneration following Peripheral Nerve Injury
Nathan Birenbaum, Saad Javed, William Spees, Ying Yan, Matthew MacEwan, Sheng-Kwei Song, Wilson Z. Ray

529 Unmonitorable Intraoperative Monitoring Signals: Should We Cancel the Surgery?
Joseph Schaefer, Elias Atallah, Kevin Hines, James S. Harrop

530 Recent Trends in Medicare Utilization and Reimbursement for Spinal Cord Stimulators: Percutaneous and Open Placement
Giyth Mahdi, Marcus Romanik, Rohin Singh, Joshua Catapano, Michael Lawton, Zaman Mirzadeh, Clinton Morgan, Robert Rudy

531 Influence of Pre-Surgical High Impact Chronic Pain Designation in Recipients of Spine Surgery for Spondylolisthesis
Christine Park, Chad Cook, Praveen V. Mummaneni, Andrew Chan, Erica F. Bisson, Mohammad Bydon, Yagiz Yoleu, Steven D. Glassman, Kevin Foley, Mark E. Shaffrey, Avery Buchholz, Luis M. Tiumialan, Jay D. Turner, Eric A. Potts, Christopher I. Shaffrey, Domagoj Coric, Anthony L. Asher, Michael Y. Wang, Paul Park, Cheerag D. Upadhyaya, Dean Chou, Nitin Agarwal, Regis W. Haid, Michael S. Virk, Jacob Goldberg, Kai-Ming G. Fu, Oren N. Gottfried

532 Operative Treatment of Bertolotti Syndrome: Resection versus Fusion
Anthony Mikula, Nikita Lakomkin, Ryan Ransom, Patrick Flanigan, Laura Waksdahl, Zach Pennington, Manish Sharma, Benjamin D. Elder, Jeremy Fogelson

533 Erector spinae plane versus suprafascial/subfascial infiltration of liposomal bupivacaine in lumbar spine surgery
Andy Wang, Alper Dincer, James Kryzanski
8:38-8:40 am
Dylan Goodrich, Tejas Karnati, Allan Martin, Julius Ebinu, Kee Kim

8:40-8:42 am
535 TIVA for posterior thoracolumbar fusion increases postoperative ileus risk versus inhaled anesthetic
Brandon Sherrod, Robert Kim, Josh Hunsaker, Courtney Rada, Clint Christensen, Darrel S. Brodke, Marcus D. Mazur, Erica F. Bisson, Andrew Dailey

8:42-8:44 am
536 New Generation SCS Devices for the Management of Failed Back Surgery Syndrome Refractory to Conventional SCS Devices
William Mualem, Sally El Sammak, Giorgos Michalopoulos, Christine Hunt, Mohamad Bydon

8:44-8:46 am
537 Downregulation of metalloprotease inhibitors and collagen constituents may lead to early-onset disc degeneration

8:46-8:48 am
538 Bending Angle and Oscillatory Distance may be associated with positive surgical outcomes in Tethered Cord Syndrome
Sulaman Durrani, Abdul Karim Ghaith, William Mualem, Cameron Zamanian, Ryan Jarrah, Mohamad Bydon

8:48-8:50 am
539 Vertebral body Radiomics Features on Computed Tomography Predicts Bone Mineral Density in Lumbar Degenerative Diseases

8:50-8:52 am
540 Spinecom: Remote Patient Monitoring of Patients Receiving Spine Surgery
Teddy Kim, Beth Baucom, Charles L. Branch Jr.

8:52-8:54 am
541 Non-invasive Electrical Stimulation as an Adjunct to Fusion Procedures: A Systematic Review and Meta-analysis
Abhijith Matur, Zachary Plummer, Juan Mejia Munne, Monir Tabbosa, Justin Virojanapa, Rani Nasser, Joseph S. Cheng

8:54-8:56 am
542 Utility of Intraoperative Neuromonitoring in Minimally Invasive Posterior Lumbar Fusion
Jonathan Huang, Erik Rabin, Shyam Chandrasekar, Ashley Selner, Kevin Siowng

8:56-8:58 am
543 Reoperation rate following decompression for Cauda Equina Syndrome
Landon Bulloch, Alfred Rhyne, Domagoj Coric
8:58-9:00 am
544 Histopathologic and chromosomal copy number comparative analysis of spinal meningiomas
Joseph Driver, John Chi

9:00-9:02 am
545 Changes in Plasma Cytokine Markers are Predictive of Persistent Postsurgical Pain Following Complex Spine Surgery
Owoicho Adogwa, Sai Chilakapati, Prapti Mody, Syed Khalid, Michael Burton

9:02-9:04 am
546 Changes in Proinflammatory Cytokines Robustly Predict Risk for Postoperative Delirium Following Complex Spine Surgery
Owoicho Adogwa, Sai Chilakapati, Prapti Mody, Michael Burton, Syed Khalid

9:04-9:06 am
547 Neurotechnologies for Brain-Machine Interfacing in Spinal Cord Injury
Nida Fatima, Gregory Lekovic

9:06-9:08 am
548 Surgical Management of Spinal Nerve Schwannoma of the Sacrum: a Retrospective Study and Literature Review

9:08-9:10 am
549 Nerve Transfer For C5-6 Palsies After Cervical Spine Surgery: Need For Earlier Referral?
Stephen Miranda, Jessica Nguyen, Disha Joshi, Eric L. Zager, Zarina S. Ali

9:10-9:12 am
550 The Window Test: simple bedside method to detect radial deviation of the wrist as seen in PIN palsy
Amgad S. Hanna, Daniel Hellenbrand, Phoebe Omuro, Jacob Hutchinson

9:12- 9:14 am
551 Paraganglioma of the Spine: A Systematic Review

9:14-9:16 am
552 Awareness of Complex Regional Pain Syndrome Among Medical Professionals
Tariq Al-Saadi

9:16-9:18 am
553 Preoperative serum albumin level correlates with complications after elective fusion surgery for spinal tumors
Safwan Alomari, Nicholas Theodore, Timothy F. Witham, Ali Bydon
54 Gender of the patient does not correlate with early outcomes of peripheral nerve surgery
Safwan Alomari, Daniel Lubelski, Nicholas Theodore, Timothy F. Witham, Ali Bydon

55 Do Multidisciplinary Spine Conferences Alter Management or Affect Outcome?
Maria José Cavagnaro, Jose Orenday, Naushaba Khan, Isabel Martha Strouse, Aaron Dowell, Mauricio Avila, Robert Andrew Ravinsky, Ali A. Baaj

56 Novel Approach to Nerve Repair & Neural Regeneration
Allan J. Belzberg, Greg Osgood

57 Prophylactic Low-Molecular-Weight Heparin vs Unfractionated Heparin in Spine Surgery: A Matched Case-Control Study
Mohamed Macki, Mokbel Chedid, Victor W. Chang, Travis Hamilton, Seokchun Lim

58 Using Wearable Technology to Measure the Association Between Neck Posture and Neck Pain During Orthopaedic Surgery
Joseph Bigham, Greg Walker, Viral Patel, Howard Chansky, Scott Telfer

59 Radiographic cervical corpectomy outcomes: subsidence, pseudoarthrosis, and hardware failure at 1 year minimum follow up
Brandon Sherrod, Christopher Wilkerson, Robert Kim, Davide Croci, Ilyas Eli, Erica F. Bisson, Andrew Dailey, Marcus D. Mazur

Spinal Deformity Abstract JULIUS 19-20 Breakout Session
Moderators: Christoph P. Hofstetter, Hasan A. Zaidi

60 Two- and Three-Year Outcomes of Minimally Invasive and Hybrid Correction of Adult Spinal Deformity

61 Final Tightening Technique and the Effect on Set Screw Loosening Failure Potential
David Polly, Gregory M. Mundis, Corey Gladieux
602 Lower Hounsfield Units are Associated with Proximal Junctional Kyphosis and Failure at the Upper Thoracic Spine

Anthony Mikula, Nikita Lakomkin, Zach Pennington, Zachariah Pinter, Ahmad Nassr, Brett Freedman, Arjun Sebastian, Kingsley Abode-Iyamah, Mohammad Bydon, Jeremy Fogelson, Benjamin D. Elder

603 Comparison of cervical alignment preservation in posterior cervical laminectomy and fusion versus open door laminoplasty

Yaroslav Gelfand, Will Sheppard, Kwame Firempong, Daniel Lu, Langston T. Holly

604 The Radiographic effect of posterior column osteotomy in patients undergoing anterior lumbar interbody fusion

Samuel Farber, Michael White, Brad Guidry, Robert Dugan, Kurt Shaffer, Jacquelyn Ho, Nicholas Kuttner, Juan S. Uribe, Jay D. Turner

605 Preoperative trends in CT bone density predict likelihood of proximal pathology in long segment spinal fusion

Yevgeniy Freyvert, Nathan Pratt, Jared Cooke, Zachary Tataryn, Clifford Pierre, Amir Abdul-Jabbar, Jens Chapman

606 Automated Intraoperative Measurement of Cobb Angle and C7 Plumb Line Using Machine Learning and Computer Vision

Gaetano De Biase, Parth Gami, Kelly Qiu, Yoel Alperin, Sindh Kannapan, Alfredo Quinones-Hinojosa, Kingsley Abode-Iyamah

607 Focal laminectomy with foraminotomy provides durable improvement in scoliosis patients with radicular pain syndromes

Alp Ozpinar, Nallammui Muthiah, Nima Alan, Nitin Agarwal, Adam S. Kantler, D. Kojo Hamilton, David Okonkwo

608 Understanding proximal junctional failure: cobalt chrome results in higher strain in the proximal junction


609 Transforaminal Thoracic Interbody Fusion (TTIF) for Treatment of Thoracic Spondylosis and Proximal Junctional Failure

Bryan Ladd, Rajiv Dharnipragada, Christophe Martin, Jonathan Sembrano, David Polly, Kristen E. Jones

610 The rates of proximal junctional kyphosis after L4 versus L3 pedicle subtraction osteotomies

Saman Shabani, Joshua Rivera, Praveen V. Mummaneni, Nitin Agarwal, Jeremy Huang, Shane Burch, Sigurd Berven, Dean Chou
611 ASD patient outcomes planned for a two-staged scoliosis correction: A case for standalone anterolateral MIS fusion
Alp Ozpinar, Nallammai Muthiah, Nima Alan, Nitin Agarwal, Adam S. Kanter, D. Kojo Hamilton, David Okonkwo

612 Use of Expert Panel for Symptomatic Patients with Grade I Degenerative Lumbar Spondylolisthesis

613 Motorized hinged operating table facilitated sagittal correction after spinal osteotomies using SPO and TLIF
Kenneth Holton, Rajiv Dharnipragada, Jonathan Sembrano, Christopher Martin, Kristen E. Jones, David Polly

614 The Iliac Kickstand Screw: Anatomic CT Analysis of Screw Trajectory and Osseous Corridor for Screw Placement
Alexander Schupper, Jonathan Lee, Jeffrey Okeewunmi, Wesley Bronson, Jeremy Steinberger, Lawrence Lenke, James Lin

615 Use of C7 Slope as a Surrogate Marker for T1 Slope: A Radiographic Study in Patients with and without Cervical Deformity
Arunit Jessey Chugh, Mohit Patel, Christina Gerges, Kerrin Sunshine, Betsy Wilson, Manish Kasliwal

616 Single level lateral lumbar interbody fusion using 3D porous titanium cages for rod fractures in select ASD patients
Alp Ozpinar, Nallammai Muthiah, Nitin Agarwal, Nima Alan, Adam S. Kanter, D. Kojo Hamilton, David Okonkwo

617 Radiologic and clinical outcomes after reference frame placement in the posterior superior iliac spine for spine surgery
Katherine Holste, Mark Zaki, Yamaan Saadeh, Paul Park

618 The Impact of Baseline Cervical Mal-Alignments on Development of PJ Following ASD Surgery in the Thoracolumbar Spine
619 Comparison of Multi-Level Low-Grade versus Three-Column Osteotomies in Adult Spinal Deformity Surgery
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Kevin Moattari, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

620 Durability of Alignment in the Sagittal Age-Adjusted Score Following Surgical Adult Spinal Deformity Correction
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

621 Cost-Utility Analysis of a Combined Approach for Surgical Correction of Adult Spinal Deformity

622 Radiographic Malalignment Has a Greater Impact on Outcomes than Complications in ASD Surgery
Alan Daniels, Andrew Schoenfeld, Bassel Diebo, Breton Line, Christopher Ames, Christopher I. Shaffrey, Douglas Burton, Eric Klineberg, Frank Schwab, Gregory M. Mundis, Jeffrey Gum, Justin Smith, Khaled Kebaish, Manish Gupta, Neel Anand, Oscar Krol, Paul Park, Peter G. Passias, Renaud Lafage, Richard Hostin, Robert Easellack, Robert Hart, Shaleen Vira, Shay Bess, Virginie Lafage

623 Preoperative Frailty and Deformity Ranges Predictive of Optimal Outcomes in Adult Spinal Deformity
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Lara Passfall, Nicholas Kummer, Oscar Krol, Peter G. Passias, Peter S. Tretiakov, Rachel Joujon-Roche, Shaleen Vira, Tyler Williamson

624 Sweet Spot: Can Baseline Disability Predict Outcomes in Adult Spinal Deformity Surgery?
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Jordan Lebovic, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Rachel Joujon-Roche, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson

625 Assessing the Incremental Benefits of Minimally Invasive Surgery for Frail Adult Spinal Deformity Patients
Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage
8:22-8:24 am
626 Concurrent Presence of Thoracolumbar Scoliosis and Chiari Malformation: Is Operative Risk Magnified?
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Karan Patel, Katherine Pierce, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Sara Naessig, Shaleen Vira, Stephane Oweis-Sarpong, Tyler Williamson, Virginie Lafage, Waleed Ahmad

8:24-8:26 am
627 Improvements in Cost Effectiveness of Adult Cervical Deformity Corrective Surgery Over Time
Alan Daniels, Alexandra Sororeanu, Andrew Schoenfeld, Breton Line, Christopher Ames, Christopher I. Shaffrey, D. Kojo Hamilton, Douglas Burton, Eric Klineberg, Frank Schwab, Gregory M. Mundis, Han Jo Kim, Justin Scheer, Justin Smith, Nicholas Kummer, Peter G. Passias, Rachel Joujon-Roche, Renaud Lafage, Robert Eastlack, Robert Hart, Shaleen Vira, Shay Bess, Virginie Lafage

8:26-8:28 am
628 Determining the Impact of Proximal Junctional Kyphosis on Cost-Utility in Adult Spinal Deformity Surgery
Bailey Imbo, Oscar Krol, Peter G. Passias, Peter S. Tretiakov, Rachel Joujon-Roche, Tyler Williamson, Waleed Ahmad

8:28-8:30 am
629 Three Column Osteotomy: Predicting Improved Outcomes and Minimizing Risk in Adult Spinal Deformity Corrections
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Shaleen Vira, Stephane Oweis-Sarpong, Tyler Williamson, Virginie Lafage

8:30-8:32 am
630 Impact of Realignment Systems on Rates of PJK in Surgical Correction of Adult Spinal Deformity
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Muhammad Janjua, Oscar Krol, Peter G. Passias, Peter S. Tretiakov, Rachel Joujon-Roche, Shaleen Vira, Tyler Williamson

8:32-8:34 am
631 Should Length of Construct Influence our Alignment Goals in Adult Spinal Deformity Corrective Surgery?

8:34-8:36 am
632 Trends in 5 Year Outcomes of a Prospective Consecutively Enrolled Single-Center Adult Spinal Deformity Series
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov,
Praaveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

8:36-8:38 am
633 Have We Made Advancements in Optimizing Surgical Outcomes for High Risk Adult Spinal Deformity Patients over Time?

8:38-8:40 am
634 Impact of Addressing Thoracic Secondary Drivers at Onset of Corrective Surgery for Adult Cervical Deformities
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Lara Passfall, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakoff, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

8:40-8:42 am
635 Severe Baseline Global Alignment and Proportion May Require More Aggressive Alignment Goals for Lumbo-Pelvic Mismatch
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Dean Chou, Justin Smith, Katherine Pierce, Kevin Moattari, Lara Passfall, Navraj Sagoo, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakoff, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Sara Naessig, Shaleen Vira, Tyler Williamson, Virginie Lafage, Waleed Ahmad

8:42-8:44 am
636 Is it Possible to Recover from DJK Relative to Patients without DJK following ACD Corrective Surgery
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Lara Passfall, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakoff, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

8:44-8:46 am
637 The Clinical Benefit of Addressing the Malalignment In Revision Surgery for PJK following ASD Surgery.
8:46-8:48 am
638 Efficacy of Varying Surgical Approaches on Achieving Optimal Alignment in Adult Spinal Deformity Surgery
Alan Daniels, Andrew Schoenfeld, Bassel Diebo, Breton Line, Christopher Ames, Christopher L. Shaffrey, Dean Chou, Douglas Burton, Eric Klimeberg, Frank Schaub, Han Jo Kim, International Spine Study Group, Jordan Lebovic, Justin Smith, Khadejeh Kebaish, Munish Gupta, Oscar Krol, Peter G. Passias, Praveen V. Mummaneni, Renaud Lafage, Robert Hart, Sara Naessig, Shaye Bess, Tina Raman, Tyler Williamson, Virginie Lafage, Waleed Ahmad

8:48-8:50 am
639 Ideal Cervical Spine Realignment in Cervical Deformity Patients When the Thoracolumbar Spine is Not Addressed
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakou, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

8:50-8:52 am
640 How do alignment criteria impact cost effectiveness of surgical intervention for adult spinal deformity?
Peter G. Passias, Rachel Joujon-Roche, Bailey Imbo, Peter S. Tretiakou, Tyler Williamson, Oscar Krol, Bassel Diebo, Shaleen Vira, Andrew Schoenfeld, Jordan Lebovic, Stephane Owusu-Sarpong, Muhammad Janjua

8:52-8:54 am
641 Natural History of ASD: How do those with Suboptimal Surgical Outcomes Fare Relative to Non-Operative Counterparts?
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Muhammad Janjua, Oscar Krol, Peter G. Passias, Peter S. Tretiakou, Rachel Joujon-Roche, Shaleen Vira, Tyler Williamson

8:54-8:56 am
642 Risk of Adult Spinal Deformity (ASD) Surgery Can Equal or Exceed that of Surgery for Metastatic Spinal Disease (MSD)
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakou, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

8:56-8:58 am
643 Development of the Adult Spinal Deformity-Specific Surgical Risk Calculator
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Kevin Moattari, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakou, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage
8:58-9:00 am
644 Surgical Management of Adult Cervical Deformity: Are we getting better at optimal realignment?
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson

9:00-9:02 am
645 Operative Treatment Outcomes of Adult Cervical Deformity Based on Radiographic Severity Stratification
Alan Daniels, Bailey Imbo, Breton Line, Christopher Ames, D. Kojo Hamilton, Douglas Burton, Eric Klineberg, Frank Schwab, Gregory M. Mundis, Han Jo Kim, Justin Scheer, Justin Smith, Nicholas Kummer, Peter G. Passias, Renaud Lafage, Robert Eastlack, Robert Hart, Shay Bess, Themistocles Protapsaltis, Virginie Lafage

9:02-9:04 am
646 The Effect of Distal Junctional Kyphosis on Cost-Utility of Cervical Deformity Surgery
Peter G. Passias, Oscar Krol, Jordan Lebovic, Lara Passfall, Rachel Joujon-Roche, Tyler Williamson, Bailey Imbo, Peter S. Tretiakov, Bassel Diebo, Shaleen Vira, Andrew Schoenfeld

9:04-9:06 am
647 Diminishment of Distal Junctional Kyphosis after Cervical Deformity Corrective Surgery by Radiographic Improvement
Andrew Schoenfeld, Bailey Imbo, Dean Chou, Jordan Lebovic, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Shaleen Vira, Andrew Schoenfeld

9:06-9:08 am
648 Who Benefits from a Combined Anterior-Posterior Approach in Cervical Deformity Surgery?
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Lara Passfall, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

9:08-9:10 am
649 Which Outcome Measures are Most Sensitive to Realignment after Adult Spinal Deformity Surgery?
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Peter G. Passias, Peter S. Tretiakov, Rachel Joujon-Roche, Shaleen Vira, Tyler Williamson

9:10-9:12 am
650 Are We Getting Better with Alignment Over Time?
Peter G. Passias, Oscar Krol, Tyler Williamson, Peter S. Tretiakov, Rachel Joujon-Roche, Jordan Lebovic, Bailey Imbo, Andrew Schoenfeld, Shaleen Vira, Dean Chou, Paul Park
651 Achievement of Optimal Alignment and Improvement Following Cervical Deformity Surgery: A 2-Year Outcome Analysis
Andrew Schoenfeld, Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Justin Smith, Lara Passfall, Muhammad Janjua, Nicholas Kummer, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

652 Adult Cervical Deformity Corrective Surgery Outcomes Based on Radiographic Severity
Bailey Imbo, Bassel Diebo, Dean Chou, Jordan Lebovic, Lara Passfall, Muhammad Janjua, Oscar Krol, Paul Park, Peter G. Passias, Peter S. Tretiakov, Praveen V. Mummaneni, Rachel Joujon-Roche, Renaud Lafage, Saman Shabani, Shaleen Vira, Stephane Owusu-Sarpong, Tyler Williamson, Virginie Lafage

653 In adult spinal deformity surgery, are all mechanical complications created equally?
Hani Chanbour, Steven Roth, Byron Stephens, Jeffrey Hills, Amir Abtahi, Clinton Devin, Scott L. Zuckerman

654 Staging Adult Spinal Deformity Corrective Surgeries Adds Admission Costs With No Postoperative Morbidity Improvement.

655 Proximal lumbar anterior column realignment for sagittal deformity: 12-month outcomes.
Jason Frerich, Khoi D. Than

656 Simulation-based Approach to Investigate Divergent Conclusions of RCTs in Patients with Spondylolisthesis
Seth Meade, Sebastian Salas-Vega, Nicholas Rabah, Thomas Mroz, Michael P. Steinmetz, Edward Benzel, Ghaith Habboub

657 Single vs. Dual Magnetically Controlled Growing Rods: A Systematic Review & Meta-Analysis
Sally El Sammak, Gloria Kim, Giorgos Michalopoulos, Cameron Zamanian, Mohamad Bydon

Cathleen Kuo, Mohamed Soliman, Dennis Youngs, Marissa Kruk, Ryan Hess, Elizabeth Nyahuto, Asham Khan, Patrick Jowdy, John Pollina, Jeffrey P. Mullin

659 Prospective study of adjacent-level disease: 10-year prediction of adjacent-level disease
Steve Monk, Jack Zigler, Peter Derman, Ernest Braxton, Kris Radcliff, Aaron Sittu, Nicole Ferko, Domagoj Coric, Glenn Buttermann, Anton Jorgensen
SCIENTIFIC SESSION 5  JULIUS 12-14, 24

Spine Workforce of Tomorrow
9:30-11:15 am

Moderators: Wilson Z. Ray, Gerald E. Rodts

Faculty: Joseph T. Alexander, Erica F. Bisson, Kenneth M. Crandall, Michael W. Groff, Wilson Z. Ray, Daniel K. Resnick, Christopher I. Shaffrey, Laura A. Snyder, Michael P. Steinmetz, Luis M. Tumialan, Robert G. Whitmore

Learning Objectives:
- Discuss strategies to increase diversity and inclusion in the spine surgery workforce
- Apply the importance of spine surgeon and industry partnership
- Describe the changing landscape of spine surgery both in academic and private practice

9:30-9:40 am
Recognition of Kuntz Scholars and Introduction of J.A.N.E., Mayfield, and Branch Fund Award Recipients
Wilson Z. Ray

9:41-9:46 am
J.A.N.E. Award Presentation: 700 Improvement in Resident Performance for Minimally Invasive Lumbar Decompression Using a State-of-the-Art Simulator
Carolin Melcher, Ibrahim Hussain, Sertac Kirnaz, Jacob Goldberg, Fabian Sommer, Rodrigo Navarro-Ramirez, Branden Medary, Roger Hartl

9:47-9:52 am
J.A.N.E. Abstract Award Discussant
Kenneth M. Crandall

The J.A.N.E. award honors the legacy of Dr. John Anthony Jane Sr., 1931–2015. Dr. Jane was a world-renowned neurosurgeon, scientist, and teacher. Exceptionally influential in neurosurgery, he held leadership positions in the ABNS and the Senior Society, and served as editor of the Journal of Neurosurgery for more than 20 years.

9:53-9:58 am
Mayfield Clinical Science Award Presentation: 701 Two- and Three-Year Outcomes of Minimally Invasive and Hybrid Correction of Adult Spinal Deformity

9:59-10:04 am
Mayfield Clinical Science Abstract Award Discussant
Robert G. Whitmore

10:05-10:07 am
Introduction
Laura A. Snyder
10:08-10:16 am  
**Strategies to Increase Diversity and Inclusion in the Spine Surgery Workforce**  
*Erica F. Bisson*

10:17-10:25 am  
**What is the Future of Private Practice?**  
*Luis M. Tumialan*

10:26-10:34 am  
**The Academician of the Future**  
*Michael P. Steinmetz*

10:35-10:37 am  
**Recognition of Neurosurgery Meritorious Award: Mark E. Shaffrey**  
*Christopher I. Shaffrey*

10:38-10:46 am  
**Strategies to Avoid Burnout in Spine Surgery**  
*Daniel K. Resnick*

10:47-10:55 am  
**How Spine Surgeons can Partner with Industry Ethically and Effectively**  
*Christopher I. Shaffrey*

10:56-11:04 am  
**What I Wish I Knew when I Started Practice**  
*Michael W. Groff*

11:05-11:15 am  
**Questions from the Audience and Session Conclusion**

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**SPECIAL SESSION JULIUS 12-14, 24**  
**Business of Neurosurgery in collaboration with CSNS**  
11:15 am-12:10 pm  
**Moderators:** Joseph S. Cheng, Jeremy T. Phelps  
**Faculty:** Owoicho Adogwa, Joseph S. Cheng, Jeremy T. Phelps, Justin Slavin, Gabriel A. Smith, Jeremy Steinberger, Luis M. Tumialan, Cheerag D. Upadhyaya  

**Learning Objectives:**  
- Identify the changes in coding and reimbursement that impacts a neurosurgery spine practice  
- Identify documentation requirements to facilitate authorization of imaging and surgeries  
- Discuss the variables used by hospital systems to identify the financial impact of a spinal neurosurgeon  
- Demonstrate an understanding of the variables associated with contracts for a successful neurosurgery position

11:15-11:16 am  
**Introduction**  
*Joseph S. Cheng, Jeremy T. Phelps*

11:17-11:24 am  
**Coding Updates 2022 for Spine**  
*Luis M. Tumialan*
11:25-11:32 am  
New E&M Coding: What Neurosurgeons Need to Know  
Owoicho Adogwa

11:33-11:40 am  
Growing Your Spine Practice in the Modern Marketplace  
Justin Slavin

11:41-11:48 am  
Employed Physicians: Pearls and Pitfalls in Contract Negotiations  
Jeremy Steinberger

11:49-11:56 am  
Key Points in Neurosurgical Contracts  
Cheerag D. Upadhyaya

11:57 am-12:04 pm  
Building Templates to Manage and Prevent Denials  
Gabriel A. Smith

12:05-12:10 pm  
Panel Discussion

DSPN BUSINESS MEETING  JULIUS 12-14, 24

12:10-12:30 pm  
Moderators: Erica F. Bisson, Scott A. Meyer  
Speakers: Nicholas C. Bambakidis, Domagoj Coric, Regis W. Haid, Michael P. Steinmetz, Luis M. Tumialan, Juan S. Uribe, Christopher E. Wolfla

12:10-12:12 pm  
Chair's Report  
Domagoj Coric

12:13-12:15 pm  
Treasurer's Report  
Juan S. Uribe

12:16-12:18 pm  
Secretary's Report  
Luis M. Tumialan

12:19-12:21 pm  
Nominating Committee Report  
Michael P. Steinmetz

12:22-12:24 pm  
CNS Board Report  
Christopher E. Wolfla

12:25-12:27 pm  
AANS Board Report  
Regis W. Haid

12:28-12:30 pm  
Future Sites Committee Report  
Christopher E. Wolfla
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EXHIBIT HOURS

Thursday, February 24
9:00 am-4:30 pm

Friday, February 25
9:00 am-2:00 pm
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EXHIBIT PRODUCTS & SERVICES

EXHIBIT HALL FEATURES

• Discover state-of-the-art equipment, products, and services.

• Enjoy lunch in the exhibit hall or attend an industry sponsored lunch. Industry partners present the latest cutting-edge technology while providing lunch.

• Participate in the What’s New Sessions. Join the crowd during daily beverage breaks on Thursday and Friday, as speakers share the latest in cutting-edge research and technology.
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<tr>
<th>Time</th>
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<tr>
<td>9:30 am-3:14 pm</td>
<td>Julius Ballroom 9-11, 25</td>
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<td>9:53-10:03 am</td>
<td>Navigated Prone Lateral: When &amp; How</td>
<td>Medtronic</td>
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<td>10:04-10:14 am</td>
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<td>2:32-2:42 pm</td>
<td>Radiographic and Clinical Outcomes Using Novel MIS Disc Prep and Multi-Dimensional Expandable Interbody Cage</td>
<td>Sandeep Kunwar</td>
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<td>2:43-2:52 pm</td>
<td>Metal Free Cortical Fixation with a Novel Curved Drill and PEEK Implant</td>
<td>Kornelis Peolstra</td>
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<td>2:53-3:03 pm</td>
<td>Static vs. Expandable Cages: When, Where, and Why?</td>
<td>DePuy Synthes</td>
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<td>3:04-3:14 pm</td>
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**FRIDAY, FEBRUARY 25**

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<tr>
<td>2:53-3:03 pm</td>
<td>Tech Talk Updates: Introduction of Excelsius3D</td>
<td>Christopher Holland</td>
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<tr>
<td>3:04-3:14 pm</td>
<td>The Clinical Value of Bioactive Synthetics in Spine Surgery</td>
<td>Jami Hafiz (with Collagen Matrix)</td>
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**INDUSTRY SPONSORED LUNCH SYMPOSIA**

**WEDNESDAY, FEBRUARY 23**
12:00-1:00 pm

**Spine Enhanced Recovery After Surgery & Post-Surgical Pain Management Techniques**  
Mohamad Bydon, Jeffrey Gadsden  
Julius Ballroom 6-8

**THURSDAY, FEBRUARY 24**
12:00-1:00 pm

**Case Presentations: Cervical Thoracolumbar Alignment**  
John H. Shin, Joseph Osorio  
Julius Ballroom 3/4

**Staying up-to-date on Innovation and Technology: Incorporating Robotics Navigation into Complex Spine Procedures featuring ExcelsiusGPS**  
Laura A. Snyder  
Julius Ballroom 15-17

**The Pulse platform: A Case Review of Pulse in my OR**  
Paul Holman  
Julius Ballroom 6-8

**Take a Winning View: Imaging a Corpectomy Cage at the Cervical Thoracic Junction with a Mobile CT Scanner**  
Atman Desai, Gabriel A. Smith  
Julius Ballroom 19-20

**FRIDAY, FEBRUARY 25**
12:15-1:15 pm

**Case Debate: Gaining Sagittal Balance in Lumbar Spine - MIS FLIF vs. Direct Lateral vs. ATP**  
Andrew Grossbach, Adam Polifka, Jan Yoon  
Julius Ballroom 3/4

**Incorporating Robotics and Navigation for Full Neurosurgical Procedures**  
Paul Park  
Julius Ballroom 6-8

**The TLIF of Tomorrow: Enabled by the Latest MIS Technologies & Tools**  
Charles L. Branch Jr., Christopher Holland, Lee Tan  
Julius Ballroom 15-17

**12:00-1:00 pm**

**Compelling Evidence Regarding Surgical Site Complications in Spine Surgery**  
Julius Ballroom 21-22
Attend these private sessions to receive hands-on training using the latest state-of-the-art devices and technology. If you wish to attend one of these sessions, please stop by their exhibit booth for more information.

**THURSDAY, FEBRUARY 24**
Roman Ballroom 2

**FRIDAY, FEBRUARY 25**
Optimizing Spinopelvic Fixation with iFuse Bedrock™
10:00 am - 12:00 pm
Thank You to our 2022 Spine Summit Supporters

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The 39th Annual Meeting of the AANS/CNS Section on Disorders of the Spine and Peripheral Nerves
The Pulse platform: A case review of Pulse in my OR

Thursday, February 24 from 12 to 1 p.m.

Led by Paul Holman, M.D.
Located in Julius Ballrooms 6–8

In a single expandable platform, Pulse integrates multiple enabling technologies to improve workflow, reduce variability and increase the reproducibility of surgical outcomes.

For important product information, including indications for use, contraindications, warnings, cautions, precautions, and potential adverse events please visit nuvasive.com/eIFU

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