## NASS 2020 Virtual Experience

October 6-9, 2020
Final Program

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome and Access Information</td>
<td>2</td>
</tr>
<tr>
<td>Education Information</td>
<td>3</td>
</tr>
<tr>
<td>Attendee Resources</td>
<td>4</td>
</tr>
<tr>
<td>Awards</td>
<td>5</td>
</tr>
<tr>
<td>Corporate Supporters</td>
<td>8</td>
</tr>
<tr>
<td>Meeting-at-a-Glance</td>
<td>9</td>
</tr>
<tr>
<td>Tuesday, October 6</td>
<td>14</td>
</tr>
<tr>
<td>Wednesday, October 7</td>
<td>16</td>
</tr>
<tr>
<td>Thursday, October 8</td>
<td>25</td>
</tr>
<tr>
<td>Friday, October 9</td>
<td>35</td>
</tr>
<tr>
<td>OnDemand</td>
<td>41</td>
</tr>
<tr>
<td>Abstracts</td>
<td>51</td>
</tr>
<tr>
<td>Leadership Recognition</td>
<td>111</td>
</tr>
<tr>
<td>Disclosure Policy Information</td>
<td>113</td>
</tr>
</tbody>
</table>
Welcome to the NASS 2020 Virtual Experience
October 6-9 and Beyond
Earn up to 51.25 AMA PRA Category 1 Credits™.

The Virtual Lobby Platform is your window to the meeting. View the Live Session schedule, Session Library, Exhibitor Gallery, Abstracts, Discussion boards and NASS Resources from the Virtual Lobby.

Use the **Live Schedule** to access the session you want to watch. Access the **OnDemand Session Library** to view sessions by category at any time as well as to watch sessions not featured in the live schedule.

**Exhibitor Gallery** houses company products, listing by company and a video gallery.

Read the **hundreds of abstracts available via the Virtual Lobby**. View the scientific research, watch a video, chat or post comments for colleagues and authors.

**Discussions** allow you to continue the conversation after the sessions conclude. Post comments to the sessions by category on the discussion boards.

Use the **NASS Resources portal** to access your member benefits, join or renew your membership, view offers and find the latest publications.

**Accessing the Virtual Meeting**

Go to spine.org/AMVirtualLobby and log in to the meeting using your NASS username and password. Don’t remember your login? Your login is your email address. You also can reset your password if necessary. You’ll use the same link each day to access the Live Schedule and the OnDemand Session Library.

Watch each session using the Virtual Session Platform. Ask a question during live sessions using the chat feature. Click the Discussions icon to post comments and observations, as well as direct questions to speakers via a designated email. Click the Session Details link to view moderators, description and objectives. The Speaker link will show presenters and their disclosures. There’s also posting etiquette under the Guidelines link.

**Accessing Virtual Content After the Meeting**

ALL of the Virtual Meeting content will be accessible at spine.org/AM through March 2021 and in your personal NASS Video Library indefinitely.

We look forward to your participation in the NASS Annual Meeting Virtual Experience, October 6-9 and thereafter OnDemand.

William J. Sullivan, MD
2019-2020 NASS President

Michael G. Fehlings, MD, PhD, FRCSC
2020 Program Co-chair

David J. Kennedy, MD
2020 Program Co-chair

Donna M. Lahey, RNFA, CNOR
2020 Program Co-chair

Alexander R. Vaccaro, MD, PhD
2020 Program Co-chair

Disclaimer

The material presented at the NASS 2020 Virtual Annual Meeting is made available by the North American Spine Society for educational purposes only. The material is not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed; rather, it is intended to present an approach, view, statement or opinion of the faculty which may be helpful to others who face similar situations.

While NASS will take commercially reasonable measures to ensure this virtual meeting is available without significant interruption, difficulties with hardware, software, equipment or services especially those provided by others may result in some interruptions. In such events, all content will be available OnDemand for users to later view at his/her own convenience.

NASS disclaims any and all liability for injury or other damages to any individual attending the meeting and for all claims which may arise, including those arising out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by physicians or any other person.
Learning Objectives
Upon completion of this meeting, participants should gain strategies to:
• Promote discussion of new scientific developments and best practices in spine care;
• Demonstrate the application of current techniques, procedures and research;
• Practice evidence- and value-based medicine relative to spine care.

CME Information  Questions? Contact NASS Education at education@spine.org.

How to Claim your CME
Log into your NASS account via www.spine.org/CME to claim CME. You will not be able to submit answers or print a certificate until the meeting concludes on Friday, October 9 at 5:30 p.m. CT

Evaluation and Educational Certificates
After the meeting, you may submit your evaluation electronically and print your CME certificate directly from our website. Visit www.spine.org/cme to claim education credit and to print CME certificates. Contact education@spine.org with questions.

Continuing Medical Education (CME) Credit
This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education (ACCME). The North American Spine Society is accredited by the ACCME to provide continuing medical education for physicians and takes responsibility for the content, quality and scientific integrity of this CME activity.

51.25 total CME Credits are available.

For the Virtual Experience OnDemand Content, the North American Spine Society designates this enduring material for a maximum of 51.25 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity. (This includes the Live Schedule content.) The live schedule constitutes 17.75 hours of the total available credit.

The American Medical Association has determined that physicians not licensed in the US who participate in these CME activities are eligible for AMA PRA Category 1 Credits™. (Exact number of credit hours subject to change.)

Continuing Education (CE) Credit for Allied Health Professionals
NASS is proud to offer continuing education (CE) units to accommodate nonphysician attendees’ certification requirements. The following indicates the status of CE unit accreditation for nonphysician attendees. Requirements vary for other allied health and advanced practice providers; please contact your licensing organization for their requirements.

Physician Assistants: The American Academy of Physician Assistants (AAPA) accepts Category 1 credit from AOACCME, prescribed credit from the American Academy of Family Physicians (AAFP) and AMA PRA Category 1 Credits™ for the Physician's Recognition Award from organizations, such as NASS, accredited by the ACCME.

Nurse Practitioners: The American Association of Nurse Practitioners (AANP) accepts AMA PRA Category 1 Credits™ from organizations accredited by the ACCME.

Requirements vary for other allied health and advanced practice providers; please contact your licensing organization for their requirements.

To claim CME credit and to print certificates after the meeting, please visit www.spine.org/cme. Request usernames and passwords from the login page.
Virtual Member Concierge
We encourage you to visit the Virtual Membership Concierge in the NASS Resources section of the virtual experience to check for meeting offers related to membership. There you'll be able to renew your 2021 dues, join NASS, browse the Digital Recruitment Guide powered by the NASS Career Center, and more!

Members who renew for 2021 will also gain access to The Best of NASS Annual Meetings: Bonus Content. This is a collection of the most popular OnDemand sessions of 2018 and 2019 with an additional 21 CME credits!

Not a member? Join today at www.spine.org/join and receive 50% off your 2021 Membership! To gain access to your exclusive promotion code, Text* ASKNASS to 33222 or send an email to membership@spine.org.

Questions?
Feel free to contact us at membership@spine.org or give us a call at 866-960-6277 (001-630-230-3600 from outside the United States), Monday–Friday, 8:00 a.m.–4:00 p.m. Central time. You can also Text the word ASKNASS to 33222 from any US phone number*.

*By texting you agree to receive automated text messages from NASS (frequency based on level of communication). Message and data rates may apply. Reply STOP to end. Text communication is limited to United States phone numbers only.

NASS Publications

The Spine Journal
The Spine Journal is the official scientific journal of NASS and the highest-rated journal in spine science. TSJ is an international, multidisciplinary peer-reviewed journal that publishes original articles on research and treatment of the spine and spine care.

Find The Spine Journal online at: www.thespinejournalonline.org
Submit articles to The Spine Journal at: https://www.editorialmanager.com/SPINEE/default.aspx

NEW! NASSJ
NASSJ, the open access companion to The Spine Journal, is a new international, evidence-based, online journal. NASSJ publishes peer-reviewed original content on clinical care, spine research and education. Readers and authors have a new opportunity to experience traditional and unique article types in this opening accessible and rapidly available new publication.

Find NASSJ at: https://www.nassopenaccess.org
Find Instructions for Submitting Manuscripts to NASSJ at: https://www.nassopenaccess.org/content/authorinfo

SpineLine
SpineLine, a peer-reviewed bimonthly clinical and news publication of NASS, includes multidisciplinary scientific articles, reviews, debates, and other relevant medical, ethical and policy content in spine and health care.

Find SpineLine at: www.spineline-digital.org

KnowYourBack
KnowYourBack.org is NASS’ peer-reviewed patient page. With content supplied by the Patient Education and Public Affairs committee, KnowYourBack offers you a credible information source where you can feel confident about sending your patients. Topics range from prevention to diagnoses and treatments.

NASS members should check on and update their Patient Profile on their MyAccount page and reach more patients via KnowYourBack's Find a Specialist feature. Find your profile at: https://connect.spine.org/network/members/profile.
2020 Leon Wiltse Award
Richard D. Guyer, MD
Recognizing excellence in leadership and/or clinical research in spine care.

Dr. Guyer is a 34-year member of NASS, 2006-2007 NASS President, Co-Founder of Texas Back Institute in 1982, one of the pre-eminent practices in spine globally, Founder and Chairman of the TBI Research Foundation and Director, and TBI Spine Fellowship since 1986 having trained more than 225 domestic and international fellows. TBI’s research in clinical studies including discographies, MRI’s, MIS surgeries and total disc replacements serve as seminal studies to this day. His Foundation is the recipient of grants and numerous accolades including the prestigious Volvo Award for low back pain research. He has a long running list of past committees at NASS and continues to be active with NASS on TSJ, the former Motion Preservation Section, hosting Chinese spine surgeons as part of the NASS CAOS Spine Fellows Program, and participating in NASS’ International Education Programs. Along with his partners, he has participated in nearly a dozen FDA IDE trials. Most recently, he has been the Co-Principal Investigator in two of the most recent cervical disc trials, the M-6 and the Simplify. His research in the clinical sciences remains relevant and serves in numerous clinical algorithms outlining spine care.

Nominated by Scott Blumenthal, MD and Jean-Jacques Abitbol, MD

2020 Henry Farfan Award
Barbara D. Boyan, PhD
Recognizing outstanding contributions in spine-related basic science research.

Dr. Boyan is a 6-year member of NASS, presently Alice T. and William H. Goodwin, Jr. Dean of Engineering at the Virginia Commonwealth University, where she is also the Professor of Biomedical Engineering, with affiliate appointments in Biochemistry, Pediatrics and Orthopedic Surgery and Professor Emerita at the Georgia Institute of Technology. Her remarkable contributions to spine-related basic science have been important in educating the NASS membership about the interactions between spine implant materials, surfaces, and bone physiology. Colleagues know Dr. Boyan through her work on the interaction of osteoblasts lineage cells with biomaterials used in spine for interbody fusions, including bone graft substitutes and metal cages. She has been instrumental in helping surgeons to understand the underlying concepts in bone biology that are involved in this interaction and how different materials, particularly their surface properties, impact osteogenesis during the fusion process. Dr. Boyan has published over 500 peer-reviewed papers, most of which have addressed basic questions related to musculoskeletal research. Her papers span the field from basic cell biology and mechanisms of hormone and growth factor regulation to the development of preclinical models that address actual clinical use. She has been able to convert her knowledge in basic science to inventions that are used clinically worldwide. She served on the FDA’s Orthopaedic Device Panel for six years and was chair when spine cages were first introduced. She has served as a member of the panel for the review of BMP2/Infuse and she has represented AAOS at CMS. Barbara holds 23 issued US patents. She is a member of the National Academy of Engineering, and a Fellow of the National Academy of Inventors, the American Association for the Advancement of Science, the American Institute of Mechanical and Biomedical Engineering, the European Academy of Science and Arts, and the National Academy of Inventors and the International College of Fellows of Biomaterials Science and Engineering. She has founded a number of biomedical technology companies and has served on the Boards of both public and private companies, as well as not-for-profit organizations and government agencies, including the Commonwealth Center for Advanced Manufacturing and the Virginia Innovation Partnership Authority.

Nominated by Paul Slosar, MD and Gunnar Andersson, MD, PhD
2020 David Selby Award
Michael R. Klein Jr., MD, FACS

Recognizing contributions to the art and science of spinal disorder management through service to NASS but has not been elected NASS President.

Dr. Klein is a 11-year member of NASS, a Clinical Professor, Dept. of Orthopedic Surgery, Univ. of California – Davis, and a Moderator and Facilitator of NASS’ online forum, Spine Connect. He currently serves on three NASS committees. He is very committed to fostering the educational mission of NASS, as the on-line facilitator of SpineConnect and as moderating SpinePAC symposiums at the 2016 and 2017 Annual Meetings. As Co-chair of the SpinePAC Advisory Committee, he feels we are fulfilling our obligation to the membership, that via Advocacy, NASS has a voice in Washington. He has co-hosted five SpinePAC fund raising dinners and plan to continue. Through his combined efforts, SpinePAC had its most successful fund raising in 2018, surpassing all previous years. His educational contributions to SpineConnect as facilitator, focuses on stimulating and encouraging our world-wide colleagues to post clinical cases with teaching issues, as well as encouraging spine care providers to ask for assistance in difficult deformity cases and occasionally trauma cases. Since taking on this position in 2015, the membership of SpineConnect has doubled. He has not published any manuscripts from this format; however, he chose four cases from posters who represented four different continents, stressing the importance of NASS’s commitment to worldwide education. These four posters came to the 2016 and 2017 Annual Meetings and were well received by the assembled conferees. Dr. Klein’s contribution as Co-Chair of the SpinePAC Advisory Committee stresses that NASS requires funding to continue and maintain a voice in Washington for our membership.

Nominated by Eric J. Muehlbauer, MJ, CAE

2020 Spine Advocacy Award: Jeffrey C. Wang, MD

Dr. Wang earned a Bachelor of Science degree in Biological Sciences at Stanford University and his M.D. degree at the University of Pittsburgh School Of Medicine. He did his residency in Orthopaedic Surgery at UCLA and completed a fellowship in Spine Surgery at Case Western Reserve University. In 1997, he joined the David Geffen School of Medicine at UCLA as Assistant Professor of Orthopaedic Surgery, in 2002 also was appointed Assistant Professor of Neurosurgery, and became Associate Professor in both disciplines in 2003. He became Vice Chair of the Department of Orthopaedic Surgery and spine fellowship director since 1997. In 2013, he was recruited to the University of Southern California Spine Center. He is currently a Professor of Orthopaedic Surgery and Neurosurgery at the Keck Medical Center at USC, Co-Director of the USC Spine Center and Fellowship Director of the USC Spine Fellowship. During Dr. Wang’s tenure as NASS President (2019), NASS Advocacy efforts reached new heights setting fundraising and outreach efforts, thanks in large part to Dr. Wang’s efforts and leadership. During the current election cycle, Dr. Wang has hosted a SpinePAC fundraising dinner with key health care policy maker U.S. Rep. Jimmy Gomez (CA-34) and also moderated the NASS COVID-19 joint webinar featuring U.S. Rep. Raul Ruiz (CA-36) with AANS/CNS and AAOS. Dr. Wang also helped to secure the venue for the 2018 Advocacy Dinner during the NASS Annual Meeting at the Jonathan Club in Los Angeles. In addition, Dr. Wang continues to lead by example, regularly ranking among the most generous annual donors to SpinePAC.

Nominated by NASS Advocacy Volunteer Leadership
The Spine Journal Outstanding Paper Awards

2020 Outstanding Paper in Basic Science:
Uncovering molecular targets for regenerative therapy in degenerative disc disease: do small leucine-rich proteoglycans hold the key?
Professor S. Rajasekaran, MD, PhD, FACS; Dilip Chand Raja, MS; Chitraa Tangavel, PhD; Sharon Miracle Nayagam, MSc; Vijay Anand, MS; R. Sunmathi, M Tech; Monica Steffi Matchado, M Tech; M. Ravendran, PhD; Ajoy Prasad Shetty, MS; Rishi Mugesh Kanna, MS; K. Dharmalingam, PhD

2020 Outstanding Paper in Clinical Care:
Vertebral bone quality score predicts fragility fractures independently of bone mineral density
Jeff Ehresman, BS; Andrew Schilling, AB; Xinghai Yang, MD; Zach Pennington, BS; A. Karim Ahmed, BS; Ethan Cottrill, BS, MS; Daniel Lubelski, MD; Majid Khan, MD; Kendall F. Moseley, MD; Daniel M. Sciubba, MD

2020 Outstanding Paper in Clinical Care:
Prospective validation of a clinical prediction score for survival in patients with spinal metastases: The New England Spinal Metastasis Score
Andrew J. Schoenfeld, MD; Marco L. Ferrone, MD; Joseph H. Schwab, MD, MS; Justin A. Blucher, MS; Lauren B. Barton, BS; Daniel G. Tobert, MD; John H. Chi, MD, MPH; John H. Shin, MD; James D. Kang, MD; Mitchel B. Harris, MD

Research Grant and Fellowship Awards
Research Grant and Fellowship Awards recognize those proposing advancements in spine care and research.
Jeremiah T. Easley, DVM
Nima Alan, MD
Moh H. Malek, PhD
Mohamed Rasheed Ahamed Nihaj, MBBS, MD
Piyush Kalakoti, MD
Luca Ambrosio, MD

Value Awards
Value Abstract Awards foster and recognize efforts to define value in spine care.
Azeem T. Malik, MBBS
Kibum Kim, PhD
Peter Passias, MD

Resident and Fellow Research Awards
Resident and Fellow Research Awards recognize young researchers and clinicians who work in spine care.
Taylor Jackson, MD
Thomas Buell, MD


MEMBERS: WHEN YOU RENEW YOUR 2021 MEMBERSHIP, YOU’LL GAIN ACCESS TO THE BEST OF NASS ANNUAL MEETINGS: BONUS CONTENT.

This will feature the most popular OnDemand sessions from 2018 and 2019 with 21 CME credits. With 51.25 credits available for this year’s meeting, this will give you access to a total of 72.25 credits! Be sure your 2021 membership dues are paid by December 31, 2020 and this exclusive content will be made available to you at a later date.

Visit spine.org/renew to renew online or call 866-960-6277, Monday-Friday, 8am-4pm Central time to renew by phone.
With Sincere Appreciation

The North American Spine Society thanks the following companies for their support of the NASS 2020 Virtual Meeting.

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## Meeting-at-a-Glance

### Tuesday, October 6

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00–1:45 p.m.</td>
<td><strong>Introduction Address</strong> with NASS First VP Eric Truumees, MD</td>
<td>ALL</td>
</tr>
<tr>
<td></td>
<td><strong>Presidential Address</strong> with NASS President William J. Sullivan, MD</td>
<td>ALL</td>
</tr>
<tr>
<td>1:45–2:00 p.m.</td>
<td><strong>Break</strong></td>
<td>IND</td>
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<tr>
<td></td>
<td><strong>Industry Presentation: Medacta</strong> (1:45-1:55)</td>
<td>IND</td>
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<tr>
<td>2:00–3:00 p.m.</td>
<td><strong>Concurrent Sessions:</strong></td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 1—Sections on Spinal Deformity and Intraoperative Neuropsychological Monitoring: Intraoperative Neuromonitoring and Deformity Surgery</td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 2—Health Care Disruption and Finance: To Brace or Embrace?</td>
<td>ALL</td>
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<tr>
<td>3:00–3:15 p.m.</td>
<td><strong>Break</strong></td>
<td>IND</td>
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<tr>
<td></td>
<td><strong>Industry Presentation: Integra</strong> (3:00-3:10)</td>
<td>IND</td>
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<tr>
<td>3:15–4:45 p.m.</td>
<td><strong>Surgical Technique Cadaver Demonstration:</strong> Endoscopic Spine Fusion Surgery</td>
<td>SUR</td>
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<tr>
<td>5:35–5:45 p.m.</td>
<td><strong>Industry Presentation: LifeNet Health</strong></td>
<td>IND</td>
</tr>
</tbody>
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### Wednesday, October 7

**NASS International Forum**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00–9:00 a.m.</td>
<td><strong>NASS International Symposium:</strong> Adult Spinal Deformity</td>
<td>SUR</td>
</tr>
<tr>
<td>9:00–10:00 a.m.</td>
<td><strong>NASS International Symposium:</strong> Cervical Spine Surgery</td>
<td>SUR</td>
</tr>
<tr>
<td>10:00–10:25 a.m.</td>
<td><strong>Break</strong></td>
<td>IND</td>
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<tr>
<td></td>
<td><strong>Industry Presentations:</strong> Stryker (10:00-10:10); LifeNet Health (10:10-10:20)</td>
<td>ALL</td>
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<tr>
<td>10:25–10:55 a.m.</td>
<td><strong>International Address:</strong> NASS, EUROSPINE and SPINE20</td>
<td>ALL</td>
</tr>
<tr>
<td>10:55–11:00 a.m.</td>
<td><strong>Break</strong></td>
<td>IND</td>
</tr>
<tr>
<td>11:00 a.m.–12:00 p.m.</td>
<td><strong>NASS International Symposium:</strong> Spine Trauma</td>
<td>SUR</td>
</tr>
<tr>
<td>12:00–12:45 p.m.</td>
<td><strong>Plenary Session:</strong> COVID-19: A Cataclysmic Event of Global Significance</td>
<td>ALL</td>
</tr>
<tr>
<td>12:45–1:00 p.m.</td>
<td><strong>Break</strong></td>
<td>IND</td>
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<tr>
<td></td>
<td><strong>Industry Presentation:</strong> Bioventus (12:45-12:55)</td>
<td>IND</td>
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<tr>
<td>1:00–2:00 p.m.</td>
<td><strong>Concurrent Sessions:</strong></td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 1—Complex Cervical Deformity: Optimizing Management</td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 2—Section on Biologics &amp; Basic Research: Choosing the Perfect Bone Graft: What are the Biologic Requirements for Fusion by Procedure?</td>
<td>MED</td>
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<td></td>
<td>Session 3—Healthcare and the 2020 Elections</td>
<td>ALL</td>
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<tr>
<td>2:00–2:30 p.m.</td>
<td><strong>Break</strong></td>
<td>IND</td>
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<tr>
<td></td>
<td><strong>Industry Presentations:</strong> Medtronic (2:00-2:10); Kuros Bioscience (2:10–2:20); Stryker (2:20–2:30)</td>
<td>IND</td>
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</tbody>
</table>
### Wednesday, October 7 (Continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Category</th>
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<tbody>
<tr>
<td>2:30–3:30 p.m.</td>
<td>Concurrent Sessions:</td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 1—Section on Spine Oncology: A Multidisciplinary Approach to Difficult Spine Tumor Case</td>
<td>SUR</td>
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<td>Session 2—Exercise Committee Presents: The Role of Exercise as Medicine in Spine Care: Matching Exercise Programs to the Patient</td>
<td>ALL</td>
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<tr>
<td>3:30–3:45 p.m.</td>
<td>Break Industry Presentation: Zimmer Biomet (3:30-3:40)</td>
<td>IND</td>
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<tr>
<td>3:45–4:45 p.m.</td>
<td>Featured Abstract Presentation: Best Papers</td>
<td>ALL</td>
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<tr>
<td>4:45–5:00 p.m.</td>
<td>Break Industry Presentation: Joimax (4:45-4:55)</td>
<td>IND</td>
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<tr>
<td>5:00–7:00 p.m.</td>
<td>Surgical Technique Cadaver Demonstration: Spine Deformity Surgery</td>
<td>SUR</td>
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<tr>
<td>6:45–7:45 p.m.</td>
<td>Industry Workshop: elliquence</td>
<td>IND</td>
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<tr>
<td>7:45–8:45 p.m.</td>
<td>Industry Workshop: Ethicon</td>
<td>IND</td>
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### Thursday, October 8

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00–1:00 p.m.</td>
<td>Plenary Session: Advances and Challenges in Degenerative Cervical Myelopathy</td>
<td>ALL</td>
</tr>
<tr>
<td>1:00–1:15 p.m.</td>
<td>Break Industry Presentation: Medtronic/Mazor (1:00-1:10)</td>
<td>IND</td>
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<tr>
<td>1:15–2:15 p.m.</td>
<td>Concurrent Sessions:</td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 1—Section on Robotics &amp; Navigation: Pushing the Frontiers of Spine Surgery through Advanced Technologies and Robotics</td>
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<td></td>
<td>Session 2—Muscle Health as a Biomarker for Functional Recovery Following Spine Pain and Injury</td>
<td>MED</td>
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<td></td>
<td>Session 3—Leadership Perspective: Practical Solutions to Impact Physicians’ Professional Fulfillment</td>
<td>ALL</td>
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<tr>
<td>2:45–3:45 p.m.</td>
<td>Concurrent Sessions:</td>
<td>SUR</td>
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<tr>
<td></td>
<td>Session 1—Section on Spinal Cord Injury: Translational Spinal Cord Injury: Advances and Challenges</td>
<td>SUR</td>
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<td>Session 2—Physiological Modifications for Cost Effectiveness and Enhanced Recovery: Enhanced Recovery After Spine Surgery (ERASS) - Early Results and Implementation</td>
<td>MED</td>
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<td></td>
<td>Session 3—Section on Biologics &amp; Basic Research: The Present and Future of Post BMP Biologics</td>
<td>ALL</td>
</tr>
<tr>
<td>3:45–4:00 p.m.</td>
<td>Break Industry Presentation: Vivex (3:45-3:55)</td>
<td>IND</td>
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*Continued on next page*
### CENTRAL TIME ZONE

#### Thursday, October 8 (Continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00-5:00 p.m.</td>
<td><strong>Featured Abstract Presentation:</strong> Best Papers</td>
</tr>
<tr>
<td>5:00-5:15 p.m.</td>
<td>Break</td>
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<tr>
<td></td>
<td><strong>Industry Presentation:</strong> DePuy Synthes (5:00-5:10)</td>
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<tr>
<td>5:15-6:45 p.m.</td>
<td><strong>Surgical Technique Cadaver Demonstration:</strong> MIS Tubular Decompression</td>
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<tr>
<td>7:00-7:30 p.m.</td>
<td><strong>Industry Workshop:</strong> Globus Medical</td>
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<tr>
<td>7:30-8:00 p.m.</td>
<td><strong>Industry Workshop:</strong> Globus Medical</td>
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<tr>
<td>8:00-9:00 p.m.</td>
<td><strong>Industry Workshop:</strong> DePuy Synthes</td>
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</tbody>
</table>

#### Friday, October 9

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00–1:00 p.m.</td>
<td><strong>Plenary Session:</strong> Physicians in the Crosshairs: Government Enforcement Trends and Priorities Affecting Physicians and Physician Practices</td>
</tr>
<tr>
<td>1:00–1:15 p.m.</td>
<td>Break</td>
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<td><strong>Industry Presentation:</strong> Esaote (1:00-1:10)</td>
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<tr>
<td>1:15–2:15 p.m.</td>
<td><strong>Concurrent Sessions:</strong></td>
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<tr>
<td></td>
<td>Session 1—Endoscopic Spine Surgery: Cost, Data and Advances</td>
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<td></td>
<td>Session 2—Sections on Comprehensive Episodes of Spine and Interventional Spine &amp; Musculoskeletal Medicine (ISMM): Disc and Vertebrogenic Pain</td>
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<td></td>
<td>Session 3—Artificial Intelligence and Machine Learning in Spine Surgery</td>
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<tr>
<td>2:15–2:30 p.m.</td>
<td><strong>Members Business Meeting</strong></td>
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<tr>
<td>2:30–3:40 p.m.</td>
<td><strong>Featured Abstract Presentation:</strong> Best Papers</td>
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<tr>
<td>3:40–3:45 p.m.</td>
<td>Break</td>
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<tr>
<td>3:45–4:45 p.m.</td>
<td><strong>Surgical Technique Cadaver Demonstration:</strong> Cervical Spine Surgery</td>
</tr>
<tr>
<td>4:45–5:00 p.m.</td>
<td><strong>Wrap Up/Thank You</strong></td>
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</tbody>
</table>

**Abbreviations:**
- **SUR** Surgical
- **MED** Medical
- **ALL** All Specialties (Multidisciplinary)
- **IND** Industry
## Available in the OnDemand Session Library

### Surgical Sessions
- Oblique Lumbar Interbody Fusion—Why is it Better?
- AOSpine NA: Failed Back Surgery Syndrome
- Section on Spinal Deformity: Diagnostic and Technology Innovations to Improve Safety, Outcomes and Efficiencies in Spine Deformity Surgery
- Section on Intraoperative Neurophysiological Monitoring: To Use, or Not to Use: That is the Question.
- Surgical Technique Cadaver Demonstrations: Minimally Invasive Prone Lateral Interbody Fusion
- Section on Spine Oncology: How Will an Individual Patient Do with Spine Surgery? Using Predictive Models and Calculators
- The Sacroiliac Joint: Where Does It Fit Within Your Practice?
- Perioperative Optimization in Adult Spinal Deformity

### Resident and Fellow Education Pathway
- Coding for Residents & Fellows
- Career Building
- Transition to Practice: Landing A Job

### Medical Session
- Perioperative Spinal Cord Injury
- Ambulatory Care Surgery Practice and Applications: Spine Surgery in the Ambulatory Care Setting: Getting Patients Home Happy
- Transforming Your Practice with Minimally Invasive Spine Care Using Evidence-Based Validation

### Multidisciplinary Sessions
- Interdisciplinary Spine Forum: The Worksite Health Center—An Emerging Model and Opportunity in Value-Oriented Spine Care
- Interdisciplinary Spine Forum: Treating Olympic, Paralympic and Elite Athletes
- The Future of Value-Based Healthcare in Spine Care: A Multi-Stakeholder Perspective
- Interdisciplinary Spine Forum: Thoracic Spine Pathology: Assessment and Differential Diagnosis
- Interdisciplinary Spine Forum: The Role of First Contact and Patient Interaction in an Attempt to Improve Prognosis and Reduce Chronicity in Patients with Spine Pain
### Industry Presentations

<table>
<thead>
<tr>
<th>Company</th>
<th>Presentation</th>
</tr>
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<tbody>
<tr>
<td>Abbott</td>
<td>The TRIUMPH of BurstDR™ SCS Therapy: Sustained Improvements in Mental, Physical and Emotional Functioning</td>
</tr>
<tr>
<td>Centinel Spine</td>
<td>Tiger Woods: Reborn</td>
</tr>
<tr>
<td>Mizuho OSI</td>
<td>Benefits of Intraoperative Adjustments Using the ProAxis® Spinal Surgery Table</td>
</tr>
<tr>
<td>Orthofix</td>
<td>Improvements of Quality of Motion and Associated Patient Outcomes</td>
</tr>
<tr>
<td>SI-BONE</td>
<td>Complications and Treatment Options for the SI Joint</td>
</tr>
<tr>
<td>Spinal Elements</td>
<td>Spinal Elements Introduces MIS Ultra</td>
</tr>
<tr>
<td>Thompson Surgical, Inc.</td>
<td>Establishing a Successful Anterior Lumbar Practice</td>
</tr>
<tr>
<td>Zeiss</td>
<td>An Advanced Visualization System—ZEISS TIVATO® 700 for Spine Surgery—Learn from the Experts</td>
</tr>
</tbody>
</table>
Intraoperative neuromonitoring is a vital component of improving safety in spinal deformity surgery. Faculty will review the basics of intraoperative neuromonitoring, discuss algorithms for intraoperative changes, and review pathology/technique specific applications of intraoperative neuromonitoring.

Upon completion of the symposium, participants should gain strategies to:

- Review the basic principles of intraoperative neuromonitoring;
- Analyze algorithms for intraoperative changes in neuromonitoring from the perspective of neurophysiologist, anesthesiologist, and surgeon;
- Evaluate common factors that increase the likelihood of acquiring false data in intraoperative neuromonitoring;
- Assess the use of neuromonitoring for spinal osteotomies and high-grade spondylolisthesis.

### AGENDA

**Introduction and Basics of Intraoperative Neuromonitoring**  
Richard Vogel, PhD, DABNM

**Case Presentation: Signal Loss during Deformity**  
Jason W. Savage, MD

**Management of Intraoperative Neuromonitoring Signal Loss**  
Raymond J. Hah, MD

**False Data in Intraoperative Neuromonitoring**  
Adam Doan, DC, DABNM

**Intraoperative Neuromonitoring for Spinal Osteotomies**  
Jason W. Savage, MD

**Intraoperative Neuromonitoring for High Grade Spondylolisthesis**  
Hani H. Mhaidli, MD, PhD

**Case Resolution/Questions and Answers**  
All Faculty
Companies like Amazon, Berkshire Hathaway, Walmart, Apple and JP Morgan want to influence the healthcare system with newer technologies for better patient care and transparency. In this symposium, faculty will discuss the recent advances in healthcare that may influence spine surgery and ambulatory surgery centers (ASCs), as well as what to expect in the future. Participants will gain insight from Washington insiders and insurance company executives.

Upon completion of the symposium, participants should gain strategies to:
- Be aware of latest developments in health care;
- Identify how the new developments affect spine care in the hospital and ASC;
- Recognize spine bundled payments;
- Acknowledge the transformation of healthcare with big data and Blue button 2.0;
- Identify aspects of spine surgery facing disruption early.

**Is Health Care Ready for Disruption?**
Karthik Madhavan, MD

**Latest Advancements in Technology to Affect Spine Care**
Andrew A. Sama, MD

**How Does Company Owned Insurance Affect Other Insurance Companies?**
Joseph S. Cheng, MD, MS

**What is a GPO (Group Purchasing Organization) and are Amazon and Walmart the Next Ones?**
Chester J. Donnally III, MD

**How Does Bundled Payment Work in this Scenario?**
Nathaniel P. Brooks, MD

**Apple, Google, or Amazon Will Be the Next Big Health Care Organization**
Anand Veeravagu, MD

**Questions and Answers**
All Faculty

This surgical technique cadaver demonstration will provide an overview and demonstration of endoscopic spine fusion surgery.

Upon completion of this session, participants should gain strategies to:
- Incorporate the latest techniques in complex spine surgery into their practice;
- Identify the nuances, advantages, and limitation of endoscopic spine surgery.

**Industry Presentation: Integra (3:00-3:10)**
CSF Leak Prevention with a Dural Sealant Designed Specifically for Spine

**SURGICAL TECHNIQUE CADAVER DEMONSTRATION: Endoscopic Spine Fusion Surgery**
Faculty Presenter: Michael Y. Wang, MD

**Industry Presentation: LifeNet Health**
Expert Panel: Hospitalization Cost And Resource Utilization In U.S. Lumbar Fusion Surgeries
In this session, faculty will address the burden of adult spinal deformity in healthcare, radiographic analysis and pre-operative planning, implants, the optimal osteotomy selection for correction, and complication avoidance.

Upon completion of the symposium, participants should gain strategies to:
• Identify the healthcare burden of adult spinal deformity;
• Describe implant consideration and optimization
• Implement radiographic analysis and pre-operative planning;
• Select the optimal osteotomy type for spinal deformity correction;
• Avoid and manage complications.

AGENDA
Introduction
Patrick C. Hsieh, MD, MS
Burden of Adult Spinal Deformity in Healthcare: An International Perspective
Jau-Ching Wu, MD, PhD
Radiographic Analysis and Pre-operative Planning for Adult Spinal Deformity
Jaime Moyano, MD
Pre-operative Optimization for Adult Spinal Deformity Surgery
Teresa Bas, MD, PhD
Selecting the Optimal Osteotomy Type for Spinal Deformity Correction
Bangping Qian, MD
Complication Avoidance and Management for Adult Spinal Deformity Surgery
Yong Hai, MD, PhD
Questions and Answers
All Faculty
10:00–10:25 a.m.
Break

Industry Presentation: Stryker (10:00–10:10)
Mesa: Innovation Continues

Industry Presentation: LifeNet Health (10:10–10:20)
A Case Against PEEK for ACDF

10:25–10:55 a.m.
International Address: NASS, EUROSPINE and SPINE20
Moderator: Jorg Franke, MD

Overview of EUROSPINE
Everard Munting, MD, PhD, President

Overview of NASS
William J. Sullivan, MD, President

Overview of SPINE20
Dr. Margareta C. Nordin

10:55–11:00 a.m.
Break

11:00 a.m.–12:00 p.m.
NASS INTERNATIONAL SYMPOSIUM:  Spine Trauma
Moderator: Charles A. Reitman, MD

DESCRIPTION
Faculty will discuss the classification of surgical indications, how to evaluate and manage the ankylosed spine, MIS in T-L fractures as well as present a case debate about unstable T12 burst fracture with incomplete neurologic deficit.

 Upon completion of the symposium, participants should gain strategies to:
• Classify surgical indications;
• Define what is unstable;
• Evaluate and manage the ankylosed spine;
• Describe the role and objectives of MIS in T-L fractures.

AGENDA
Introduction
Charles A. Reitman, MD

Classification/ Surgical Indications—What is “Unstable?”
Matti Scholz, MD

Evaluation and Management of TL Fractures in Ankylosed Spine
Faisal Konbaz, MBBS

Role and Objectives of MIS in T-L Fractures
Jung-Woo Hur, MD

Debate—Case is Unstable T12 Burst Fracture with Incomplete Neurologic Deficit

1. Favor Anterior Surgery
Ibrahim Omeis, MD, FAANS

2. Favor Posterior Surgery
Baron Zarate, MD

Questions and Answers
All Faculty
**DESCRIPTION**
Join our faculty panel to gain an understanding of the incidence and prevalence of COVID-19 and the impact on our world community. Discussions include the U.S. perspective on returning to work, management of the secondary surge and issues from many different perspectives including surgical, medical and multidisciplinary approaches.

Upon completion of the symposium, participants should gain strategies to:
- Gain an understanding of the incidence and prevalence of COVID-19 in the world community;
- Determine effective containment measures now and in the future for such a pandemic;
- Determine the effect of this pandemic on future operative and nonoperative care paradigms related to spinal medicine;
- Appreciate the timelessness of effective treatment strategies for COVID-19-antiviral/vaccine/passive immunity.

**AGENDA**
- U.S. Perspective on Return to Work, Management of the Secondary Surge and other Issues Related to the Pandemic from a Surgeon Perspective
  Vadim Goz, MD
- International Perspective from the Frontlines of Wuhan, China
  Yongchao Wu, MD
- Questions and Answers
  All Faculty

**12:00–12:45 p.m.**
**PLENARY SESSION:** COVID-19: A Cataclysmic Event of Global Significance
Moderator: Michael G. Fehlings, MD, PhD, FRCSC

**12:45–1:00 p.m.**
Break

**Industry Presentation: Bioventus (12:45–12:55)**
Spinal Fusion Series: Use of OSTEOAMP, a Novel Allograft, in a Variety of Complex Procedures
## SURGICAL SYMPOSIUM: Complex Cervical Deformity: Optimizing Management
Moderator: Shay Bess, MD

### DESCRIPTION
Adult cervical deformity is associated with severe patient disability, however complications associated with cervical deformity surgery are greater and potentially more catastrophic than complications associated with thoracolumbar deformities. Consequently, many surgeons are unfamiliar or uncomfortable with surgically treating cervical spine deformities. In this session, faculty address the assessment and treatment options for adult cervical spine deformity.

Upon completion of the symposium, participants should gain strategies to:

- Identify the radiographic parameters most predictive of disability for cervical spine deformities;
- Review how the cervical spine classification can differentiate between deformity types and guide surgical treatment;
- Differentiate between flexible and rigid cervical deformities to help guide treatment options;
- Recognize catastrophic complications associated with cervical deformity surgery and how to avoid these complications.

## MEDICAL SYMPOSIUM: Section on Biologics & Basic Research: Choosing the Perfect Bone Graft: What are the Biologic Requirements for Fusion by Procedure?
Moderators: Raymond Hah, MD and R. Todd Allen, MD

### DESCRIPTION
The data regarding efficacy of the various osteobiologics for fusion is limited. There is wide practice variation on the type and quantity of graft selection. Faculty will explore the existing evidence on osteobiologic choice by procedure and more closely examine the rationale for selection.

Upon completion of the symposium, participants should gain strategies to:

- Encourage the attendee to think about what osteobiologic choices they make and why;
- Review the literature on efficacy and complications of bone graft options in various fusion settings;
- Explore expert opinion on graft selection for obtaining successful fusion.

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**AGENDA**

**Introduction**
Shay Bess, MD

- **Fundamental Cervical Spine Alignment Concepts All Surgeons Should Know When Treating Cervical Deformity**
  Virginie Lafage, PhD
- **Does Cervical Deformity Classification Guide Treatment**
  Justin S. Smith, MD
- **Spinal Osteotomies for Cervical Deformity: Outcomes and Complications**
  Christopher P. Ames, MD
- **Rigid vs. Flexible Cervical Deformity: Diagnosis and Treatment Guidelines**
  Robert K. Eastlack, MD
- **Distal Junctional Kyphosis: Diagnosis, Risk Factors and Prevention in Cervical Deformity Surgery**
  Themistocles Protopsaltis, MD
- **Patient-Specific Cervical Deformity Corrections with Consideration of Associated Risk: Establishment of Risk Benefit Thresholds for Invasiveness Based on Deformity and Frailty Severity**
  Peter G. Passias, MD

**Questions and Conclusions**
Shay Bess, MD

**AGENDA**

**Personal Introspection: What Do You Use for Fusion in These Settings and Why?**
Raymond J. Hah, MD

- **Multilevel Anterior Cervical Discectomy and Fusion**
  Jeffrey C. Wang, MD
- **Anterior Lumbar Interbody Fusion (Lateral/Oblique)**
  R. Todd Allen, MD
- **Adult Spinal Deformity**
  Raymond J. Hah, MD
- **Spinal Oncology**
  Daniel M. Sciubba, MD

**Questions and Answers**
All Faculty
Recent polling indicates that health care remains the number one issue voters will consider before casting a ballot in this year’s Presidential elections. In this symposium, faculty will take an in-depth look at what the 2020 election may mean for the future of the health care, especially as it pertains to spine care providers ability to deliver high quality care to patients. Additionally, participants will gain a better understanding of how potential outcomes align with NASS priority objectives and how NASS Advocacy efforts are working to shape this conversation.

Upon completion of the symposium, participants should gain strategies to:

- Evaluate how the current political environment is shaping the policies that will affect spine care providers and their patients;
- Recognize the legislative proposals that are being considered by Congress as they identify ways to address the major challenges to the U.S. health care system;
- Gain an in-depth understanding of NASS’ current federal legislative priorities and emerging trends in healthcare policy in Washington, DC.

**AGENDA**

**Update on NASS Legislative Agenda and State of Play in 116th Congress**
Philip L. Schneider, MD

**What a New Democratic Admin. May Mean For Health Care Policy and Spine Care with U.S. Senator Tina Smith (D-MN)**
Philip L. Schneider, MD

**What A Second Trump Admin. May Mean For Health Care Policy and Spine Care U.S. Senator Mike Braun (R-IN)**
Philip L. Schneider, MD

2:00–2:30 p.m.
**Break**

**Industry Presentation: Medtronic (2:00–2:10)**
Nano Technology meets Navigation: Introducing Adaptix™ Interbody System with Titan nanoLOCK™ Surface Technology

**Industry Presentation: Kuros Bioscience (2:10–2:20)**
Immunomodulation by MagnetOs bone graft and a Novel Injectable Parathyroid Hormone for Interbody Fusion

**Industry Presentation: Stryker (2:20–2:30)**
Drive to Make Healthcare Better Featuring: Airo TruCT, Bone Vac, Mesa2, Niagara and SpineJack
This interactive session will start with a pre-test with audience participation. The same questions will be asked at the end of the session (pre/post-test). Faculty will present cases that will serve as topics for interactive discussion. One of the faculty will be presenting the case while other faculty will for volunteers to answer the questions as they arise during the case. Each case will cover a particular challenge in treating spinal tumors. For example, the first case will be a previously operated on sacral that chordoma with a contaminated path from incision to tumor. Another case will discuss when to re-biopsy if a biopsy is nondiagnostic or unclear. Another case will address what cases are most appropriate for radiation and the challenges in timing of this treatment. Finally, the session will conclude with a variety of challenging cases with a post-test given to participants.

Upon completion of the symposium, participants should gain strategies to:

- Perform appropriate workup/treatment of spinal tumors of unknown origin;
- Consider appropriate factors in determining treatment of a patient with a contaminated prior open approach to a primary lesion;
- Identify criteria for diagnosis and treatment options for metastatic lesions;
- Diagnose and treat high grade spinal cord compression from metastatic tumors and understand when radiation is appropriate;
- Manage cases when the first biopsy is unclear or nondiagnostic;
- Perform appropriate workup/treatment of tumors about the neural elements.

**AGENDA**

- **Introduction**
  Daniel M. Sciubba, MD and Joseph H. Schwab, MD

- **Case 1: Primary Tumors of the Spine and Sacrum**
  Matthew L. Goodwin, MD, PhD, FACSM

- **Case 2: Metastatic Lesions of the Spine: When is Radiation Most Effective?**
  Kristin Redmond, MD, MPH

- **Case 3: Difficult Cases In and About the Spine**
  John H. Shin, MD

- **Questions and Closing**
  All Faculty
Therapeutic exercise is well-documented as an effective intervention across the continuum of care for spinal pain disorders and is recommended in most major clinical practice guidelines. In this session, faculty will provide essential knowledge to help the spine provider make informed decisions to appropriately match exercise programs to the unique characteristics of each patient.

Upon completion of the symposium, participants should gain strategies to:

- Describe the benefits of exercise for general health and various conditions relevant to spine care (e.g., osteoporosis, osteoarthritis, rheumatoid arthritis, sarcopenia, obesity);
- Distinguish between specific and general exercises for spine care applications;
- Choose the appropriate dose of exercise to support spine care;
- Identify the behavioral and nutritional considerations associated with exercise;
- Apply the knowledge learned to prescribe exercise programs for spine care.

AGENDA

Introduction
John M. Mayer, DC, PhD, FACSM

Matching Exercise to the Patient: General Physical Activity
Ram Haddas, PhD

Matching Exercise to the Patient: Exercise Dose
Mark D. Croucher, DC

Matching Exercise to the Patient: Specific Back and Core Exercises
Yoheli Perez, PT

Matching Exercise to the Patient: Directional Preference
Ryan A. Tauzell, PT, MA, Cert. MDT

Matching Exercise to the Patient: Behavioral Health Considerations
Donald R. Murphy, DC, FRCC

Matching Exercise to the Patient: Nutritional and Weight Management Considerations
Brittany V.B. Johnson, MS, RDN, CSSD

Summary
John M. Mayer, DC, PhD, FACSM

3:30–3:45 p.m.
Break

Industry Presentation: Zimmer Biomet (3:30–3:40)
mymobility® with Apple Watch® a New Standard in Digital Health
3:45–4:45 p.m.

**FEATURED ABSTRACT PRESENTATION:** Best Papers

Moderators: Jefferson Wilson, MD, PhD, FRCSC and Michael G. Fehlings, MD, PhD, FRCSC

3:45–3:52 p.m.

1. Use of ALIF at the lumbosacral junction results in less lumbopelvic fixation failure than TLIF or no interbody fusion following correction of adult spinal deformity

Robert K. Eastlack, MD; Alexandra Soroceanu, MD, MPH; Gregory M. Mundis Jr., MD; Justin S. Smith, MD, PhD; Breton Line, BS; Peter G. Passias, MD; Pierce D. Nunley, MD; David O. Okonkwo, MD; Khoi D. Than, MD; Juan S. Uribe, MD; Dean Chou, MD; Khaled M. Kebaish, MD; Christopher I. Shaffrey, MD; Shay Bess, MD; International Spine Study Group


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:52–3:59 p.m.

2. The re-herniation after decompression (RAD) score identifies patients at low-risk for re-herniation after lumbar decompression surgery

Garrett Harada, MD; Bryce Basques, MD, MHS; Alexander Hornung, BS; Dino Samartzis, ScD, PhD, MSc; Howard S. An, MD

1Los Angeles, CA, US; 2Thomas Jefferson University, Philadelphia, PA, US; 3Midwest Orthopedics at Rush, Chicago, IL, US; 4Queen Mary Hospital, Hong Kong, Hong Kong; 5Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:59–4:06 p.m.

3. Global Spine Outreach (GSO): how to safely establish a sustainable short-term spine deformity outreach program

Gregory M. Mundis Jr, MD; Fernando Rios, MD; Lesley Mundis, PA-C; Melissa Hicks

1Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 2San Diego, CA, US; 3Global Spine Outreach, Nashville, TN, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:06–4:13 p.m.

4. At what point should the thoracolumbar region be addressed in patients undergoing corrective cervical deformity surgery?

Peter G. Passias, MD; Katherine E. Pierce, BS; Virginie Lafage, PhD; Renaud Lafage, MSc; Eric O. Klineberg, MD; Bassel G. Diebo, MD; Themistocles S. Protopsaltis, MD; D. Kojo Hamilton, MD; Shaleen N. Vira, MD; Breton Line, BS; Robert A. Hart, MD; Douglas C. Burton, MD; Shay Bess, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Justin S. Smith, MD, PhD; Christopher P. Armes, MD; International Spine Study Group


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
5. Are octogenarians at higher risk for complications after elective lumbar spinal fusion surgery compared with younger patients? A study from the Kaiser Permanente National Spine Registry

T. Kent Ganocy II, MD; Kathryn Royse, PhD, MPH; Heather Prentice, PhD, MPH; Jessica E. Harris, MS; Calvin C. Kuo, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

6. PLF or ALIF+PS: Which has a lower operative nonunion rate? Analysis of a cohort of 2,061 patients from a national spine registry

Elizabeth P. Norheim, MD; Kathryn Royse, PhD, MPH; Harsimran Brara, MD; David J. Moller, MD; Patrick W. Suen, MD; Shayan Rahman, MD; Jessica E. Harris, MS; Kern H. Guppy, MD, PhD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

7. Mild and severe obesity reduce effectiveness of lumbar fusions: one-year patient-reported outcomes in 8,171 patients from a national spine registry

Olivia Rice, MD; Joshua C. Patt, MD, MPH; Anthony L. Asher, MD; Matthew J. McGirt, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Discussion

4:45–5:00 p.m.
Break
Industry Presentation: Joimax (4:45-4:55)
The Future of Spine

5:00–7:00 p.m.
SURGICAL TECHNIQUE CADAVER DEMONSTRATION: Spine Deformity Surgery
Faculty Presenter: Sigurd H. Berven, MD

This surgical technique cadaver demonstration will provide an overview and demonstration of spinal deformity surgery.

Upon completion of this session, participants should gain strategies to:
• Incorporate the latest techniques in complex spine surgery into their practice;
• Determine concepts and principles of spinal deformity surgery as well as the technical considerations and surgical strategies to treat adult spinal deformity.

6:45–7:45 p.m.
Industry Workshop: elliquence
The Full Continuum of Least Invasive Spine Procedures

7:45–8:45 p.m.
Industry Workshop: Ethicon
Spine Surgery During COVID-19
In this session, faculty will discuss the available research for degenerative cervical myelopathy (DCM) as well as present case discussions to address the challenges of DCM management.

Upon completion of the symposium, participants should gain strategies to:

• Identify the top research priorities for DCM and their significance for the field of DCM;
• Recognize the minimum dataset for DCM, and its significance for the field of DCM;
• Identify new opportunities to contribute to care advances in DCM through research;
• Approach challenges in the management of DCM through case discussions.

AGENDA

Introduction: AOSpine and AOSpine Knowledge Forum
Brian K. Kwon, MD, PhD, FRCSC

Spinal Cord Injury
Michael G. Fehlings, MD, PhD, FRCSC

DCM: The Global Burden and Need for Knowledge Discovery
Jefferson Wilson, MD, PhD, FRCSC

Why Involve Patients and Non-Specialists in DCM Research?
Jefferson Wilson, MD, PhD, FRCSC

AOSpine RECODE-DCM: Developing a DCM Research Toolkit
Benjamin Davies, MbChB

AOSpine RECODE-DCM: The Top 10 Research Priorities
Mark Kotter, MD, PhD

Case Discussions: Challenging Issues in Degenerative Cervical Myelopathy
Christopher G. Furey, MD, Sanford E. Emery, MD, MBA, Zachary Gordon, MD, William Richardson, MD, Melissa Erickson, MD

Summary and Discussion
Michael G. Fehlings, MD, PhD, FRCSC

12:00–1:00 p.m.
PLENARY SESSION: Advances and Challenges in Degenerative Cervical Myelopathy
Moderators: Brian K. Kwon, MD, PhD, FRCSC; Michael G. Fehlings, MD, PhD, FRCSC; Christopher G. Furey MD; and Benjamin Davies, MbChB

1:00–1:15 p.m.
Break

Industry Presentation: Medtronic/Mazor (1:00-1:10)
Mazor X™: The Innovation Continues
**DESCRIPTION**

This symposium will review the latest advances in robotics, navigation, and augmented reality in spine surgery. Since the learning curve is often a rate-limiting step in adopting new techniques and technology, we will review a new 3D printing technology that helps improve this curve.

**Upon completion of this session, participants should gain strategies to:**

- Review the latest literature that evaluates the techniques as well as the benefits and drawbacks of using robotics in spine surgery;
- Define how navigation can be used to help facilitate performing spine endoscopy;
- Describe the clinical use of augmented reality systems in spine surgery along with their clinical results;
- Explain the use of a novel 3D printed system to simulate spine surgery.

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**AGENDA**

**Updates in Robotic Spine Surgery**
Srinivas K. Prasad, MD

**New Application of Navigation: Navigated Endoscopy**
Nathaniel P. Brooks, MD

**Simulation Using 3D Printing: Teaching and Clinical Applications**
Eric W. Nottmeier, MD

**Is Augmented Reality the Next Frontier in Spine Surgery?**
Chetan K. Patel, MD
Faculty will address the evolving imaging and biological-based technologies that have allowed for the characterization of previously less visible microscopic features of muscle structure. While these technologies are fast becoming a cornerstone of precision medicine/rehabilitation, they are not meant to replace its healthcare partners, but rather to enhance clinical decision making on a patient-by-patient basis.

Upon completion of the symposium, participants should gain strategies to:

- Identify spinal muscle structure, function and pathological changes in the presence of spinal disease;
- Characterize the degeneration of muscle and spinal cord white matter pathways following head/neck trauma and in patients with degenerative cervical myelopathy;
- Assess the impact of muscle health on pre- and post-operative outcomes;
- Recognize new technologies and advancements for characterizing muscle health and their value in clinical decision-making.
A recent systematic review identified 50 organization-directed workplace interventions to identify and ameliorate the effect of physician burnout, including stress or job satisfaction. DeChant, et al. classified these interventions into four distinct categories: Teamwork; Time; Transitions; and Technology. Thirty-five (70%) of reported interventions decreased physician burnout and improved job satisfaction. In this symposium, participants will hear a recognized leader discuss interventions that address physician wellness and fulfillment, discuss lessons learned and next steps, and understand how to incorporate this approach in their healthcare setting.

Upon completion of the symposium, participants should gain strategies to:

- Recognize the role that physician wellness plays to reduce turnover and stress, and to improve job satisfaction;
- Determine interventions to improve physicians’ professional fulfillment;
- Draft action plan to address professional fulfillment in your own organization.

### AGENDA

#### Introduction to Leadership Development Program and Speakers

Richard L. Skolasky, ScD

#### Campfire 1: Overview of Physician Stress and Burnout

Richard L. Skolasky, ScD

#### Campfire 2: Professional Fulfillment: Roles of Workplace Systems, Culture and Individuals

Susan J. Rehm, MD

#### Developing Action Plans, Next Steps

Susan J. Rehm, MD and Richard L. Skolasky, ScD

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**2:15–2:45 p.m.**

**Break**

**Industry Presentation: EOS (2:15-2:25)**

Set Your Practice Apart: 2D/3D Imaging Solutions for Degenerative Spine Management

**Industry Presentation: GE (2:25-2:35)**

3D Printed Interbody Fusion Devices - Clinical Benefits
DESCRIPTION
Over the past decade, there has been a flourish of novel strategies to reverse the functional loss after severe spinal cord injury (SCI), ranging from stem cells, epidural stimulations, brain-machine interface, neuroplasticity enhancement, among others. Faculty will present the newest and most exciting advances in translational spinal cord injury research, as well as discuss some of the latest topics and publications. The session will provide opportunities to discuss some of the research in process and enrolling in new SCI trials.

Upon completion of the symposium, participants should gain strategies to:

- Appraise their knowledge about the most recent advances on translational spinal cord injury research;
- Discuss the current updates of the ongoing spinal cord injury trials;
- Consider the use of stem cells and safety of cell transplantations in treatment of SCI;
- Analyze the research advancement epidural stimulations and brain machine interface for SCI treatment.

AGENDA

Use of Neural Stem Cells in Spinal Cord Injury
Mark Tuszynski, MD, PhD

Updates in Spinal Cord Injury Small Molecule Clinical Trials
Michael G. Fehlings, MD, PhD FRCSC

Current Status of Neural Progenitors in the Treatment of Spinal Cord Injury
Shekar N. Kurpad, MD, PhD

Epidural Spinal Cord Stimulation in Chronic Complete Spinal Cord Injury
Uzma Samadani, MD, PhD

Questions and Answers
All Faculty
DESCRIPTION
ERASS is an attempt to redesign the age-old management of surgical patients based on essential physiological approaches to enhance recovery. An electronic record system is imperative in ERASS data procurement and necessary modalities to translate data from EMR to your database.

Faculty will provide a brief history of ERASS and essential physiological modifications, present results of implementation in various universities and their respective results from these protocols. Key interventions such as pre-operative counselling, fluid management, carbohydrate loading on insulin resistance, strategies to minimize blood loss and protocols for transfusion and their outcomes in large institutions are addressed.

Upon completion of the symposium, participants should gain strategies to:
• Recognize the functioning of ERAS and key interventions;
• Assess results from early protocols implantation in different institutions;
• Gain insight about anesthesia protocols to minimize redundancy;
• Identify IV Tylenol and liposomal bupivacaine usage in an opioid crisis;
• Implement EMR incorporation for data translation.

AGENDA
Introduction to ERASS and History
Karthik Madhavan, MD

Results: ERASS at University of Pennsylvania
Zarina Ali, MD

Results: ERASS at Miami
Michael Y. Wang, MD

Results: ERASS at Stanford
Anand Veeravagu, MD

Importance of Thoracolumbar Fascial Block in Spine Surgery
Alok D. Sharan, MD, MHCDS

Utilization of EMR in Data Procurement
Neil R. Malhotra, MD

Panel Discussion: One Intervention You Should Not Forget
All Faculty
CONCURRENT SESSION
2:45–3:45 p.m.
MULTIDISCIPLINARY SYMPOSIUM: Section on Biologics and Basic Research: The Present and Future of Post BMP Biologics
Moderators: Christopher D. Chaput, MD and Zorica Buser, PhD

DESCRIPTION
Faculty will present the types and evidence of osteobiologics with an emphasis on recombinant proteins/peptides, and discuss small molecules or biologics with a similar mode of action as BMP2. By incorporating the “campfire” format, attendees can become acquainted with the cutting edge in osteobiologics while at the same time sharing their experiences and engaging with thought leaders in the field.

Upon completion of the symposium, participants should gain strategies to:
• Identify new peptides and small molecule biologics for spine fusion;
• Describe types of carriers and their role in the function of small molecules;
• Discuss the current level of evidence, patient selection and surgical approach;
• Identify potential adverse events and costs associated with each osteobiologic.

AGENDA
Introduction, I-Factor and B2A
Christopher D. Chaput, MD

Nell1 and LMP Mechanism of Action: Similarity and Differences with BMP2
Safdar N. Khan, MD

Preclinical Evidence for Nell1 and LMP: Potential Side Effects and Regulatory Future
Gregory D. Schroeder, MD

The Importance of the Carrier
Zorica Buser, PhD

3:45–4:00 p.m.
Break

Industry Presentation: Vivex (3:45–3:55)
Minimally Invasive Technology Viable Allogeneic Bone Matrix
4:00–5:00 p.m.

**FEATURED ABSTRACT PRESENTATION:** Best Papers

**Moderators:** Donna M. Lahey, RNFA, CNOR and Christina L. Goldstein, MD, FRCSC

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**4:00–4:07 p.m.**

84. Low density pedicle screw constructs are associated with lower incidence of proximal junctional failure in adult spinal deformity surgery

*Wesley M. Durand*; Han Jo Kim, MD; D. Kojo Hamilton, MD; Renaud Lafage, MSc; Peter G. Passias, MD; Themistocles S. Protopsaltis, MD; Virginie Lafage, PhD; Justin S. Smith, MD, PhD; Christopher I. Shaffrey, MD; Munish C. Gupta, MD; Eric O. Klineberg, MD; Frank J. Schwab, MD; Jeffrey L. Gum, MD; Gregory M. Mundis Jr., MD; Robert K. Eastlack, MD; Khaled M. Kebaish, MD; Alexandra Soroceanu, MD, MPH; Richard A. Hostin Jr., MD; Douglas C. Burton, MD; Shay Bess, MD; Christopher P. Ames, MD; Robert A. Hart, MD; Alan H. Daniels, MD; International Spine Study Group

1Brown University, Alpert Medical School, Providence, RI, US; 2Hospital for Special Surgery, New York, NY, US; 3University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 4NY Spine Institute, NYU Langone Health, New York, NY, US; 5Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 6UVA Health System, Charlottesville, VA, US; 7Duke University, Durham, NC, US; 8Washington University School of Medicine, St. Louis, MO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10Norton Leatherman Spine Center, Louisville, KY, US; 11Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 12Scripps Clinic, San Diego, CA, US; 13Johns Hopkins University, Baltimore, MD, US; 14University of Calgary, Calgary, Canada; 15Southwest Scoliosis Institute, Dallas, TX, US; 16University of Kansas Medical Center, Kansas City, KS, US; 17Denver, CO, US; 18University of California, San Francisco, San Francisco, CA, US; 19Swedish Neuroscience Institute, Seattle, WA, US; 20Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 21Brighton, CO, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

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**4:07–4:14 p.m.**

85. Incidence and resolution strategies for early onset postoperative leg pain following lumbar total disc replacement

*Richard D. Guyer, MD*; Scott L. Blumenthal, MD; Donna D. Ohnmeiss, PhD; Nicole Ferko, MSc; Ashley Bonner, PhD; Aaron Situ, MSc

1Center for Disc Replacement at Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US; 3Cornerstone Research Group, Burlington, ON, Canada; 4Eversana, Burlington, ON, Canada

FDA Device/Drug Status: activL and ProDisc-L (Approved for this indication)

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**4:14–4:21 p.m.**

86. Why are DBMs so variable? Influence of fibers, carrier, and tissue bank

*Gregory M. Mundis Jr., MD*; Nick Russell, PhD; William Walsh, PhD; Peter Kim, MS; Jennifer Chen, PhD; Frank Vizesi, PhD

1Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 2Carlsbad, CA, US; 3Surgical and Orthopaedic Research Labs, Randwick, Maroubra, Australia; 4SeaSpine Orthopedics, Carlsbad, CA, US; 5SeaSpine, Carlsbad, CA, US

FDA Device/Drug Status: Grafton (Approved for this indication), DBX Putty (Approved for this indication), Optium Putty (Approved for this indication)

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**4:21–4:28 p.m.**

87. Rates of loosening, failure, and revision of iliac fixation in adult deformity surgery

*Robert K. Eastlack, MD*; Alexandra Soroceanu, MD, MPH; Gregory M. Mundis Jr., MD; Alan H. Daniels, MD; Justin S. Smith, MD, PhD; Breton Line, BS; Peter G. Passias, MD; Pierce D. Nunley, MD; David O. Okonkwo, MD; Khoi D. Than, MD; Juan S. Uribe, MD; Dean Chou, MD; Khaled M. Kebaish, MD; Christopher I. Shaffrey, MD; Shay Bess, MD; International Spine Study Group


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
4:28–4:35 p.m.

88. Cell stiffness decreases with severity of disc degeneration and inflammatory stimulation
Nadeen Chahine, PhD; Eric Leung, BA; Meghan Cerpa, MPH; Meghna Vulapalli, BS; Venkat Boddapati, MD; Timothy Jacobsen, MEng; Ronald A. Lehman Jr., MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:35–4:42 p.m.

89. Is academic department teaching status associated with adverse outcomes after lumbar fusion for degenerative spine diseases?
Dean C. Perfetti, MD, MPH; Daniel Kiridly, MD, MBA; Matthew Morris, MD; Alan Job, MD; Austen Katz, MD; Jeff S. Silber, MD, DC; David A. Essig, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:42–4:49 p.m.

90. Nanoroughened microstructured orthopaedic implant surfaces induce osteogenesis via soluble signaling factors produced by MSCs
Michael Berger, BS; David Joshua Cohen, MD; Kyla Bosh; Michelle B. Gallagher, MS; Paul J. Slosar, MD; Zvi S. Schwartz; Barbara D. Boyan, PhD

1VCU College of Engineering, Department of Biomedical Engineering, Richmond, VA, US; 2Virginia Commonwealth University, Richmond, VA, US; 3Medtronic (Titan Spine), Mequon, WI, US; 4SpineCare Medical Group, Daly City, CA, US; 5Richmond, VA, US

FDA Device/Drug Status: Interbody Fusion Implants (Approved for this indication)

4:49–5:00 p.m.

Discussion

5:00–5:15 p.m.

Break

Industry Presentation: DePuy Synthes (5:00-5:10)
DePuy Synthes Spine UNLEASH™ MIS Procedural Solution for TLIF and ATP/Lateral
<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>5:15–6:45 p.m.</td>
<td><strong>SURGICAL TECHNIQUE CADAVER DEMONSTRATION</strong>: MIS Tubular Decompression&lt;br&gt;Faculty Presenter: John C. Liu, MD&lt;br&gt;This surgical technique cadaver demonstration will provide an overview and demonstration of MIS Tubular Decompression. <strong>Upon completion of this session, participants should gain strategies to:</strong>&lt;br&gt;• Incorporate the latest techniques in complex spine surgery into their practice;&lt;br&gt;• Identify the nuances, advantages, and limitation of minimally invasive spine surgery.</td>
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<tr>
<td>7:00–7:30 p.m.</td>
<td><strong>Industry Workshop: Globus Medical</strong>&lt;br&gt;The Next Evolution of ExcelsiusGPS® featuring Interbody Solutions</td>
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<tr>
<td>7:30–8:00 p.m.</td>
<td><strong>Industry Workshop: Globus Medical</strong>&lt;br&gt;Maximizing Lordosis with Posterior MIS Approaches</td>
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<tr>
<td>8:00–9:00 p.m.</td>
<td><strong>Industry Workshop: DePuy Synthes</strong>&lt;br&gt;Cervical Classifications, Alignment and Case Base Review Session</td>
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</table>
In 2018 alone, the federal government collected over $2.5 billion from healthcare providers under the federal False Claims Act, continuing a decades-long trend of multi-billion dollar recoveries. Healthcare providers face constant scrutiny from government regulators. A former federal healthcare fraud prosecutor turned defense lawyer will discuss the trends and priorities in government enforcement, the major statutes and regulations governing healthcare providers, as well as provide recent examples of enforcement initiatives and tips on how to stay off of the government’s radar.

Upon completion of the symposium, participants should gain strategies to:
- Evaluate the major statutes and regulations governing healthcare providers;
- Recognize examples of recent government enforcement initiatives in the healthcare space;
- Build an effective compliance program to avoid government scrutiny.
CONCURRENT SESSION
1:15–2:15 p.m.
Surgical Symposium: Endoscopic Spine Surgery: Cost, Data and Advances
Moderators: Nathaniel P. Brooks, MD; Christoph P. Hofstetter, MD, PhD; and Michael P. Steinmetz, MD

DESCRIPTION
Endoscopic spine surgery is becoming more prevalent globally. The adoption of this technology and associated techniques require acquisition of new equipment and skills. The purpose of this symposium is to provide participants with an understanding of the costs of developing an endoscopic practice, an understanding of procedure coding for endoscopic spine procedures and a sample description of advanced endoscopic procedures. Finally, in the interest of education and entertainment, faculty will debate the adoption of endoscopic procedures.

Upon completion of the symposium, participants should gain strategies to:
- Evaluate the cost of developing an endoscopy practice;
- Negotiate for a spine surgeon transitioning to residency regarding developing endoscopy;
- Implement endoscopy in ambulatory care surgery;
- Incorporate newer technology (LASER) and robotics in combination with endoscopy.

AGENDA
Introduction by Moderators
Cost and Expenditure of Endoscopy and Negotiations for New Practice
Christopher A. Yeung, MD
Training Fellows and Transition to Job and Board Certification
Cristoph P. Hofstetter, MD, PhD
Endoscopy in ASC: My First 10 Cases
Daniel T. Laich, DO
Advanced Technique: Robotics, Navigation, and Endoscopy on the Spine
Jin-Sung Luke Kim, MD, PhD
Advanced Technique: Laser and Endoscopic Spine Surgery
Choll W. Kim, MD, PhD
Coding for Advanced Endoscopic Techniques
Albert E. Telfeian, MD, PhD
Debate A: Endoscopy is the Best Thing Ever
Nathaniel P. Brooks, MD
Debate B: Endoscopy is a Fad
Michael P. Steinmetz, MD
Rebuttal
Nathaniel P. Brooks, MD
Verdict, Questions and Answers
Karthik Madhavan, MD

CONCURRENT SESSION
1:15–2:15 p.m.
Medical Symposium: Sections on Comprehensive Episodes of Spine and Interventional Spine & Musculoskeletal Medicine (ISMM): Disc and Vertebrogenic Pain
Moderator: Alison A. Stout, DO

DESCRIPTION
Faculty will discuss disc mechanics and discography, as well as review the evidence for intradiscal biologics and provide an overview of basivertebral nerve (BVN) ablation.

Upon completion of the symposium, participants should gain strategies to:
- Recognize disc mechanics;
- Identify the evidence for intradiscal biologics;
- Gain insight about basivertebral nerve (BVN) ablation to treat back pain.

AGENDA
Disc and Vertebrogenic Pain: Anatomy, Innervation and Mechanics
Matthew Smuck, MD
Discography
Zachary McCormick, MD
Intradiscal Biologics: A Review of the Evidence
Byron J. Schneider, MD
Basivertebral Nerve Ablation for Axial Lumbar Pain: Limitations and Promise
Alison A. Stout, DO
Faculty will address predictive modeling for prognosis and diagnosis in spine care, applications of deep learning and natural language processing, as well as guidelines and best practices for development and use of machine learning and artificial intelligence tools in spine surgery.

Upon completion of the symposium, participants should gain strategies to:

- Identify core principles of machine learning for prognosis and diagnosis in spine care;
- Review recent progress in applications of deep learning and natural language processing for spine surgery;
- Evaluate guidelines and best practices for development and use of machine learning tools in spine surgery;
- Pinpoint emerging areas of artificial intelligence for future translation to spine surgery.

AGENDA

Introduction
Joseph H. Schwab, MD

Principles of Predictive Modeling in Spine Surgery
Michiel Bongers, MD

Deep Learning in Spine Surgery
Aditya V. Karhade, MD

Natural Language Processing in Spine Surgery
Olivier Groot, MD

Emerging Areas of Artificial Intelligence for Future Translation to Spine Surgery
Jacobien Oosterhoff, MD; Hamid Ghaednia, MD

Review and Conclusion
Joseph H. Schwab, MD

Questions and Answers
All faculty

2:15–2:44 p.m.
Members’ Business Meeting

2:30–3:40 p.m.
FEATURED ABSTRACT PRESENTATION: Best Papers
Moderator: Saeed Khayatzadeh, PhD

155. Safer way for vertebroplasty under fluid mechanics theory
Hsuan Yu Chen, MD1;2; Yen-Po Lin, MD1;3; Han Ying Wang, MD1;2; Feng Huei Lin, PhD1;4; Po-Quang Chen, MD, PhD5;6; Ding-cheng Chan, MD, PhD, FACP5;6; Tze Hong Wong, MD, PhD5;6; Ming-Hsiao Hu, MD, PhD5;6

1Institute of Biomedical Engineering, National Taiwan University, Taipei, Taiwan; 2Department of Orthopedic Surgery, National Taiwan University Hospital, Hsin-Chu Biomedical Park Branch, Taipei, Taiwan; 3Department of Orthopedic Surgery, National Taiwan University Hospital, Hsin-Chu Branch, Taipei, Taiwan; 4Department of Orthopedic Surgery, National Taiwan University Hospital, Taipei, Taiwan; 5National Taiwan University Hospital Chu-Tung Branch, Hsinchu County, Taiwan

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
Operative vs. nonoperative treatment for adult symptomatic lumbar scoliosis at 5-6-year follow-up: outcomes and impact of related serious adverse events

Justin S. Smith, MD, PhD; Michael P. Kelly, MD; Elizabeth Yanik, PhD, MSc; Christine R. Baldus, RN; Thomas Buell, MD; Jon D. Lurie, MD, MS; Charles Edwards Sr., MD; Steven D. Glassman, MD; Lawrence G. Lenke, MD; Oheneba Boachie-Adjei, MD; Jacob M. Buchowski, MD, MS; Leah Y. Carreon, MD, MSc; Charles H. Crawford III, MD; Stephen J. Lewis, MD; Stefan Parent, MD; Virginie Lafage, PhD; Munish C. Gupta, MD; Han Jo Kim, MD; Christopher P. Ames, MD; Shay Bess, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Keith H. Bridwell, MD; International Spine Study Group

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Do cells matter? In vitro and in vivo analysis of autograft viability

Gregory M. Mundis Jr., MD; Frank Vizesi, PhD, PhD; Nick Russell, PhD; Jiawei He, PhD

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

The effects of a single injection of NTG-101 upon neurotrophin expression in a canine model of degenerative disc disease

William Mark Erwin, DC, PhD; Ajay Matta, PhD; Muhammad Zia Karim, DVM; Hoda Gerami, BS; Bettina Zoe Benigno, BS

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Efficacy of surgical decompression in patients with cervical spondylotic myelopathy results of the Canadian prospective multi-center study

Mohammed Karim, MD; Bradley Jacobs, MD, FRCSC; Michael G. Johnson, MD, FRCSC; Christopher S. Bailey, MD, FRCSC; Sean D. Christie, MD; Jérôme Paquet, MD, FRCSC; Andrew Nataraj, MSc, MD, FRCSC; David W. Cadotte, MD, PhD; Jefferson Wilson, MD, PhD, FRCSC; Neil A. Manson, MD, FRCSC; Hamilton Hall, MD, FRCSC; Kenneth C. Thomas, MD, FRCSC; Raja Y. Rampersaud, MD, FRCSC; Greg McIntosh, BS; Charles G. Fisher, MD, FRCSC, MHS; Nicolas Dea, MD, MSc, FRCSC

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
3:05–3:12 p.m.

160. Fusion for fracture has no place in a lumbar fusion bundled payment model: an analysis of Medicare beneficiaries
Azeem T. Malik, MBBS1; Khaled Himed, BS2; Joseph Drain, MD2; Elizabeth Yu, MD2; Jeffery Kim, MD1; Safdar N. Khan, MD1

1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbus, OH, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:12–3:19 p.m.

161. Cervical disc replacement using a PEEK-on-ceramic implant: prospective data from seven sites participating in an FDA IDE trial for single-level surgery
Richard D. Guyer, MD1; Domagoj Coric, MD2; Cameron N. Carmody, MD3; Rick C. Sasso, MD4; Michael J. Musacchio, MD5; Hyun W. Bae, MD6; Donna D. Ohnmeiss, PhD7

FDA Device/Drug Status: Simplify (Investigational/Not approved)

3:19–3:26 p.m.

162. Two-level cervical disc replacement using a PEEK-on-ceramic device: prospective outcome data from an FDA IDE trial
Domagoj Coric, MD1; Richard D. Guyer, MD2; Pierce D. Nunley, MD3; K. Brandon Strenge, MD4; Donna D. Ohnmeiss, PhD5

1Carolina Neurosurgery & Spine Associates, Charlotte, NC, US; 2Center for Disc Replacement at Texas Back Institute, Plano, TX, US; 3Spine Institute of Louisiana, Shreveport, LA, US; 4The Orthopaedic Institute of Western Kentucky, Paducah, KY, US; 5Texas Back Institute, Plano, TX, US
FDA Device/Drug Status: Simplify disc (Investigational/Not approved)

3:26–3:33 p.m.

163. Predicting severe clinically relevant distal junctional kyphosis development following adult cervical deformity surgery with further distinction from mild asymptomatic episodes
Peter G. Passias, MD1; Sara Naessig, BS2; Virginie Lafage, PhD3; Renaud Lafage, MSc3; Bassel G. Diebo, MD4; Themistocles S. Protopsaltis, MD5; Han Jo Kim, MD6; Robert K. Eastlack, MD6; Alexandra Soroceanu, MD, MPH7; Eric O. Klineberg, MD8; Robert A. Hart, MD9; Douglas C. Burton, MD10; Shay Bess, MD11; Frank J. Schwab, MD12; Christopher I. Shaffrey, MD13; Justin S. Smith, MD, PhD14; Christopher P Ames, MD15; International Spine Study Group16

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:33–3:40 p.m.

Discussion
3:40–3:45 p.m.
Break

3:45–4:45 p.m.
SURGICAL TECHNIQUE CADAVER DEMONSTRATION: Cervical Spine Surgery
Faculty Presenter: Rick C. Sasso, MD

This surgical technique cadaver demonstration will provide an overview and demonstration of cervical spine surgery. Upon completion of this session, participants should gain strategies to:

- Incorporate the latest techniques in complex spine surgery into their practice;
- Identify the nuances, advantages, and limitation of cervical spine surgery.

4:45–5:00 p.m.
Wrap-Up/Thank You
Moderator: William J. Sullivan, MD
In this symposium, faculty will discuss the pearls and pitfalls of the oblique anterolateral approach, commonly referred to as oblique lumbar interbody fusion (OLIF) or anterior-to-psoas (ATP) approach, which utilizes an oblique trajectory to provide pre-psoas retroperitoneal access to the lumbar spine for interbody fusion. Participants will take home valuable points regarding the advantages of this technique vs. anterior (ALIF) and lateral lumbar interbody fusion (LLIF). Additionally, faculty will present a detailed discussion of potential complications and strategies to reduce their occurrence and discuss the anatomic challenges and the value provided by approach surgeons for potential and new adopters of this technique. Variations and modifications of the approach, and additional learning curve when approaching L5-S1 are also reviewed.

Upon completion of the symposium, participants should gain strategies to:

• Identify the evolution and anatomic basis of the oblique anterolateral approach;
• Discuss the advantages and potential pitfalls of the oblique technique;
• Review the different variations of the technique and approach;
• Assess the special anatomic considerations when including L5-S1 in the fusion.

AGENDA
History of the Oblique Approach
Chirag A. Berry, MD, MBBS, MS

Advantages of Staying Outside the Psoas
Chadi Tannoury, MD

Do I Need an Approach Surgeon?
Neel Anand, MD

Tubes or Blade Retraction?
Richard Hynes, MD

Pitfalls and Complication Avoidance
Tony Tannoury, MD

L5-S1 Inclusion: Anatomic Challenges
Chirag A. Berry, MD, MBBS, MS

Faculty will define failed back surgery syndrome (FBSS), address the work-up to rule out other causes of persistent symptoms after surgery, discuss the pitfalls in the work-up and treatment, review the evidence for conservative care, and identify patients that may benefit from neuromodulation.

Upon completion of the symposium, participants should gain strategies to:

• Define failed back surgery syndrome and the provide the work-up to exclude other causes of persistent symptoms after surgery;
• Discuss the pitfalls in the work-up and treatment of FBSS;
• Institute conservative care based on the current evidence for FBSS;
• Indicate the patients that may benefit from neuromodulation for FBSS.

AGENDA
Failed Back Surgery Syndrome: What is it?
Brandon D. Lawrence, MD

Pitfalls in the Work-up and Treatment
Daniel E. Gelb, MD

Failed Back Surgery Syndrome: Evidence for Conservative Care
Eric O. Klineberg, MD

Failed Back Surgery Syndrome: Evidence of Neuromodulation
Daniel M. Sciubba, MD
Technological advances in diagnostic and surgical modalities have the potential to improve outcomes and reduce complications in spine deformity surgery. Faculty will review recent innovations developed for surgical techniques and patient diagnostics to improve surgical outcomes.

Upon completion of the symposium, participants should gain strategies to:
- Analyze technological advances in spinal alignment assessment and surgical planning for spine deformity surgery;
- Assess advances in surgical techniques and patient management to reduce blood loss and duration of hospital stay in spine deformity surgery;
- Explore minimally invasive, image guidance, sacroiliac fixation and robotic surgical techniques for spine deformity surgery;
- Evaluate the potential of new spine diagnostic and treatment technologies to improve patient outcomes compared to the cost increases associated with adoption of these technologies.

AGENDA

Introduction
Shay Bess, MD

Innovations in Spinal Alignment Assessment and Surgical Planning for Spine Deformity Surgery
Jason W. Savage, MD

Advances in Surgical Techniques to Reduce Blood Loss in Spine Deformity Surgery
Norman B. Chutkan, MD, FACS

Reducing Hospital Stay Following Spine Deformity Surgery: New Innovations
Tony Tannoury, MD

Appropriateness of Minimally Invasive Surgery for Adult Spine Deformity
Hani H. Mhaidli, MD, PhD

Robotic Technology to Improve Safety and Work Flow in Spine Deformity Surgery
Raymond J. Hah, MD

Are New Technologies Cost Effective? How Can We Balance the Cost of Innovation with Sustainable Medical Economics?
Sigurd H. Berven, MD

Closing Comments
Shay Bess, MD

Through debate sessions, faculty will present the pros and cons to facilitate decision-making regarding the utilization of intraoperative neurophysiological monitoring (IONM).

Upon completion of the symposium, participants should gain strategies to:
- Appreciate the variables underlying the utilization decision;
- Reference key relevant publications to the question;
- Feel more justified in decisions regarding the usage of IONM.

AGENDA

Introduction
W. Bryan Wilent, PhD, DABNM, FASNM and Tara Stewart, PhD, DABNM

Debate 1: ACDFs: Should IONM be Utilized?
- Pro: The Severity of the Possible Risks Warrants the Utilization of IONM
  Sina Pourtaheri, MD
- Con: The Risk of Injury is Too Low to Justify the Cost of IONM
  John Ratliff, MD

Debate 2: Lateral/Oblique Lumbar Fusions: Do I Need an IONM Team Running MEPs?
- Pro: MEPs are Critical in Avoiding Lumbar Plexus Injuries
  Justin W. Silverstein, PhD, CNIM
- Con: Automated EMG Alone is Sufficient for These Procedures
  Puya Alikhani, MD

Debate 3: Posterior Lumbar Fusions: Is IONM Still Needed if Using Advanced Imaging and/or Robotics?
- Pro: Multimodality Monitoring is Still Needed to Diagnose Evolving Dysfunction in Higher Risk Patients
  John P. Clark III, PhD, CNIM
- Con: Advances in Technologies have Increased the Accuracy of Pedicle Screw Placement and have Obviated the Need for IONM
  Donald M. Whiting, MD, FACS

Debate 4: Spinal Cord Stimulator Implantations: Is It Better to Perform Under General Anesthesia with IONM?
- Pro: IONM is Just as Accurate and It’s Better for Patients
  Steven M. Falowski, MD
- Con: No, Awake is the Standard and Still the Best Method
  Michael B. Furman, MD, MS

Closing Remarks
Faculty
SURGICAL TECHNIQUE CADAVER DEMONSTRATION

Minimally Invasive Prone Lateral Interbody Fusion
Faculty Presenter: Juan S. Uribe, MD

This surgical technique cadaver demonstration will provide an overview and demonstration of minimally invasive lateral interbody fusion.

Upon completion of this session, participants should gain strategies to:
- Incorporate the latest techniques in minimally invasive lateral interbody fusion into their practice;
- Identify the nuances, advantages, and limitation of minimally invasive lateral interbody spine surgery.

SURGICAL SYMPOSIUM

Section on Spine Oncology: How Will an Individual Patient Do with Spine Surgery Using Predictive Models and Calculators
Moderators: Joseph H. Schwab, MD and Daniel M. Sciubba, MD

Patients and providers require better tools to forecast outcomes following spine surgery on an individual basis. Using predictive models and easy-to-use clinical calculators that exist on the internet or mobile device platforms, successes and complications can be predicted with better accuracy and precision.

Upon completion of the symposium, participants should gain strategies to:
- Review types of calculators available to predict outcomes;
- Describe methods by which outcomes can be measured;
- Integrate calculators into clinical practice.

AGENDA

Introduction and Presentation of Cases
Daniel M. Sciubba, MD

Methodology and Platforms for Predictive Modeling
Joseph H. Schwab, MD

Presentation of Various Available Calculators: Length of Stay to Survival
Daniel M. Sciubba, MD

Calculator Workshop: Using Calculators on My Own Patients
Matthew L. Goodwin, MD, PhD, FACSM

Conclusion and Future Directions
Joseph H. Schwab, MD

SURGICAL SYMPOSIUM

The Sacroiliac Joint: Where Does It Fit Within Your Practice?
Moderators: David W. Polly Jr., MD and Heidi Prather, DO

Faculty will examine the anatomy and biomechanics of the SI joint, and as a possible source of pain vs. the lumbar spine and/or hip. Faculty will provide better understanding of non-surgical and surgical treatments for SI joint.

Upon completion of the symposium, participants should gain strategies to:
- Learn anatomy and biomechanics of the SI Joint;
- Recognize the SI Joint as a possible source of pain vs. lumbar and/or hip;
- Use the current evidence-based SI Joint non-surgical and surgical treatments.

AGENDA

Introduction
David W. Polly Jr., MD and Heidi Prather, DO

Anatomy and Biomechanics
Bengt Sturesson, MD, PhD

SI Joint Pain, Prevalence and Burden of Disease
Sigurd H. Berven, MD

SI Joint Differential Diagnosis: Lumbar/SI/Hip
Jonathan N. Sembrano, MD

Non-Surgical Treatments
Heidi Prather, DO

Surgical Treatments; Lateral/Posterolater/Dorsal
David W. Polly Jr., MD

The SI Joint in Deformity Correction
David W. Polly Jr., MD and Peter G. Whang, MD, FACS

Closing Remarks
David W. Polly Jr., MD and Heidi Prather, DO
The surgical treatment of adult spinal deformity (ASD) has been shown to improve function and PROs. Unfortunately, there is significant morbidity associated with surgery for ASD. Perioperative optimization has been shown to decrease risks and improve clinical outcomes in this patient population.

Upon completion of the symposium, participants should gain strategies to:

- Discuss the importance of perioperative optimization in ASD surgery;
- Review the evaluation and management of osteoporosis in the ASD patient;
- Examine the role of predictive modeling and risk stratification in the treatment of ASD;
- Define frailty and its impact on the treatment of patients with ASD.

AGENDA

Introduction
Jason W. Savage, MD

The Importance of Perioperative Optimization in Adult Spinal Deformity Surgery
Jason W. Savage, MD

Evaluation and Management of Osteoporosis in the Adult Spinal Deformity Patient
Paul A. Anderson, MD

Risk Stratification and Predictive Modeling in Adult Spinal Deformity
Christopher P. Ames, MD

Frailty and Its Impact on the Surgical Treatment of Adult Spinal Deformity
Sigurd H. Berven, MD

Closing Remarks
Raymond J. Hah, MD

RESIDENT AND FELLOW EDUCATION PATHWAY

Career Building Symposium
Moderator: Andrew J. Schoenfeld, MD

The fellowship match process may be daunting. Faculty will provide insight to follow best practices and know which actions to avoid in the fellowship interview match process (come prepared with questions). In addition, faculty will address approaches that can allow candidates to be competitive in the match. Career advancement opportunities, via the presentation of abstracts, research papers and presentations also will be addressed.

Upon completion of this symposium, participants should gain strategies to:

- Follow best practices and know which actions to avoid in the fellowship interview and match process;
- Identify key approaches that can allow candidates to be competitive in the match;
- Plan career advancement through the preparation of abstracts, research papers and presentations.

AGENDA

Abstracts, Papers and Presentations
Andrew J. Schoenfeld, MD

Advice for the Fellowship Match/Evaluating Programs
Saad B. Chaudhary, MD, MBA

Interacting with NASS
Elizabeth Yu, MD
RESIDENT AND FELLOW EDUCATION PATHWAY
Coding for Residents and Fellows
Moderator: Andrew J. Schoenfeld, MD

In this symposium, faculty will provide a comprehensive introduction to one of most essential skills when starting clinical practice: an effective and working understanding of surgical procedure and office-based coding.

Upon completion of this symposium, participants should gain strategies to:
- Effectively code surgical procedures in the cervical thoracic and lumbar spine;
- Effectively code office-based evaluation and non-operative procedural care;
- Avoid pitfalls and coding violations.

AGENDA
Introduction/ Office Coding and Documentation
Andrew J. Schoenfeld, MD

Surgical Coding and Documentation: Cervical Procedures
Saad B. Chaudhary, MD, MBA

Surgical Coding and Documentation: Thoracic and Lumbar Procedures
Sandeep N. Gidvani, MD

Coding Pitfalls
William F. Lavelle, MD

RESIDENT AND FELLOW EDUCATION PATHWAY
Transition to Practice: Landing a Job
Moderator: Andrew J. Schoenfeld, MD

The transition from training to practice can be one of the most daunting and critical periods in the life of a physician. From finding a job, negotiating opportunities for success, clinical and practice-based challenges, there are pitfalls present at every turn. Faculty will ease some of the anxiety and provide insight into navigating the period spanning the end of clinical training and the start of independent practice. Ideal for residents, fellows and individuals within the first five years of clinical practice, this session will cover useful information for all interested parties and those also looking to transition to a new position in the near future.

Upon completion of this symposium, participants should gain strategies to:
- Recognize best practices and actions to avoid in the job search, interview and negotiating process;
- Know key steps in the development of a clinical practice and networking within the local and national medical community;
- Describe pitfalls that can interfere with a successful transition from training to practice.

AGENDA
Finding a Job
Khoi D. Than, MD

Academic Positions
Saad B. Chaudhary, MD, MBA

Community Positions
Sandeep N. Gidvani, MD

Pitfalls
Avery L. Buchholz, MD, MPH

Negotiating
Andrew J. Schoenfeld, MD

Overview of Employment Contracts
Sandeep N. Gidvani, MD
MEDICAL SYMPOSIUM
Perioperative Spinal Cord Injury
Moderators: Michael G. Fehlings, MD, PhD, FRCSC and Christoph P. Hofstetter, MD, PhD

Perioperative spinal cord injury is a well-described possible adverse outcome of spine surgery. In particular, surgeries such as deformity surgery, tumor surgery and revision surgeries are associated with the risk of transient or permanent spinal cord dysfunction. In this symposium, faculty will discuss some of latest topics and publications. This will abreast the clinicians and researchers alike as well as provide opportunities to discuss some of the research they are working on.

Upon completion of the symposium, participants should gain strategies to:
  • Identify surgeries that are prone to iatrogenic spinal cord injury;
  • Describe intraoperative maneuvers to avoid injury;
  • Determine the utility of electrophysiological monitoring;
  • Acknowledge the rational underlying optimal hemodynamic management.

AGENDA
The Pathology and Incidence of Perioperative Spinal Cord Injury
Michael G. Fehlings, MD, PhD, FRCSC

Strategies to Avoid Spinal Cord Injury in Patients with Unstable Spine Fractures
Rajiv Saigal, MD, PhD

Surgical Strategies to Avoid Spinal Cord Injury in Tumor Surgery
Christoph P. Hofstetter, MD, PhD

Surgical Strategies to Avoid Spinal Cord Injury in Deformity Surgery
Stephen J. Lewis, MD

Utility of Intraoperative Electrophysiological Monitoring
Richard Vogel, PhD, DABNM

Optimal Hemodynamic Management during High Risk Procedures
Brian K. Kwon, MD, PhD, FRCSC

MEDICAL SYMPOSIUM
Ambulatory Care Surgery Practice and Applications: Spine Surgery in the Ambulatory Care Setting: Getting Patients Home Happy
Moderator: Michael P. Steinmetz, MD

This symposium is for spine surgeons considering an ambulatory surgical center (ASC) practice in the near future. Early ASC adopters will provide an overview of ambulatory centers and their unique logistics, discuss the hospital/ASC collaboration pros and cons, and address the common procedures performed in ASC and procedures to dodge.

Upon completion of the symposium, participants should gain strategies to:
  • Recognize pros and cons of working in ASC;
  • Distinguish ASC vs. hospital-based practice vs. half-n-half;
  • Identify reimbursement patterns for Medicare and private insurance;
  • Adopt ASC in practice;
  • Determine common surgeries performed in ASC and exit strategy.

AGENDA
Overview of ASC
Karthik Madhavan, MD

Discrepancies in Reimbursement between ASC and Hospitals
Scott Raffa, MD

XLIF 360 and ASC Copay
Larry T. Khoo, MD

Hospital-Based Practice: My Take On It
Michael P. Steinmetz, MD

What Nerve Block Can You Do for Spine Surgery?
Jeffrey Xu, MD

Questions and Answers
All Faculty
MULTIDISCIPLINARY SYMPOSIUM
Interdisciplinary Spine Forum: Thoracic Spine Pathology: Assessment and Differential Diagnosis
Moderators: Evan K. Johnson, PT DPT, OCS and Rick J. Placide, MD, PT

When evaluating the patient with thoracic spine complaints, there are unique aspects to the history, physical exam and differential diagnosis. Faculty will review the history and exam of the patient with thoracic spine complaints, discuss the differential diagnoses in the patient with thoracic spine complaints as well as review the regional effects the thoracic spine has on neighboring structures.

Upon completion of the symposium, participants should gain strategies to:
• Recall the elements of a history and exam in the patient with thoracic spine complaints;
• Describe the most common differential diagnoses in patients who present with thoracic spine pain;
• Exhibit the ability to apply knowledge of thoracic spine mechanical dysfunction in selecting treatment options;
• Recognize the regional effects of thoracic spine mechanical dysfunction.

AGENDA
Thoracic Spine Pain—History and Physical Exam
Evan K. Johnson, PT DPT, OCS and Rick J. Placide, MD, PT
Medical and Surgical Lesions of the Thoracic Spine
Rick J. Placide, MD, PT
Mechanical Thoracic Dysfunction
Evan K. Johnson, PT DPT, OCS
Regional Considerations when Treating Thoracic Dysfunctions
Evan K. Johnson, PT DPT, OCS
Thoracic Spine Masqueraders
Rick J. Placide, MD, PT

MEDICAL SYMPOSIUM
Transforming Your Practice with Minimally Invasive Spine Care Using Evidence-Based Validation
Moderators: Kai-Uwe Lewandrowski, MD and Anthony T. Yeung, MD

This timely symposium on minimally invasive spinal (MIS) surgery techniques provides the participant with the most up-to-date information on the validated indications of surgical spine care. The target audience consists of well-established practicing spine surgeons who are contemplating transitioning part of their practice away from open translaminar surgery to minimally invasive spine procedures. The symposium is aimed at those spine surgeons who recognize the need to modernize their practice by including minimally invasive and endoscopic spine surgery but are not sure how and need practical hands-on tips.

Upon completion of the symposium, participants should gain strategies to:
• Acquire new information on MIS approaches and techniques, and skill-based knowledge on diagnostic workup, indications and outcomes;
• Develop and improve knowledge on the pathologic anatomy and pathophysiology of common painful conditions of the spine;
• Formulate a plan of care employing non-operative and MIS surgical care based on the specific patient’s situation.

AGENDA
Introduction and Welcome: Mainstreaming, Implementation, Indications and Training Standards for MIS Spine Care
Kai-Uwe Lewandrowski, MD
Indications for Endoscopic Treatment of Degenerative Conditions of the Lumbar Motion Segment: The Pathoanatomy and Physiology of Common Pain Generators
Anthony T. Yeung, MD
Evidence-Based Validation and Implementation of Clinical Protocols Employing Prognosticators of Successful Outcomes with Novel MIS Techniques
Kai-Uwe Lewandrowski, MD
Pushing the Limits of Endoscopic Spine Surgery in an Academic Setting
Peter Shin, MD
Medical Implications of Disruptive Developments in Spine Surgery
Artie Eaves, Esquire
Closing Summary and Post-symposium Survey Demonstration
https://sitsurvey.typeform.com/to/j89Swvoh
Kai-Uwe Lewandrowski, MD
Chronicity and poorer outcomes are fairly common in patients with spine pain. These patients pose a challenge to spine providers and health care payment systems. In this session, panel presenters will describe methods for identifying key factors that may lead to chronicity and prolonged disability.

**Upon completion of the symposium, participants should gain strategies to:**

- Describe the importance and roles of “deep empathy” in initial patient interactions;
- Identify comorbidities which can slow recovery;
- Evaluate the risks for pain sensitization;
- Make the biopsychosocial approach more tangible and complementary to the biomedical approach;
- Recognize applicability of Keele StarT Back and Pain Catastrophizing Scale (PCS); 
- Implement this information into our clinical decision making.

**AGENDA**

**Introduction**
David Kartzman, DC

**Interview with Kush Goyal, MD**
Kush K. Goyal, MD and David Kartzman, DC

**Interview with Brian Justice, DC**
Brian Justice, DC and David Kartzman, DC

**Interview with Christopher Bono, MD**
Christopher M. Bono, MD and David Kartzman, DC

**Wrap Up and Summary**
David Kartzman, DC

**MULTIDISCIPLINARY SYMPOSIUM**
**Interdisciplinary Spine Forum: Treating Olympic, Paralympic and Elite Athletes**
Moderator: Robb Russell, DC

Management of sports injuries, particularly of elite athletes, is itself a team effort. In this session, participants will hear from practitioners who have experience caring for athletic spine-related pain and injuries for athletes from the Olympic & Paralympic Training Site in Chula Vista, California. Offering perspectives on physical medicine and rehabilitation, including interventional approaches, as well as chiropractic care and acupuncture, this panel will provide insight into how interdisciplinary teamwork can apply to competitive and recreational athletes you may see in practice.

**Upon completion of the symposium, participants should gain strategies to:**

- Recognize the evolution and role of interdisciplinary spine care for elite athletes;
- Distinguish the individual and collaborative roles of different healthcare professionals in of interdisciplinary spine care for elite athletes;
- Employ information presented to assist in creating team-based care models for interdisciplinary spine care of athletes.

**AGENDA**

**Introduction**
Robb Russell, DC

**USOPC, Team USA and Interdisciplinary Spine Care: Overview**
Kevin Pierce, DC

**Physical Medicine for Elite Athletes**
Kenneth Vitale, MD

**Physical Medicine for Elite Athletes--Interventional Considerations**
Haewon Lee, MD

**USOPC, Team USA and Acupuncture for Spine Pain**
Jennifer Watters, DC, LAc
MULTIDISCIPLINARY SYMPOSIUM
Interdisciplinary Spine Forum: The Worksite Health Center—An Emerging Model and Opportunity in Value-Oriented Spine Care
Moderator: Claire Johnson, DC, MSED, PhD

An estimated 10 percent of the adult population under 65-years-old will receive their healthcare through a worksite health center in the next decade. Worksite health centers provide cost-effective, quality healthcare to employees at their place of employment. These clinics add value through improved health, lowered healthcare expenditures, and improved productivity. Over half of employers with a worksite health center report a return on investment of 1.5 (for every dollar invested, they have saved a dollar and a half) or higher. One-third of organizations with 5,000 or more employees provide a clinic at or near the worksite and this trend is steadily increasing. With a high prevalence of spine-related disorders in the workplace, such as back and neck pain, the need for integrated, worksite spine care continues to rise. Spine care providers should be familiar with this emerging model and opportunity in value-oriented spine care.

Upon completion of the symposium, participants should gain strategies to:
• Identify essential components of spine care in worksite health centers;
• Describe the clinical, cost and satisfaction data supporting worksite health centers;
• Apply knowledge of current models and future direction of spine care in worksite health centers.

AGENDA
Spine Care and Worksite Health Centers: The Perfect Combination
Claire Johnson, DC, MSED, PhD

The Importance of Spine Care in Worksite Health Centers: A View from the National Association of Worksite Health Centers
Larry Boress, MPA

Integrated Provider Spine Care Teams: Experiences from Worksite Health Centers in the Technology Sector
Larry Kwan, MD

Spine Care in an On-site Health Center: The Perspective of a Large Employer
Nicole Giczkowski

Essentials of Spine Care in Worksite Health Centers: A Provider’s Perspective
Bart Green DC, MSED, PhD

Presentation of Case Scenarios and Panelist Responses
Claire Johnson, DC, MSED, PhD

MULTIDISCIPLINARY SYMPOSIUM
The Future of Value-Based Healthcare in Spine Care: A Multi-Stakeholder Perspective
Moderators: Andrew J. Pugely, MD and Matthew J. Smith, MD, EMHL

Faculty will explain fee-for-service healthcare vs. value-based healthcare (VBHC) and how to participate in VBHC, in addition to addressing VBHC programs and the steps to participate in VBHC programs.

Upon completion of the symposium, participants should gain strategies to:
• Describe the differences between fee-for-service healthcare and value-based healthcare;
• Identify data elements required to participate in VBHC (cost/quality);
• Recognize VBHC programs of today and the recent past;
• Appreciate perspectives from a multi-stakeholder group (physicians, hospital admin, industry, government and commercial payors);
• Learn how to take the next steps at participating in VBHC programs.

AGENDA
Symposium Introduction/Moderator
Andrew J. Pugely, MD

How Can Spine Providers Demonstrate Value?
Darrell Brodke, MD

Government Payor Perspective: CMS/CMMI Roadmap for VBHC
Chris Ritter, PhD

Commercial Payor Perspective: United Health Care and VBHC
Russ Amundson, MD

How VBHC Fits into Medtronic’s Mission as Med Tech Company
Sean Haag, MBA

Direct to Employer Health Care Contracting– The Walmart Story
Ruth Coleman

How Hospital Systems Can Survive in a Value-Based World
Jim Weinstein, DO

Questions and Answers
All Faculty
INDUSTRY PRESENTATION
The TRIUMPH of BurstDR™ SCS Therapy: Sustained Improvements in Mental, Physical and Emotional Functioning
Abbott

INDUSTRY PRESENTATION
Tiger Woods: Reborn
Centinel Spine

INDUSTRY PRESENTATION
Benefits of Intraoperative Adjustments Using the ProAxis® Spinal Surgery Table
Mizuho OSI

INDUSTRY PRESENTATION
Improvements of Quality of Motion and Associated Patient Outcomes
Orthofix

INDUSTRY PRESENTATION
Complications and Treatment Options for the SI Joint
SI-BONE

INDUSTRY PRESENTATION
Spinal Elements Introduces MIS Ultra
Spinal Elements

INDUSTRY PRESENTATION
Establishing a Successful Anterior Lumbar Practice
Thompson Surgical, Inc.

INDUSTRY PRESENTATION
An Advanced Visualization System—ZEISS TIVATO® 700 for Spine Surgery—Learn from the Experts
Zeiss
NASS 35th Annual Meeting Abstracts

1. Use of ALIF at the lumbosacral junction results in less lumbopelvic fixation failure than TLIF or no interbody fusion following correction of adult spinal deformity

Robert K. Eastlack, MD1; Alexandra Soroceanu, MD, MPH2; Gregory M. Mundis Jr., MD3; Justin S. Smith, MD, PhD4; Breton Line, BS5; Peter G. Passias, MD6; Pierce D. Nunley, MD7; David O. Okonkwo, MD8; Khoi D. Than, MD9; Juan S. Uribe, MD10; Dean Chou, MD11; Khaled M. Kebaish, MD12; Christopher I. Shaffrey, MD13; Shay Bess, MD12; International Spine Study Group14


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

2. The reherniation after decompression (RAD) score identifies patients at low-risk for re-herniation after lumbar decompression surgery

Garrett Harada, MD1; Bryce Basques, MD, MHS2; Alexander Hornung, BS3; Dino Samartzis, ScD, PhD, MSc4; Howard S. An, MD5

1Los Angeles, CA, US; 2Thomas Jefferson University, Philadelphia, PA, US; 3Midwest Orthopedics at Rush, Chicago, IL, US; 4Queen Mary Hospital, Hong Kong, Hong Kong; 5Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

3. Global Spine Outreach (GSO): how to safely establish a sustainable short-term spine deformity outreach program

Gregory M. Mundis Jr., MD1; Fernando Rios, MD2; Lesley Mundis, PA-C2; Melissa Hicks3

1Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 2San Diego, CA, US; 3Global Spine Outreach, Nashville, TN, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

4. At what point should the thoracolumbar region be addressed in patients undergoing corrective cervical deformity surgery?

Peter G. Passias, MD1; Katherine E. Pierce, BS2; Virginie Lafage, PhD3; Renaud Lafage, MSc3; Eric O. Klineberg, MD4; Bassel G. Diebo, MD4; Themistocles S. Protopsaltis, MD5; D. Kojo Hamilton, MD6; Shaleen N. Vira, MD7; Breton Line, BS8; Robert A. Hart, MD9; Douglas C. Burton, MD10; Shay Bess, MD11; Frank J. Schwab, MD12; Christopher I. Shaffrey, MD12; Justin S. Smith, MD, PhD13; Christopher P. Ames, MD13; International Spine Study Group14


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

5. Are octogenarians at higher risk for complications after elective lumbar spinal fusion surgery compared with younger patients? A study from the Kaiser Permanente National Spine Registry

T. Kent Ganocy II, MD1; Kathryn Royse, PhD, MPH2; Heather Prentice, PhD, MPH3; Jessica E. Harris, MS3; Calvin C. Kuo, MD4


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

6. PLF or ALIF+PS: which has a lower operative nonunion rate? Analysis of a cohort of 2,061 patients from a national spine registry

Elizabeth P. Norheim, MD1; Kathryn Royse, PhD, MPH2; Harsimran Brara, MD3; David J. Moller, MD4; Patrick W. Suen, MD5; Shayan Rahman, MD6; Jessica E. Harris, MS7; Kern H. Guppy, MD, PhD8


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
7. Mild and severe obesity reduce effectiveness of lumbar fusions: one-year patient-reported outcomes in 8,171 patients
Olivia Rice, MD1; Joshua C. Patt, MD, MPH2; Anthony L. Asher, MD3; Matthew J. McGirt, MD4
1Carolinas Medical Center, Charlotte, NC, US; 2Carolinas Medical Center, Charlotte, NC, US; 3Hospital for Special Surgery, New York, NY, US; 4Hospital for Special Surgery, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

8. Modifiable polymer promotes a pro-osteogenic, M2-like macrophage phenotype and osteoblastic differentiation of progenitor cells
Joseph Bartolacci1; Arthi Shridhar, PhD2; Stephen F. Badylak, DVM, PhD3
1McGowan Institute for Regenerative Medicine, Pittsburgh, PA, US; 2Pittsburgh, PA, US
FDA DEVICE/DRUG STATUS: ZFuze (Approved for this indication)

9. C5 palsy after cervical laminectomy: natural history and risk factors in a 10-year series
G. Alexander Jones, MD1; Ryan Hofler, MD, MS1; Joseph Frazier, BS2; Russ P. Nockels, MD3; Amany Aziz, MD3; Jehad Zakaria, MD1
1Department of Neurological Surgery, Loyola University Medical Center, Maywood, IL, US; 2Loyola University Stritch School of Medicine, Maywood, IL, US; 3Department of Radiology, Loyola University Medical Center, Maywood, IL, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

10. Pelvic non-responders, postoperative cervical malalignment, and proximal junctional kyphosis following treatment of adult spinal deformity: influence of realignment strategies on occurrence
Peter G. Passias, MD1; Katherine E. Pierce, BS2; Virginie Lafage, PhD3; Renaud Lafage, MSC3; Themistocles S. Protopsaltis, MD4; Bassel G. Diebo, MD5; Khaled M. Kebaish, MD6; Joseph Bartolacci, PhD7; Arthi Shridhar, PhD2; Stephen F. Badylak, DVM, PhD3
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

11. Long-term outcomes following intraosseous basivertebral nerve ablation for the treatment of chronic low back pain: five-year treatment results from a prospective randomized double-blind sham-controlled multi-center study
Jeffrey Fischgrund, MD1; Alfred L. Rhyne, MD2; Christopher A. Yeung, MD3; Ercin Trumeees, MD4; D. Greg Anderson, MD4; James B. Reynolds, MD6
1Franklin, MI, US; 2OrthoCarolina, Charlotte, NC, US; 3Desert Institute for Spine Care, Phoenix, AZ, US; 4Seton Brain & Spine Institute, Austin, TX, US; 5Rothman Institute, Philadelphia, PA, US; 6Spine Care Medical Group, Daly City, CA, US
FDA DEVICE/DRUG STATUS: Intracept Procedure (Approved for this indication)

12. Healthcare costs and characteristics of spinal fusion patients receiving concentrated bone marrow aspirate (BMAC), iliac crest autograft or bone morphogenic protein (BMP) therapy: a retrospective cohort study utilizing administrative claims
Ripsi Patel, MPH1; Alicia Silver, MP
1Terumo BCT, Charlotte, NC, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

13. Clinical efficacy of tranexamic acid in posterolateral lumbar fusion: a prospective, randomized controlled trial
Bryce Basques, MD, MHS1; Garrett Harada, MD2; Jannat M. Khan, MD; Edward J. Goldberg, MD3; Howard S. An, MD4; Matthew Colman, MD5
1Thomas Jefferson University, Philadelphia, PA, US; 2Los Angeles, CA, US; 3Midwest Orthopedics at Rush, Chicago, IL, US; 4Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

14. Non-linear burst spinal cord stimulation can attenuate pain and catastrophizing in patients with persistent back pain and high psychological distress
Steven M. Falowski, MD1; Eric Cornidez, MD, MBA2; Robyn Capobianco, PhD3
1St. Luke’s University Health Network, Bethlehem, PA, US; 2Pain Institute of Southern Arizona, Tucson, AZ, US; 3Abbott Neuromodulation, Austin, TX, US
FDA DEVICE/DRUG STATUS: Spinal cord stimulation (Approved for this indication)
15. Use of predictive machine learning models at the population level has the potential to save cost by directing economic resources to those likely to improve most: a simulation analysis stratified by risk in largest combined US/European ASD registry

Rushikesh S. Joshi, BS1; Miquel Serra-Burriel, PhD2; Ferran Pellise, MD, PhD2; Darryl Lau, MD2; Justin S. Smith, MD, PhD4; Michael P. Kelly, MD, Ahmet Alanay, MD5; Emre Acaroglu, MD5; Francisco J. Perez-Grueso, MD1; Francie Kleinsteuck, MD, Ibrahim Obeid, MD6; Douglas C. Burton, MD, Virginie Lafage, PhD7; Frank J. Schwab, MD8; Christopher I. Shaffrey, MD11; Shay Bess, MD12; Christopher P. Arnes, MD13; ESSG European Spine Study Group15

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.


16. Is it safe to stop at C7 during multi-level posterior cervical decompression and fusion? Multi-center analysis

Eric Truumees, MD

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

17. Robotic-assisted lumbar spinal fusion surgery leads to increased risk of revision surgery, readmission, complications, and prolonged opioid utilization compared to non-robotic lumbar spinal fusion surgery

Daniel Yang, BS1; Neill Li, MD2; Shyam A. Patel, MD3; Dominic T. Kleinhenz, MD4; Alan H. Daniels, MD5

1Irvine, CA, US; 2Brown University, Department of Orthopaedics, Providence, RI, US; 3LifeSpan/Rhode Island Hospital, Providence, RI, US; 4University of California, San Francisco, CA, US; 5Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

18. Fatty infiltration of the lumbar multifidus (LM) may be associated with adjacent segment degeneration after fusion for spondylolisthesis

Ping G. Duan, PhD, MD1; Sigurd H. Berven, MD2; Jeremy Guinn, BS3; Joshua Rivera4; Dean Chou, MD1

1Department of Neurosurgery, University of California, San Francisco, CA, US; 2Department of Orthopaedic Surgery, University of California, San Francisco, CA, US; 3Department of Orthopaedic Surgery, The First Affiliated Hospital of Nanchang University, Nanchang, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

19. Does asymptomatic human immunodeficiency virus (AHIV)-positive status in patients undergoing spinal fusion for degenerative disc disease (DDD) increase risk for adverse postoperative outcomes?

Neil V. Shah, MD, MS1; Matthew J. Lettieri, BA2; Ryan Scheer, BS3; Dillon Sedaghatpour, MD4; Brian Ford, BS5; Bassel G. Diebo, MD6; Carl B. Paulino, MD3

1Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 2Brooklyn, NY, US; 3SUNY Downstate Medical Center, Brooklyn, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

20. Achievement of optimal clinical outcomes in adult spinal deformity surgery requires prioritizing realignment goals and varies based on pelvic incidence

Katherine E. Pierce, BS1; Waleed Ahmad2; Sara Naessig, BS3; Muhammad B. Janjua, MD4; Bassel G. Diebo, MD5; Peter G. Passias, MD6


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

21. The safety and efficacy of cervical laminectomy and fusion versus cervical laminoplasty surgery in degenerative cervical myelopathy: a prospective randomized trial

Haitham Kandel, MD1; Mohamed Soliman, PhD2; Mohamed ElMallawy, MD3; Tarek Tareef, MD, MSC, MbChB4; Ahmed Elsaid, MD5; Wael El-Mahdy, MD, PhD, FRCSI6

1Cairo University, Cairo, Egypt; 2Faculty of Medicine, Cairo University, Cairo, Egypt; 3Cairo, Egypt; 4Cairo University Medical School, Cairo, Egypt

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
22. Risk of surgical intervention is nearly normalized following coronary artery bypass grafting in spinal surgery with key exceptions

Waleed Ahmad1; Joshua Bell, MD2; Katherine E. Pierce, BS3; Sara Naessig, BS3; Frank A. Segreto, BS3; Shaleen N. Vira, MD4; Virginie Lafage, PhD5; Carl B. Paulino, MD2; Andrew J. Schoenfeld, MD6; Bassel G. Diebo, MD5; Hamid Hassanzadeh, MD3; Peter G. Passias, MD7
1New York, NY, US; 2University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 3NYU Spine Research Lab, New York, NY, US; 4NYU Langone Hospital, New York NY, US; 5NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 6Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 7Hospital for Special Surgery, New York, NY, US; 8SUNY Downstate Medical Center, Brooklyn, NY, US; 9Brigham and Women's Hospital, Boston, MA, US; 10Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 11NY Spine Institute, NYU Langone Health, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

23. Natural language processing for automated identification of intraoperative vascular injury in anterior lumbar spine surgery

Aditya V. Karhade, MD1; Michel Bongers, MD2; Olivier Groot, MD2; Harold A. Fogel, MD2; Stuart H. Hershman, MD3; Daniel G. Tobert, MD4; Sunita Srivastava, MD5; Christopher M. Bono, MD5; James D. Kang, MD5; Mitchel Harris, MD, FACSp6; Joseph H. Schwab, MD1
1Harvard Medical School, Boston, MA, US; 2Boston, MA, US; 3Massachusetts General Hospital, Boston, MA, US; 4Brigham and Women's Hospital, Boston, MA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

24. Cervical spine steroid injections for delay of surgery for cervical spondylotic myelopathy

Mustfa K. Manzur, MPH, MS, BS1; Andre Samuel, MD2; Steven J. McAnany, MD2; Todd J. Albert, MD2; Sravishth Iyer, MD2; Avani S. Vaishnav, MBBS; Catherine Himo Gang, MPH2; Sheeraz A. Qureshi, MD, MBA2
1Thomas Jefferson University, Philadelphia, PA, US; 2Hospital for Special Surgery, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

25. The collective influence of lumbopelvic mismatch and proportional shape on clinical outcomes and proximal junctional kyphosis following adult spinal deformity corrective surgery

Katherine E. Pierce, BS1; Waleed Ahmad2; Sara Naessig, BS3; Bassel G. Diebo, MD4; Peter G. Passias, MD5
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

26. Does anticoagulant thromboprophylaxis increase bleeding complications in spinal surgery and spinal cord injury? A systematic review and meta-analysis

Anh Nguyen, MD, MSc1; Sonia Tran, MBBS, MS2; Robin Turner, PhD3; Ahmed Sadek, PhD4; Alexander S. Montgomery, FRCS5
1St George’s University Hospital, London, UK; 2Childrens Hospital at Westmead, Westmead, Australia; 3Centre for Biostatistics, Dunedin, NZ; 4Wessex Neurological Centre, Southampton, UK; 5London, United Kingdom
FDA DEVICE/DRUG STATUS: Low molecular weight heparin (Approved for this indication), low dose unfractionated heparin (Approved for this indication)

27. Efficacy of topical versus intravenous tranexamic acid in pediatric spinal deformity

Karen Weissmann, MD1; Virginie Lafage, PhD2; Renaud Lafage, MSc3; Charles Huaiquilaf Salazar, MD4; Jonathan Elysee2; Francoise Descazeaux, MD3
1Fundacion Medica San Cristobal, Santiago, Region Metropolitana, Chile; 2Hospital for Special Surgery, New York, NY, US; 3Santiago, Chile
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

28. Does baseline thoracolumbar shape influence patterns of cervical decompensation following surgical adult spinal deformity correction?

Waleed Ahmad1; Peter G. Passias, MD2; Haddy Alas, BS3; Virginie Lafage, PhD4; Renaud Lafage, MSc4; Breton Line, BS5; Alan H. Daniels, MD6; D. Kojo Hamilton, MD7; Robert A. Hart, MD8; Douglas C. Burton, MD9; Christopher I. Shaffrey, MD10; Frank J. Schwab, MD10; Christopher P. Ames, MD11; Justin S. Smith, MD, PhD12; Shay Bess, MD13; Eric O. Klineberg, MD14; Han Jo Kim, MD14; International Spine Study Group15
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
29. C2 SVA: when angles are too complicated and the X-ray image is too small

Eric Leung, BA1; Griffin R. Baum, MD, MSc2; Zeeshan Sardar, MD, MSc3; Richard P. Menger, MD4; Meghan Cerpa, MPH5; Meghana Vulapalli, BS6; Joseph A. Osorio, MD, PhD7; Lawrence G. Lenke8, MD; Ronald A. Lehman Jr, MD9; Simon Morr, MD, MPH10


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

30. Retrospective comparative analysis of combined vs only posterior approach for treating severe scoliosis

Matevž Topolovec, MD, PhD; Nikša Hero, MD, PhD

Orthopaedic hospital Valdoltra, Ankaran, Slovenia

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

31. A comparison of various surgical treatments for cervical spondylotic myelopathy: a propensity score matched analysis

Nathan J. Lee, MD1; Jun S. Kim, MD2; Paul Park, MD2; K. Daniel Riew, MD

1Columbia University, New York, NY, US; 2New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

32. Preoperative high frequency opioid use dramatically increases complication rate within 90 days, increases two-year reoperation rates, and predisposes to opioid dependency following adult deformity correction

Peter G. Passias, MD1; Waleed Ahmad2; Joshua Bell, MD2; Katherine E. Pierce, BS3; Sara Naessig, BS3; Frank A. Segreto, BS4; Shaleen N. Vira, MD5; Virginie Lafage, PhD6; Carl B. Paulino, MD6; Andrew J. Schoenfeld, MD7; Bassel G. Diebo, MD8; Hamid Hassanzadeh, MD9

1NY Spine Institute, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 4NYU Spine Research Lab, New York, NY, US; 5NYU Langone Hospital, New York, NY, US; 6NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 7Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 8Hospital for Special Surgery, New York, NY, US; 9SUNY Downstate Medical Center, Brooklyn, NY, US; 10Brigham and Women’s Hospital, Boston, MA, US; 11Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

33. Utilizing predictive analytics to understand the influence of modifiable risk factors on readmission in patients receiving lumbar spinal fusion

Shane Shahrestani, MS1; Alexander Ballatori, BA2; Andy Ton, BS3; Xiao Chen, BA4; Jeffrey C. Wang, MD4; Zorica Buser, PhD5

1Yorba Linda, CA, US; 2Los Angeles, CA, US; 3Anaheim, CA, US; 4USC Spine Center, Los Angeles, CA, US; 5Keck School of Medicine, University of Southern California, Los Angeles, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

34. A novel bone cement screw system combined with vertebroplasty for the treatment of Kummell disease with bone deficiency at vertebral anterior border: minimum three-year follow-up study

Biao Wang, MD1; Lingbo Kong, MD, PhD2; Dingjun Hao, MD3

1Honghui Hospital, Xi’an, Shaanxi, China; 2Xi’an, China; 3Xi’an Honghui Hospital, Xi’an, Shaanxi, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

35. Failure to normalize risk profile of spine fusion patients with coronary artery disease

Waleed Ahmad1; Joshua Bell, MD2; Sara Naessig, BS3; Katherine E. Pierce, BS4; Frank A. Segreto, BS5; Shaleen N. Vira, MD6; Brandon P. Hirsch, MD7; Carl B. Paulino, MD8; Andrew J. Schoenfeld, MD9; Bassel G. Diebo, MD10; Hamid Hassanzadeh, MD11

1New York, NY, US; 2University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 3NYU Langone Hospital, New York NY, US; 4NYU Spine Research Lab, New York, NY, US; 5NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 6Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 7CORE Institute, Gilbert, AZ, US; 8SUNY Downstate Medical Center, Brooklyn, NY, US; 9Brigham and Women’s Hospital, Boston, MA, US; 10Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 11NY Spine Institute, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

36. Scoliosis surgery normalizes cardiac function in AIS patients

Vishal Sarwahi, MD1; Jesse M. Galina, BS2; Rachel Gecelter3; Aaron M. Atlas, BS4; Sayyida S. Hasan, BS5; Terry D. Amaral, MD6; Sarika Kalantre, MD7


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
37. Outpatient minimally invasive lumbar fusion using multimodal analgesic management in the ambulatory surgery setting
James Parrish, MPH1; Nathaniel Jenkins, BS, MS1; Augustus J. Rush III, MD2; Dustin H. Massel, MD3; Nadia Hryniewycz, BS4; Thomas Brundage, BS5; Jeffrey Podnar, MD6; Kern Singh, MD1
1 Rush University Medical Center, Chicago, IL, US; 2 Miami, FL, US; 3 Midwest Orthopaedics At Rush, Chicago, IL, US; 4 Chicago, IL, US; 5 Park Ridge, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

38. Opioid use prior to adult spine deformity (ASD) surgery worsens postoperative outcomes and risks continued postoperative use, independent of spine deformity magnitude and type of surgery performed: a propensity matched cohort analysis
Breton Line, BS1; Shay Bess, MD2; Christopher P. Ames, MD3; Robert K. Eastlack, MD4; Gregory M. Mundis Jr., MD5; Virginie Lafage, PhD6; Eric O. Klineberg, MD7; Munish C. Gupta, MD8; Richard A. Hostin Jr., MD9; Douglas C. Burton, MD10; Michael P. Kelly, MD; Khaled M. Kebaish, MD11; Frank J. Schwab, MD12; Christopher I. Shaffrey, MD13; Justin S. Smith, MD, PhD13; International Spine Study Group

1 Denver International Spine Center, Denver, CO, US; 2 Denver, CO, US; 3 University of California, San Francisco, San Francisco, CA, US; 4 Scripps Clinic, San Diego, CA, US; 5 Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 6 Hospital for Special Surgery, New York, NY, US; 7 UC, Davis School of Medicine, Sacramento, CA, US; 8 Washington University School of Medicine, St. Louis, MO, US; 9 Southwest Scoliosis Institute, Dallas, TX, US; 10 University of Kansas Medical Center, Kansas City, KS, US; 11 Johns Hopkins University, Baltimore, MD, US; 12 Duke University, Durham, NC, US; 13 UVA Health System, Charlottesville, VA, US; 14 Brighton, CO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

39. Critical analysis of anterior/posterior staged vs same day surgery in patients undergoing identical corrective surgery for adult spinal deformity
Waleed Ahmad; Peter G. Passias, MD; Renaud Lafage, MSc; Virginie Lafage, PhD; Breton Line, BS; Gregory M. Mundis Jr., MD; Robert K. Eastlack, MD; Pierce D. Nunley, MD; D. Kojo Hamilton, MD; Robert A. Hart, MD; Douglas C. Burton, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Christopher P. Ames, MD; Justin S. Smith, MD, PhD; Shay Bess, MD; Eric O. Klineberg, MD; International Spine Study Group


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

40. Long-term radiographic outcomes following adult spinal deformity surgery
Amit H. Parekh, DO; Joshua D. Schwind, MD; Jeremy S. Smith, MD; Jon I. White, MD; Jeffrey E. Deckey, MD; Gerald Alexander, MD; Edward J. Quilligan, BS; Vance O. Gardner, MD

1 Valley Hospital, Las Vegas, NV, US; 2 Orthopedic Specialty Institute, Orange, CA, US; 3 Orthopaedic Specialty Institute Medical Group of Orange County, Orange, CA, US; 4 Irvine Orthopaedics, Irvine, CA, US; 5 Hoag Orthopedics Education and Research Institute, Orange, CA, US; 6 Hoag Orthopedics, Orange, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

41. Surgical outcomes for upper lumbar disc herniations: a systematic review and meta-analysis of the literature
Murray Echt, MD; Ryan Holland, MD; Phillip Cezayirli, MD; Rafael De la Garza Ramos, MD; Mousa K. Harmand, MD; Yaroslav J. Gelfand, MD; Merritt Kinon, MD; Vijay Yanamadala, MD; Saad B. Chaudhary, MBA; Samuel K. Cho, MD; Reza Yassari, MD; MSc


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

42. Removed from Program

43. Preoperative regional erector spine plane blocks reduce opioid use, increase mobilization, and reduce length of stay following lumbar spine fusion
Robert J. Owen, MD; Darrel S. Brodke, MD; Noah Quinlan, MD; Brandon D. Lawrence, MD; W. Ryan Spiker, MD; Addisyn Poduska, CST; Nicholas Spina, MD

1 University Orthopaedic Center, Salt Lake City, UT, US; 2 Salt Lake City, UT, US; 3 University of Utah Hospital, Salt Lake City, UT, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

44. The impact of frailty on patient reported outcome measures following elective thoraco-lumbar spine surgery
Philippe Beauchamp-Chalifour, MD, MSc; Raphaële Charest-Morin, MD

1 Université Laval, Québec, QC, Canada; 2 Quebec, QC, Canada

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
45. **A prospective, in-depth analysis of perioperative anterior thigh symptoms associated with a direct lateral access approach for lumbar interbody fusion**

Pierce D. Nunley, MD; Clint P. Hill, MD; K. Brandon Strenge, MD; John (Sean) P. Malloy IV, DO, PT, ATC; Sandeep Kunwar, MD; Marcus Stone, PhD

1Spine Institute of Louisiana, Shreveport, LA, US; 2Orthopaedic Institute of Western KY, Paducah, KY, US; 3East Coast Orthopaedics, PA, Pompano Beach, FL, US; 4Fremont, CA, US; 5Spine Institute of Louisiana Foundation, Shreveport, LA, US

FDA DEVICE/DRUG STATUS: Duo Interbody Fusion System (Approved for this indication)

46. **Surgical outcomes in Rett syndrome patients are comparable to cerebral palsy patients**

Vishal Sarwahi, MD; Jesse M. Galina, BS; Aaron M. Atlas, BS; Chhavi Katyal, MD; Marina Moguilevitch, MD; Sayyida S. Hasan, BS; Yungtai Lo, PhD; Terry D. Amaral, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

47. **Does the use of interbodies in lumbar fusions affect the reoperation rate for adjacent segment disease (operative ASD)? Data from the Kaiser Permanente National Spine Registry**

Calvin C. Kuo, MD; Kathryn Royse, PhD, MPH; Harsimran Brara, MD; Johannes A. Bernbeck, MD; Vartan Tashjian, MD, MS; Shayan Rahman, MD; Kern H. Guppy, MD, PhD; Jessica E. Harris, MS; Ravi S. Bains, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

48. **Fusion and decompression vs decompression only for lumbar facet cysts**

Jarren A. Section, MD; Noorullah Maqsoodi, BS; Addisu Mesfin, MD

1Strong Memorial Hospital- University of Rochester, Benbrook, TX, US; 2Rochester, NY, US; 3University of Rochester, Rochester, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

49. **A systematic review of spine surgery complications in the ambulatory surgical center setting**

Nadia Hrynewycz, BS; Thomas Brundage, BS; Nathaniel Jenkins, BS, MS; James Parrish, MPH; 1Kern Singh, MD

1Chicago, IL, US; 2Midwest Orthopedics at Rush, Chicago, IL, US; 3Rush University Medical Center, Chicago, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

50. **Preoperative depression predicts prolonged opiate usage following lumbar spine fusion**

Xiao Chen, BA; Shane Shahrerastani, MS; Alexander Ballatori, BA; Andy Ton, BS; Jeffrey C. Wang, MD; Zorica Buser, PhD

1Los Angeles, CA, US; 2Yorba Linda, CA, US; 3Anaheim, CA, US; 4USC Spine Center, Los Angeles, CA, US; 5Keck School of Medicine, University of Southern California, Los Angeles, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

51. **Is percutaneous pedicle screws (PPS) fixation associated with minimized risk of perioperative proximal junctional kyphosis (PJK) in adult spinal deformity?**

Gregory M. Mundis Jr, MD; Robert K. Eastlack, MD; Neel Anand, MD; Eric O. Klineberg, MD; Juan S. Uribe, MD; Han Jo Kim, MD; Michael Y. Wang, MD; Pierce D. Nunley, MD; Adam S. Kanter, MD; Shay Bess, MD; Frank J. Schwab, MD; Paul Park, MD; Khoi D. Than, MD; Themistocles S. Protopsaltis, MD; Virginie Lafage, PhD; Renaud Lafage, MSc; International Spine Study Group


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

52. **Calcium phosphates with submicron topography enhance human macrophage M2 polarization in vitro**

Lukas A. van Dijk, MSc; Lizette Utomo, PhD; Huipin Yuan, PhD; Debby Gawlitta, PhD; Joost DeBrujin, PhD

1University Medical Centre Utrecht, Utrecht, Netherlands; 2Bilthoven, Netherlands; 3UMC Utrecht, Utrecht, Netherlands; 4Kuros Biosciences, Bilthoven, Netherlands

FDA DEVICE/DRUG STATUS: MagnetOs Granules (Not approved for this indication)
53. Biomimetic laser-etched titanium promotes gene expression of early bone markers
Roland Beard, MS; Margaret R. Van Horn, PhD; Brandon Bucklen, PhD
Globus Medical Audubon, PA, US
FDA DEVICE/DRUG STATUS: SINTROS (Globus Medical) (Approved for this indication)

54. Titanium plasma spray enhances ability of PEEK to express genes related to bone formation
Roland Beard, MS; Margaret R. Van Horn, PhD; Brandon Bucklen, PhD
Globus Medical, Audubon, PA, US
FDA DEVICE/DRUG STATUS: SUSTAIN (Globus Medical) (Approved for this indication)

55. Early deformity development following decompressive surgery for lumbar spinal stenosis
Arya Ahmady, MD; Zachary L. Gordon, MD; Louis Magdon III, MD; Nicholas U. Ahn, MD; Christina W. Cheng, MD; Christopher G. Furey, MD
1University Hospitals Cleveland Medical Center, Dept of Orthopaedic Surgery, Cleveland, OH, US; 2Blue Ridge Orthopaedic and Spine Center, Warrenton, VA, US; 3University Hospitals Cleveland Medical Center, Cleveland, OH, US; 4Case Western Reserve University, Cleveland, OH, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

56. Minimally invasive pedicle screws provide similar clinical outcomes to open posterior fusion in the management of adult isthmic spondylolisthesis
Daniel Bowles, MD; Jose A. Canseco, MD, PhD; Christopher Antonacci, MS; Aditya Thandoni, BA; D. Greg Anderson, MD; Mark F. Kurd, MD; Alan S. Hilibrand, MD; Christopher K. Kepler, MD, MBA; Alexander R. Vaccaro, MD, PhD; Gregory D. Schroeder, MD; Joseph K. Lee, MD; Ian D. Kaye, MD
Rothman Institute, Thomas Jefferson University, Philadelphia, PA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

57. Congenital scoliosis patients can attain similar curve correction and perioperative outcomes to AIS patients without the need for hemivertebra excision
Vishal Sarwahi, MD; Jesse M. Galina, BS; Thomas J. Dowling III, MD; Jordan Fakhoury, DO; Sayyida S. Hasan, BS; Yungtai Lo, PhD; Terry D. Amaral, MD
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

58. Benefits of macroscale topography features on and within interbody cages
William Walsh, PhD; Matthew H. Pelletier, PhD; Tian Wang, PhD; Daniel Wills, DVM; Shaeffer Bannigan; Frank Vizesi, PhD
1Surgical and Orthopaedic Research Labs, Randwick, Maroubra, Australia; 2Surgical & Orthopaedic Research Labs, Randwick, NSW, Australia; 3Surgical & Orthopaedic Research Laboratories (SORL), Sydney, Australia; 4Surgical and Orthopaedic Research Laboratories, Level 1 Clinical Sci Bldg, Randwick, NSW, Australia; 5San Diego, CA, US; 6SeaSpine, Carlsbad, CA, US
FDA DEVICE/DRUG STATUS: Shoreline RT (Approved for this indication)

59. Does attachment of the dorsolumbar fascia to a spinous process prosthesis affect kinematics at the operative and adjacent levels? An in vitro human cadaveric model
Daina M. Brooks, BS; Bryan W. Cunningham, PhD; Mohit M. Kukreja, MD, MS, DNB; Kenneth Mullinix, BS; Nicholas Rolle, BS; P. Justin Tortolani, MD
1Medstar Union Memorial Hospital, Baltimore, MD, US; 2Audubon, PA, US; 3Baltimore, MD, US
FDA DEVICE/DRUG STATUS: Crosslink (Approved for this indication)

60. Beta-lactam antibiotic surgical prophylaxis is safe in patients with self-reported penicillin allergies: a cohort study of lumbar spine surgery patients
Kyle Kesler, MD; Alan Shamrock, MD; Christopher Lindsay, MD; Nathan R. Hendrickson, MD, MS; Joshua M. Eisenberg, MD; Piyush Kalakoti, MD; Andrew J. Pugely, MD
1University of Iowa, Iowa City, IA, US; 2University of Iowa Hospitals and Clinics, Iowa City, IA, US; 3University of Iowa, Dept of Orthopedics, Iowa City, IA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

61. ALIF vs TLIF for isthmic spondylolisthesis: differences in radiographic outcomes
Daniel Bowles, MD; Jose A. Canseco, MD, PhD; Christopher Antonacci, MS; Aditya Thandoni, BA; D. Greg Anderson, MD; Mark F. Kurd, MD; Alan S. Hilibrand, MD; Christopher K. Kepler, MD, MBA; Alexander R. Vaccaro, MD, PhD; Gregory D. Schroeder, MD; Ian D. Kaye, MD; Joseph K. Lee, MD
Rothman Institute, Thomas Jefferson University, Philadelphia, PA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
62. Multimodal analgesic management for lumbar decompression surgery in the ambulatory setting: clinical case series and review of the literature
Nathaniel Jenkins, BS, MS1; James Parrish, MPH1; Thomas Brundage, BS2; Nadia Hrynewycz, BS3; Kern Singh, MD1
1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopedics at Rush, Chicago, IL, US; 3Chicago, IL, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

63. Three-dimensional printing of titanium without bone graft outperforms PEEK + autologous iliac crest bone graft in sheep interbody fusion model
Jesús Pino Minguez, MD, PhD; Joseph L. Laratta, MD2; Jeffrey L. Gum, MD; Andrew J. Pugely, MD; Steven D. Glassman, MD3
1Head of HM La Rosaleda Spine Department and Orthopaedic Professor at University of Santiago de Compostela, Department of Surgery, Santiago de Compostela, Coruna, Spain; 2Norton Leatherman Spine, Louisville, KY, US; 3University of Iowa, Iowa City, IA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

64. Intravenous vs oral acetaminophen administration in perioperative care of one- and two-level LLIFs with instrumented posterior lumbar fusion: a comparative effectiveness study
Nicole Utah, BS1; Christina Dowe, BS2; Antonio T. Brecevich, MD2; Fedan Avrumova, BS3; Daniel Alicea, MS4; Frank P. Cammisa, MD5; Darren R. Lebl, MD2; Alexander P. Pugely, MD6; Daniel Alicea, MS7; Andrew A. Sama, MD8; Russel C. Huang, MD9; Matthew E. Cunningham, MD, PhD10; Federico P. Girardi, MD11; Celeste Abjornson, PhD12; Chad M. Craig, MD, FACP13
1New York, NY, US; 2Hospital for Special Surgery, New York, NY, US
FDA DEVICE/DRUG STATUS: OFIRMEV (Approved for this indication)

65. Indirect decompression for the treatment of degenerative lumbar stenosis: clinical outcome in a consecutive series of 568 patients
Peter B. Derma, MD, MBA1; Donna D. Ohrmeiss, PhD2; Abbey Lauderback3; Richard D. Guyer, MD4
1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

66. The morbidity, readmissions, and cost for pediatric cerebral palsy patients undergoing primary spinal fusion surgery: a national analysis on 2,779 patients
Nathan J. Lee, MD1; Michael Fields, BS2; Kyle L. McCormick, BA3; Daniel Hong, MD4; Jun S. Kim, MD5; Joseph M. Lombardi, MD6; Benjamin D. Royle, MD, MPH7; Lawrence G. Lenke, MD8
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

67. 3D-printed porous biomimetic titanium promotes osteogenic gene expression in murine mesenchymal stem cells
Roland Beard, MS; Margaret R. Van Horn, PhD; Brandon Bucklen, PhD
Globus Medical, Audubon, PA, US
FDA DEVICE/DRUG STATUS: HEDRON (Globus Medical) (Approved for this indication)

68. Spinal fusion with a resorbable mesh pouch in a preclinical posterolateral model
William Walsh, PhD1; Rema Oliver, PhD2; Tian Wang, PhD3; Daniel Wills, DVM4; Michelle Pacer5; Frank Vizesi, PhD, PhD6
1Surgical and Orthopaedic Research Labs, Randwick, Maroubra, Australia; 2Surgical Orthopaedic Research Laboratories (SORL), Sydney, Australia; 3Surgical and Orthopaedic Research Laboratories, Level 1 Clinical Sci Bldg, Randwick, NSW, Australia; 4Oceanside, US; 5SeaSpine, Carlsbad, CA, US
FDA DEVICE/DRUG STATUS: Resorbable Mesh Bag (Ballast) (Approved for this indication)

69. Ischemic spinal nerve root injury secondary to herniated lumbar intervertebral disc
Paul B. Bishop, DC, MD, PhD1; Nicolas Dea, MD, MSc, FRCSC1; Charles G. Fisher, MD, FRCSC, MHS2
1Blusson Spine Centre, Vancouver, BC, Canada; 2Vancouver General Hospital, Vancouver, BC, Canada
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

70. A biologically-inspired 3D-printed titanium alloy interbody spacer promotes osseointegration in an ovine lumbar interbody fusion model
Margaret R. Van Horn, PhD1; Roland Beard, MS1; Bryan W. Cunningham, PhD2; Kenneth Mullinix, BS3; May Allall4; Brandon Bucklen, PhD5
1Globus Medical, Audubon, PA, US; 2MedStar Union Memorial Hospital, Baltimore, MD, US; 3Audubon, PA, US
FDA DEVICE/DRUG STATUS: HEDRON (Globus Medical) (Approved for this indication)
71. Can the novel lumboiliac triangle technique based on biplane oblique fluoroscopy facilitate transforaminal percutaneous endoscopic lumbar discectomy for patients with LS-S1 disc herniation combined with high iliac crest? A case-control study of 100 patients

Jun-Song Yang, MD; Peng Liu, MD; Tuan-Jiang Liu, MD; Ding-Jun Hao, MD

1Department of Spine Surgery, Honghui Hospital, Xi’an Jiaotong University, Xi’an, China; 2Honghui Hospital, Xi’an Jiaotong University, Xi’an, Shaanxi, China; 3Xi’an, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

72. Accuracy of rod contouring to desired angles with and without a template: implications for achieving desired spinal alignment and outcomes

Justin S. Smith, MD, PhD; Christopher P. Ames, MD; Christopher R. Good, MD, FACS; Benny Dahl, MD, PhD; Paul E. Kraemer, MD; Jeffrey L. Gurn, MD; Dennis Devito, MD; Robert S. Lee, MBBS, FRCS; Marco Brayda-Bruno, MD; Christopher Bell, MS; Shay Bess, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

73. Sex-based difference in response to recombinant human bone morphogenetic protein-2 (rhBMP-2) in a rat posterolateral fusion model

Jonathan Paul, MPH, BS; Mark A. Plantz, BS; Tejas Nandurkar, MS; Joseph G. Lyons, BS; Parker Marsh, BS; James Foley, MD; Allison Wintring, BS; Eileen Phan, BA; Elinna Fred; Soyeon Jeong, MS; Chawon Yun, PhD; Silvia Minardi, PhD, MS; Stuart R. Stock, PhD; Kenneth R. Blank, PhD, MHA; Robert M. Havey, MS; Muturi Muriuki, PhD; Avinash G. Patwardhan, PhD; Erin L. Hsu, PhD; Wellington K. Hsu, MD

1Chicago, IL, US; 2Northfield, IL, US; 3Simpson Querrey Institute, Chicago, IL, US; 4University of Louisville School of Medicine, Louisville, KY, US; 5Northwestern University, Feinberg School of Medicine, Chicago, IL, US; 6Northwestern University, Chicago, IL, US; 7Tinley Park, IL, US; 8Edward Hines Jr. VA Hospital, Hines, IL, US; 9Forest Park, IL, US; 10Loyola University Medical Center Dept. of Orthopaedic Surgery, Wheaton, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

74. Cervical disc arthroplasty for axial neck pain: outcomes up to seven years

Matthew F. Gornet, MD; Katrine Sorensen, MSc; Francine W. Schranck, RN, BSN; Anne G. Copay, PhD

1The Orthopedic Center of St. Louis, St. Louis, MO, US; 2Wilmington, NC, US; 3SPIRITT Research, Saint Louis, MO, US; 4St. Louis, MO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

75. Prospective, randomized study of lumbar facet replacement and lumbar interbody fusion for spondylolisthesis

Michael P. Steinmetz, MD; Paul M. Arnold, MD; William C. Welch, MD, FACS, FICS; Domagoj Coric, MD; Ahmad N. Nassr, MD

1Cleveland Clinic, Cleveland, OH, US; 2Carle Foundation Hospital, Urbana, IL, US; 3Penn Neurosurgery, Philadelphia, PA, US; 4Carolina Neurosurgery & Spine Associates, Charlotte, NC, US; 5Professor of Orthopedic Surgery and Neurosurgery, Mayo Clinic College of Medicine and Science Consultant, Department of Orthopedic Surgery, Rochester, MN, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

76. Reduction in opioid medication use after arthroplasty with Prestige LP™ cervical disc as compared to ACDF in patients with two-level surgery: a randomized study with 10-year follow-up

Matthew F. Gornet, MD; Todd H. Lanman, MD; J. Kenneth Burkus, MD; Randall F. Dryer, MD; Jeffrey R. McConnell, MD; Scott D. Hodges, DO; Francine W. Schranck, RN, BSN; Guorong Ma, PhD

1The Orthopedic Center of St. Louis, St. Louis, MO, US; 2Beverly Hills, CA, US; 3The Hughston Clinic, PC, Columbus, GA, US; 4Central Texas Spine Institute, Austin, TX, US; 5LVPG Orthopedics and Sports Medicine, Allentown, PA, US; 6Center for Sports Medicine & Orthopaedics, Chattanooga, TN, US; 7SPIRITT Research, Saint Louis, MO, US; 8Medtronic Spinal and Biologics, Minneapolis, MN, US

FDA DEVICE/DRUG STATUS: Prestige LP™ Disc, approved for 2-level cervical disc arthroplasty in 2016 (Approved for this indication)

77. The incidence of subsequent lumbar spine surgery after lumbar disc arthroplasty: a minimum two-year follow-up

Dean C. Perfetti, MD, MPH; Austen Katz, MD; Alan Job, MD; Jesse M. Galina, BS; Alexander M. Satin, MD; Jeff S. Silber, MD; DC; David A. Essig, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
78. The current incidence of adjacent segment pathology following cervical disc arthroplasty (CDA) or anterior cervical discectomy and fusion (ACDF): a systematic review and meta-analysis of randomized clinical trials
Chester J. Donnally III, MD; Parthik Patel, MD; Jose A. Canseco, MD, PhD; Srijanath Divi, MD; Vadim Goz, MD; Kartik Shenoy, MD; Alan S. Hillibrand, MD
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

79. Secondary surgery rate and five-year outcomes of hybrid TDR/ACDF vs multilevel ACDF
Glenn R. Buttermann, MD
Midwest Spine Institute LLC, Stillwater, MN, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

80. FDA trial of decompression and paraspinous tension band for degenerative spondylolisthesis: 12 months follow-up in 93 subjects
Rick C. Sasso, MD; Ivan Cheng, MD; William F. Lavelle, MD; S. Tim Yoon, MD, PhD; Alan T. Villavicencio, MD; Kee D. Kim, MD; Ravi S. Bains, MD; Calvin C. Kuo, MD; Hyun W. Bae, MD; Elizabeth Yu, MD; Todd F. Alamin, MD; Louie C. Fielding; Jeffrey Fischgrund, MD; Harel Deutsch, MD; Khalid A. Sethi, MD, FACS; Harvinder S. Sandhu, MD; Michael Stauff, MD; Reginald J. Davis, MD, FACS; Dennis G. Crandall, MD; William C. Welch, MD, FACS, FICS
FDA DEVICE/DRUG STATUS: LimiFlex Paraspinous Tension Band (Investigational/Not approved)

81. Seven-year results of a randomized controlled IDE trial for lumbar artificial discs in single level degenerative disc
Rolando Garcia Jr., MD, MPH; Jack E. Zigler, MD; Kris E. Radcliff, MD; Dormajog Coric, MD; James J. Yue, MD; Nicole Ferko, MSc; Aaron Situ, MSc, BS
1Orthopedic Care Center, Aventura, FL, US; 2Texas Back Institute, Plano, TX, US; 3Rothman Institute, Thomas Jefferson University, Egg Harbor Township, NJ, US; 4Carolina Neurosurgery & Spine Associates, Charlotte, NC, US; 5CT Ortho Specialists, Hamden, CT, US; 6Cornerstone Research Group, Burlington, ON, Canada; 7Eversana, Burlington, ON, Canada
FDA DEVICE/DRUG STATUS: Activ L (Approved for this indication), Prods L (Approved for this indication)

82. Interdisciplinary care may reduce delirium in elderly spine patients: the UT Southwestern Perioperative Optimization of Senior Health Program
Mark N. Pernik, BA; Palvasha Deme, BA; Madelina Nguyen; Salah Aoun, MD; Owoicho Adogwa, MD, MPH; Kristen Hall, BS, MBA; Nickolas A. Stewart; Luke Dosselman, BS; Shelley McDonald, DO, PhD; Sarah Wingfield, MD; Carlos A. Bagley, MD, MBA
1UT Southwestern Medical Center, Department of Neurosurgery, Dallas, TX, US; 2Duke, Durham, NC, US; 3UT Southwestern Medical Center, Department of Internal Medicine, Geriatrics Division, Dallas, TX, US; 4UT Southwestern Medical Center, Department of Orthopaedic Surgery, Dallas, TX, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

83. 2018 Research Grant Award Winner
84. Low density pedicle screw constructs are associated with lower incidence of proximal junctional failure in adult spinal deformity surgery

Wesley M. Durand1; Han Jo Kim, MD2; D. Kojio Hamilton, MD3; Renaud Lafage, MSc4; Peter G. Passias, MD5; Thermiotocles S. Protopsaltis, MD5; Virginie Lafage, PhD6; Justin S. Smith, MD, PhD; Christopher I. Shaffrey, MD1; Munish C. Gupta, MD2; Eric O. Klineberg, MD6; Frank J. Schwab, MD2; Jeffrey L. Gum, MD10; Gregory M. Mundis Jr., MD11; Robert K. Eastlack, MD12; Khaled M. Keabaish, MD13; Alexandra Soroceanu, MD, MPH14; Richard A. Hostin Jr, MD15; Douglas C. Burton, MD16; Shay Bess, MD17; Christopher P. Arnes, MD18; Robert A. Hart, MD19; Alan H. Daniels, MD20; International Spine Study Group21

1Brown University, Alpert Medical School, Providence, RI, US; 2Hospital for Special Surgery, New York, NY, US; 3University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 4NY Spine Institute, NYU Langone Health, New York, NY, US; 5Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 6UVA Health System, Charlottesville, VA, US; 7Duke University, Durham, NC, US; 8Washington University School of Medicine, St. Louis, MO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10Norton Leatherman Spine Center, Louisville, KY, US; 11Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 12Scripps Clinic, San Diego, CA, US; 13Johns Hopkins University, Baltimore, MD, US; 14University of Calgary, Calgary, Canada; 15Southwest Scoliosis Institute, Dallas, TX, US; 16University of California, San Francisco, San Francisco, CA, US; 17University of California, San Francisco, San Francisco, CA, US; 18Swedish Neuroscience Institute, Seattle, WA, US; 19Warren Alpert Medical School of BU/RI Hospital, Providence, RI, US; 20Brighton, CO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

85. Incidence and resolution strategies for early onset postoperative leg pain following lumbar total disc replacement

Richard D. Gujer, MD1; Scott L. Blumenthal, MD1; Donna D. Ohnmeiss, PhD2; Nicole Ferko, MSc3; Ashley Bonner, PhD4; Aaron Situ, MSc, BS4

1Center for Disc Replacement at Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US; 3Cornerstone Research Group, Burlington, ON, Canada; 4Eversana, Burlington, ON, Canada

FDA DEVICE/DRUG STATUS: activL and ProDisc-L (Approved for this indication)

86. Why are DBMs so variable? Influence of fibers, carrier, and tissue bank

Gregory M. Mundis Jr., MD1; Nick Russell, PhD2; William Walsh, PhD3; Peter Kim, MS4; Jennifer Chen, PhD5; Frank Vizesi, PhD6

1Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 2Carlsbad, CA, US; 3Surgical and Orthopaedic Research Labs, Randwick, Maroubra, Australia; 4SeaSpine Orthopedics, Carlsbad, CA, US; 5SeaSpine, Carlsbad, CA, US

FDA DEVICE/DRUG STATUS: Grafton (Approved for this indication), DBX Putty (Approved for this indication), Optium Putty (Approved for this indication)

87. Rates of loosening, failure, and revision of iliac fixation in adult deformity surgery

Robert K. Eastlack, MD1; Alexandra Soroceanu, MD, MPH2; Gregory M. Mundis Jr., MD3; Alan H. Daniels, MD4; Justin S. Smith, MD, PhD5; Breton Line, BS6; Peter G. Passias, MD7; Pierce D. Nunnely, MD8; David O. Okonkwo, MD9; Khoi D. Than, MD10; Juan S. Uribe, MD11; Dean Chou, MD12; Khaled M. Keabaish, MD13; Christopher I. Shaffrey, MD14; Shay Bess, MD15; International Spine Study Group16


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

88. Cell stiffness decreases with severity of disc degeneration and inflammatory stimulation

Nadeen Chaaine, PhD1; Eric Leung, BA2; Meghan Cerpa, MPH3; Meghana Vulapalli, BS4; Venkat Boddapati, MD5; Timothy Jacobsen, MEng1; Ronald A. Lehman Jr., MD5


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

89. Is academic department teaching status associated with adverse outcomes after lumbar fusion for degenerative spine diseases?

Dean C. Perfetti, MD, MPH1; Daniel Kidlyd, MD, MBA2; Matthew Morris, MD3; Alan Job, MD4; Austen Katz, MD5; Jeff S. Silber, MD, DC6; David A. Essig, MD7


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
**90. Nanoroughened microstructured orthopaedic implant surfaces induce osteogenesis via soluble signaling factors produced by MSCs**

Michael Berger, BS1; David Joshua Cohen, MD2; Kyla Bosh3; Michelle B. Gallagher, MS3; Paul J. Slosar, MD4; Zvi S. Schwartz; Barbara D. Boyan, PhD5

1VCU College of Engineering, Department of Biomedical Engineering, Richmond, VA, US; 2Virginia Commonwealth University, Richmond, VA, US; 3Medtronic (Titan Spine), Mequon, WI, US; 4SpineCare Medical Group, Daly City, CA, US; 5Richmond, VA, US

**FDA DEVICE/DRUG STATUS:** Interbody Fusion Implants (Approved for this indication)

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**91. Long term follow-up of adolescent idiopathic scoliosis patients who had pedicle screw and fusion to the lower lumbar vertebrae: low back pain study**

Xie En, MD

Hong Hui Hospital, Xi’an Jiaotong University College of Medicine, Xi’an, Shan Xi, China

**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.

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**92. Opioid use after anterior cervical spine surgery: what is the appropriate prescription quantity?**

Francis C. Lovechio, MD1; Ajay Premkumar, MD2; Michael E. Steinhaus, MD1; Dianna L. Mejia, BA2; Alexander Koo3; Virginie Lafage, PhD4; Srawish Iyer, MD5; Russel C. Huang, MD2; Darren R. Lebl, MD6; Sheeraz A. Qureshi, MD, MBA1; Han Jo Kim, MD1; Kern Singh, MD2; Todd J. Albert, MD1

1Hospital for Special Surgery, New York, NY, US; 2New York, NY, US; 3Rush University Medical Center, Dept of Neuro Surgery, Chicago, IL, US

**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.

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**93. Cost utility analysis of a combined approach for surgical correction of adult spinal deformity**

Waleed Ahmad1; Peter G. Passias, MD2; Virginie Lafage, PhD3; Renaud Lafage, MSc4; Khaled M. Kebaish, MD5; Michael P. Kelly; MD; Jeffrey L. Gum, MD4; Breton Line, BS3; Robert A. Hart, MD3; Douglas C. Burton, MD6; Justin S. Smith, MD, PhD7; Christopher P. Ames, MD8; Christopher I. Shaffrey, MD9; Frank J. Schwab, MD2; Richard A. Hostin Jr., MD10; Shay Bess, MD11,12; International Spine Study Group13


**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.

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**94. What is the difference in patient outcomes in circumferential minimally invasive (cMIS) vs open correction of adult scoliosis?**

Dean Chou, MD1; Peter G. Passias, MD2; Gregory M. Mundis Jr., MD2; Renaud Lafage, MSc3; Robert K. Eastlack, MD2; Kai-Ming G. Fu, MD, PhD1; Richard G. Fessler, MD, PhD2; Paul Park, MD3,4; Khoi D. Than, MD5; Neel Anand, MD6; Juan S. Uribe, MD11; Adam S. Kanter, MD12; Shay Bess, MD13; Eric O. Klineberg, MD14; Han Jo Kim, MD15; Richard A. Hostin Jr., MD15; Khaled M. Kebaish, MD16; Munish C. Gupta, MD17; Virginie Lafage, PhD18; International Spine Study Group18


**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.

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**95. PROMIS scores alone are not a reliable measure of patient outcomes after surgery for lumbar stenosis**

Andrew Y. Liu, MD1; Aron Sulovari, BA2; Noorullah Maqsoodi, BS3; Clifford R. Everett, MD, MPH4; Addisu Mesfin, MD5


**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.

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**96. Assessing the predictive ability of metabolic syndrome-ATP III for survival and complications in patients with metastatic spinal cord compression**

Nida Fatima, MD, MBBS1; Elie Massaad, MD2; Muhamed Hadzipasic, MD, PhD3; Ganesh M. Shankar, MD, PhD3; John H. Shin, MD

1Department of Neurosurgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, US

**FDA DEVICE/DRUG STATUS:** This abstract does not discuss or include any applicable devices or drugs.
97. Complications following adult spinal deformity impact length of stay and are driven by intervention severity and can be predicted using a weighted score
Eric O. Klineberg, MD1; Renaud Lafage, MSc2; Virgínia Lafage, PhD2; Justin S. Smith, MD, PhD3; Christopher I. Shaffrey, MD4; Gregory M. Mundis Jr., MD5; Han Jo Kim, MD6; Munish C. Gupta, MD7; Christopher P. Ames, MD7; Peter G. Passias, MD8; Themistocles S. Protopsaltis, MD9; Douglas C. Burton, MD10; Frank J. Schwab, MD11; Shay Bess, MD11; International Spine Study Group12
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

98. Rapid recovery pathway utilizing intrathecal morphine decreases overall hospital costs and improves quality of care in adolescent idiopathic scoliosis
Vishal Sarwahi, MD1; Sayyida S. Hasan, BS2; Benita Liao, MD3; Jesse M. Galina, BS4; Terry D. Amaral, MD5; Yungtai Lo, PhD6; Aaron M. Atlas, BS7; Michelle Kars, MD8
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

99. Radiographic assessment of fusion: a comparison of interbody spacers, following anterior cervical decompression and fusion
Tianna Bennett, BS1; Karen Weissmann, MD2; Renaud Lafage, MSc3; Jonathan Elysee3; Basel Sheikh Alshabab, MD4; Virgínia Lafage, PhD5; Russel C. Huang, MD5; Han Jo Kim, MD5; Darren R. Lebl, MD5; Todd J. Albert, MD1
1New York, NY, US; 2Fundacion medica san cristobal, Santiago, Region metropolitana, Chile; 3Hospital for Special Surgery, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

100. Participation in bundled payments in spine surgery was associated with lower readmission rates: the one-year BPCI-Advanced experience
Natalie Glass, PhD1; Ashley Bell, BS2; Andrew J. Pugely, MD2
1University of Iowa Hospitals & Clinics, Iowa City, IA, US; 2University of Iowa, Iowa City, IA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

101. Prospective evaluation of degenerative cervical myelopathy in asymptomatic patients over 60 years
Ryan M. Schiedo, MD1; Ankur Naranj, MD2; Samuel Adams, MD2; Sara Holmes, MS3; Lettiero Politi, MD3; Patrick J. Connolly, MD3; Michael Stauff, MD1
1University of Massachusetts Memorial Medical Center, Worcester, MA, US; 2University of Massachusetts Medical School, Worcester, MA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

102. The gait deviation index as an indicator of gait abnormality among degenerative spinal pathologies
Damon E. Mar, PhD1; Isador H. Lieberman, MD, FRCSC, MBA2; Ram Haddas, PhD, MSc, MEng1
1Texas Back Institute, Plano, TX, US; 2Scoliosis and Spine Tumor Center, Texas Back Institute, Texas Health Presbyterian Hospital Plano, Plano, TX, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

103. Discharge to subacute rehabilitation is a predictor of wound complications after spine surgery
Daniel Bowles, MD1; Jose A. Canseco, MD, PhD2; Nicholas Semenza, BS3; Ariana Reyes, MD4; Parthik Patel, MD5; Fortunato Padua, MD, MSc6; D. Greg Anderson, MD7; Mark F. Kurd, MD8; Alan S. Hilibrand, MD9; Christopher K. Kepler, MD, MBA9; Alexander R. Vaccaro, MD, PhD10; Gregory D. Schroeder, MD11
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

104. At-risk tackling techniques in American football
Rex A. Marco, MD; Rachel Bratescu, MD
Houston Methodist Orthopedics & Sports Medicine, Houston, TX, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

105. ALIF generates better correction of the fractional lumbar curve vs posterior instrumentation alone in spinal deformity fusion to the pelvis
Benjamin J. Geddes, MD1; Steven D. Glassman, MD1; Tino Mkorombindo, BS2; Jonathan Gardner2; Leah Y. Carreon, MD, MSc1
1Norton Leatherman Spine Center, Louisville, KY, US; 2Louisville, KY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
106. Predictive probability of the global alignment and proportion score for the development of mechanical failure following adult spinal deformity surgery in Asian patients

Mitsuru Yagi, MD, PhD; Satoshi Suzuki, MD; Naobumi Hosogane, MD, PhD; Ejiro Okada, MD; Osahiko Tsuji, MD, PhD; Naruhito Nagoshi, MD, PhD; Nobuyuki Fujita, MD; Masaya Nakamura, MD, PhD; Morio Matsumoto, MD; Kota Watanabe, MD

1Department of Orthopedic Surgery, Keio University School of Medicine, Tokyo, Japan; 2Keio University, Tokyo, Japan; 3Kyorin University, Mitaka, Tokyo, Japan; 4Saiseikai Central Hospital, Tokyo, Japan; 5Saitama, Japan; 6Toronto Western Hospital, Toronto, ON, Canada; 7Fujita Health Univ., Aichi, Japan; 8Keio University School of Medicine, Tokyo, Japan; 9Keio University, Keio, Japan

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

107. Effect of osteoporosis and bisphosphonate on reoperations in adult spinal deformity

Waleed Ahmad; Joshua Bell, MD; Katherine E. Pierce, BS; Sara Naessig, BS; Frank A. Segredo, BS; Shaleen N. Vira, MD; Virginie Lafage, PhD; Carl B. Paulino, MD; Andrew J. Schoenfeld, MD; Bassel G. Diebo, MD; Hamid Hassanzadeh, MD; Peter G. Passias, MD

1New York, NY, US; 2University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 3NYU Spine Research Lab, New York, NY, US; 4NYU Langone Hospital, New York NY, US; 5NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 6Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 7Hospital for Special Surgery, New York, NY, US; 8SUNY Downstate Medical Center, Brooklyn, NY, US; 9B Brigham and Women's Hospital, Boston, MA, US; 10Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 11University of Virginia, Department of Orthopedic Surgery, Charlottesville, VA, US; 12NY Spine Institute, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

108. A novel bone graft has higher fusion rate than local autologous bone in stand-alone posterolateral fusion: a propensity score adjusted analysis

Scott D. Daffner, MD; Joshua Bunch, MD; Howard S. An, MD; Douglas C. Burton, MD; Robert. Milam IV, MD; Daniel K. Park, MD; Peter G. Whang, MD, FACS; K. Brandon Strenge, MD; John Jones, MA, MS

1West Virginia University School of Medicine, Morgantown, WV, US; 2University of Kansas Medical Center, Kansas City, KS, US; 3Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US; 4OrthoCarolina Spine Center, Charlotte, NC, US; 5Southfield, MI, US; 6Yale University - School of Medicine, New Haven, CT, US; 7The Orthopaedic Institute of Western Kentucky, Paducah, KY, US; 8Bioventus LLC, Durham, NC, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

109. Radiographic predictors of indirect neural decompression in minimally invasive transposas lateral interbody fusion

Corey Walker, MD; Jakub Godzik, MD; Jay D. Turner, MD, PhD; Juan S. Uribe, MD

1Barrow Neurological Institute, Phoenix, AZ, US; 2Phoenix, AZ, US; 3Barrow Brain and Spine, Phoenix, AZ, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

110. Clinical significance of lateral pedicle screw malposition in the lumbar spine

Isabel C. Smith, BS; Samuel W. Golenbock, MSc; Raymond Hwang, MD, MS, MBA; Gyu Ho Lee, MA; Jeffrey Fischgrund, MD; Kevin Baker, PhD; Daniel K. Park, MD; Paul M. Arnold, MD; Rick C. Sasso, MD; David H. Kim, MD

1New England Baptist Hospital, Boston, MA, US; 2New England Baptist Hospital, New England Orthopedic and Spine Surgery, Chestnut Hill, MA, US; 3Cahn School of Medicine at Mount Sinai, New York, NY, US; 4Franklin, MI, US; 5Beaumont Health, Royal Oak, MI, US; 6Southfield, MI, US; 7Carle Foundation Hospital, Urbana, IL, US; 8Indiana Spine Group, Carmel, IN, US; 9Tufts University Medical Group, NEBH, Boston, MA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

111. Drivers of cost in primary single-level lumbar fusion surgery

Raymond Hwang, MD, MS, MBA; Samuel W. Golenbock, MSc; David H. Kim, MD

1New England Baptist Hospital, New England Orthopedic and Spine Surgery, Chestnut Hill, MA, US; 2New England Baptist Hospital, Boston, MA, US; 3Tufts University Medical Group, NEBH, Boston, MA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

112. Degenerative disc disease and isthmic spondylolisthesis have similar outcomes after L5-S1 ALIF

Bryce Basques, MD, MHS; Garrett Harada, MD; Sapan D. Gandhi, MD; Samuel Rudisill, BS; Zakariah Syajai, BS; Omar Alam, MD; Frank M. Phillips, MD

1Thomas Jefferson University, Philadelphia, PA, US; 2Los Angeles, CA, US; 3Rush University Medical Center, Chicago, IL, US; 4Midwest Orthopedics at Rush, Chicago, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

113. Lumbar discectomy patients who undergo reoperation experience worse clinical outcomes and greater socioeconomic burden four years after the primary procedure

Peter D. Klassen, MD; Richard Bostelmann, MD; Claudius Thome, MD, PhD

1Hospital Lingen, Lingen, Germany; 2Duesseldorf, Germany; 3Medical University Innsbruck, Innsbruck, Austria

FDA DEVICE/DRUG STATUS: Barricaid Annular Closure Device (ACD) - p.m.A-approved (Approved for this indication)
114. Dual thread screw design provides equivalent fixation to up sized screw diameter in revision pedicle screw instrumentation

Joseph L. Laratta, MD1; Ryan Weegens, BA2; Jeffrey L. Gum, MD3; Michael J. Voor, PhD4; Leah Y. Carreon, MD, MSc1; Steven D. Glassman, MD1

1Norton Leatherman Spine, Center, Louisville, KY, US; 2University of Louisville School of Medicine, Louisville, KY, US; 3University of Louisville, Louisville, KY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

115. Preoperative factors associated with outpatient lumbar decompression surgery

Ariana Reyes, MD1; Jose A. Canseco, MD, PhD2; Daniel Bowles, MD3; Parthik Patel, MD4; Michael Chang, BA5; Mark F. Kurz, MD6; D. Greg Anderson, MD7; Alan S. Hilibrand, MD8; Christopher K. Kepler, MD, MBA9; Alexander R. Vaccaro, MD, PhD10; Gregory D. Schroeder, MD11


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

116. Decompression of far-out syndrome using unilateral biportal endoscopy: surgical techniques and clinical outcome

Man Kyu Park, MD

Parkweonwook hospital, Busan, South Korea

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

117. Zero PCA is an achievable target for postoperative rapid recovery management of AIS patients

Vishal Sarwahi, MD1; Sayyida S. Hasan, BS2; Michelle Kars, MD3; Benita Liao, MD4; Jesse M. Galina, BS5; Yungtai Lo, PhD6; Terry D. Amaral, MD7


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

118. The incremental clinical benefit of adding layers of complexity to the planning and execution of adult spinal deformity corrective surgery

Peter G. Passias, MD1; Katherine E. Pierce, BS2; Virginie Lafage, PhD3; Renaud Lafage, MSC4; Gregory M. Mundis Jr., MD5; Jeffrey L. Gum, MD6; Khaled M. Kebaish, MD7; Robert K. Eastlack, MD8; Bassel G. Diebo, MD9; Justin S. Smith, MD, PhD10; Christopher P. Ames, MD11; Christopher I. Shaffrey, MD12; Douglas C. Burton, MD13; Robert A. Hart, MD14; Shay Bess, MD15; Frank J. Schwab, MD16; Munish C. Gupta, MD17; International Spine Study Group18


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

119. Even acute preoperative opioid use before adult spinal deformity surgery associated with increased reoperations at five years

Andre Samuel, MD1; Francis C. Lovecchio, MD1; Ajay Premkumar, MD2; Avani S. Vaishnav, MBBS; Han Jo Kim, MD3; Steven J. McAnany, MD4; Sravisht Iyer, MD5; Todd J. Albert, MD6; Catherine Himo Gang, MPH7; Sheeraz A. Qureshi, MD8; Jeffrey C. Wang, MD9; Frank J. Schwab, MD10; Jeffrey

1Hospital for Special Surgery, New York, NY, US; 2New York, NY, US; 3Hospital for Special Surgery, Stamford, CT, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

120. An enhanced risk-adjustment method for defining bundled payments in complex spine surgery: an analysis of Medicare beneficiaries

Azeem T. Malik, MBBS1; Jeffery Kim, MD2; Elizabeth Yu, MD3; Safdar N. Khan, MD4

1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbus, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

121. Effects of long-term opioid vs long-term NSAID use prior to lumbar spinal fusion

Alexander Ballatori, BA1; Shane Shahrestani, MS2; Andy Ton, BS3; Xiao Chen, BA4; Zorica Buser, PhD5; Jeffrey C. Wang, MD5

1Los Angeles, CA, US; 2Yorba Linda, CA, US; 3Anaheim, CA, US; 4Keck School of Medicine, University of Southern California, Los Angeles, CA, US; 5USC Spine Center, Los Angeles, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
122. Variation in 90-day neurological complications across increasing fusion levels for posterior cervical fusion: a five-year analysis

Neil V. Shah, MD, MS; Ishaan Jain, BS; George A. Beyer, MS; Peter G. Passias, MD; Nicolas Lonjon, PhD; Nicholas H. Post, MD; Carl B. Paulino, MD; Vincent Challier, MD; Bassel G. Diebo, MD

1Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 2Brooklyn, NY, US; 3SUNY Downstate Medical Center, Brooklyn, NY, US; 4NY Spine Institute, NYU Langone Health, New York, NY, US; 5Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 6Department of Orthopedic Surgery, UTSouthwestern Medical Center, Dallas, TX, US; 7Department of Orthopedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 8NY Spine Institute, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

123. Residual foraminal stenosis and increasing levels decompressed are risk factors for postoperative C5 palsy

Robert Brenner, MD, MSc; Carolyn Stickley, BS; Eman Balouch, MD, PhD; Nicholas O’Malley, BS; Jack Zhong, BA; Carlos Leon, BS; Constance Maglaras, PhD; Ethan W. Ayres, MPH; Yong H. Kim, MD; Aaron J. Buckland, MBBS, FRACS


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

124. Enhanced recovery after surgery protocols in spine surgery: harnessing national data to identify optimal protocols

Murray Echt, MD; Jashvant Poeran, MD, PhD; Nicole Zubizarreta, MPH; Stavros G. Memtsoudis, MD, PhD; Saad B. Chaudhary, MD, MBA


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

125. High volume surgeons have better surgical outcomes and lower costs

Vishal Sarwahi, MD; Jesse M. Galina, BS; Sayyida S. Hasan, BS; Aaron M. Atlas, BS; Thomas J. Dowling III, MD; Jordan Fakhoury, DO; Yungtai Lo, PhD; Terry D. Amaral, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

126. Enhanced utility with greater number of levels treated for patient-specific, pre-contoured rods in posterior cervical fusion

Cole Bortz, BA; Katherine E. Pierce, BS; Haddy Alas, BS; Avery Brown, BS; Shaleen N. Vira, MD; Bassel G. Diebo, MD; Peter G. Passias, MD

1New York, NY, US; 2NYU Spine Research Lab, New York, NY, US; 3Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 4Department of Orthopedic Surgery, UTSouthwestern Medical Center, Dallas, TX, US; 5Department of Orthopedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 6NY Spine Institute, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

127. Preoperative optimization of modifiable frailty factors reduces risk of hospital acquired conditions in elective surgical spine patients

Katherine E. Pierce, BS; Sara Naessig, BS; Waleed Ahmad; Frank A. Segreti, BS; Shaleen N. Vira, MD; Constance Maglaras, PhD; Brooke K. O’Connell, MS; Carl B. Paulino, MD; Joshua Bell, MD; Hamid Hassanazadeh, MD; Renaud Lafage, MSc; Virginie Lafage, PhD; Tina Raman, MD; Themistocles S. Protopsaltis, MD; Aaron J. Buckland, MBBS, FRACS; Bassel G. Diebo, MD

1NYU Spine Research Lab, New York, NY, US; 2NYU Langone Hospital, New York NY, US; 3NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 4Department of Orthopedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 5SUNY Downstate Medical Center, Brooklyn, NY, US; 6University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 7University of Virginia, Department of Orthopedic Surgery, Charlottesville, VA, US; 8Hospital for Special Surgery, New York, NY, US; 9Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 10NY Spine Institute, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

128. Subacute and chronic preoperative opioid use associated with reoperations in single-level ACDF patients without myelopathy

Andre Samuel, MD; Francis C. Lovecchio, MD; Ajay Premkumar, MD; Avani S. Vaishnav, MBBS; Steven J. McNaney, MD; Saravish Iyer, MD; Han Jo Kim, MD; Todd J. Albert, MD; Catherine Himo Gang, MPH; Sheeraz A. Qureshi, MD

1Hospital for Special Surgery, New York, NY, US; 2New York, NY, US; 3Hospital for Special Surgery, Stamford, CT, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
129. GAP score with modified relative pelvic version (RPV) parameter: GAP-V score
Jeffrey Kim, MD; Woojin Cho, MD, PhD; Adam D. Nessim, BS; Ariella Applebaum, BA
Bronx, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

130. Hounsfield units (HU) on computed tomography (CT) correlates with cage subsidence after lateral lumbar interbody fusion (LLIF)
Zhuo Xi, MD, PhD; Huibing Ruan, MD; Shane Burch, MD; Vedat Deviren, MD; Sigurd H. Berven, MD; Dean Chou, MD
1Neurosurgery Department Shengjing Hospital of China Medical University, Liaoning, Shenyang, China; 2The Fourth Affiliated Hospital of Nanchang University, Jiangxi, China; 3University of California San Francisco, San Francisco, CA, US; 4UCSF, Dept of Orthopaedic Surgery, San Francisco, CA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

131. Reaching minimal clinically important difference (MCID) is not predictive of improved cost-per-QALY at two years in surgically treated adult spinal deformity patients (ASD)
Richard A. Hostin Jr., MD; Samrat Yeramaneni, MBBS, MS, PhD; Khaled M. Kebaish, MD; Emmanuel McNeely, MS, MHA; Jeffrey L. Gum, MD; Douglas C. Burton, MD; Christopher P. Ames, MD; Justin S. Smith, MD, PhD; Virginie Lafage, PhD; Breton Line, BS; Shay Bess, MD; International Spine Study Group
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

132. Does navigation make spinal fusion for adolescent idiopathic scoliosis safer? Insights from 17,400 cases from a national database
Japsimran Kaur, BS; Jayme Koltsov, PhD; Kali Tileston, MD; Ivam Cheng, MD; John S. Vorhies, MD
1Stanford, CA, US; 2Redwood City, CA, US; 3Stanford University, Redwood City, CA, US; 4Stanford University Dept. of Orthopaedic Surgery, Stanford, CA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

133. Cost effectiveness of adult lumbar scoliosis surgery: an as-treated analysis from the adult symptomatic scoliosis surgery trial with five-year follow-up
Steven D. Glassman, MD; Leah Y. Carreon, MD, MSc; Christopher I. Shaffrey, MD; Michael P. Kelly, MD; Charles H. Crawford III, MD; Elizabeth Yanik, PhD, MSc; Jon D. Lurie, MD, MS; Shay Bess, MD; Christine R. Baldus, RN; Keith H. Bridwell, MD
1Norton Leatherman Spine Center, Louisville, KY, US; 2Duke University, Durham, NC, US; 3Washington University in St. Louis, St. Louis, MO, US; 4Dartmouth College, Lebanon, NH, US; 5Denver, CO, US; 6Washington University, Department of Orthopedics, St. Louis, MO, US; 7Washington University In St. Louis School of Medicine, Saint Louis, MO, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

134. Variability in SRS 22r outcome measures in non- and operatively treated patients with adolescent idiopathic scoliosis (AIS) greater than 40°
Jared Crasto, MD; W. Timothy Ward, MD
1University of Pittsburgh Medical Center, Pittsburgh, PA, US; 2Childrens Hospital of Pittsburgh, Pittsburgh, PA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

135. Multicenter prospective assessment of outcomes and complications associated with adult spinal deformity surgery in 62 patients with severe global coronal malalignment
Thomas Buell, MD; Justin S. Smith, MD, PhD; Christopher I. Shaffrey, MD; Han Jo Kim, MD; Eric O. Klineberg, MD; Virginie Lafage, PhD; Renaud Lafage, MSc; Themistocles S. Protopsaltis, MD; Peter G. Passias, MD; Gregory M. Mundis Jr., MD; Robert K. Eastlack, MD; Vedat Deviren, MD; Alan H. Daniels, MD; Jeffrey L. Gum, MD; Alexander Soroceanu, MD, MPH; D. Kojo Hamilton, MD; Munish C. Gupta, MD; Douglas C. Burton, MD; Richard A. Hostin Jr., MD; Khaled M. Kebaish, MD; Robert A. Hart, MD; Frank J. Schwab, MD; Shay Bess, MD; Christopher P. Ames, MD; International Spine Study Group
1University of Virginia Neurosurgery, Charlottesville, VA, US; 2UVA Health System, Charlottesville, VA, US; 3Duke University, Durham, NC, US; 4Hospital for Special Surgery, New York, NY, US; 5UC, Davis School of Medicine, Sacramento, CA, US; 6Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US; 8Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 9Scripps Clinic, San Diego, CA, US; 10University of California, San Francisco, San Francisco, CA, US; 11Warren Alpert Medical School of BU/RI Hospital, Providence, RI, US; 12Norton Leatherman Spine Center, Louisville, KY, US; 13University of Calgary, Calgary, Canada; 14University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 15Washington University School of Medicine, St. Louis, MO, US; 16University of Kansas Medical Center, Kansas City, KS, US; 17Southwest Scoliosis Institute, Dallas, TX, US; 18Johns Hopkins University, Baltimore, MD, US; 19Swedish Neuroscience Institute, Seattle, WA, US; 20Denver, CO, US; 21Brighton, CO, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
136. Can supine radiographs help in saving fusion levels in adolescent idiopathic scoliosis?

André Samuel, MD1; Yu-Cheng Yao, MD2; Kyle W. Morse, MD1; Virginie Lafage, PhD3; Roger F. Widmann, MD1; Han Jo Kim, MD1

1Hospital for Special Surgery, New York, NY, US; 2Taipei Veterans General Hospital, Taipei, Taiwan

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

137. Study great expectations on the novel predictor of outcome after spinal surgery

Xie En, MD

Hong Hui Hospital, Xi’an Jiaotong University College of Medicine, Xi’an, Shan Xi, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

138. Cervical radiographic parameters and patient reported outcomes following Harrington instrumentation: a minimum 35-years follow-up

Noorullah Maqsoodi, BS1; Jarren A. Section, MD2; Adan Omar, MD3; Aron Sulovari, BA4; Paul T. Rubery Jr, MD1; Emmanuel N. Menga, MD4; Addisu Mesfin, MD4

1Rochester, NY, US; 2Strong Memorial Hospital- University of Rochester, Benbrook, TX, US; 3University Of Rochester, Rochester, NY, US; 4University of Rochester School of Medicine and Dentistry, Rochester, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

139. Adoption of enhanced recovery after surgery (ERAS) protocol for lumbar fusion decreases in-hospital postoperative opioid consumption

Ehsan Jazini, MD1; Colin M. Haines, MD1; Lindsay Orosz, PA-C1; Niteesh Bharara, MD1; Thomas C. Schuler, MD, FACS1; Omar Sohail, BA4; Rita Roy, MD3; Nathan Johnson2; Leah Y. Carreon, MD, MSc3; Christopher R. Good, MD, FACS4


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

140. Complications and revision rates in minimally invasive Mazor robotic-guided vs fluoroscopic-guided spinal fusions: the MIS ReFRESH prospective comparative study

Christopher R. Good, MD, FACS1; Samuel R. Schroerlucke, MD2; Andrew F. Cannestra, MD, PhD2; Victor W. Hsu, MD4; Faisal Zahrawi, MD4; Jae Lim4; Hulanillo Villalobos, MD4; Pedro M. Ramirez, MD4; Thomas M. Sweeney II, MD, PhD5; Michael Y. Wang, MD10


FDA DEVICE/DRUG STATUS: Mazor Renaissance Robotics (Approved for this indication)

141. The influence of glycemic control as measured by hemoglobin A1c levels on complications following elective lumbar spinal fusion

Daniel Kiridly, MD, MBA1; Cesar Iturriaga, DO2; Ashna Joseph, BS3; Peter Olivares, BS4; Jesse M. Galina, BS5; Alexander M. Sartin, MD6; Jeffrey A. Goldstein, MD6; Dean C. Perfetti, MD, MPH7; Austen Katz, MD6; Jeff S. Silber, MD, DC8; David A. Essig, MD10


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

142. Effects of blood transfusions on gram-positive vs gram-negative infections in a mouse model of spine implant infection

Peter P. Hsieu, MD, Chad Ishmael, MD, Christopher Hart, MD, Clark J. Chen, BS; Kellyn R. Hori, BS; Howard Y. Park, MD; Zachary Burke, MD; Benjamin Kelley, MD; Nicholas Bernthal, MD

UCLA Department of Orthopaedic Surgery, Los Angeles, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

143. Optimization of a rat lumbar intervertebral disc degeneration model for low back pain

Stephen Stephan, MD1; Juliane Glaeser, PhD2; Wafa Tawackoli, PhD2; Lea Kanim, MA3; Derek Ju, MD6; Zachary M. NaPier, MD6; Hyun W. Bae, MD7; Dmitriy Sheyn, PhD, MSc3

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FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
144. Concordance between patients’ and surgeons’ expectations of cervical spine surgery
Roland Duculan, MD, Frank P. Cammisa, MD, Andrew A. Sama, MD; Alexander P. Hughes, MD; Darren R. Lebl, MD; Carol A. Mancuso, MD; Federico P. Girardi, MD
Hospital for Special Surgery, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

145. The impact of Michigan’s new opioid prescribing laws on spine surgery patients: analysis of the Michigan Spine Surgery Improvement Collaborative (MSSIC)
Paul Park, MD; Victor Chang, MD; Jason M. Schwalb, MD; David Nerenz, PhD; Lonni R. Schultz, PhD; Richard W. Easton, MD; Osama Kashlan, MD; Mark E. Oppenlander, MD; Ilyas Aleem, MD, MSc, FRSCC
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

146. Structural allograft vs polyetheretherketone (PEEK) implants in patients undergoing spinal fusion surgery: a systematic review and meta analysis
Nida Fatima, MD, MBBS; Elle Massaad, MD; Muhamed Hadzipasic, MD, PhD; Ganesh M. Shankar, MD, PhD, John H. Shin, MD
Department of Neurosurgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

147. Neurologic complications following adult spinal deformity and impact on health-related quality of life measures
Eric O. Klineberg, MD; Lauren Agatstein, MA; Renaud Lafage, MSc; Justin S. Smith, MD, PhD; Christopher I. Shaffrey, MD; Gregory M. Mundis Jr., MD; Han Jo Kim, MD; Munish C. Gupta, MD; Michael P. Kelly, MD; Christopher P. Arnes, MD; Peter G. Passias, MD; Themistocles S. Protopsaltis, MD; Douglas C. Burton, MD; Frank J. Schwalb, MD; Shay Bess, MD; Virginie Lafage, PhD; International Spine Study Group
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

148. Cost utility of revision surgery in cervical deformity patients with distal junctional kyphosis
Peter G. Passias, MD; Waleed Ahmad; Joshua Bell, MD; Katherine E. Pierce, BS; Sara Naessig, BS; Bassel G. Diebo, MD; Hamid Hassanzadeh, MD; Justin S. Smith, MD, PhD; Themistocles S. Protopsaltis, MD; Virginie Lafage, PhD; Christopher P. Arnes, MD
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

149. Increased risk of medical complications in patients with normal pressure hydrocephalus undergoing decompression for cervical myelopathy
Joshua Bell, MD; Lawal Labaran; Varun Puvanesarajah, MD; Micheal Raad, MD; Amit Jain, MD; Hamid Hassanzadeh, MD
1University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 2Richton Park, IL, US; 3Johns Hopkins Medicine, Baltimore, MD, US; 4Baltimore, MD, US; 5Dept of Orthopaedic Surgery, Baltimore, MD, US; 6University of Virginia, Department of Orthopedic Surgery, Charlottesville, VA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

150. Outpatient vs inpatient anterior lumbar surgery: a multisite, comparative analysis of patient safety measures
Ehsan Saadat, MD; Anthony Ma, BS; Jason M. Cuellar, MD, PhD; Patrick S. Hill, MD; Todd H. Lanman, MD; Edward K.Nomoto, MD; Stephen Stephan, MD; Michael Eng, MD; Brian Perri, DO; Albert Wong, MD; Alexandre Rasouli, MD
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

151. A cadaveric precision and accuracy analysis of augmented reality mediated percutaneous pedicle implant insertion
Camilo A. Molina, MD; Frank M. Phillips, MD; Kornelis A. Poelstra, MD, PhD; Matthew Colman, MD; Larry T. Kho, MD
1Johns Hopkins Hospital, Baltimore, MD, US; 2Midwest Orthopaedics At Rush, Chicago, IL, US; 3The Robotic Spine Institute of Silicon Valley, Los Gatos, CA, US; 4Los Angeles, CA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
152. Comparison of current health insurance provider criteria for coverage of lumbar discectomy procedures

Ari J. Holtzman, MD1,2,3; Zachary T. Sharfman, MD, MS1,2,3; Daniel Berman, MD1,2,3; Nathaniel L. Tindel, MD1,2,3

1Montefiore Medical Center, Department of Orthopedic Surgery, Bronx, NY, US; 2Jacobi Medical Center, Department of Orthopaedic Surgery, Bronx, NY, US; 3Albert Einstein College of Medicine, Bronx, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

153. Radiographic comparison between conventional laminectomy and a new technique for posterior lumbar decompression: a cadaveric study

Bo Zhang, MD1; Andrew B. Harris2; Alex Solomon, MD2; Sang-Hun Lee, MD, PhD3; Floreana K. Naef, MD4; Khaled M. Kebaish, MD4

1Johns Hopkins Medicine, Baltimore, MD, US; 2Johns Hopkins University, Department of Radiology, Baltimore, MD, US; 3Johns Hopkins University, Dept. of Orthopedic surgery, Baltimore, MD, US; 4Johns Hopkins University, Baltimore, MD, USA

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

154. The use of autologous free vascularized fibula grafts in reconstruction of the mobile spine following tumor resection: illustrated surgical technique and outcomes

Michiel Bongers, MD1; Paul T. Ogink, MD2; Brett D. Rosenthal, MD; Joseph H. Schwab, MD2

1Boston, MA, US; 2Orthopaedic Spine Center, Boston, MA, US; 3Massachusetts General Hospital, Boston, MA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

155. Safer way for vertebroplasty under fluid mechanics theory

Hsuan Yu Chen, MD1,2,3; Yen-Po Lin, MD3; Han Ying Wang, MD3; Feng Huei Lin, PhD1; Po-Quang Chen, MD, PhD3; Ding-cheng Chan, MD, PhD, FACP3; Tze Hong Wong, MD, PhD3; Ming-Hsiao Hu, MD, PhD3

1Institute of Biomedical Engineering, National Taiwan University, Taipei, Taiwan; 2Department of Orthopedic Surgery, National Taiwan University Hospital, Hsin-Chu Biomedical Park Branch, Taipei, Taiwan; 3Department of Orthopedic Surgery, National Taiwan University Hospital, Hsin-Chu Branch, Taipei, Taiwan; 4Department of Orthopedic Surgery, National Taiwan University Hospital, Taipei, Taiwan; 5National Taiwan University Hospital Chu-Tung Branch, Hsinchu County, Taiwan

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

156. Operative vs nonoperative treatment for adult symptomatic lumbar scoliosis at 5-6-year follow-up: outcomes and impact of related serious adverse events

Justin S. Smith, MD, PhD1; Michael P. Kelly, MD; Elizabeth Yanik, PhD, MSc2; Christine R. Baldus, RN3; Thomas Buell, MD,4; Jon D. Lurie, MD, MS5; Charles Edwards Sr., MD6; Steven D. Glassman, MD7; Lawrence G. Lenke, MD7; Cheneba Boachie-Adjei, MD8; Jacob M. Buchowski, MD, MS9; Leah Y. Carreon, MD, MSc10; Charles H. Crawford III, MD11; Stephen J. Lewis, MD12; Stefan Parent, MD; Virginie Lafage, PhD13; Munish C. Gupta, MD14; Han Jo Kim, MD15; Christopher P. Ames, MD16; Shay Bess, MD17; Frank J. Schwab, MD18; Christopher I. Shaffrey, MD19; Keith H. Bridwell, MD20; International Spine Study Group21


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

157. Do cells matter? In vitro and in vivo analysis of autograft viability

Gregory M. Mundis Jr., MD1; Frank Vizesi, PhD, PhD2; Nick Russell, PhD3; Jiawei He, PhD3

1Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 2SeaSpine, Carlsbad, CA, US; 3Carlsbad, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

158. The effects of a single injection of NTO-101 upon neurotrophin expression in a canine model of degenerative disc disease

William Mark Erwin, DC, PhD1; Ajay Matta, PhD2; Muhammad Zia Karim, DVM2; Hoda Gerami, BS2; Bettina Zoe Benigno, BS2

1Dept of Surgery, Univ of Toronto, Toronto, ON, Canada; 2Notogen, Toronto, ON, Canada

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
**159. Efficacy of surgical decompression in patients with cervical spondylotic myelopathy results of the Canadian prospective multi-center study**

Mohammed Karim, MD¹; Bradley Jacobs, MD, FRCSC; Michael G. Johnson, MD, FRCSC; Christopher S. Bailey, MD, FRCSC; Sean D. Christie, MD; Jérôme Paquet, MD, FRCSC; Andrew Nataraj, MSc, MD, FRCSC; David W. Cadotte, MD, PhD; Jefferson Wilson, MD, PhD, FRCSC; Neil A. Manson, MD, FRCSC; Hamilton Hall, MD, FRCSC; Kenneth C. Thomas, MD, FRCS; Raja Y. Rampersaud, MD, FRCSC; Greg McIntosh, BS; Charles G. Fisher, MD, FRCSC, MHS; Nicolas Dea, MD, MSc, FRCSC

¹Combined Neurosurgery and Orthopaedic Spine Program, University of British Columbia, Vancouver, BC, Canada; ²Department of Clinical Neurosciences, Division of Neurosurgery, Department of Radiology, Hotchkiss Brain Institute, University of Calgary, Calgary, AB, Canada; ³Department of Surgery, Section of Orthopaedics and Neurosurgery, University of Manitoba, Winnipeg, MB, Canada; ⁴Department of Surgery, Western University, London, ON, Canada; ⁵Division of Neurosurgery, Dalhousie University, Halifax, NS, Canada; ⁶Department of Orthopaedics, Centre Hospitalier Universitaire de Québec, Quebec, QC, Canada; ⁷Division of Neurosurgery, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada; ⁸Division of Neurosurgery, Department of Surgery, University of Toronto, Toronto, ON, Canada; ⁹Canada East Spine Centre, Saint John Regional Hospital, Saint John, NB, Canada; ¹⁰Department of Surgery, University of Toronto, Toronto, ON, Canada; ¹¹Division of Orthopaedic Surgery and Neurosurgery, Department of Surgery, University of Toronto, Toronto, ON, Canada; ¹²Canadian Spine Society, Toronto, ON, Canada

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

**160. Fusion for fracture has no place in a lumbar fusion bundled payment model: an analysis of Medicare beneficiaries**

Azeeem T. Malik, MBBS¹; Khaled Himed, BS²; Joseph Drain, MD²; Elizabeth Yu, MD²; Jeffery Kim, MD¹; Safdar N. Khan, MD¹

¹The Ohio State University Wexner Medical Center, Columbus, OH, US; ²Columbus, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

**161. Cervical disc replacement using a PEEK-on-ceramic implant: prospective data from seven sites participating in an FDA IDE trial for single-level surgery**

Domagoj Coric, MD¹; Richard D. Guyer, MD²; Cameron N. Carmody, MD³; Rick C. Sasso, MD⁴; Michael J. Musacchio, MD⁵; Hyun W. Bae, MD⁶; Donna D. Ohnmeiss, PhD⁷


FDA DEVICE/DRUG STATUS: Simplify (Investigational/Not approved)

**162. Two-level cervical disc replacement using a PEEK-on-ceramic device: prospective outcome data from an FDA IDE trial**

Domagoj Coric, MD¹; Richard D. Guyer, MD²; Pierce D. Nunley, MD³; K. Brandon Strenge, MD⁴; Donna D. Ohnmeiss, PhD⁵

¹Carolina Neurosurgery & Spine Associates, Charlotte, NC, US; ²Center for Disc Replacement at Texas Back Institute, Plano, TX, US; ³Spine Institute of Louisiana, Shreveport, LA, US; ⁴The Orthopaedic Institute of Western Kentucky, Paducah, KY, US; ⁵Texas Back Institute, Plano, TX, US

FDA DEVICE/DRUG STATUS: Simplify disc (Investigational/Not approved)

**163. Predicting severe clinically relevant distal junctional kyphosis development following adult cervical deformity surgery with further distinction from mild asymptomatic episodes**

Peter G. Passias, MD¹; Sara Naessig, BS²; Virginie Lafage, PhD³; Renaud Lafage, MSc⁴; Bassel G. Diebo, MD⁵; Themistocles S. Protopsaltis, MD⁵; Han Jo Kim, MD⁶; Robert K. Eastlack, MD⁶; Alexandra Soroceanu, MD, MPH⁷; Eric O. Klineberg, MD⁸; Robert A. Hart, MD⁹; Douglas C. Burton, MD¹⁰; Shay Bess, MD¹¹; Frank J. Schwab, MD¹²; Christopher I. Shaffrey, MD¹²; Justin S. Smith, MD, PhD¹²; Christopher P. Ames, MD¹⁴; International Spine Study Group¹⁵


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

**164. Development and validation of machine learning algorithms for predicting mortality following surgery for metastatic spine tumors: metastatic mortality scoring system (MMS)**

Nida Fatima, MD, MBBS¹; Hui Zheng, PhD²; Elie Massaad, MD¹; Muhamed Hadzipasic, MD, PhD¹; Ganesh M. Shankar, MD, PhD¹; John H. Shin, MD¹

¹Department of Neurosurgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, US; ²Department of Bio Statistics, Massachusetts General Hospital, Harvard Medical School, Boston, MA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
165. Impact of a centralized spinal orthoses program on cost of care in the hospital setting

Susan Willey, MS, PT; James Lenk, BS, MPT; Linda Waters, PT; Jonathan Cayce, PhD, MS; Charles French, MBA

1Ascension Via Christi, Wichita, KS, US; 2DeRoyal Industry, Powell, TN, US

FDA DEVICE/DRUG STATUS: DeRoyal Spinal Orthoses (Approved for this indication)

166. Effectiveness of epidural amniotic fluid injection for low back pain

Glenn R. Buttermann, MD; Louis C. Saeger, MD; Matthew G. Thorson, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

167. Validation of the ACS-NSQIP risk index in a prospective, multicenter adult spinal deformity database

Katherine E. Pierce, BS; Peter G. Passias, MD; Virginie Lafage, PhD; Renaud Lafage, MSc; Gregory M. Mundis Jr., MD; Juan S. Uribe, MD; Han Jo Kim, MD; Themistocles S. Protopsaltis, MD; Alan H. Daniels, MD; Robert A. Hart, MD; Douglas C. Burton, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Christopher P. Ames, MD; Justin S. Smith, MD, PhD; Shay Bess, MD; Eric O. Klineberg, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

168. Factors associated with the failure to meet 90-day estimated survival after the surgical treatment of spinal metastases

Eric Vess, MD; Matthew St. John, MD, MS, Noorullah Maqsoodi, BS; Caroline P. Thirukumaran, MBBS, MHA, PhD; Addisu Mesfin, MD

University of Rochester, Department of Orthopaedics, Rochester, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

169. To prevent PJK in Scheuermann’s Kyphosis restore kyphosis to patient’s PI value and choose proximal UV

Vishal Sarwahi, MD; Jesse M. Galina, BS; Sayyida S. Hasan, BS; Jeffrey A. Goldstein, MD; Alexander M. Satin, MD; Yungtae Lo, PhD; Terry D. Amaral, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

170. Radiculitis: assessing the risk of biologic use in minimally invasive transforaminal lumbar interbody fusions

Carolyn Stickley, BS; Erik Wang, BA; Ethan W. Ayres, MPH; Constance Maglaras, PhD; Charla R. Fischer, MD; Jonathan R. Stieber, MD; Martin Quirno, MD; Themistocles S. Protopsaltis, MD; Peter G. Passias, MD; Aaron J. Buckland, MBBS, FRACS


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

171. Does conflict of interest affect the reported fusion rates with bone graft extenders?

Yu-Po Lee, MD; Garwin Chin, MD; Joshua Lee; Noah Zhang; Saif Aldeen Farhan, MD; P D. Kiester, MD; Charles D. Rosen, MD; Nitin N. Bhatia, MD

UC Irvine Medical Center, Orange, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

172. Assessment of spinopelvic parameters following stand alone decompression in the patients with lumbar spinal stenosis

Naveed Nabizadeh, MD; Mohammad E. Majd, MD; Sam Bemani, MD; Farshad Nikouei, MD; Hasan Ghandhari, MD

1Norton Leatherman Spine Center, Louisville, KY, US; 2Baptist Health Floyd, Indiana University, New Albany, IN, US; 3Bone and Joint Reconstruction Center, Iran University of Medical Sciences, Tehran, Iran

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

173. The timing and incidence of surgical intervention following diagnosis of lumbar disc herniation at military treatment facilities

Ashley Anderson, MD; Alfred J. Pisano, MD; Matthew Braswell, MD; Nora Watson, PhD; Melvin D. Helgeson, MD; Daniel Brooks, PhD; Scott Wagner, MD

1USU-Walter Reed National Military Medical Center, Bethesda, MD, US; 2Charlotte Medical Center, Charlotte, NC, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
174. Generic measures of frailty assessment may be inadequate for the heterogeneity of spine surgery patients; a systematic review of frailty indices used in spine surgery

Jamie R. Wilson, BA, MD, FRCS¹; Robert A. Ravinsky, MD, MPH, FRCCS²; Jetan H. Badhwala, MD³; Fan Jiang, MD⁴; Michael G. Fehlings, MD, PhD, FRCCS⁴

¹Dept of Neurosurgery, University of Nebraska Medical Center, Omaha, NE, US; ²Toronto, ON, Canada; ³Division of Neurosurgery, Department of Surgery, University of Toronto, Toronto, ON, Canada; ⁴Toronto Western Hospital, Toronto, ON, Canada

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

175. Discrepancy in patient-reported pain using the numeric pain scale and a percentage change to quantify treatment effectiveness after pain injections

Barthelemy Liabaud, MD¹; Puneet Ralhan, DO²; Sirish Khana, BS³; Andrew Beaufort, MD⁴; Joshua D. Lavian, BA⁵; Sanjeev Agarwal, MD⁵

¹SUNY Downstate, Brooklyn, NY, US; ²Desert Spine and Sports Physicians, Phoenix, AZ, US; ³SUNY Downstate Medical Center, Brooklyn, NY, US; ⁴SUNY Downstate Health Sciences University, Brooklyn, NY, US; ⁵Comprehensive Spine Center, Brooklyn, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

176. Thoracolumbar interfascial plain (TLIP) block and intrathecal fentanyl injection results in an opioid-free peri- and postoperative recovery and early ambulation after percutaneous lumbar spine surgery

Christian Morgenstern, MD, PhD, MSc¹; Carlos Rafael Ramirez Paesano, PhD, MD²; Albert Juanola, MD³; Rudolf Morgenstern, MD, PhD⁴

¹Centro Médico Teknon, Barcelona, Spain; ²Centro Médico Teknon. Dpto. Anestesia (Anestalia), Barcelona, Barcelona, Spain; ³Centro Médico Teknon., Barcelona, Barcelona, Spain; ⁴Instituto Morgenstern S.L., Esplugues de Llobregat, Barcelona, Spain

FDA DEVICE/DRUG STATUS: Fentanyl (Approved for this indication), Zalviso (Approved for this indication), Bupivacaine (Approved for this indication), Globus RISE (Approved for this indication)

177. Vertebral height restoration following painful vertebral compression fracture: an international multicenter experience using spine jack

Devin Bagace, BS, BA³; Reade De Leacy, MBBS

Mount Sinai Hospital New York, NY, US

FDA DEVICE/DRUG STATUS: SpineJack (Not approved for this indication)

178. Minimally invasive surgery mitigates but does not eliminate adverse perioperative outcomes for frail TLIF

Sara Naessig, BS¹; Katherine E. Pierce, BS²; Carlos Leon, BS³; Jack Zhong, BA⁴; Carolyn Stickley, BS⁵; Constance Maglaras, PhD⁶; Brooke K. O’Connell, MS⁷; Bassel G. Diebo, MD⁸; Claire White-Dzuro, BA⁹; Shaleen N. Vira, MD⁵; Steven Hale, MD⁶; Themistocles S. Protopsaltis, MD¹⁰; Aaron J. Buckland, MBBS, FRACS¹¹; Peter G. Passias, MD¹²


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

179. Propensity-matched analysis of 1,062 patients following minimally invasive vs open sacroiliac joint fusion

Alexander Ballatori, BA¹; Shane Shahrestani, MS²; Xiao Chen, BA³; Andy Ton, BS⁴; Jeffrey C. Wang, MD⁵; Zorica Buser, PhD⁶

¹Los Angeles, CA, US; ²Yorba Linda, CA, US; ³Anaheim, CA, US; ⁴USC Spine Center, Los Angeles, CA, US; ⁵Keck School of Medicine, University of Southern California, Los Angeles, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

180. Over reporting disc herniation in lumbar spine MRI’s performed for patients with spondylolisthesis

Hassan Semaan, MD¹; Bryan Curnutte, MD¹; Tawfik Obri, MD²; Mazzin Elsamaloty, BS³; Joud Obri, BS⁴; Hossein K. Elgafy, MD, FRCCS, MBA⁵

¹Toledo, OH, US; ²Tawfik Obri, Maurnee, OH, US; ³University of Toledo, Toledo, OH, US; ⁴Maurnee, OH, US; ⁵University of Toledo Medical Center, Toledo, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

181. Spinal shortening osteotomy as a major factor to improve associated syrinx in scoliotic patient with Chiari 1 Malformation (CM-1)

Zhi Zhao, MD¹; Yingsong Wang, MD¹; Jing-Ming Xie, MD¹; Zhiyue Shi, MD¹; Ni Bi, MD¹; Tao Li, MD¹; Quan Li, MD²; Ying Zhang, MD¹

¹Department of Orthopaedics, 2nd Affiliated Hospital of Kunming Medical University, Kunming, Yunnan Province, China; ²Kunming, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
Abstracts

182. Limited cost benefit of lateral interbody fusion (LIF) for adult spinal deformity (ASD) surgery in Japan
Tatsuya Yamamoto, MD; Mitsuru Yagi, MD, PhD; Satoshi Suzuki, MD; Osahiko Tsuji, MD, PhD; Narihito Nagoshi, MD, PhD; Eijiro Okada, MD; Nobuyuki Fujita, MD; Masaya Nakamura, MD, PhD; Morio Matsumoto, MD; Kota Watanabe, MD

1Keio University, Tokyo, Japan; 2Department of Orthopedic Surgery, Keio University School of Medicine, Tokyo, Japan; 3Saitama, Japan; 4Toronto Western Hospital, Toronto, ON, Canada; 5Saiseikai Central Hospital, Tokyo, Japan; 6Fujita Health Univ., Aichi, Japan; 7Department of Orthopedic Surgery, Keio University School of Medicine, Shinjuku, Tokyo, Japan; 8Keio University School of Medicine, Tokyo, Japan; 9Keio University, Keio, Japan

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

183. Operation is no better than nonoperative care in improving pain and disability in chronic low back pain: long term results of randomized controlled trials of western China
Xie En, MD
Hong Hui Hospital, Xi’an Jiaotong University College of Medicine, Xi’an, Shan Xi, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

184. Effect of end plate contact surface topology and structural modulus on subsidence: comparison of two 3D-printed titanium lateral interbody devices
Ali Kiapour, PhD; Puya Alikhani, MD

1Boston, MA, US; 2Tampa, FL, US

FDA DEVICE/DRUG STATUS: LSTS Lateral Fixation Device (Approved for this indication), Modulus Lateral Fixation Device (Approved for this indication)

185. A novel testing methodology to quantify multidirectional flexibility properties of the lumbar spine
Daina M. Brooks, BS; Bryan W. Cunningham, PhD; Mohit M. Kukreja, MD, MS, DNB; Kenneth Mullinix, BS; Nicholas Rolle, BS; P. Justin Tortolani, MD

1Medstar Union Memorial Hospital, Baltimore, MD, US; 2Audubon, PA, US; 3Baltimore, MD, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

186. Comparison of a 3D printed truss-based lateral interbody device to an annular lateral interbody device for resistance to subsidence: a cadaveric study
Ali Kiapour, PhD; Vijay K. Goel, PhD; Puya Alikhani, MD

1Boston, MA, US; 2University of Toledo, Toledo, OH, US; 3Tampa, FL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

187. Compared to gold standard bone SPECT/CT showed superior accuracy in detecting pseudarthrosis
Richard W. Easton, MD; Nai-Wei Chen, PhD; Matthew Lipphardt, MD; Truman Silvasi, MD; Cecile Pestano, RN, BSN, CCRP


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

188. The safety and efficacy of hydrogen peroxide in controlling blood loss and surgical site infection after multi-segmental lumbar spine surgery: a retrospective, case-controlled study of 2,626 patients
Jun-Song Yang, MD; Peng Liu, MD; Tuan-Jiang Liu, MD; Ding-Jun Hao, MD

1Department of Spine Surgery, Honghui Hospital, Xi’an Jiaotong University, Xi’an, China; 2Honghui Hospital, Xi’an Jiaotong University, Xi’an, Shaanxi, China; 3Xi’an, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

189. Spinal stenosis grading in magnetic resonance imaging using deep convolutional neural networks
Suk-Joong Lee, MD; Hyun-Joo Lee, MD, PhD

1Dongsan Medical Center, Keimyung University, Daegu, Republic of Korea; 2Kyungpook National University Hospital, Daegu, Republic of Korea

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

190. Assessing the impact of surgical and patient factors on recovery kinetics after ASD surgery
Brian J. Neuman, MD; Rahul Sachdev, BS; Emmanuel McNeely, MS, MHA; Eric O. Klineberg, MD; Peter G. Passias, MD; Themistocles S. Protopsaltis, MD; Justin S. Smith, MD, PhD; Christopher P Arnes, MD; Shay Bess, MD; Khaled M. Kebaish, MD; International Spine Study Group


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
191. Multiple revision surgeries are associated with reduced patient satisfaction in adult spinal deformity

Wesley M. Durand1; Alan H. Daniels, MD2; Renaud Lafage, MSc3; Peter G. Passias, MD4; Han Jo Kim, MD5; Thermostocles S. Protopsaltis, MD6; Virginie Lafage, PhD7; Justin S. Smith, MD, PhD8; Christopher I. Shaffrey, MD9; Munish C. Gupta, MD10; Eric O. Klineberg, MD11; Frank J. Schwab, MD12; Jeffrey L. Gum, MD13; Gregory M. Mundis Jr., MD14; Robert K. Eastlack, MD15; Khaled M. Kebaish, MD16; Alexandra Soroceanu, MD, MPH17; Richard A. Hostin Jr., MD18; Douglas C. Burton, MD19; Shay Bess, MD20; Christopher P. Arnes, MD21; Robert A. Hart, MD22; D. Kojo Hamilton, MD23; International Spine Study Group24

1Brown University, Alpert Medical School, Providence, RI, US; 2Warren Alpert Medical School of BU/RI Hospital, Providence, RI, US; 3Hospital for Special Surgery, New York, NY, US; 4NY Spine Institute, NYU Langone Health, New York, NY, US; 5Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 6UVA Health System, Charlottesville, VA, US; 7Duke University, Durham, NC, US; 8Washington University School of Medicine, St. Louis, MO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10Norton Leatherman Spine Center, Louisville, KY, US; 11Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 12Scripps Clinic, San Diego, CA, US; 13Johns Hopkins University, Baltimore, MD, US; 14University of Calgary, Calgary, Canada; 15Southwest Spine Institute, Dallas, TX, US; 16University of Kansas Medical Center, Kansas City, KS, US; 17Denver, CO, US; 18University of California, San Francisco, San Francisco, CA, US; 19Swedish Neuroscience Institute, Seattle, WA, US; 20University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 21Brighton, CO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

192. Healthcare resource utilization in lumbar spine surgery for stenosis: A national claims data analysis

Jayme Koltsov, PhD1; Ivan Cheng, MD2; Kirkham B. Wood, MD3; Todd F. Alamin, MD4; Serena S. Hu, MD5

1Redwood City, CA, US; 2Stanford University, Redwood City, CA, US; 3Stanford University School of Medicine Dept of Orthopedic Surgery, Redwood City, CA, US; 4Stanford Medicine Outpatient Center, Redwood City, CA, US; 5Stanford University School of Medicine, Redwood City, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

193. Biomimetic 3D-printed titanium-alloy interbody spacers demonstrate uniform bone growth over 12 weeks

Margaret R. Van Horn, PhD1; Roland Beard, MS2; Wenhai Wang, PhD2; Bryan W. Cunningham, PhD2; Kenneth Mullinix, BS3; Brandon Bucklen, PhD4

1Globus Medical, Audubon, PA, US; 2MedStar Union Memorial Hospital, Baltimore, MD, US; 3Audubon, PA, US

FDA DEVICE/DRUG STATUS: HEDRON (Globus Medical) (Approved for this indication)

194. The fate of patients with early postoperative surgical site infections following instrumented lumbar fusion

Arya Ahmady, MD1; Zachary L. Gordon, MD2; Nicholas U. Ahn, MD3; Christina W. Cheng, MD2; Christopher G. Furey, MD3

1Ann Arbor, MI, US; 2University Hospitals Cleveland Medical Center, Dept of Orthopaedic Surgery, Cleveland, OH, US; 3University Hospital of Cleveland, Department of Orthopedic Surgery, Cleveland, OH, US; 4University Hospitals Cleveland Medical Center, Cleveland, OH, US; 5Case Western Reserve University, Cleveland, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

195. Fostering physical activity after complex lumbar spine surgery: long-term results of a randomized trial

Roland Duculan, MD, Manuela Rigaud, MS; Frank P. Carmmisa, MD; Andrew A. Sama, MD; Alexander P. Hughes, MD; Carol A. Mancuso, MD; Federico P. Girardi, MD

Hospital for Special Surgery, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

196. Reducing bioburden in the operating room: manual cleaning and pulsed-xenon ultraviolet light disinfection produces significant reduction in colony forming units

Ashley Xiong, CCRC

Mayo Clinic, Rochester, MN, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

197. In vitro and in vivo assessment of bone regeneration after local steroid administration using a rodent posterolateral fusion model

Mark A. Plantz, BS1; Abhishek S. Kannan2; Silvia Minardi, PhD, MS3; David J. Ellenbogen, BA4; Joseph G. Lyons, BS5; Jonathan Paul, MPH, BS6; Tejas Nandurkar, MS7; Parker Marsh, BS8; Kennedy Sana9; Eileen Phan, BA10; Allison Wintring, BS11; Eianna Fred12; Soyeon Jeong, MS1; Chawon Yun, PhD1; Stuart R. Stock, PhD2; Erin L. Hsu, PhD2; Wellington K. Hsu, MD1

1Northwestern University, Chicago, IL, US; 2Chicago, IL, US; 3Northfield, IL, US; 4Simpson Querrey Institute, Chicago, IL, US; 5Northwestern University Simpson Querrey Institute, Chicago, Il, US; 6University of Louisville School of Medicine, Louisville, KY, US; 7Northwestern University, Feinberg School of Medicine, Chicago, IL, US

FDA DEVICE/DRUG STATUS: rhBMP-2 (INFUSE) [non-human use] (Investigational/Not approved)
198. Chronic use of hydromorphone and oxycodone associated with reoperations after lumbar decompression and lumbar interbody fusions

Andre Samuel, MD1; Francis C. Lovechio, MD1; Ajay Premkumar, MD2; Philip Louie, MD3; Avani S. Vaishnav, MBBS, Han Jo Kim, MD; Steven J. McAnany, MD3; Srvavish Iyer, MD; Todd J. Albert, MD; Catherine Himo Gang, MPH; Sheeraz A. Qureshi, MD, MBA

1Hospital for Special Surgery, New York, NY, US; 2New York, NY, US; 3Hospital for Special Surgery, Stamford, CT, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

199. Functional outcome and long-term follow up results after surgery for spinal meningiomas: a population-based cohort study

Jenny Pettersson-Segerlind, MD1; Charles Tatter, MD2; Alexander Fletcher-Sandersjö, MD1; Oscar Persson, MD, PhD; Gustav Burstrom, MD3; Jiri Jr. Bartek, MD; Petter Förander, MD, PhD1; Erik Edström, MD, PhD4; Adrian Elmi Terander, MD, PhD1

1Karolinska University Hospital, Stockholm, Sweden; 2Patientområde Neurokirurgi, Terna Neuro, Karolinska Universitetssjukhuset, Stockholm, Sweden; 3Karolinska Institute, Stockholm, Sweden; 4Karolinska University Hospital, Dept Neurosurgery, Solna, Sweden

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

200. Comparison of freehand, fluoro-guided, CT navigation, and robot-guided TLIF and ALIF

Jack Zhong, BA1; Carlos Leon, BS2; Kimberly Ashayeri, MD3; Eaman Balouch, MD, PhD3; Nicholas O’Malley, BS4; Carolyn Stickley, BS5; Constance Maglaras, PhD5; Brooke K. O’Connell, MS6; Aaron J. Buckland, MBBS, FRACS3


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

201. The necessity and risk factors of subsequent fusion after decompression alone for lumbar spinal stenosis with lumbar spondylolisthesis: 5 years follow-up in two large populations

Hikari Urakawa, MD1; Andre Samuel, MD1; Yoshihiro Katsuura, MD1; Srvavish Iyer, MD1; Steven J. McAnany, MD2; Todd J. Albert, MD; Catherine Himo Gang, MPH1; Sheeraz A. Qureshi, MD, MBA1

1Hospital for Special Surgery, New York, NY, US; 2Hospital for Special Surgery, Stamford, CT, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

202. Hyperlordotic anterior interbody use without superior articulating process resection has an increased risk of iatrogenic neurological injury single level circumferential fusion

Kimberly Ashayeri, MD1; Leon Eisen, MD2; Themistocles S. Protopsaltis, MD3; Aaron J. Buckland, MBBS, FRACS3

1New York, NY, US; 2NYU Langone, NY, NY, US; 3Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

203. The effect of surgical decompression and fusion on functional balance in patients with degenerative lumbar spondylolisthesis

Ram Haddas, PhD, MSc, MEng1; Isador H. Lieberman, MD, FRCS, MBA2; Andrew R. Block, PhD1; Peter B. Derman, MD, MBA1

1Texas Back Institute, Plano, TX, US; 2Scoliosis and Spine Tumor Center, Texas Back Institute, Texas Health Presbyterian Hospital Plano, TX, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

204. Patient-reported outcomes in patients who stop following up: are they doing better or worse than the patients that come back?

Darren Chen, BA1; Avani S. Vaishnav, MBBS2; Steven J. McAnany, MD3; Srvavish Iyer, MD3; Todd J. Albert, MD3; Catherine Himo Gang, MPH3; Sheeraz A. Qureshi, MD, MBA3

1New York, NY, US; 2Hospital for Special Surgery, Stamford, CT, US; 3Hospital for Special Surgery, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.


Azeem T. Malik, MBBS1; Jack Xie, MS2; Joseph P. Drain, MD3; Elizabeth Yu, MD3; Safdar N. Khan, MD3; Jeffery Kim, MD1

1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbus, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

206. Additional surgery after anterior cervical discectomy and fusion vs posterior foraminotomy for single- or multilevel cervical radiculopathy

Andre Samuel, MD1; Michael E. Steinhaus, MD1; Philip Louie, MD2; Hikari Urakawa, MD2; Avani S. Vaishnav, MBBS; Steven J. McAnany, MD2; Srvavish Iyer, MD; Todd J. Albert, MD; Catherine Himo Gang, MPH1; Sheeraz A. Qureshi, MD, MBA1

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FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
207. Postmenopausal women presenting for spinal fusion surgery have abnormal microarchitecture despite normal DXA
Han Jo Kim, MD; Matthew E. Cunningham, MD, PhD; Frank J. Schwab, MD; Alexander Dash, BA; Alexandra Krez, BA; Caroline Zaworski, BA; Jonathan Harrison, BA; Brandon B. Carlson, MD, MPH; Emily M. Stein, MD

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

208. Low pelvic incidence (PI) patients are at high risk of over correction following ASD surgery
Alexandra Soroceanu, MD, MPH; Themistocles S. Protopsaltis, MD; Gregory M. Mundis Jr., MD; Justin S. Smith, MD, PhD; Michael P. Kelly, MD; Alan H. Daniels, MD; Eric O. Klineberg, MD; Christopher P. Ames, MD; Robert A. Hart, MD; Shay Bess, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Virginie Lafage, PhD; Munish C. Gupta, MD; International Spine Study Group

1University of Calgary, Calgary, Canada; 2Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 3Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 4UVA Health System, Charlottesville, VA, US; 5Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 6UC, Davis School of Medicine, Sacramento, CA, US; 7University of California, San Francisco, San Francisco, CA, US; 8Swedish Neuroscience Institute, Seattle, WA, US; 9Denver, CO, US; 10Duke University, Durham, NC, US; 11University of Kansas Medical Center, Kansas City, KS, US; 12Duke University, Durham, NC, US; 13University of California, San Francisco, San Francisco, CA, US; 14UVA Health System, Charlottesville, VA, US; 15UC, Davis School of Medicine, Sacramento, CA, US; 16Brighton, CO, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

209. Patient-specific cervical deformity corrections with consideration of associated risk: establishment of risk benefit thresholds for invasiveness based on deformity and frailty severity
Peter G. Passias, MD; Katherine E. Pierce, BS; Virginie Lafage, PhD; Renaud Lafage, MSc; Breton Line, BS; D. Kojo Hamilton, MD; Juan S. Uribe, MD; Richard A. Hostin Jr., MD; Alan H. Daniels, MD; Robert A. Hart, MD; Douglas C. Burton, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Christopher P. Ames, MD; Justin S. Smith, MD, PhD; Shay Bess, MD; Eric O. Klineberg, MD; International Spine Study Group

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

210. Development of a modified frailty index for adult spinal deformities independent of functional changes following surgical correction: a true baseline risk assessment tool
Peter G. Passias, MD; Katherine E. Pierce, BS; Virginie Lafage, PhD; Renaud Lafage, MSc; Breton Line, BS; D. Kojo Hamilton, MD; Juan S. Uribe, MD; Richard A. Hostin Jr., MD; Alan H. Daniels, MD; Robert A. Hart, MD; Douglas C. Burton, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Christopher P. Ames, MD; Justin S. Smith, MD, PhD; Shay Bess, MD; Eric O. Klineberg, MD; International Spine Study Group

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

211. Complications and outcomes in small vs large surgeries for ASD?
Themistocles S. Protopsaltis, MD; Alexandra Soroceanu, MD, MPH; Gregory M. Mundis Jr., MD; Justin S. Smith, MD, PhD; Jeffrey L. Gunn, MD; Alan H. Daniels, MD; Christopher P. Ames, MD; Robert A. Hart, MD; Shay Bess, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Virginie Lafage, PhD; Eric O. Klineberg, MD; International Spine Study Group

1Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 2University of Calgary, Calgary, Canada; 3Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 4UVA Health System, Charlottesville, VA, US; 5Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 6UC, Davis School of Medicine, Sacramento, CA, US; 7Norton Leatherman Spine Center, Louisville, KY, US; 8Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 9University of California, San Francisco, San Francisco, CA, US; 10Swedish Neuroscience Institute, Seattle, WA, US; 11Denver, CO, US; 12Duke University, Durham, NC, US; 13Hospital for Special Surgery, New York, NY, US; 14UC, Davis School of Medicine, Sacramento, CA, US; 15Brighton, CO, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
212. Operative treatment of adult spinal deformity patients with severe scoliosis: retrospective review of a prospectively collected multicenter series with minimum 2-year follow up

Thomas Buell, MD; Justin S. Smith, MD, PhD; Christopher I. Shaffrey, MD; Han Jo Kim, MD; Eric O. Klineberg, MD; Virginie Lafage, PhD; Renaud Lafage, MSc; Themistocles S. Protopsaltis, MD; Peter G. Passias, MD; Gregory M. Mundis Jr., MD; Robert K. Eastlack, MD; Vedat Deviren, MD; Michael P. Kelly, MD; Alan H. Daniels, MD; Jeffrey L. Gum, MD; Alexandra Sorocoeanu, MD, MPH; D. Kojo Hamilton, MD; Munish C. Gupta, MD; Douglas C. Burton, MD; Richard A. Hostin Jr., MD; Khaled M. Kebaish, MD; Robert A. Hart, MD; Frank J. Schwab, MD; Shay Bess, MD; Christopher P. Ames, MD; International Spine Study Group

1University of Virginia Neurosurgery, Charlottesville, VA, US; 2VA Health System, Charlottesville, VA, US; 3Duke University, Durham, NC, US; 4Hospital for Special Surgery, New York, NY, US; 5UC, Davis School of Medicine, Sacramento, CA, US; 6Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US; 8Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 9Scripps Clinic, San Diego, CA, US; 10University of California, San Francisco, San Francisco, CA, US; 11Warren Alpert Medical School of BU/RI Hospital, Providence, RI, US; 12Norton Leatherman Spine Center, Louisville, KY, US; 13University of California, San Francisco, CA, US; 14University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 15University of Washington School of Medicine, St. Louis, MO, US; 16University of Kansas Medical Center, Kansas City, KS, US; 17Southwest Scoliosis Institute, Dallas, TX, US; 18Johns Hopkins University, Baltimore, MD, US; 19Swedish Neuroscience Institute, Seattle, WA, US; 20Denver, CO, US; 21Brighton, CO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

213. Study comparing NTG-101, a growth factor-based therapy with mesenchymal stem cell (MSC) based treatment of degenerative disc disease (DDD) in preclinical rodent model

Ajay Matta, PhD; Muhammad Zia Karim, DVM; Hoda Gerami, BS; Bettina Zoe Benigno, BS; William Mark Erwin, DC, PhD

1Notogen, Toronto, ON, Canada; 2Dept of Surgery, Univ of Toronto, Toronto, ON, Canada

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

214. Viable allograft supplement for disc degeneration: measurable disc height increases at 12 months in first 24 subjects

Douglas P. Beall, MD

Clinical Radiology of Oklahoma, Edmond, OK, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

215. Outcomes with transforaminal endoscopic vs percutaneous laser decompression for contained lumbar herniated disc: A survival analysis of treatment benefit

Kai-Uwe Lewandowski, MD; Paulo T. De Carvalho, MD, PhD; Anthony T. Yeung, MD

1Center For Advanced Spinal Surgery, Tucson, AZ, US; 2UNIRIO, Rio de Janeiro, RJ, Brazil; 3Desert Institute for Spine Care, Phoenix, AZ, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

216. Contrary to popular belief, self-image in adult spinal deformity (ASD) is most correlated with physical and social function and mental health and minimally correlated with magnitude of spine deformity

Raymara Pinteric; Shay Bess, MD; Breton Line, BS; Michael P. Kelly, MD; Christopher P. Ames, MD; Gregory M. Mundis Jr., MD; Robert K. Eastlack, MD; Richard A. Hostin Jr., MD; Eric O. Klineberg, MD; Munish C. Gupta, MD; Khaled M. Kebaish, MD; Virginie Lafage, PhD; Renaud Lafage, MSc; Douglas C. Burton, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Justin S. Smith, MD, PhD; International Spine Study Group

1Brighton, CO, US; 2Denver, CO, US; 3Denver International Spine Center, Denver, CO, US; 4University of California, San Francisco, San Francisco, CA, US; 5Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 6Scripps Clinic, San Diego, CA, US; 7UC, Davis School of Medicine, Sacramento, CA, US; 8UC, Davis School of Medicine, Sacramento, CA, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10Washington University School of Medicine, St. Louis, MO, US; 11Johns Hopkins University, Baltimore, MD, US; 12Hospital for Special Surgery, New York, NY, US; 13University of Kansas Medical Center, Kansas City, KS, US; 14Duke University, Durham, NC, US; 15UVA Health System, Charlottesville, VA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

217. Outcomes of surgical treatment for patients with mild scoliosis and age appropriate sagittal alignment with minimum 2-year follow up

Justin K. Scheer, MD; Justin S. Smith, MD, PhD; Peter G. Passias, MD; Han Jo Kim, MD; Shay Bess, MD; Themistocles S. Protopsaltis, MD; Douglas C. Burton, MD; Eric O. Klineberg, MD; Virginie Lafage, PhD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Munish C. Gupta, MD; Christopher P. Ames, MD; International Spine Study Group


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
218. Preoperative opioid use is associated with increased readmission and reoperation rates following lumbar decompression, instrumentation and fusion

Alex Mierke, MD1; Jun Ho Chung2; Wayne K. Cheng, MD3; Olumide A. Danisa, MD2
1Loma Linda University, Loma Linda, CA, US; 2Loma Linda University School of Medicine, Loma Linda, CA, US; 3University of Chicago Medical Center, Chicago, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

219. Transforminal lumbar interbody fusion may prevent early postoperative pedicle screw loosening

David H. Kim, MD1; Raymond Hwang, MD, MS, MBA2; Gyu Ho Lee, MA3; Riya Joshi, MBBS, MPH4; Kevin Baker, PhD5; Paul M. Arnold, MD6; Rick C. Sasso, MD7; Daniel K. Park, MD8; Jeffrey Fischgrund, MD9

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

220. The cross-sectional area of psoas muscle impacts functional outcomes of MI-TLIF for lumbar degenerative diseases

Hikari Urakawa, MD1; Kosuke Sato, MD2; Avani S. Vaishnav, MBBS3; Ryan Lee, MBA4; Chirag Chaudhary, MS, MBBS5; Yoshihiro Katsuura, MD1; Steven J. McAnany, MD6; Sravisht Iyer, MD1; Todd J. Albert, MD1; Catherine Himo Gang, MPH7; Sheeraz A. Qureshi, MD, MBA1
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FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

221. Change in sagittal alignment after decompression alone in patients with lumbar spinal stenosis: a prospective cohort study

Jamal Bech Bouknaitir, MD1; Leah Y. Carreon, MD, MSc2; Stig Borson, MD, PhD2; Mikkel Andersen, MD4
1Zealand University Hospital, Koege, Denmark; 2Sygehus Lillebaelt - Rygkirurgi Middelfart, Middelfart, Middelfart, Denmark; 3Zealand University Hospital, Dept. of Orthopaedic Surgery, Koege, Denmark; 4Middelfart, Denmark

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

222. Metabolic bone mineralization disorders (MBD) increase 2-year adverse outcome following lumbar short fusion for degenerative lumbar disease

Bassel G. Diebo, MD1; George A. Beyer, MS2; Neil V. Shah, MD, MS3; Hallie Tiberzi, BA3; Adam J. Wolfert, BA4; Salem Najjar, BA4; Renaud Lafage, MSc5; Frank A. Segreto, BS6; Peter G. Passias, MD7; Frank J. Schwab, MD8; Virginie Lafage, PhD9; Carl B. Paulino, MD2
1Department of Orthopedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 2SUNY Downstate Medical Center, Brooklyn, NY, US; 3Staten Island University Hospital, Staten Island, NY, US; 4Zucker School of Medicine at Hofstra/Northwell, Hempstead, NY, US; 5Hospital for Special Surgery, New York, NY, US; 6NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

223. Development and validation of a novel scoring tool for predicting facility discharge after elective posterior lumbar fusion

Garrett Harada, MD1; Bryce Basques, MD, MHS2; Dino Samartzis, ScD, PhD, MSc3; Edward J. Goldberg, MD4; Matthew Colman, MD4; Howard S. An, MD5
1Los Angeles, CA, US; 2Thomas Jefferson University, Philadelphia, PA, US; 3Queen Mary Hospital, Hong Kong, Hong Kong; 4Midwest Orthopedics at Rush, Chicago, IL, US; 5Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

224. The utility of neuromonitoring in cervical myelopathy patients

Jason Bryman, MD1; Kristen Combs, MD2; Robert Kay, MD1; Adam Taylor, MD2; Erik Tye, MD2; Kevin W. Rolfe, MD, MPH4
1Harbor UCLA Medical Center, Torrance, CA, US; 2Torrance, CA, US; 3Harbor UCLA Medical Center, Redondo Beach, CA, US; 4Downey, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

225. Severity of cervical disc degeneration and health-related quality of life outcomes following anterior cervical discectomy and fusion

Parthik Patel, MD1; Jose A. Canseco, MD, PhD2; Michael Markowitz, DO3; Daniel Campbell, BS4; Lauren Thaete4; Joseph K. Lee, MD5; Mark F. Kurd, MD6; D. Greg Anderson, MD7; Alan S. Hillibrand, MD8; Christopher K. Kepler, MD, MBA9; Alexander R. Vaccaro, MD, PhD4; Gregory D. Schroeder, MD7

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
226. Sequential correction of the severe and rigid thoracic kyphoscoliosis: a new technical note and preliminary results
Cao Yang, MD
Wuhan, China
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

227. Is the axial spinal cord classification predictive of intraoperative neurologic alert for pediatric scoliosis patients? A validation study
Smitha Mathew, MD; Todd Milbrandt; William J. Shaughnessy, MD; Anthony A. Stans, MD; Annalise N. Larson, MD
Mayo Clinic, Rochester, MN, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

228. A predictive model of perioperative myocardial infarction in spine surgery
Peter G. Passias, MD; Katherine E. Pierce, BS; Sara Naessig, BS; Waleed Ahmad; Cheongeon Oh, PhD; Erik Wang, BA; Bassel G. Diebo, MD
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

229. Comparative analysis of 30-day readmission, reoperation, and morbidity between lumbar disc arthroplasty performed in the inpatient and outpatient settings utilizing the 2005-2018 ACS-NSQIP datasets
Austen Katz, MD; Dean C. Perfetti, MD, MPH; Alan Job, MD; Michael Fitzgerald, MD; Jeffrey A. Goldstein, MD; Daniel Kiridly, MD, MBA; Alexander M. Satin, MD; David A. Essig, MD
Northwell Health Orthopedics, Long Island Jewish Medical Center, Queens, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

230. Racial and ethnic variation in sagittal spinopelvic parameters in an urban setting
Woojin Cho, MD, PhD; Sandip Tarpada, BA; Dongyoung Kim, BS; Brittany A. Oster, BS; Hyun Jin Lim, BA
1Bronx, NY, US; 2Englewood Cliffs, NJ, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

231. The use of fusion mass screws in revision spinal deformity surgery: preliminary results and analysis
Ashish Mittal, MD; Alexander Rosinski, MS; Khalid Odeh, MD; Victor Ungurean, MD; Dimitry G. Kondrashov, MD
1San Francisco, CA, US; 2Chisinau, Moldova; 3San Francisco Spine Surgeons, San Francisco, CA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

232. Optimal lumbar lordosis correction for adult spinal deformity with severe sagittal imbalance in patients over age 65: role of pelvic tilt and pelvic tilt ratio
Jung-Hee Lee, MD, PhD; Ki Young Lee, MD; Sang Kyu Im, MD; Haeseong Lim, PhD; Jinsoo Kim, MD; Taesu Jang, MD; Seong Jin Cho, MD
1Kyunghee University Medical Center, Seoul, Republic of Korea; 2Department of Orthopedic Surgery, Graduate School, College of Medicine, Kyung Hee University, Seoul, South Korea; 3Seoul, South Korea; 4Seoul Medical Center, Seoul, Republic of Korea
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

233. Development of risk stratification predictive models for cervical deformity surgery
Peter G. Passias, MD; Waleed Ahmad; Cheongeon Oh, PhD; Virginie Lafage, PhD; Renaud Lafage, MSc; D. Kojo Hamilton, MD; Themistocles S. Protopsaltis, MD; Eric O. Klineberg, MD; Jeffrey L. Gurm, MD; Breton Line, BS; Robert A. Hart, MD; Douglas C. Burton, MD; Shelby Bess, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Justin S. Smith, MD, PhD; Christopher P. Arnes, MD; International Spine Study Group
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

234. Cost-effectiveness analysis of teriparatide therapy for the prevention of proximal junctional kyphosis/failure and subsequent revision after adult spinal deformity surgery
Ichiro Okano, MD; Jingyan Yang, PhD; Stephanie Salzmann, MD; Jennifer Shue, MS; Andrew A. Sama, MD; Frank P. Carmmisa, MD; Federico P. Girardi, MD; Alexander P. Hughes, MD
Hospital for Special Surgery, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
235. Evaluation of a nanosynthetic silicated calcium phosphate putty in a posterolateral rabbit spinal fusion model

William Walsh, PhD1; Rema Oliver, PhD2; Tian Wang, PhD2; Daniel Wills, DVM3; Jordan Conway3; Thomas Buckland, PhD3; Iain R. Gibson, PhD7

1Surgical and Orthopaedic Research Labs, Randwick, Marouba, Australia; 2Surgical & Orthopaedic Research Lab-UNSW, Randwick, Australia; 3Surgical & Orthopaedic Research Laboratories (SORL), Sydney, Australia; 4Surgical and Orthopaedic Research Laboratories, Level 1 Clinical Sci Bldg, Randwick, NSW, Australia; 5SIRAKOSS Limited, Aberdeen, Scotland; 6Perspective Device Consulting, Didcot, United Kingdom; 7University of Aberdeen, Aberdeen, IN, United Kingdom

FDA DEVICE/DRUG STATUS: Osteo 3 (the Nanosynthetic Silicated CaP Putty) (Investigational/Not approved)

236. Ectopic bone formation by submicron structured calcium phosphates: role of the innate immune system

Huipin Yuan, PhD1; Lukas A. van Dijk, MSC2; Joost DeBrujin, PhD3

1Bilthoven, Netherlands; 2University Medical Centre Utrecht, Utrecht, Netherlands; 3Kuros Biosciences, Bilthoven, Netherlands

FDA DEVICE/DRUG STATUS: MagnetOs Granules (Not approved for this indication)

237. Individual plates vs single plate for multi-level fixation results in superior biomechanics in anterior cervical fusion surgery

Ali Kiapour, PhD1; Elie Massaad, MD2; John H. Shin, MD2

1Boston, MA, US; 2Massachusetts General Hospital, Boston, MA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

238. Interbody spacers and instability: is there a difference in subsidence and range of motion between various cages for osteotomy techniques?

Basem Ishak, MD; Alexander Von Glinski, MD1; Clifford Pierre, MD1; Jonathan M. Mahoney, BS2; Jonathan Harris2; Evan Thai2; May Allall1; Brandon Bucklen, PhD3; Rod J. Oskouian Jr., MD4; Jens R. Chapman, MD4

1Swedish Medical Center, Seattle, WA, US; 2Globus Medical, Audubon, PA, US; 3Swedish Neuroscience Specialists, Seattle, WA, US; 4Swedish Neuroscience Institute, Seattle, WA, US

FDA DEVICE/DRUG STATUS: RISE (Globus Medical Inc.) (Not approved for this indication), SUSTAIN (Globus Medical Inc.) (Not approved for this indication), SIGNATURE (Globus Medical Inc.) (Not approved for this indication)

239. Comparison of single-position robot-assisted surgery vs conventional minimally invasive surgery following LLIF: an in vitro assessment

Themistocles S. Protopsaltis, MD1; Jeffrey J. Larson, MD2; Richard F. Frisch Jr, MD3; Kade T. Huntsman, MD3; Todd J. Lansford, MD3; Robert L. Brady, MD4; Chris Mauilucci, MD, FACS2; Gerald Hayward, BS5; Jonathan Harris6; Jorge Gonzalez2; Brandon Bucklen, PhD5

1Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 2Coeur D’Alene Spine & Brain, PLLC, Coeur D Alene, ID, US; 3Southeastern Spine Institute, Mt Pleasant, SC, US; 4Salt Lake Orthopaedic Clinic, Salt Lake City, UT, US; 5South Carolina Sports Medicine, North Charleston, SC, US; 6Coastal Orthopaedics, PC., Norwalk, CT, US; 7Tulane University School of Medicine, New Orleans, LA, US; 8Globus Medical, Inc., Audubon, PA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

240. A subtractive biomimetic titanium surface promotes bony ongrowth in an ovine lumbar interbody fusion model

Margaret R. Van Horn, PhD1; Roland Beard, MS2; Bryan W. Cunningham, PhD2; Kenneth Mullinix, BS3; May Allall1

1Globus Medical, Audubon, PA, US; 2MedStar Union Memorial Hospital, Baltimore, MD, US; 3Audubon, PA, US

FDA DEVICE/DRUG STATUS: SINTROS (Globus Medical) (Approved for this indication)

241. Pre-clinical safety and performance assessment of a novel 3D-printed HA-DBM composite scaffold using a rodent posterolateral fusion model

Mark A. Plantz, BS1; Joseph G. Lyons, BS2; Jonathan Paul, MPH, BS3; Tejas Nandurkar, MS3; Parker Marsh, BS4; James Foley, MD, PhD5; Alison Wintring, BS5; Eileen Phan, BA5; Elianna Fred6; Soyeon Jeong, MS1; Chawon Yun, PhD1; Silvia Minardi, PhD, MS1; Ramille N. Shah, PhD6; Adam E. Jakus, PhD7; Kenneth R. Blank, PhD, MS, MHA8; Robert M. Havey, MS9; Muturi Muriuki, PhD10; Avinash G. Patwardhan, PhD11; Stuart R. Stock, PhD12; Erin L. Hsu, PhD1; Wellington K. Hsu, MD1

1Northwestern University, Chicago, IL, US; 2Northfield, IL, US; 3Chicago, IL, US; 4Simpson Querrey Institute, Chicago, IL, US; 5University of Louisville School of Medicine, Louisville, KY, US; 6Northwestern University, Feinberg School of Medicine, Chicago, IL, US; 7Dimension Inx LLC, Chicago, IL, US; 8Tinley Park, IL, US; 9Edward Hines Jr. VA Hospital, Hines, IL, US; 10Forest Park, IL, US; 11Loyola University Medical Center Dept. of Orthopaedic Surgery, Wheaton, IL, US

FDA DEVICE/DRUG STATUS: rhBMP-2 (INFUSE) [non-human use] (Investigational/Not approved)
242. A national analysis on complications and readmissions for adult cerebral palsy patients undergoing primary spinal fusion surgery
Nathan J. Lee, MD; Michael Fields, BS; Kyle L. McCormick, BA; Venkat Boddapati, MD; Meghan Cerpa, MPH; Jun S. Kim, MD; Paul Park, MD; Zeeshan Sardar, MD, MSc; Ronald A. Lehman Jr, MD; Lawrence G. Lenke, MD

1Columbia University, New York, NY, US; 2New York, NY, US

2Columbia University Medical Center, New York, NY, US;
3NewYork-Presbyterian The Allen Hospital, New York, NY, US;
4The Spine Hospital -Columbia University/New York Presbyterian, New York, NY, US;
5Columbia University Department of Orthopedic Surgery, New York, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

243. Predictors of inpatient admission in the setting of anterior lumbar interbody fusion
Nathaniel Jenkins, BS, MS; James Parrish, MPH; Nadia Hrynewycz, BS; Thomas Brundage, BS; Minimally Invasive Spine Study Group; Kern Singh, MD

1Rush University Medical Center, Chicago, IL, US; 2Chicago, IL, US;
3Midwest Orthopedics at Rush, Chicago, IL, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

244. Relationship between 25-hydroxy vitamin D level and surgical site infection in spine surgery
Serena E. Liu, MD, MSc; Aron Sulovari, BA; Peter Joo, BA; Caroline P. Thirukumaran, MBBS, MHA, PhD; Addisu Mesfin, MD

1University of Rochester Medical Center, Rochester, NY, US; 2Rochester, NY, US;
3University of Rochester School of Medicine and Dentistry, Rochester, NY, US; 4University of Rochester, Rochester, NY, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

245. Predicting massive intraoperative blood loss in adult spinal deformity surgery
Alexandra Soroceanu, MD, MPH; Justin K. Scheer, MD; Themistocles S. Protopsaltis, MD; Munish C. Gupta, MD; Peter G. Passias, MD; Jeffrey L. Gum, MD; Justin S. Smith, MD, PhD; Gregory M. Mundis Jr., MD; Shay Bess, MD; Virginie Lafage, PhD; Christopher P. Arnes, MD; Eric O. Klineberg, MD;

International Spine Study Group

1University of Calgary, Calgary, Canada; 2University of California, San Francisco, San Francisco, CA, US; 3Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 4Washington University School of Medicine, St. Louis, MO, US; 5NY Spine Institute, NYU Langone Health, New York, NY, US; 6Norton Leatherman Spine Center, Louisville, KY, US; 7UVA Health System, Charlottesville, VA, US;
8Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 9Denver, CO, US; 10Hospital for Special Surgery, New York, NY, US; 11UC, Davis School of Medicine, Sacramento, CA, US; 12Brighton, CO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

246. Medical optimization after orthopedic spine and total joint arthroplasty decreases readmission
Megan Mooney, MD; Emily I. Wynkoop, MD; Anthony D. Kouri, MD; Mina B. Tanious, MD; Hossein K. Elgafy, MD, FRCS, MBA

University of Toledo Medical Center, Department of Orthopaedic Surgery, Toledo, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

247. Management of grade IV pressure ulcer with a novel negative pressure device in traumatic paraplegia subjects
Rajeshwar N. Srivastava, MD; Mukesh K. Dwivedi, PhD; Amit K. Bhagat, PhD; Saloni Raj, MPH; Lavini Raj, BS

1King George’s Medical University, Dept of Ortho Surgery, Lucknow, India; 2Department of Orthopaedic Surgery, Lucknow, India; 3Department of Orthopaedic Surgery King George’s Medical University, Lucknow, Uttar Pradesh, India

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

248. Hepatitis C virus infection as a predictor of complications and increased costs following primary lumbar fusion surgery
Chester J. Donnally III, MD; Partihk D. Patel, MD; Jose A. Canseco, MD, PhD; Kartik Shenoy, MD; Srikanth Divi, MD; Vadim Goz, MD; Abdul Arain, MD, MSc; Alexander R. Vaccaro, MD, PhD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

249. A novel posterior total joint replacement for the lumbar spine as an alternative to fusion: pilot data for the first 84 patients
John A. Sielatycki, MD; Steven C. Humphreys, MD; Marissa Koscielski, MS; Tyler Metcalf, BS; Jacquelyn S. Pennings, PhD; Robert N. Dunn, MD; Clinton J. Devin, MD; Scott D. Hodges, DO

1Center for Sports Medicine and Orthopaedics, Chattanooga, TN, US; 2Keni Spine, Soldotna, AK, US; 3Columbus, OH, US; 4Vanderbilt University Medical Center, Nashville, TN, US; 5Cape Town, Western Cape, South Africa

FDA DEVICE/DRUG STATUS: 3Spine BalancedBack Lumbar Joint Replacement (Investigational/Not approved)
250. Occurrence and clinical implications of heterotopic ossification after cervical disc arthroplasty with Prestige LP™ disc at two contiguous levels

Matthew F. Gornet, MD; Todd H. Lanman, MD; J. Kenneth Burkus, MD; Randall F. Dryer, MD; Jeffrey R. McConnell, MD; Scott D. Hodges, DO; Francine W. Schranck, RN, BSN; Guorong Ma, PhD

1 The Orthopedic Center of St. Louis, St. Louis, MO, US; 2 Beverly Hills, CA, US; 3 The Hughston Clinic, PC, Columbus, GA, US; 4 Central Texas Spine Institute, Austin, TX, US; 5 LVPQ Orthopedics and Sports Medicine, Allentown, PA, US; 6 Center for Sports Medicine & Orthopaedics, Chattanooga, TN, US; 7 SPIRITT Research, Saint Louis, MO, US; 8 Medtronic Spinal and Biologics, Minneapolis, MN, US

FDA DEVICE/DRUG STATUS: Prestige LP™ Disc, Approved for 2-level cervical disc arthroplasty in 2016 (Approved for this indication)

251. Location of the fused level does not affect the behavior of disc replacement adjacent to fusion in hybrid surgery

Tingkui Wu, MD

West China Hospital, Sichuan University, Chengdu, Sichuan, China

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

252. Kinematic response of cervical disc arthroplasty in different hybrid constructs

Jehad Zakaria, MD; Muturi Muriuki, PhD; Robert M. Havey, MS; Suguna Pappu, MD, PhD; Kenneth R. Blank, PhD, MS, MHA; Avinash G. Patwardhan, PhD

1 Mayo, IL, US; 2 Forest Park, IL, US; 3 Edward Hines Jr. VA Hospital, Hines, IL, US; 4 Department of Neurological Surgery, Maywood, IL, US; 5 Tinley Park, IL, US; 6 Loyola University Medical Center Dept. of Orthopaedic Surgery, Wheaton, IL, US

FDA DEVICE/DRUG STATUS: M6C artificial cervical disc, Orthофix, Inc (Not approved for this indication)

253. Long term outcome following percutaneous image-guided treatment of spinal synovial cysts: a population-based cohort study

Alexander Fletcher-Sandersjöö, MD; Erik Edström, MD, PhD; Åsa Kuntze-Söderqvist, MD, PhD; Per Grane, MD, PhD; Adrian Elmi Terander, MD, PhD

1 Karolinska University Hospital, Stockholm, Sweden; 2 Karolinska University Hospital, Dept Neurosurgery, Solna, Sweden

FDA DEVICE/DRUG STATUS: DepoMedrol cum lidocaine; Pfizer (Approved for this indication)

254. Minimally invasive sacroiliac joint fusion with decortication and bone grafting: 2-year clinical outcomes

Donald W. Kucharzyk, DO; Antoine Tohmeh, MD

1 DK Orthopedics, Crown Point, IN, US; 2 MultiCare Neuroscience Institute, Spokane Valley, WA, US

FDA DEVICE/DRUG STATUS: Simmetry Sacroiliac Joint Fusion System (Approved for this indication)

255. Minimally-invasive percutaneous treatments for low back pain: a randomized controlled study of thermal disc decompression vs mechanical percutaneous disc decompression

Fabrizio Vecchietti, MD; Edoardo Maria Pandolfi, MD; Fabrizio Fasoli, MD

1 Ospedale CTO Roma, Roma, Italy; 2 CTO Alesini, Roma, Italy; 3 CTO, Roma, Italy

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

256. Does patient frailty status influence recovery patterns and ultimate outcome following spinal fusion for cervical deformity?

Katherine E. Pierce, BS; Peter G. Passias, MD; Virginie Lafage, PhD; Renaud Lafage, MSC; Themistocles S. Protopsaltis, MD; Han Jo Kim, MD; Robert K. Eastlack, MD; Alan H. Daniels, MD; D. Kojo Hamilton, MD; Alexandra Soroceanu, MD, MPH; Robert A. Hart, MD; Douglas C. Burton, MD; Shay Bess, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Justin S. Smith, MD, PhD; Christopher P. Ames, MD


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

257. Persistent opioid use and resource utilization in spine surgery

Kibum Kim, PhD; Jennifer Babin, PharmD; Joseph E. Biskupiak, PhD; Mary Helen Tran, PharmD, MBA

1 University of Utah, Salt Lake City, UT, US; 2 Pacira BioSciences, Parsippany, NJ, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

258. Exploring perioperative complications of anterior lumbar interbody fusion in patients with a history of prior abdominal surgery: a retrospective cohort study

Arbaz Momin, BS; Michael P. Steinmetz, MD

1 Cleveland, OH, US; 2 Cleveland Clinic, Cleveland, OH, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
259. Hospital mark-up and outcomes following lumbar fusions: moving towards the era of transparency in prices
Azeem T. Malik, MBBS1; Joseph P. Drain, MD1; Safdar N. Khan, MD2; Jeffery Kim, MD1; Elizabeth Yu, MD2
1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbus, OH, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

260. Preoperative medical comorbidities do not affect minimum clinically important difference (MCID) for lumbar fusion in grade one spondylolisthesis
Joseph L. Laratta, MD1; Leah Y. Carreon, MD, MSc2; Avery L. Buchholz, MD, MPH3; Andrew Yew, MD4; Erica F. Bisson, MD5; Steven D. Glassman, MD6
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

261. Postoperative glycemic variability as a predictor of adverse outcomes following posterior cervical fusion
Parthik Patel, MD1; Jose A. Canseco, MD, PhD2; Fortunato Padua, MD, MSc3; Michael Chang, BA1; Daniel Bowles, MD5; Ariana Reyes, MD4; Mark F. Kurd, MD5; D. Greg Anderson, MD6; Alan S. Hilibrand, MD6; Christopher K. Kepler, MD, MBA6; Gregory D. Schroeder, MD7; Alexander R. Vaccaro, MD, PhD7
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

262. Opioid use prior to adult spinal deformity surgery is associated with decreased cost effectiveness: a matched cohort analysis
Breton Line, BS1; Shay Bess, MD2; Samrat Yamrakatani, MBBS, MS, PhD3; Richard A. Hostin Jr, MD4; Christopher P. Arnes, MD5; Virginie Lafage, PhD6; Renaud Lafage, MSc6; Douglas C. Burton, MD7; Eric O. Klenerberg, MD8; Munish C. Gupta, MD9; Michael P. Kelly, MD; Gregory M. Mundis Jr, MD10; Robert K. Eastlack, MD11; Peter G. Passias, MD12; Themistocles S. Protopsaltis, MD13; Robert A. Hart, MD14; Khaled M. Keboaish, MD15; Han Jo Kim, MD16; Frank J. Schwab, MD16; Christopher I. Shaffrey, MD16; Justin S. Smith, MD, PhD17; International Spine Study Group18
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

263. Detection of scoliosis curve flexibility by means of MRI
Naveed Nabizadeh, MD1; Mohammad E. Majd, MD2; Amir Aghaie Aghdam, MD3; Hasan Ghandhari, MD4; Farshad Nikouei, MD4
1Norton Leatherman Spine Center, Louisville, KY, US; 2Baptist Health Flyod, Clinical Professor of Indiana University, New Albany, IN, US; 3Shafa Hospital, Islamic Republic of Tehran, Iran; 4Bone and Joint Reconstruction Research Center, Iran University of Medical Sciences, Tehran, Iran
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

264. Assessment of impact of single photon emission computed tomography (SPECT) on management of degenerative cervical and lumbar disease: a multi-institution survey of spine surgeons
Ruwian Ratnayake, MD1; Gregory M. Mundis Jr, MD2; Bahar Shahidi, PT, PhD3; Behrooz A. Akbarnia, MD4; Robert K. Eastlack, MD4
1San Diego Spine Foundation, San Diego, CA, US; 2Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 3University of California San Diego, La Jolla, CA, US; 4Scripps Clinic, San Diego, CA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
265. Lumbar vertebral body Hounsfield units are associated with cage subsidence after transforaminal lumbar interbody fusion
Donald R. Fredericks Jr., MD; Alfred J. Pisano, MD; Melvin D. Helgeson, MD; Scott Wagner, MD
1Walter Reed National Military Medical Center, Bethesda, MD, US; 2North Potomac, MD, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

266. Cervical paraspinal muscle fatty degeneration does not relate to muscle cross sectional area: qualitative assessment preferable for cervical sarcopenia
Ashley Xiong, CCRC
Mayo Clinic, Rochester, MN, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

267. The impact of preventative multimodal analgesia on postoperative opioid requirement and pain control in patients undergoing lumbar fusions
Alan T. Villavicencio, MD; Sharad Rajpal, MD; Ewell L. Nelson, MD; Christopher Zielinski, PharmD; Kara D. Beasley, DO; Sigita Burneikienė, MD
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

268. Analysis of 27 adolescent idiopathic scoliosis patients corrected with patient specific rods with a minimum of 2 years follow-up
Federico Solla, MD; Antoine Laquievre, MD; Vincent Cunin, MD; Jean-Luc Clément, MD
1Paediatric Orthopaedic Surgery Unit, Lenval Children's Hospital, Nice, France; 2Paediatric Orthopaedic Surgery Unit, Academic Hospital of Caen, Caen, Calvados, France; 3Paediatric Orthopaedic Surgery Unit, Mother and Child Hospital, Lyon, France
FDA DEVICE/DRUG STATUS: UNiD Rod (Approved for this indication)

269. Clinically relevant improvement is maintained five years after surgery for spinal stenosis
Andreas K. Andresen, MD; Christian C. Stoetttrup, MD; Peter Udby, MD; Rune T. Paulsen, MD; Soren Fruensgaard, MD; Leah Y. Carreon, MD, MSc
1Spine Center of Southern Denmark, Middelfart, Denmark; 2Lillebaelt Hospital, Middelfart, Denmark; 3Zealand University Hospital, Department of Orthopedic Surgery, Køge, Zealand, Denmark; 4Lillebaelt Hospital, Middelfart, Region Syddanmark, Denmark; 5Silkeborg Central Hospital, Silkeborg, Denmark; 6Sygehus Lillebaelt - Rykirurgi Middelfart, Middelfart, Denmark
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
273. Economic burden of nonoperative treatment of adult spinal deformity

Peter G. Passias, MD1; Waleed Ahmad2; Renaud Lafage, MSc3; Virginie Lafage, PhD4; Eric O. Klineberg, MD5; Khaled M. Kebaish, MD6; Jeffrey L. Gum, MD7; Michael Kelly, MD7; Breton Line, BS8; Robert A. Hart, MD9; Douglas C. Burton, MD10; Justin S. Smith, MD, PhD11; Christopher P. Ames, MD12; Christopher I. Shaffrey, MD13; Frank J. Schwab, MD14; Richard A. Hostin Jr., MD15; Shay Bess, MD16; International Spine Study Group16


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

274. Not without my attending: a survey of public attitudes and perceptions of concurrent and overlapping surgery

Andrew Kim, MS1; Ram K. Alluri, MD2; Hyunwoo P. Kang, MD2; Jeffrey C. Wang, MD3; Raymond J. Hah, MD3

1Oak Park, IL, US; 2LAC USC, Los Angeles, CA, US; 3University of Southern California, Los Angeles, CA, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

275. Opioid use after adult spinal deformity surgery: propensity-matched comparison of Japanese versus American cohorts

Jeffrey L. Gum, MD1; Leah Y. Carreon, MD, MSc1; Mitsuru Yagi, MD, PhD2; Naobumi Hosogane, MD, PhD3; Kota Watanabe, MD4; Justin S. Smith, MD, PhD5; Christopher I. Shaffrey, MD6; Han Jo Kim, MD7; Eric O. Klineberg, MD8; Virginie Lafage, PhD9; Renaud Lafage, MSc10; Themistocles S. Protopsaltis, MD11; Peter G. Passias, MD12; Gregory M. Mundis Jr., MD13; Robert K. Eastlack, MD14; Michael P. Kelly, MD, Alan H. Daniels, MD15; Emmanuel McNeely, MS, MHA16; Alexandra Soroceau, MD, MPH17; D. Kojo Hamilton, MD18; Munish C. Gupta, MD19; Douglas C. Burton, MD16; Richard A. Hostin Jr., MD10; Khaled M. Kebaish, MD20; Robert A. Hart, MD21; Frank J. Schwab, MD21; Shay Bess, MD22; Christopher P. Ames, MD23; International Spine Study Group24

1Norton Leatherman Spine Center, Louisville, KY, US; 2Department of Orthopedic Surgery, Keio University School of Medicine, Tokyo, Japan; 3Kyorin University, Mitaka, Tokyo, Japan; 4Keio University, Keio, Japan; 5UVA Health System, Charlottesville, VA, US; 6Duke University, Durham, NC, US; 7Hospital for Special Surgery, New York, NY, US; 8UC, Davis School of Medicine, Sacramento, CA, US; 9Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 10NY Spine Institute, NYU Langone Health, New York, NY, US; 11Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 12Scripps Clinic, San Diego, CA, US; 13Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 14The Johns Hopkins Hospital, Baltimore, MD, US; 15University of Calgary, Calgary, Canada; 16University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 17Washington University School of Medicine, St. Louis, MO, US; 18University of Kansas Medical Center, Kansas City, KS, US; 19Southwest Scoliosis Institute, Dallas, TX, US; 20Johns Hopkins University, Baltimore, MD, US; 21Swedish Neuroscience Institute, Seattle, WA, US; 22Denver, CO, US; 23University of California, San Francisco, San Francisco, CA, US; 24Brighton, CO, US

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

276. Average lumbar Hounsfield units predicts osteoporosis related complications following lumbar spine fusion

Taylor Jackson, MD1; Jeffery D. St. Jeor, BS2; Ashley Xiong, CCRC1; Brett A. Freedman, MD1; Arjun S. Sebastian, MD, MSc1; Bradford L. Currier, MD1; Ahmad N. Nassr, MD1; Benjamin D. Elder, MD, PhD3


FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
277. Is adjacent segment disease following instrumented short lumbosacral fusion influenced by postoperative sagittal alignment?  
Joshua Bell, MD1; Chelsea D. Frost, MD, MS2; Minghui Huang3; Varun Puvanesarajah, MD1; Manninder S. Bhatia, DO4; Amrit Jain, MD5; Harnid Hassanazadeh, MD1; Adam L. Shimer, MD1; Francis H. Shen1  
1University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 2University of Virginia, Charlottesville, VA, US; 3Johns Hopkins Medicine, Baltimore, MD, US; 4Crozet, VA, US; 5Dept of Orthopaedic Surgery, Baltimore, MD, US  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

278. Allograft reconstructed iliac bone graft donor site remodels to viable bone and its preliminary clinical effectiveness in revision fusion  
Glenn R. Buttermann, MD1; Andrew L. Freeman2; Byron Simmons, MD3  
1Midwest Spine Institute, Stillwater, MN, US; 2Fortus Medical, Minneapolis, MN, US; 3St. Joseph’s Hospital, St. Paul, MN, US  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

279. Indications, survival and cause of death after surgery for spinal metastatic disease: a retrospective study of 1,820 patients in Sweden 2006-2016  
Christian Carwik, MD1; Claes Olerud, MD, PhD2; Yohan Robinson, MD, PhD, MBA3  
1Uppsala University Hospital, Uppsala, Sweden; 2Dept Orthopaedics, Uppsala, Uppsala, Sweden; 3Gothenburg University, Västra Frölunda, Sweden  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

280. The risk factors of respiratory complications after posterior spine deformity surgery for patients with early onset scoliosis  
Ying Zhang, MD; Yingsong Wang, MD; Jing-Ming Xie, MD1; Quan Li, MD; Tao Li, MD; Zhi Zhao, MD; Zhiyue Shi, MD; Ni Bi, MD  
Department of Orthopaedics, 2nd Affiliated Hospital of Kunming Medical University, Kunming, Yunnan Province, China  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

281. Defining spino-pelvic alignment goals for adult spinal deformity surgery that optimize outcomes by incorporating age and frailty status  
Peter G. Passias, MD1; Katherine E. Pierce, BS2; Sara Naessig, BS3; Waleed Ahmad4; Bassel G. Diebo, MD5; Renaud Lafage, MS6; Virginie Lafage, PhD7  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

282. Establishment of an individualized distal junctional kyphosis risk index taking into account radiographic and surgical components  
Peter G. Passias, MD; Sara Naessig, BS; Katherine E. Pierce, BS; Renaud Lafage, MS; Virginie Lafage, PhD; Robert K. Eastlack, MD; Alan H. Daniels, MD; Themistocles S. Protopsaltis, MD; Eric O. Klineberg, MD; Gregory M. Mundis Jr., MD; Robert A. Hart, MD; Douglas C. Burton, MD; Shay Bess, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Justin S. Smith, MD, PhD; Christopher P. Ames, MD; International Spine Study Group16  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

283. The position of the L1 vertebra relative to the gravity line does not appear to correlate with proximal junctional kyphosis following adult spinal deformity surgery with two year follow up  
Zhuo Xi, MD, PhD1; Ping G. Duan, PhD, MD2; Joshua Rivera3; Shane Burch, MD4; Sigurd H. Berven, MD5; Dean Chou, MD6  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

284. Activity goals of patients considering spine surgery: a pilot study  
Mustafa K. Manzur, MPH, MS, BS1; Yahya A. Othman2; Arjun Khorana3; Avani S. Vaishnav, MBBS; Michelle Richardson, BS4; Han Jo Kim, MD5; James C. Farmer, MD6; Russel C. Huang, MD7; Srinavish Iyer, MD8; Harvinder S. Sandhu, MD9; Todd J. Albert, MD10; Mark Fontana, PhD11; Catherine MacLean, MD, PhD12; Catherine Himo Gang, MPH13; Sheeraz A. Qureshi, MD, MBA14  
1Thomas Jefferson University, Philadelphia, PA, US; 2Weill Cornell Medicine, Qatar Foundation, Rayyan, Qatar; 3Hospital For Special Surgery, New York City, NY, US; 4Rochester, NY, US  
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
285. Choosing touched vertebrae with grade 0/1 rotation on lying down x-rays saves fusion levels, decreases risk of adding on, and prevents translation
Vishal Sarwahi, MD1; Jesse M. Galina, BS2; Sayyida S. Hasan, BS3; Aaron M. Atlas, BS4; Stephen Wendolowski5; Yungtai Lo, PhD6; Terry D. Amaral, MD6
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

286. Incidence, prognosis, and risk factors for bladder and bowel dysfunction due to incidental dural tears in lumbar microendoscopic surgery
Masahito Oshina, MD1; Yasushi Oshina, MD, PhD2
1NTT Medical Center Tokyo, Tokyo, Japan; 2University of Tokyo Hospital, Tokyo, Japan
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

287. Early postoperative physical activity predicts clinical improvement in disability 1-year following spine surgery
Hiral Master, PhD, PT, MPH1; Jacqaulyn S. Pennings, PhD1; Rogelio A. Coronado, PT, PhD1; Payton Robinette, BA1; Christine Haug, MPH, CCRP2; Richard L. Skolasky, ScD3; Lee H. Riley III, MD4; Brian J. Neuman, MD5; Joseph S. Cheng, MD, MS6; Oran S. Aaronson, MD7; Clinton J. Devlin, MD1; Stephen Wegener, PhD8; Kristin R. Archer, PhD, DPT1
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

Caleb Yeung, MD1; Andrew J. Schoenfeld, MD2; Harry M. Lightsey, IV, MD2; James D. Kang, MD3; Melvin C. Makhni, MD, MBA4
1Boston, MA, US; 2Brigham and Women’s Hospital, Boston, MA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

289. Risk of spinal surgery among individuals who have been re-vascularized for coronary artery disease
Peter G. Passias, MD1; Waleed Ahmad2; Joshua Bell, MD2; Sara Naessig, BS3; Katherine E. Pierce, BS4; Frank A. Segreto, BS5; Shaleen N. Vira, MD5; Virginie Lafage, PhD6; Bassel G. Diebo, MD7; Hamid Hassanzadeh, MD8
1NY Spine Institute, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3University of Virginia, Department of Orthopaedics, Charlottesville, VA, US; 4NYU Langone Hospital, New York NY, US; 5NYU Spine Research Lab, New York, NY, US; 6NYU Langone Medical Center - Orthopedic Hospital, Manhattan, NY, US; 7Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 8Hospital for Special Surgery, New York, NY, US; 9Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 10University of Virginia, Department of Orthopedic Surgery, Charlottesville, VA, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

290. The impact of insurance payor on hospital length of stay and discharge time in adult patients undergoing elective spine surgery
Luke Dosselman, BS1; Salah Aoun, MD2; Najib El Tecle, MD3; Brandon Lopez4; Kristen Hall, BS5; Valery Peinado Reyes, PA-C6; Emmanuel Adevyemo, BA7; Zachary Christian, BA8; Carlos A. Bagley, MD9
1Dallas, TX, US; 2UTSW, Dallas, TX, US; 3St Louis University Hospital, Saint Louis, MO, US; 4UT Southwestern, Dallas, TX, US; 5UT Southwestern Medical Center, Dallas, TX, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

291. Adjustment of the global alignment and proportion scores accounting for frailty in adult spinal deformity surgical patients
Peter G. Passias, MD1; Katherine E. Pierce, BS2; Sara Naessig, BS3; Waleed Ahmad4; Tina Raman, MD, MD5; Constance Maglaras, PhD6; Frank J. Schwab, MD7; Aaron J. Buckland, MBBS, FRACS8; Themistocles S. Protopsaltis, MD6; Bassel G. Diebo, MD7; Renaud Lafage, MSc6; Virginie Lafage, PhD9
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

292. Global Alignment and Proportion (GAP) score with modified age factor: GAP-A score
Woojin Cho, MD, PhD1; Adam D. Nessim, BS2; Jeffrey Kim, MD3; Ariella Applebaum, BA
1Bronx, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
293. The modified adult spinal deformity frailty index (mASD-Fi) is a good preoperative risk assessment tool
Katherine E. Pierce, BS1; Waleed Ahmad2; Sara Naessig, BS3; Bassel G. Diebo, MD4; Peter G. Passias, MD5
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

294. Ambulatory neuromuscular scoliosis patients have similar rates of infection, perioperative complications, and revision to adolescent idiopathic scoliosis patients
Vishal Sarwahi, MD1; Aaron M. Atlas, BS2; Jesse M. Galina, BS3; Sayyida S. Hasan, BS4; Yungtai Lo, PhD5; Marina Moguilevitch, MD6; Chhavi Katal, MD7; Terry D. Amaral, MD8
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

295. Should selective thoracic fusion be reserved for non-structural compensatory lumbar curves? Radiographic and clinical results from propensity score matched patients at minimum five year follow up
Jay S. Reidler, MD, MPH1; Scott L. Zuckerman, MD2; Andrew C. Vivas, MD3; Joseph M. Lombardi, MD4; Jun S. Kim, MD5; Meghan Cerpa, MPH6; Lawrence G. Lenke, MD7
1Johns Hopkins Hospital, Baltimore, MD, US; 2New York, NY, US; 3Columbia University Department of Orthopedic Surgery, New York, NY, US; 4Jane Och Spine Hospital, New York-Presbyterian/Allen Hospital, Columbia University Medical Center, New York, NY, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

296. Residual coronal malalignment results in less improvement in pain and disability after ASD surgery
Amit Jain, MD1; Emmanuel McNeely, MS, MHA2; Brian J. Neuman, MD3; Jeffrey L. Gum, MD4; Shay Bess, MD5; Richard A. Hostin Jr., MD6; Virginie Lafage, PhD7; Samrat Yeramaneni, MBBS, MS, PhD8; Eric O. Klineberg, MD9; Renaud Lafage, MSc9; Munish C. Gupta, MD10; Justin S. Smith, MD, PhD11; Douglas C. Burton, MD12; Peter G. Passias, MD13; Themistocles S. Protopsaltis, MD14; Khaled M. Kebara, MD15; International Spine Study Group16
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

Research Grant Award Winner Presentations

2016 Research Grant Award Winner
The severity of preoperative HbA1c and predicting postoperative complications in spine surgery
Tomoko Tanaka MD1; Toby Bradford, MD, BS2; Michael Gardner, MD3; Norman S. Litofsky, MD4
1Arkansas Children’s Hospital, Little Rock, AR, US; 2Highland Hospital, Oakland, CA, US; 3University of Missouri, Columbia, MO, US; 4UMHC Division of Neurosurgery, Columbia, MO, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

2017 Research Grant Award Winner
Real-time non-radiation-based navigation using 3D ultrasound for pedicle screw placement
Ilker Hacihaliloglu, PhD1; Michael J. Vives, MD2
1Department of Biomedical Engineering, Rutgers University, Piscataway, NJ, US; 2Department of Orthopedics, Rutgers New Jersey Medical School, Newark, NJ, US
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.
2018 Research Grant Award Winner
Epidural electrical stimulation assisted gait improvements in spinal cord injured rats using a combinatorial strategy with scaffolds, compounds, cells, and motor training
Anthony J. Windebank, MD; Ahad M. Siddiqui, PhD; Riazul Islam, MBA; Carlos Cuellar, PhD; Jodi Silvernail; Bruce Knudsen, BS, MS; Dallice Curley, BS; Tammy Strickland, MSc; Emilie Manske; Timur Latypov, MD; Shuya Zhang, BS; Priska Sumner, MD; Jarred J. Nesbitt, BS; Bingkun Chen, MD, PhD; Peter Grahn, PhD; Nicolas N. Madigan, MChB, PhD; Michael J. Yaszsmski, MD, PhD; Igor Lavrov, MD, PhD
FDA DEVICE/DRUG STATUS: Rapamycin (Approved for this indication), Oligopolyethylene glycol hydrogel scaffold, Schwann cell delivered Glial derived neurotrophic factor (GDNF) (Investigational, Not approved for this indication).

2018 Research Grant Award Winner
Nutrient supply and nucleus pulposus cell function: effects of cartilage endplate permeability and potential implications for intradiscal biologic therapy
Jason Wong, MD; Aaron Dolor, PhD; Mohamed Habib, PhD; Jeffrey C. Lotz, PhD; Aaron J. Fields, PhD
1Cedars Sinai Medical Center, Los Angeles, CA, US; 2University of California San Francisco, San Francisco, CA, US
FDA DEVICE/DRUG STATUS: Human recombinant MMP-8, Clostridium collagenase (Not approved for this indication).

Basic Science/Biologics ePosters

P1. How important is the anterior column support in a long lumbopelvic spinal fixation? An in-silico biomechanics analysis
Wooin Cho, MD, PhD; Wenhai Wang, PhD; Brandon Bucklen, PhD; Rafael De la Garza Ramos, MD; Reza Yassari, MD, MSc
1Bronx, NY, US; 2Globus Medical, Audubon, PA, US; 3Montefiore Medical Center, Department of Neurosurgery, Spine Research Group, Bronx, NY, US; 4Montefiore Medical Center, Bronx, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P2. To cross or not to cross: a biomechanical investigation of crossing cervicothoracic junction in posterior cervical laminectomy and fusion
Yaroslav J. Gelfand, MD; Jonathan Harris; Merritt Kinon, MD; Rafael De la Garza Ramos, MD; Jorge Gonzalez; Reza Yassari, MD, MSc; Brandon Bucklen, PhD
1Montefiore Medical Center, Bronx, NY, US; 2Globus Medical, Audubon, PA, US; 3Montefiore Medical Center, Department of Neurosurgery, Spine Research Group, Bronx, NY, US
FDA Device/Drug Status: QUARTEX (Globus Medical) (Approved for this indication)

P3. The impact of osteobiologic subtype selection on perioperative complications and cost in single- and multi-level lumbar spinal fusion
Shane Shahrestani, MS; Alexander Ballatori, BA; Xiao Chen, BA; Andy Ton, BS; Jeffrey C. Wang, MD; Zorica Buser, PhD
1Yorba Linda, CA, US; 2Los Angeles, CA, US; 3Anaheim, CA, US; 4USC Spine Center, Los Angeles, CA, US; 5Keck School of Medicine, University of Southern California, Los Angeles, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P4. In vitro assessment of adjustable lordotic expandable lateral interbody spacers on endplate loading and lordosis correction
Ripul R. Panchal, DO, FACS; Dhara Amin, PhD; May Allall; Jonathan Harris; Brandon Bucklen, PhD
1American Neurospine Institute, PLLC, Plano, TX, US; 2Globus Medical, Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P5. In vitro comparison of novel adjustable-lordotic expandable and static hyperlordotic lateral interbody spacers on endplate loading and lordosis correction
Ripul R. Panchal, DO, FACS; Dhara Amin, PhD; May Allall; Jonathan Harris; Brandon Bucklen, PhD
1American Neurospine Institute, Plano, TX, US; 2Globus Medical, Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P6. A roughened 3D-printed surface enhances stem cell proliferation and osteoblast differentiation
Margaret R. Van Horn, PhD; Roland Beard, MS, Brandon Bucklen, PhD
Globus Medical, Audubon, PA, US
FDA Device/Drug Status: SABLE (Globus Medical) (Approved for this indication)

P7. Hierarchical surface roughness produced with additive manufacturing technology significantly increases osteogenic cellular differentiation and gene expression when compared to PEEK and smooth titanium surfaces
David Rowe, MD
UConn Fluorescence Imaging Core, Farmington, CT, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P8. Biomechanical analysis of standalone lumbar interbody cages versus 360-degree constructs: an in vitro and finite element investigation**

Ali Kiapour, PhD; Vijay K. Goel, PhD; Elie Massaad, MD; John H. Shin, MD

1Boston, MA, US; 2University of Toledo, Toledo, OH, US; 3Massachusetts General Hospital, Boston, MA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P9. Early and sustained improvements in motor function in rats after infusion of allogeneic umbilical cord derived mesenchymal stem cells following spinal cord injury**

Mohamad Bydon, MD

Mayo Clinic, Rochester, MN, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P10. Bone morphogenetic protein usage decreases the risk of reoperations after anterior cervical discectomy and fusion: a five-year survivorship analysis**

Waleed Ahmad1; Joshua Bell, MD2; Katherine E. Pierce, BS3; Sara Naessig, BS4; Frank A. Segreto, BS5; Shaleen N. Vira, MD6; Virginie Lafage, PhD7; Carl B. Paulino, MD8; Andrew J. Schoenhfeld, MD9; Bassel G. Diebo, MD10; Hamid Hassanzadeh, MD10; Peter G. Passias, MD11

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FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**Biomechanics ePosters**

**P11. How much lumbar lordosis does a patient need to reach their age-adjusted alignment target? A formulated approach predicting successful surgical outcomes**

Michael H. McCarthy, MD, MPH; Renaud Lafage, MSc1; Justin S. Smith, MD, PhD2; Shary Bess, MD3; Themistocles S. Protopsaltis, MD4; Christopher P. Ames, MD5; Eric O. Klineberg, MD6; Han Jo Kim, MD7; Christopher I. Shaffrey, MD7; Douglas C. Burton, MD8; Gregory M. Mundis Jr., MD8; Munish C. Gupta, MD9; Frank J. Schwab, MD10; Virginie Lafage, PhD10; International Spine Study Group11

1Hospital for Special Surgery, New York, NY, US; 2UVa Health System, Charlottesville, VA, US; 3Denver, CO, US; 4Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 1University of California, San Francisco, San Francisco, CA, US; 2UC, Davis School of Medicine, Sacramento, CA, US; 3Duke University, Durham, NC, US; 4University of Kansas Medical Center, Kansas City, KS, US; 5Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 6Washington University School of Medicine, St. Louis, MO, US; 11Brighton, CO, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P12. Lumbosacral residual rod strains in long PSR constructs often exceed in vitro rod bending strains**

Anna G. Newcomb, MS1; Taylor Hostetler, BS2; Jennifer Lehrman, MS3; Bernardo De Andrade Pereira, MD4; Piyatan Wangsawatwong, MD4; Jay D. Turner, MD, PhD5; Brian Kelly, PhD6

1St. Joseph’s Hospital and Medical Center, Phoenix, AZ, US; 2Barrow Neurological Institute, Phoenix, AZ, US; 3Barrow Neurological Institute, Phoenix, AZ, US; 4Barrow Brain and Spine, Phoenix, AZ, US

FDA Device/Drug Status: PSR (Approved for this indication)

**P13. ACDF fusion rates**

Noah Nichols, BS1; Dean Chou, MD2; Alysha Jamieson3; Lee A. Tan, MD2


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P14. Analysis of the segmental and adjacent level impacts of forcing the connection of misaligned pedicle screws and rods and subsequent unintended forces applied to the construct and spine: a finite element analysis**

David Cesar Noriega Gonzalez, MD, PhD; Arjan Loenen, MSc2; Pierce D. Nunley, MD3; Jerome Noailly, PhD4; Keita Ito, MD4; Bert van Rietbergen, PhD2

1Valladolid, Spain; 2Eindhoven University of Technology, Eindhoven, Noord-Brabant, Netherlands; 3Spine Institute of Louisiana, Shreveport, LA, US; 4Universitat Pompeu Fabra (UPF), Barcelona, Spain

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P15. Power-assisted pedicle screw placement decreases screw wobble
David L. Skaggs, MD; Amy Claeson, PhD; Frank J. Schwab, MD; Anup Gandhi, PhD
1Childrens Hospital Los Angeles, Los Angeles, CA, US; 2Zimmer Biomet, Westminster, CO, US; 3Hospital for Special Surgery, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P16. Spinopelvic deformities and postural malalignment affect gait patterns in ASD patients
Georges Kawkabani, MD, MSc; Renee Maria Saliby, MD; Mario Mekhail, MSc; Eddy Saad, BS; Rami El Rachkidi, MD, MSc; Ismat Ghanem, MD; Khalil E. Kharrat Sr., MD; Virginie Lafage, PhD; Renaud Lafage, MSc; Wafa Skalli, PhD
1Hotel dieu de france, Beirut, Lebanon; 2Beirut, Lebanon; 3University of Saint-Joseph, Beirut, Lebanon; 4Hospital-Dieu Hospital, Beyrouth, Lebanon; 5Hospital for Special Surgery, New York, NY, US; 6Institut de Biomecanique Humaine Georges Charpak, Paris, France; 7University of Saint Joseph, Faculty of Medicine, Beirut, Lebanon
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P17. Investigating the effects of cage width and placement on subsidence performance using anatomically representative models
Guy R. Fogel, MD; Christian Yee-Yanagishita; Jeremy Malik; Brooke Douglas; Yun Peng; Michael Jekir
1Spinepainbegone, San Antonio, TX, US; 2NuVasive, San Diego, CA, US; 3San Diego, CA, US
FDA Device/Drug Status: Modulus XLIF (Approved for this indication)

Complications ePosters

P18. Peri-incisional subcutaneous fat thickness is associated with infection after posterior lumbar surgery in obese patients: a propensity score matched retrospective study
Dong Hu, MD; Dong Yang, MD, PhD; Songhua Xiao, MD
1Beijing Tsinghua Changguang Hospital, Beijing, China; 2Department of Orthopedic, First Affiliated Hospital of Nanchang University, Nanchang, Jiangxi, China; 3Department of Orthopedic, Beijing Tsinghua Changgung Hospital, Beijing, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Nida Fatima, MD, MBBS; Elie Massaad, MD; Muhamed Hadzipasic, MD, PhD; Ganesh M. Shankar, MD, PhD; John H. Shin, MD
Department of Neurosurgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P20. Surgical site infection as a risk factor for long-term instrumentation failure in patients with spinal deformity: a retrospective cohort study
Joseph P. Gjolaj, MD, FACS
University of Miami & Jackson Memorial Hospital Department of Orthopaedic Surgery, Miami, FL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P21. Inpatient outcomes after elective lumbar spinal fusion for patients with human immunodeficiency virus in the absence of acquired immunodeficiency syndrome
Joseph P. Gjolaj, MD, FACS; Chester J. Donnally III, MD; Alexander J. Butler, MD; Karthik Madhavan, MD
1University of Miami & Jackson Memorial Hospital Department of Orthopaedic Surgery, Miami, FL, US; 2Philadelphia, PA, US; 3University of Miami, Miami, FL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P22. Local retropharyngeal space anesthetic for dysphagia reduction after anterior cervical discectomy and fusion surgery: a single-center, prospective, randomized, double-blinded, placebo-controlled clinical trial
Alan T. Villavicencio, MD; Ewell L. Nelson, MD; Sharad Rajpal, MD; Kara D. Beasley, DO; Sigita Burneikiene, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P23. Does prior cervical fusion (CF) affect PJK rate and UIV level selection in thoracolumbar fusion surgery for adult spinal deformity (ASD)?**

Gregory M. Mundis Jr, MD1; Renaud Lafage, MSc2; Virginie Lafage, PhD2; Robert K. Eastlack, MD3; Eric O. Klineberg, MD4; Peter G. Passias, MD5; Therminosticles S. Protossaltis, MD6; Alexandra Soroceanu, MD, MPH7; Christopher I. Shaffrey, MD8; Justin S. Smith, MD, PhD9; Shay Bess, MD10; Khaled M. Kebaish, MD11; Munish C. Gupta, MD12; Richard A. Hostin Jr, MD13; Michael P. Kelly, MD14; Han Jo Kim, MD15; International Spine Study Group14

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P24. Acute failure of S2-alar-iliac pelvic fixation following adult deformity correction**

Christopher T. Martin, MD1; David W. Polly Jr, MD1; Kenneth Holton, MD1; Jose San Miguel, MD, PhD1; Melissa Albersheim, MD2; Jonathan N. Sembrano, MD3; Kristen E. Jones, MD4

1The Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, MN, US; 2The Department of Orthopedic Surgery, NYU Langone Health, New York, NY, US; 3The Department of Orthopaedic Surgery, NYU Langone Hospital, NYU Langone Health, New York, NY, US; 4University of Calgary, Calgary, Canada; 5Duke University, Durham, NC, US; 6UVA Health System, Charlottesville, VA, US; 7Denver, CO, US; 8Johns Hopkins University, Baltimore, MD, US; 9Washington University School of Medicine, St. Louis, MO, US; 10Southwest Scoliosis Institute, Dallas, TX, US; 11Brighton, CO, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P25. Association of preoperative hemoglobin A1c and body mass index with wound infection rate in spinal surgery**

Miner Ross, MD, MPH1; Sudarshan Iyer, BS2; Kenneth R. Gundle, MD3,4; Donald A. Ross, MD1,2

1Department of Neurological Surgery, Oregon Health and Science University, Portland, Oregon, US; 2Operative Care Division, Portland Veterans Administration, Portland, OR, US; 3Department of Orthopaedics and Rehabilitation, Oregon Health and Science University Portland, OR, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P26. Closed drainage versus non-drainage for single-level lumbar discectomy: a prospective randomized controlled study**

Biao Wang, MD1; Lingbo Kong, MD, PhD2; Dingjun Hao, MD3

1Honghui Hospital, Xi’an, Shaanxi, China; 2Xi’an, China; 3Xi’an Honghui Hospital, Xi’an, Shaanxi, China

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P27. Who is at risk of developing postoperative urinary retention following spine surgery? A retrospective study suggests think ABC!**

Richard W. Easton, MD1; Nicholas S. Papakonstantinou, MD1; Christopher A. Hulon, MD1; Brady Vibert, MD1; Matthew Liphardt, MD2; Bradley Ahlgren, MD3; Patrick Karabon, MS4; Cecile Pestano, RN, BSN, CCRP1


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P28. Are serum ion levels elevated in pediatric patients with spinal implants versus controls?**

Smita Mathew, MD1; Annalise N. Larson, MD2; Yong Xie, MD3; Todd Milbrandt1; Matthew P. Abdel, MD4; Andre van Wijnen, MD5; Geoffrey Haft, MD6

1Boston, MA, US; 2Massachusetts General Hospital, Boston, MA, US; 3University of Rochester Medical Center, Rochester, NY, US; 4Scripps Clinic, La Jolla, CA, US; 5Sanford USD Medical Center, Sioux Falls, SD

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P29. Predicting tumor specific survival in patients with metastatic renal cell carcinoma: which scoring system is most accurate?**

Elie Massaad, MD1; Ali Kiapour, PhD2; Muhamed Hadzipasic, MD, PhD2; John H. Shin, MD2

1Boston, MA, US; 2Massachusetts General Hospital, Boston, MA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P30. Safe and improved spinal surgery using a new device in multiple indications**

John H. Peloza, MD1; Michael Millgram, MD2; Larry T. Kho, MD3; Hani Malone, MD4; Richard D. Guyer, MD4; Jean-Charles Le Huec, MD, PhD5; Ely Ashkenazi, MD6

1Center for Spine Care, Dallas, TX, US; 2Israel Spine Center, Tel Aviv, Israel; 3Los Angeles, CA, US; 4Scripps Clinic, La Jolla, CA, US; 5Center for Disc Replacement at Texas Back Institute, Plano, TX, US; 6Bordeaux, France

FDA Device/Drug Status: Dreal (Carevature Medical Ltd.) (Approved for this indication)

**P31. Lateral interface pressures during a spinal procedure: can we optimize positioning?**

Daniel Refai, MD1; Eric Leung, BA2; Olumide Arowojowo3; Richard A. Hynes, MD4; Russ P. Nockels, MD5; Ronald A. Lehman Jr, MD6


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P32. Trends in robotic spine surgery: a six-year analysis of morbidity and mortality

Peter G. Passias, MD1; Avery Brown, BS2; Katherine E. Pierce, BS3; Waleed Ahmad4; Sara Naessig, BS5; Bassel G. Diebo, MD6
1NY Spine Institute, NYU Langone Health, New York, NY, US; 2Department of Orthopaedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 3NYU Spine Research Lab, New York, NY, US; 4Mercy Health, Rockford, IL, US; 5Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 6Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P33. Complication rates following chiari malformation surgical management for Arnold-Chiari type I based on surgical variables: a national perspective

Peter G. Passias, MD1; Waleed Ahmad2; Katherine E. Pierce, BS3; Muhammad B. Janjua, MD4; Shaleen N. Vira, MD5; Bassel G. Diebo, MD6

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P34. Evaluating the impact of multiple sclerosis on two year postoperative outcomes following ACDF for cervical degenerative pathology: a propensity score-matched analysis

Neil V. Shah, MD, MS1; George A. Beyer, MS2; Maheem Islam3; Pelin Celiker, BS4; Frank A. Segreto, BS5; Renaud Lafage, MSc6; Peter G. Passias, MD7; Frank J. Schwab, MD8; Virginie Lafage, PhD9; Carl B. Paulino, MD10; Bassel G. Diebo, MD11
1Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 2SUNY Downstate Medical Center, Brooklyn, NY, US; 3NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 4Hospital for Special Surgery, New York, NY, US; 5NY Spine Institute, NYU Langone Health, New York, NY, US; 6Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 7Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P35. Quantitative romberg using a force plate: an objective measure for cervical myelopathy

Jeffrey L. Gum, MD1; Steven D. Glassman, MD1; Morgan Brown, MS2; Christy L. Daniels, MS3; Joseph L. Laratta, MD4; Leah Y. Carreon, MD, MSc5

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P36. Operative time and learning curve between conventional fluoroscopy, fluoroscopy-based instrument navigation, and robot-assisted instrumentation in minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF)

Timothy Wang, MD1; Farah Hamouda, BS2; Eric W. Sankey3; Christopher L. Shaffrey, MD4; John Kim, MD5; Isaac O. Karikari, MD6; Muhammad Abd-El-Barr, MD, PhD7
1Duke University, Durham, NC, US; 2Chapel Hill, NC, US; 3Duke University Hospital, Durham, NC, US; 4Duke University Medical Center, Durham, NC, US; 5Duke Spine Center, Durham, NC, US

FDA Device/Drug Status: TrackX (Approved for this indication)

P37. Artificial intelligence clustereing of adult spinal deformity morphology predicts surgical characteristics, alignment, and outcomes

Wesley M. Durandi1; Renaud Lafage, MSc2; Kojo Hamilton, MD3; Peter G. Passias, MD4; Han Jo Kim, MD5; Themistocles S. Protopsaltis, MD6; Virginie Lafage, PhD7; Justin S. Smith, MD8; PhD9; Christopher I. Shaffrey, MD8; Munish C. Gupta, MD10; Eric O. Klineberg, MD11; Frank J. Schwab, MD12; Jeffrey L. Gum, MD13; Gregory M. Mundis Jr., MD14; Robert K. Eastlack, MD15; Khaled M. Kebash, MD16; Alexandra Soroceanu, MD, MPH17; Richard A. Hostin Jr., MD18; Douglas C. Burton, MD19; Shay Bess, MD20; Christopher P. Ames, MD21; Robert A. Hart, MD22; Alan H. Daniels, MD23; International Spine Study Group24
1Brown University, Alpert Medical School, Providence, RI, US; 2Hospital for Special Surgery, New York, NY, US; 3University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 4NY Spine Institute, NYU Langone Health, New York, NY, US; 5Department of Orthopaedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 6UVA Health System, Charlottesville, VA, US; 7Duke University, Durham, NC, US; 8Washington University School of Medicine, St. Louis, MO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10Norton Leatherman Spine Center, Louisville, KY, US; 11Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 12Scripps Clinic, San Diego, CA, US; 13Johns Hopkins University, Baltimore, MD, US; 14University of Calgary, Calgary, Canada; 15Southwest Scoliosis Institute, Dallas, TX, US; 16University of Kansas Medical Center, Kansas City, KS, US; 17Denver, CO, US; 18University of California, San Francisco, San Francisco, CA, US; 19Swedish Neuroscience Institute, Seattle, WA, US; 20Warren Alpert Medical School of BU/Ri Hospital, Providence, RI, US; 21Brighton, CO, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P38. Spondyloysis in athletic children, how many hours of training a week is too much?

Karen Weissmann, MD1; Virginie Lafage, PhD2; Renaud Lafage, MSc3; David Seguel, MD4; Evangelia M. Zgonis, BS5; Tianna Bennett, BS6; Monica Chacon, PhD7
1Fundacion Medica San Cristobal, Santiago, Region Metropolitana, Chile; 2Hospital for Special Surgery, New York, NY, US; 3Instituto Traumatologico de Chile, Santiago, Chile; 4New York, NY, US; 5Hospital San Juan De Dios - Caja Costarricense Del Seguro Social, San Jose, Costa Rica

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P39. Spinal epidural abscesses: can we predict treatment modalities?  
Keith W. Lyons, MD; Steven Baltic, MD, MS; Matthew Pappas, BS, BA; Janae Dunchack, BA, MS; Paul Werth, MS; Kevin J. McGuire, MD; Adam M. Pearson, MD, MS; William Abdu, MD  
1Dartmouth-Hitchcock Medical Center, Lebanon, NH, US; 2Dartmouth College, Hanover, NH, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P40. Automated measurement of spinopelvic parameters on lateral lumbar radiographs using deep learning  
John T. Schwartz, BS; Varun Arvind, MD, PhD; Aly Valliani, BS; Brian Cho, BS; Eric Geng, BA; Jun S. Kim, MD; Samuel K. Cho, MD  
1Icahn School of Medicine at Mount Sinai, New York, NY, US; 2New York, NY, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P41. Flexion-extension radiographs underestimate instability in patients with single-level lumbar spondylolisthesis. Comparing flexion-supine imaging may be more appropriate  
Nathan J. Lee, MD; Jun S. Kim, MD; Joseph M. Lombardi, MD; Andrew C. Vivas, MD; Jay S. Reider, MD, MPH; Scott L. Zuckerman, MD; Paul Park, MD; Eric Leung, BA; Meghan Cerpa, MPH; Lawrence G. Lenke, MD; Ronald A. Lehman Jr., MD; Zeeshan Sardar, MD, MSc  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P42. When does MRI change management of pediatric back pain? A predictive scoring system  
Michael T. Nolte, MD; Garrett Harada, MD; Ryan LeDuc; Bryce Basques, MD, MHS; Philip Louie, MD; Ethan Gordon, MS; Monica Kogan, MD; Dino Samartzis, ScD, PhD, MSc; Howard S. An, MD  
1Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 2Los Angeles, CA, US; 3Chicago, IL, US; 4Thomas Jefferson University, Philadelphia, PA, US; 5New York, NY, US; 6Midwestern Orthopedics at Rush, Chicago, IL, US; 7Queen Mary Hospital, Hong Kong, Hong Kong; 8Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P43. Validity of routine diagnostic tests for vertebral osteomyelitis/discitis and its influence by the infecting organism  
Michael Ghassibi, DO; Tzu Chuan Yen, MD; Shelby M. Harris, BS; Emily Leary, PhD; Theodore J. Choma, MD  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P44. Computed tomography hounsfeld units accurately estimate the severity of cervical paraspinal muscle fat infiltration  
Ashley Xiong, CCRC  
Mayo Clinic, Rochester, MN, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P45. Radiological features of slip progression in adult patients with isthmic spondylolisthesis  
Fumitake Tezuka, MD, PhD; Jonathan Paul, MPH, BS; Koichi Sairyo, MD; Alpesh A. Patel, MD, FACS; Wellington K. Hsu, MD  
1Tokushima University, Tokushima, Japan; 2Chicago, IL, US; 3Northwestern Department of Orthopaedics, Chicago, IL, US; 4Northwestern University School of Medicine, Northwestern University, Chicago, IL, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P46. Do diabetics experience more cervical spine degenerative disc disease  
Mark Lambrechts, MD; Wyatt Whitman, BS; Kyle Maryan, BS; Tzu Chuan Yen, MD; Jinpu Li, MA; Suryanshi Rawat, BS; Casey A. Fogarty; Emily Leary, PhD; Christina L. Goldstein, MD, FRCS; Theodore J. Choma, MD  
1Missouri Orthopaedic Institute, Columbia, MO, US; 2University Hospital-Hospital of Missouri, Columbia, MO, US; 3University of Missouri School of Medicine, Columbia, MO, US; 4School of Medicine, University of Missouri – Columbia, Columbia, MO, US; 5Columbia, MO, US; 6UCH Health Memorial Hospital North Spine Center, Colorado Springs, US; 7Missouri Spine Center, Columbia, MO, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P47. The association of patient frailty increased complication and readmission rates after lumbar spinal fusion surgery  
Shane Shahrrestani, MS; Andy Ton, BS; Xiao Chen, BA; Alexander Ballatori, BA; Jeffrey C. Wang, MD; Zorica Buser, PhD  
1Yorba Linda, CA, US; 2Anaheim, CA, US; 3Los Angeles, CA, US; 4USC Spine Center, Los Angeles, CA, US; 5Keck School of Medicine, University of Southern California, Los Angeles, CA, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P48. Disparities in etiology, clinical presentation and determinants for distal junctional kyphosis based on timing of occurrence: are we treating two separate issues?

Katherine E. Pierce, BS1; Peter G. Passias, MD2; Virginie Lafage, PhD2; Renaud Lafage, MSc2; Han Jo Kim, MD3; Alan H. Daniels, MD4; Robert K. Eastlack, MD5; Eric O. Klineberg, MD6; Breton Line, BS3; Themistocles S. Protopsaltis, MD2; Douglas C. Burton, MD6; Shay Bess, MD7; Frank J. Schwab, MD8; Christopher I. Shaffrey, MD9; Justin S. Smith, MD, PhD10; Christopher P. Arnes, MD10; International Spine Study Group11


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Exercise ePosters

P49. Physical activity measures in lumbar laminectomy patients: a prospective comparison of fitness tracker measures versus patient-reported outcome measures

Dennis M. Bienstock, BS1; Dhruv S. Shankar, BS2; Jinseong Kim, BS2; Nicole Zubizarreta, MPH2; Jashvant Poeran, MD, PhD2; Wesley H. Bronson, MD, MS3; Saad B. Chaudhary, MD, MBA4; James C. Iatridis, PhD1


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Injections/Interventions ePosters

P50. Effect of systemic teriparatide (PTH1-34) versus placebo on bone mineral density (BMD) after lumbar spinal arthrodesis

Astrid Gimbel, BHSc3; Mikkel Andersen, MD2; Annette Bennedsgaard Jespersen, MD, PhD2; Anne Pernille Hermann, MD, PhD2; Leah Y. Carreon, MD, MSc1

1Odense, Denmark; 2Middelfart, Denmark; 3Spine Center Region of Southern Denmark, Middelfart, Denmark; 4Odense University Hospital, Odense C, Denmark; 5Sygehus Lillebælt - Rygkirurgi Middelfart, Denmark

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P51. The effect of structural spinal deformities on the effectiveness of spinal cord stimulators

Ajith Malige, MD; Andrew Kantzos, MD; Gbolabo O. Sokunbi, MD; St. Luke’s University Health Network, Bethlehem, PA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P52. Trends in usage of navigation-assisted and robotic in elective spine surgeries: a study of 105,212 cases from 2007 to 2016

Sara Naessig, BS1; Waleed Ahmad2; Katherine E. Pierce, BS3; Shaleen N. Vira, MD1; Bassel G. Diebo, MD6; Peter G. Passias, MD6

1NYU Langone Hospital, New York NY, US; 2New York, NY, US; 3NYU Spine Research Lab, New York, NY, US; 4Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 5Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 6NY Spine Institute, NYU Langone Health, New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P53. Allogeneic disc matrix as treatment for disc degeneration: improvement in pain and function at 1- and 2-levels

Douglas P. Beall, MD

Clinical Radiology of Oklahoma, Edmond, OK, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Interdisciplinary Care ePosters

P54. Multimodal pain control regimen for anterior lumbar fusion drastically reduces in-hospital opioid consumption

Jeffrey L. Gurn, MD1; Portia Steele, ACNP-BC2; Charles H. Crawford III, MD3; Maden Djurasovic, MD; R. Kirk Owens II, MD1; Morgan Brown, MS1; Christy L. Daniels, MS1; Benjamin M. Sampredo, CRNA, BSN, BS3; John R. Dimar II, MD1; Steven D. Glassman, MD1; Leah Y. Carreon, MD, MSc1


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P55. What is the value of undergoing surgery for spinal metastases at dedicated cancer centers?

Azeem T. Malik, MBBS1; Safdar N. Khan, MD1; John Alexander, MD1; Ryan Voskul, MD2; Joseph Drain, MD2; Torn J. Scharschmidt, MD1

1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbia, OH, US; 3The Ohio State University Medical Center, Columbus, OH, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P56. A multidisciplinary spine clinic model significantly reduces spine surgery utilization
Joshua Benton, BA1; Brandon Weiss, BS2; Michael Longo, BA2; Wenzhi Mowrey, PhD3; Rafael De la Garza Ramos, MD4; Yaroslav J. Gelfand, MD5; Phillip Cezayiri, MD6; Erida Castro-Rivas, MS6; Mark Headlam, BS7; Lavinia Williams, RN8; Adaobi Udemma, ACNP-BC9; Reza Yassari, MD, MSc10; Vijay Yanamadala, MD11
1Albert Einstein College of Medicine, Bronx, NY, US; 2Montefiore Department of Neurosurgery, Bronx, NY, US; 3Montefiore Medical Center, Department of Neurosurgery, Spine Research Group, Bronx, NY, US; 4Montefiore Medical Center, Bronx, NY, US; 5Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, NY, US; 6Stamford, CT, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P57. ERAS vs non-ERAS: protocol implementation resulted in significant outcomes improvement in patients undergoing lumbar spine fusion
Richard W. Easton, MD1; Nicholas S. Papakonstantinou, MD1; Kevin Baker, MD2; Erin A. Baker, MS3; Brady Vibert, MD1; Matthew Lipphardt, MD4; Bradley Ahlgren, MD1; Cecile Pestano, RN, BSN, CCRP1; Christopher A. Hulen, MD1; Daniel Silvasti, MD1; Gregory Smith, MD4
FDA Device/Drug Status: Hydromorphone (Approved for this indication), Methadone HCl (Approved for this indication), Tranexamic Acid (Approved for this indication), Patient-Controlled Analgesia (PCA) Pump (Approved for this indication)

P58. The inherent value of preoperative optimization: absolute and incremental reduction in components of metabolic syndrome can enhance recovery and minimize perioperative burden.
Sara Naessig, BS1; Waleed Ahmad2; Katherine E. Pierce, BS3; Ethan W. Ayres, MPH4; Shaleen N. Vira, MD5; Peter G. Passias, MD6
1NYU Langone Hospital, New York NY, US; 2New York, NY, US; 3NYU Spine Research Lab, New York, NY, US; 4Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 5Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 6NY Spine Institute, NYU Langone Health, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P59. Chronic preoperative opioid use is associated with higher perioperative resource utilization and adverse outcomes in adult spinal deformity patients
Ibrahim Sadiq, MD1; Faizal Kassam, MD, FRCSC2; Ariana Frederick, MS3; Fred Nicholls, MD, MA, FRCSC3; Peter D. Lewkonja, MD4; Bradley Jacobs, MD, FRCSC4; Ganesh Swamy, MD5; Alexandra Soroceanu, MD, MPH6
1Calgary, AB, Canada; 2Foothills Medical Centre, Calgary, AB, Canada; 3University of Calgary, Calgary, AB, Canada; 4Caleo Health, Calgary, AB, Canada; 5University of Calgary, Foothills Hospital, Calgary, AB, Canada; 6University of Calgary, Calgary, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P60. The top 100 spine surgery articles on social media: an altmetric study
James Parrish, MPH1; Nathaniel Jenkins, BS, MS2; Nadia Hryniewycz, BS2; Thomas Brundage, BS3; Kern Singh, MD1
1Rush University Medical Center, Chicago, IL, US; 2Chicago, IL, US; 3Midwest Orthopedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P61. A significant number of elective spine surgery plans are altered by a weekly indications conference with high surgeon compliance
Joshua Benton, BA1; Rafael De la Garza Ramos, MD2; Yaroslav J. Gelfand, MD3; Erida Castro-Rivas, MS4; Mark Headlam, BS5; Lavinia Williams, RN6; Adaobi Udemma, ACNP-BC7; Reza Yassari, MD, MSc8; Vijay Yanamadala, MD9
1Albert Einstein College of Medicine, Bronx, NY, US; 2Montefiore Medical Center, Department of Neurosurgery, Spine Research Group, Bronx, NY, US; 3Montefiore Medical Center, Bronx, NY, US; 4Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, NY, US; 5Montefiore, Bronx, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Motion Preservation ePosters

P62. Removed from Program

P63. Current incidence of adjacent segment pathology following lumbar fusion versus motion preserving procedures: a systematic review and meta-analysis of recent projections
Chester J. Donnelly III, MD1; Parthik Patel, MD2; Harsh Shah, MD2; Jose A. Canseco, MD, PhD3; Srikanth Divi, MD; Vadim Goz, MD4; Kartik Shenoy, MD5; Alexander R. Vaccaro, MD, PhD6
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P64. In which cases do surgeons specializing in total disc replacement perform fusion in patients with symptomatic lumbar disc degeneration?
Jack E. Zigler, MD1; Donna D. Ohnmeiss, PhD2; Scott L. Blumenthal, MD1; Richard D. Guyer, MD1; Alexander M. Satin, MD2
1Center for Disc Replacement at Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P65. Total disc replacement as a part of adult scoliosis surgical treatment of 205 patients with minimum of two years of follow-up
Thierry P. Marnay, MD
Castelnau-le-Lez, France
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P66. Disagreement between patients’ and surgeons’ expectations for outcomes of lumbar surgery according to domains of physical and mental health
Roland Duculan, MD; Frank P. Cammisa, MD; Andrew A. Sama, MD; Alexander P. Hughes, MD; Darren R. Lebl, MD; Carol A. Mancuso, MD; Federico P. Girardi, MD
Hospital for Special Surgery, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P67. Effects cognitive behavioral therapy on cervical spine surgery: results of a randomized controlled trial
Peter G. Passias, MD1; Sara Naessig, BS2; Waleed Ahmad3; Katherine E. Pierce, BS4; Brooke K. O’Connell, MS5; Constanse Maglaras, PhD5; Bassel G. Diebo, MD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P68. The impact of spine surgeon training, office wait times, and social media presence on physician review websites
Andrew Sama, BA1; Nicholas Schiller, MSc2; Johnathon R. McCormick, BS3; Kevin Bondar, BA4; Deborah J. Li, BA1; Jose A. Canseco, MD, PhD5; Chester J. Donnally III, MD6
1Miami, FL, US; 2University of Miami, Miami, FL, US; 3University of Miami Miller School of Medicine, Miami, FL, US; 4Miller School of Medicine, Miami, FL, US; 5Rothman Institute/Thomas Jefferson University Hospital, Philadelphia, PA, US; 6Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P69. Social media accessibility, shorter office wait times, and review website personalization are correlated with better online review scores for spine surgeons
Chester J. Donnally III, MD1; Johnathon R. McCormick, BS2; Mark Pastore, DO3; Andrew Sama, BA4; Nicholas Schiller, MSc5; Deborah J. Li, BA1; Kevin Bondar, BA4; Kartik Shenoy, MD5; Christopher K. Kepler, MD, MBA6; Alexander R. Vaccaro, MD, PhD8
1Philadelphia, PA, US; 2University of Miami Miller School of Medicine, Miami, FL, US; 3Philadelphia College of Osteopathic Medicine, Philadelphia, PA, US; 4Miami, FL, US; 5University of Miami, Miami, FL, US; 6Miller School of Medicine, Miami, FL, US; 7Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 8Rothman Institute, Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P70. A combined anterior-posterior approach in select cervical deformity corrections has potential for superior cost effectiveness driven by outcomes
Katherine E. Pierce, BS1; Peter G. Passias, MD2; Renaud Lafage, MSc3; Virginie Lafage, PhD4; Gregory M. Mundis Jr., MD5; Robert K. Eastlack, MD5; Michael P. Kelly, MD; Themistocles S. Protopsaltis, MD6; Leah Y. Carreon, MD, MSc7; Breton Line, BS8; Robert A. Hart, MD9; Douglas C. Burton, MD10; Shay Bess, MD11; Frank J. Schwab, MD12; Christopher I. Shaffrey, MD12; Justin S. Smith, MD, PhD13; Christopher P. Ames, MD14; International Spine Study Group15
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P71. When not to operate in spinal deformity: identifying subsets of patients with simultaneous clinical deterioration, major complications, and reoperation

Peter G. Passias, MD; Katherine E. Pierce, BS; Renaud Lafage, MSc; Virginie Lafage, PhD; D. Kojo Hamilton, MD; Gregory M. Mundis Jr., MD; Han Jo Kim, MD; Richard A. Hostin Jr., MD; Alan H. Daniels, MD; Robert A. Hart, MD; Douglas C. Burton, MD; Christopher I. Shaffrey, MD; Frank J. Schwab, MD; Christopher P. Arnes, MD; Justin S. Smith, MD, PhD; Shay Bess, MD; Eric O. Klineberg, MD

1NY Spine Institute, NYU Langone Health, New York, NY, US; 2Icahn School of Medicine, New York, NY, US; 3The Spine Hospital - Columbia University in New York, NY, US; 4Spinal Deformity Institute, Dallas, TX, US; 5Keck School of Medicine, University of Southern California, Los Angeles, CA, US; 6University of California, San Francisco, San Francisco, CA, US; 7UVA Health System, Charlottesville, VA, US; 8Department of Orthopedics, La Jolla, CA, US; 9University of Minnesota, Minneapolis, MN, US; 10Duke University, Durham, NC, US; 11University of California, San Francisco, San Francisco, CA, US; 12NY Spine Institute, NYU Langone Health, New York, NY, US; 13University of Texas Southwestern Medical Center, Dallas, TX, US; 14Spinal Deformity Institute, Dallas, TX, US; 15International Spine Study Group

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P72. Natural language processing of operative note dictations to automatically generate CPT codes for billing

Jun S. Kim, MD; Varun Arvind, MD, PhD; John T. Schwartz, BS; Aly Valliani, BS; Eric Geng, BA; Nathan J. Lee, MD; Joseph M. Lombardi, MD; Andrew C. Vivas, MD; Jay S. Reider, MD, MPH; Scott L. Zuckerman, MD; Brian Cho, BS; Meghana Vulpalari, BS; Samuel K. Cho, MD; Ronald A. Lehman Jr., MD; Lawrance G. Lenke, MD; K. Daniel Riew, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P73. Clinical review of spine surgery patient safety indicators avoids CMS payment reductions

John A. Buza III, MD, MS; Ryan Nazar, MD, MHA; Portia Steele, ACNP-BC; Leah Y. Carreon, MD, MSC; Joseph L. Laratta, MD; Steven D. Glassman, MD; Jeffrey L. Gum, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P74. Adult spinal deformity patients with metabolic syndrome have significantly higher costs

Hamid Hassanzadeh, MD; Lawal Labaran; Themistocles S. Protopsaltis, MD; Aaron J. Buckland, MBBS, FRACS


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P75. Average costs, length of stay, and 30- and 90-day readmissions in obese and morbidly obese patients who undergo lumbar spine fusion

Xiao Chen, BA; Shane Shahrastani, MS; Andy Ton, BS; Alexander Ballatori, BA; Jeffrey C. Wang, MD; Zorica Buser, PhD

1Los Angeles, CA, US; 2Yorba Linda, CA, US; 3Anaheim, CA, US; 4USC Spine Center, Los Angeles, CA, US; 5Keck School of Medicine, University of Southern California, Los Angeles, CA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P76. Economic impact of the initial incorporation of robotics in spine surgery

Peter G. Passias, MD; Avery Brown, BS; Katherine E. Pierce, BS; Walied Ahmad; Sara Naessig, BS; Shaleen N. Vira, MD; Jordan Lebovic, BA; Bassel G. Diebo, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Spinal Deformity ePosters

P77. Enhanced recovery after surgery reduces post-operative opioid use and 30-day readmission rates after open thoracolumbar fusion for adult degenerative scoliosis

Emmanuel Adeyemo, BA; Umaru Barrie, BS; Salah Aoun, MD; Olatunde Badejo, BA; Mark N. Pernik, BA; Zachary Christian, BA; Luke Dosselman, BS; Kristen Hall, BS; Carlos A. Bagley, MD

1UT Southwestern Medical Center, Dallas, TX, US; 2UTSW, Dallas, TX, US; 3Texas Scottish Rite Hospital for Children, Dallas, TX, US; 4UT Southwestern Medical Center, Dallas, TX, US; 5University of Texas Southwestern Medical Center, Dallas, TX, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P78. Spinopelvic sagittal imbalance as a risk factor for fracture type of proximal junctional failure after posterior instrumented fusion.
Jen-Chung Liao, MD
Chang Gung Memorial Hospital, Tao Yuan, Taiwan
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P79. Prevalence and surgical outcomes of primary severe sagittal plane deformity (pSPD) in adult spinal deformity (ASD) surgery: comparison between Japan and the United States
Mitsuru Yagi, MD, PhD1; Christopher P. Ames, MD2; Naobumi Hosogane, MD, PhD3; Justin S. Smith, MD, PhD4; Christopher I. Shaffrey, MD5; Frank J. Schwab, MD6; Virginie Lafage, PhD7; Morio Matsumoto, MD8; Shay Bess, MD9; Kota Watanabe, MD10; International Spine Study Group10
1Department of Orthopedic Surgery, Keio University School of Medicine, Tokyo, Japan; 2University of California, San Francisco, San Francisco, CA, US; 3Kyorin University, Mitaka, Tokyo, Japan; 4UVA Health System, Charlottesville, VA, US; 5Duke University, Durham, NC, US; 6Hospital for Special Surgery, New York, NY, US; 7Keio University School of Medicine, Tokyo, Japan; 8Denver, CO, US; 9Keio University, Keio, Japan; 10Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P80. Demographic differences and health impact of severe global sagittal, coronal, and mixed spinal deformity in symptomatic adults
Thomas Buell, MD1; Justin S. Smith, MD, PhD2; Christopher I. Shaffrey, MD3; Han Jo Kim, MD4; Eric O. Klineberg, MD5; Virginie Lafage, PhD6; Renaud Lafage, MSc7; Themistocles S. Protopsaltis, MD8; Peter G. Passias, MD9; Gregory M. Mundis Jr., MD10; Robert K. Eastlack, MD11; Vedat Deviren, MD12; Michael P. Kelly, MD, Alan H. Daniels, MD13; Jeffrey L. Gunn, MD14; Alexandra Soroceanu, MD15; MPH16; D. Kojo Hamilton, MD17; Munish C. Gupta, MD18; Douglas C. Burton, MD19; Richard A. Hostin Jr., MD20; Khaled M. Kebaish, MD21; Robert A. Hart, MD22; Frank J. Schwab, MD23; Shay Bess, MD24; Christopher P. Ames, MD25; International Spine Study Group21
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P81. Assessing methods to prevent pseudarthrosis in ASD surgery of lesser magnitude
Emmanuel McNeely, MS, MHA1; Brian J. Neuman, MD2; Rahul Sachdev, BS3; Eric O. Klineberg, MD4; Justin S. Smith, MD, PhD4; Gregory M. Mundis Jr., MD5; Alexandra Soroceanu, MD, MPH6; Richard A. Hostin Jr., MD7; Peter G. Passias, MD, Themistocles S. Protopsaltis, MD8; D. Kojo Hamilton, MD9; Christopher P. Ames, MD10; Khaled M. Kebaish, MD11; International Spine Study Group12
1The Johns Hopkins Hospital, Baltimore, MD, US; 2Baltimore, MD, US; 3UC, Davis School of Medicine, Sacramento, CA, US; 4UVA Health System, Charlottesville, VA, US; 5Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 6University of California, Calgary, Canada; 7Southwest Scoliosis Institute, Dallas, TX, US; 8NY Spine Institute, NYU Langone Health, New York, NY, US; 9Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 10University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 11University of California, San Francisco, San Francisco, CA, US; 12Johns Hopkins University, Baltimore, MD, US; 13International Spine Study Group
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P82. A proper spinal column shortening in PVCR make a better result
Tao Li, MD1; Yingsong Wang, MD1; Jing-Ming Xie, MD1; Zhaoguan Zhang, MD2; Ying Zhang, MD3; Zhi Zhao, MD4; Ni Bi, MD5; Zhiyue Shi, MD6; Quan Li, MD7
1Department of Orthopaedics, 2nd Affiliated Hospital of Kunming Medical University, Kunming, China; 2Kunming, Yunnan, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P83. Preoperative hounsfield units at the planned upper instrumented vertebrae (UIV) may predict proximal junctional Kyphosis (PJK) in adult spinal deformity
Yu-Cheng Yao, MD1; Jonathan Elysee2; Michael H. McCarthy, MD, MPH; Philip Louie, MD3; Renaud Lafage, MSc4; Karen Weissmann, MD4; Basel Sheikh Alshabab, MD5; Virginie Lafage, PhD6; Frank J. Schwab, MD7; Han Jo Kim, MD8
1Taipei Veterans General Hospital, Taipei, Taiwan; 2Hospital for Special Surgery, New York, NY, US; 3New York, NY, US, 4Fundacion Medica San Cristobal, Santiago, Region Metropolitana, Chile
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P84. Predictive model for selection of upper treated vertebra using a machine learning approach
Renaud Lafage, MSc1; Basel Sheikh Alshabab, MD2; Jonathan Elysee3; Francis C. Lovecchio, MD1; Karen Weissmann, MD4; Han Jo Kim, MD5; Frank J. Schwab, MD6; Virginie Lafage, PhD1
1Hospital for Special Surgery, New York, NY, US; 2Fundacion Medica San Cristobal, Santiago, Region Metropolitana, Chile
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P85. Reducing delirium after complex spinal surgery (≥4 levels): the UT Southwestern Perioperative Optimization of Senior Health Program

Mark N. Pernik, BA1; Palvasha Deme, BA2; Madelina Nguyen3; Salah Aoun, MD4; Owoicho Adogwa, MD, MPH5; Kristen Hall, BS6; Nicholas A. Stewart6; Luke Dosselman, BS7; Shelley McDonald, DO, PhD7; Sarah Wingfield, MD8; Carlos A. Bagley, MD8
1UT Southwestern, Dallas, TX, US; 2UT Southwestern Medical School, Dallas, TX, US; 3Dallas, TX, US; 4UTSW, Dallas, TX, US; 5University of Texas Southwestern Medical School, Dallas, TX, US; 6UT Southwestern Medical Center, Dallas, TX, US; 7Duke, Durham, NC, US; 8University of Texas Southwestern Medical Center, Dallas, TX, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P86. Postoperative bracing does not improve the rate of proximal junctional kyphosis in adult spinal deformity

Stanley Crawford, DO1; Nina Lara, MD2; Jan Revella, RN3; John M. Popovich Jr., PhD, DPT, ATC4; Biodun Adeniyi, MBBS, MS5; Dennis G. Crandall, MD6; Michael S. Chang, MD7

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P87. Does short segment reduction and fusion (TLIF) of spondylolytic spondylolisthesis normalise lumbar lordosis and improve spino-pelvic alignment?

Tom Robinson, FRCS (Tr & Orth), MBBS, Timothy Boddice, MBBS, MSc; Harry Fitzjohn, MBBS, BS; Rajesh R. Shah, FRCS
Hull & East Yorkshire NHS Trust, Hull, Humberside, United Kingdom

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P88. Extended length of stay after complex adult spinal deformity surgery: predictors and impact on clinical and patient-reported outcomes

Jun S. Kim, MD1; Nathan J. Lee, MD2; Joseph M. Lombardi, MD3; Andrew C. Vivas, MD4; Joseph M. Lombardi, MD3; Jay S. Reider, MD, MPH5; Scott L. Zuckerman, MD6; Daniel Hong, MD7; Meghan Cerpa, MPH8; Eric Leung, BA9; Paul Park, MD10; Zeeshan Sardar, MD, MSc11; Ronald A. Lehman Jr., MD12; Lawrence G. Lenke, MD13

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P89. Do readmissions and reoperations adversely affect patient-reported outcomes associated with complex adult spinal deformity surgery at a minimum two year postoperative?

Nathan J. Lee, 4D1; Jun S. Kim, 4D2; Andrew C. Vivas, MD4; Joseph M. Lombardi, MD3; Jay S. Reider, MD, MPH5; Scott L. Zuckerman, MD6; Daniel Hong, MD7; Meghan Cerpa, MPH8; Eric Leung, BA9; Paul Park, MD10; Zeeshan Sardar, MD, MSc11; Ronald A. Lehman Jr., MD12; Lawrence G. Lenke, MD13

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P90. External validation of the ESSG-ISSG calculator utilizing a single institutional experience for adult spinal deformity corrective surgery

Peter G. Passiass, MD1; Sara Naessig, BS2; Waleed Ahmad3; Bassel G. Diebo, MD4; Tina Raman, MD5; Virginie Lafage, PhD6; Renaud Lafage, MSc7; Justin S. Smith, MD, PhD8; Muhammad B. Janjua, MD9; Christopher P. Ames, MD10

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P91. Patient-reported outcomes and as treated analysis from the minimize implants maximize outcomes clinical trial

Annalise N. Larson, MD1; David W. Polly Jr., MD2; Paul D. Sponseller, MD3; B. Stephens Richards, MD4; Sumeet Garg, MD5; Stefan Parent, MD; Suken A. Shah, MD6; Stuart L. Weinstein, MD7; Charles H. Crawford III, MD7; James Sanders, MD8; Michael P. Kelly, MD9; Lauren Blakemore, MD10; Matthew Oetgen, MD11; Nicholas D. Popovich Jr., PhD12; Mark A. Erickson, MD13

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P92. Does BMI over 40 have a significant risk in spine deformity patients?
Yaroslav J. Gelfand, MD; Rafael De la Garza Ramos, MD; Joshua Benton, BA; Murray Echt, MD; Vijay Yanamadala, MD; Reza Yassari, MD, MSc
1Montefiore Medical Center, Bronx, NY, US; 2Montefiore Medical Center, Department of Neurosurgery, Spine Research Group, Bronx, NY, US; 3Albert Einstein College of Medicine, Bronx, NY, US; 4Bronx, NY, US; 5Stamford, CT, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P93. The global alignment and proportion (GAP) score needs a modified LDI parameter: creating the GAP-D score
Jeffrey Kim, MD; Woojin Cho, MD, PhD; Ariella Applebaum, BA; Adam D. Nessim, BS
Bronx, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P94. Global alignment and proportion (GAP) score with modified RLL parameter: GAP-L score
Adam D. Nessim, BS; Woojin Cho, MD, PhD; Jeffrey Kim, MD; Ariella Applebaum, BA
Bronx, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P95. Lower Hounsfield units (HU) of the upper instrumented vertebrae (UIV) may contribute to proximal junctional kyphosis (PJK) in adult spinal deformity (ASD) surgery
Ping G. Duan, PhD, MD; Sigurd H. Berven, MD; Joshua Rivera; Zhuo Xi, MD, PhD; Shane Burch, MD; Dean Chou, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P96. Moderate scoliosis continues to progress at 30 year follow up. A call for concern?
Christopher Alcala, MD; Amir A. Mehbod, MD; Timothy A. Garvey, MD; Joseph H. Perra, MD; Ensor E. Transfeldt, MD
Twin Cities Spine Center Piper Building, Minneapolis, MN, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P97. Correlation of UIV and cervical spine surgery to functional outcomes in AIS: a minimum 40-years follow-up
Aron Sulovari, BA; Adam Omar, MD; Emmanuel N. Menga, MD; Paul T. Rubery Jr, MD; James Sanders, MD; Addisu Mesfin, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P98. Radiographic sagittal alignment in the asymptomatic elderly: what is normal for age?
David McConda, MD; Susan Odum, PhD; Matt Chapman, MD; P. Bradley Segebarth, MD
1Bluegrass Spine Care, Shelbyville, KY, US; 2Atrium Health Musculoskeletal Institute, OrthoCarolina Research Institute, Charlotte, NC, US; 3OrthoCarolina Spine Center, Charlotte, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P99. The utility of computer-assisted navigation and intraoperative neuromonitoring for adult spinal deformity surgery: a national claims database study
Tanmaya Sambare, BA; Jayme C.B. Koltsov, PhD; Sariah Khormaei, MD, PhD; Ivan Cheng, MD
Department of Orthopaedic Surgery, Stanford University School of Medicine, Redwood City, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P100. Upper instrumented vertebral pelvic angle and risk of proximal junctional kyphosis at two year follow-up
Hao-Hua Wu, MD; Dean Chou, MD; Joshua Rivera; Ping G. Duan, PhD, MD; Shane Burch, MD; Sigurd H. Berven, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P101. Distal junctional failure: a feared complication of adult spinal deformity surgery
Houssam Bouloussa, MD, MS; Soufiane Ghailane, MD
1UPMC Medical Education, Pittsburgh, PA, US; 2CHU Bordeaux Spine Unit 1 - Service Pr VITAL, Bordeaux, France
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**Surgery Cervical ePosters**

**P102. The relative impact of myelopathic degree on postoperative outcomes in operative cervical deformity patients based on deformity severity**

Peter G. Passias, MD\(^1\); Katherine E. Pierce, BS\(^2\); Waleed Ahmad\(^3\); Sara Naessig, BS\(^4\)

\(^1\)NY Spine Institute, NYU Langone Health, New York, NY, US; \(^2\)NYU Spine Research Lab, New York, NY, US; \(^3\)New York, NY, US; \(^4\)NYU Langone Hospital, New York NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P103. The modification of appropriateness criteria for a cervical deformity corrective surgery**

Katherine E. Pierce, BS\(^1\); Waleed Ahmad\(^2\); Sara Naessig, BS\(^3\); Shaleen N. Vira, MD\(^4\); Thea H. Lafage, MSc\(^5\); Virginie Lafage, PhD\(^5\); Aaron B. Buckland, MBBS, FRACS\(^6\); Thermoscles S. Protolsalsis, MD\(^6\); Bassel G. Diebo, MD\(^7\); Peter G. Passias, MD\(^8\)

\(^1\)NYU Spine Research Lab, New York, NY, US; \(^2\)New York, NY, US; \(^3\)NYU Langone Hospital, New York NY, US; \(^4\)Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; \(^5\)Hospital for Special Surgery, New York, NY, US; \(^6\)Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; \(^7\)Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; \(^8\)NY Spine Institute, NYU Langone Health, New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P104. A review of time demand, radiation exposure and outcomes of skin-anchored intraoperative 3D navigation in minimally invasive posterior cervical laminoforaminotomy**

Avani S. Vaishnav, MBBS; Philip Louie, MD\(^1\); Steven J. McAnany, MD\(^2\); Sravisht Iyer, MD\(^3\); Todd J. Albert, MD\(^3\); Catherine Himo Gang, MPH\(^4\); Sheeraz A. Qureshi, MD, MBA\(^5\)

\(^1\)New York, NY, US; \(^2\)Hospital for Special Surgery, Stamford, CT, US; \(^3\)Hospital for Special Surgery, New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P105. The influence of standalone cage versus plate-augmented single-level ACDF on global and local cervical sagittal alignment**

Daniel Kridly, MD, MBA\(^1\); Cesar Iturriaga, DO\(^2\); Ashna Joseph, BS\(^3\); Jesse M. Galina, BS\(^4\); Peter Oliavres, BS\(^5\); Alexander M. Satin, MD\(^6\); Jeffrey A. Goldstein, MD\(^7\); Dean C. Perfetti, MD, MPH\(^8\); Austen Katz, MD\(^9\); Rohit B. Verma, MD\(^10\); Jeff S. Silber, MD, DC\(^11\); David A. Essig, MD\(^12\)


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**Surgery Thoracolumbar ePosters**

**P107. Are modic changes associated with health-related quality of life after discectomy?**

Peter Udby, MD\(^1\); Leah Y. Carreon, MD, MSc\(^2\); Mikkel Andersen, MD\(^3\); Søren Ohrt-Nissen, MD, PhD\(^4\); Stig Bronsor, MD, PhD\(^5\)

\(^1\)Zealand University Hospital, Department of Orthopedic Surgery, Køge, Zealand, Denmark; \(^2\)Sygehus Lillebælt - Rygkirurgi Middelfart, Middelfart, Middelfart, Denmark; \(^3\)Middelfart, Denmark; \(^4\)Copenhagen, Denmark; \(^5\)Zealand University Hospital, Dept. of Orthopaedic Surgery, Koege, Denmark

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P108. Propensity-matched comparison of open, navigated and robotic-assisted TLIF**

Leah Y. Carreon, MD, MSc\(^1\); Morgan Brown, MS\(^2\); Christy L. Daniels, MS\(^3\)

\(^1\)Norton Leatherman Spine Center, Louisville, KY, US; \(^2\)Norton Healthcare, Louisville, KY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P109. Improvements in screw placement and accuracy with newer generation robotic-assisted minimally invasive instrumented lumbar fusions
Samuel R. Schroerlucke, MD; Elizabeth N. Harris, PA-C; Rita Roy, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P110. Hospital network participation and outcomes following elective posterior lumbar fusions: are mergers warranted?
Azeem T. Malik, MBBS; Elizabeth Yu, MD; Joseph Drain, MD; Jeffery Kim, MD; Safdar N. Khan, MD
1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbus, OH, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P111. Undergoing elective posterior lumbar fusions at “US News & World Report” ranked hospitals versus non-ranked hospitals: do rankings even matter?
Azeem T. Malik, MBBS; Frank M. Phillips, MD; Jeffery Kim, MD; Elizabeth Yu, MD; Safdar N. Khan, MD
1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Midwest Orthopaedics At Rush, Chicago, IL, US; 3Columbus, OH, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P112. Role of metabolites in bio-fluids as a prognostic indicator of neurological recovery in Acute Spinal Cord Injury (ASCI)
Rajeshwar N. Srivastava, MD; Dr Alka Singh, PhD; Saloni Raj, MPH
1King George's Medical University, Dept of Ortho Surgery, Lucknow, India; 2Dept. of Orthopaedic Surgery, Lucknow, India; 3Department of Orthopaedic Surgery King George's Medical University, Lucknow, Uttar Pradesh, India
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P113. Pedicle morphology of the lumbar spine in a diverse population
Brandon Petrone, DO; Thomas J. Dowling III, MD; Jordan Fakhoury, DO; Joseph Alban0, DO; Robert C. Stockton, DO; Jonathon M. Lentz, DO; Kanwarpaul S. Grewal, DO
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P114. Intraoperative transverse process fractures and posterolateral lumbar fusion rates
David H. Kim, MD; Raymond Hwang, MD, MS, MBA; Gyu Ho Lee, MA; Samuel W. Golenbock, MSc; Kevin Baker, PhD; Paul M. Arnold, MD; Rick C. Sasso, MD; Daniel K. Park, MD; Jeffrey Fischgrund, MD
1Tufts University Medical Group, NEBH, Boston, MA, US; 2New England Baptist Hospital, New England Orthopedic and Spine Surgery, Chestnut Hill, MA, US; 3icahn School of Medicine at Mount Sinai, New York, NY, US; 4New England Baptist Hospital, Boston, MA, US; 5Beaumont Health, Royal Oak, MI, US; 6Carle Foundation Hospital, Urbana, IL, US; 7Indiana Spine Group, Carmel, IN, US; 8Southfield, MI, US; 9Franklin, MI, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P115. Patients with degenerative spondylolisthesis maintain clinically relevant improvement five years after surgery
Andreas K. Andrensen, MD; Christian C. Stoettrup, MD; Rune T. Paulsen, MD; Peter Udby, MD; Soren Fruensgaard, MD; Leah Y. Carreon, MD, MSc
1Spine Center of Southern Denmark, Middelfart, Denmark; 2Lillebaelt Hospital, Middelfart, Denmark; 3Lillebaelt Hospital, Middelfart, Region Syddanmark, Denmark; 4Zealand University Hospital, Department of Orthopedic Surgery, Koge, Zeeland, Denmark; 5Silkeborg Central Hospital, Silkeborg, Denmark; 6Sygehus Lillebaelt - Rygkirurgi Middelfart, Denmark
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P116. Comparing short term complications of inpatient versus outpatient elective vertebral augmentation for osteoporotic vertebral compression fractures
John Shin, MD; Colin B. Harris, MD; Michael J. Vives, MD
1Rutgers New Jersey Medical School, Newark, NJ, US; 2Rutgers - New Jersey Medical School, Essex Fells, NJ, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P117. Navigated robotic assistance improves pedicle screw accuracy in minimally invasive surgery of the thoracolumbar spine: 341 patients in a single institution
Arnold B. Vardiman, MD; David J. Wallace, MD; Neil Crawford, PhD; Jessica Riggienan, BS; Samantha Greeley, BA; Charles Gerald T. Ledonio, MD, CCRP; Grant Jamgoghan, BS; Brandon Bucklen, PhD
FDA Device/Drug Status: Excelsius GPS (Globus Medical) (Approved for this indication)
**P118. Pelvic fixation improves coronal balance, decreases pelvic obliquity, but is not essential in neuromuscular scoliosis (NMS)**

Vishal Sarwahi, MD; Jesse M. Galina, BS; Beverly Thornhill, MD; Kathleen Maguire, MD; Sayyida S. Hasan, BS; Jordan Fakhoury, DO; Thomas J. Dowling III, MD; Terry D. Amaral, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P119. Comparison of five-year outcomes between wide laminectomy, segmental bilateral laminotomies and unilateral hemi-laminectomy for lumbar spinal stenosis**

Jamal Bech Bouknaitir, MD; Leah Y. Carreon, MD, MSc; Stig Borson, MD, PhD; Casper Friis Pederson, Cand.Scient.; Mikkel Andersen, MD

1Zealand University Hospital, Koege, Denmark; 2Sygehus Lillebælt - Rygkirurgi Middelfart, Denmark; 3Zealand University Hospital, Dept. of Orthopaedic Surgery, Koege, Denmark; 4Centre for Spine Surgery and Research, Spine Centre of Southern Denmark, Hospital Lillebaelt, Middelfart, Denmark; 5Middelfart, Denmark

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P120. Five-year patient reported outcomes ABM/P-15 versus allograft in non-instrumented posterolateral fusion**

Mikkel Andersen, MD; Michael K. Jacobsen, MD; Soren Overgaard, MD, PhD; Leah Y. Carreon, MD, MSc

1Middelfart, Denmark; 2Spine Surgery and Research, Spine Center of Southern Denmark- part of Lillebaelt Hospital, Middelfart, Southern Denmark, Denmark; 3Odense University Hospital, Odense, Denmark; 4Sygehus Lillebaelt - Rygkirurgi Middelfart, Denmark

FDA Device/Drug Status: ABM/P-15 (Investigational/Not approved)

**P121. Fusion rate for stand-alone lateral lumbar interbody fusion: a systematic review**

Mustfa K. Manzur, MPH; MS, BS; Michael E. Steinhaus, MD; Sohrab Virk, MD; Bridget Jivanelli, MS, BA; Avani S. Vaishnav, MBBS; Steven J. McAnany, MD; Sratvislt Iyer, MD; Todd J. Albert, MD; Catherine Himo Gang, MPH; Sheeraz A. Qureshi, MD, MBA


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P122. Use of a novel allograft in single- and two-level posterolateral lumbar spinal fusion: two year clinical and radiographic results from a prospective multicenter study**

Scott D. Daffner, MD; Joshua Bunch, MD; Howard S. An, MD; Douglas C. Burton, MD; Robert. Milami IV, MD; Daniel K. Park, MD; K. Brandon Strenge, MD; Peter G. Whang, MD, FACS

1West Virginia University School of Medicine, Morgantown, WV, US; 2University of Kansas Medical Center, Kansas City, KS, US; 3Rush University Medical Center, Department of Orthopedic Surgery, Chicago, IL, US; 4OrthoCarolina Spine Center, Charlotte, NC, US; 5Southfield, MI, US; 6The Orthopaedic Institute of Western Kentucky, Paducah, KY, US; 7Yale University - School of Medicine, New Haven, CT, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P123. 24-month outcomes of a prospective investigation of a novel mesh interbody spacer in single level fusions**

Pierce D. Nunley, MD; John H. Chi, MD; Martin H. Krag, MD; Mohammad Bydon, MD; Stephane Lavoie, MD; Yi Lu, MD, PhD; Marcus Stone, PhD


FDA Device/Drug Status: OptiMesh (Not approved for this indication)

**P124. The Lordosing Effect of the prone transpsoas Technique: preliminary results of a multicenter experience**

Antoine Tohmeh, MD; Luiz Pirmenta, MD, PhD; Gabriel Pokorny, BS; Ashish Patel, MD; Rodrigo A. Amaral, MD; William R. Taylor, MD

1MultiCare Neuroscience Institute, Spokane Valley, WA, US; 2IPC, Sao Paulo, Brazil; 3Guaratuba, 280, Sao Paulo, Brazil; 4Dupage Medical Group, Naperville, IL, US; 5IPC - Instituto de Patologia da Coluna, Sao Paulo, Brazil; 6University of California San Diego - Dept of Neurosurgery, La Jolla, CA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P125. Concurrence presence of thoracolumbar scoliosis and Arnold Chiari Malformation: is operative risk magnified**

Peter G. Passias, MD; Sara Naessig, BS; Waleed Ahmad; Katherine E. Pierce, BS; Muhammad B. Janjua, MD; Bassel G. Diebo, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P126. Psychometric evaluation of PROMIS physical function computer adaptive testing in minimally invasive lumbar spine surgery: an analysis of responsiveness, coverage, discriminant validity and concurrent validity

Avani S. Vaishnav, MBBS; Steven J. McNaney, MD; Sravisht Iyer, MD; Todd J. Albert, MD; Catherine Himo Gang, MPH; Sheeraz A. Qureshi, MD, MBA

1Hospital for Special Surgery, Stamford, CT, US; 2Hospital for Special Surgery, New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P127. PROMIS better reflects the impact of length of stay and the occurrence of complications within 90 days than legacy outcome measures for lumbar degenerative surgery

Sara Naessig, BS; Cole Bortz, BA; Katherine E. Pierce, BS; Waleed Ahmad; Shaleen N. Vira, MD; Bassel G. Diebo, MD; Aaron J. Buckland, MBBS, FRACS; Peter G. Passias, MD

1NYU Langone Hospital, New York, NY, US; 2New York, NY, US; 3NYU Spine Research Lab, New York, NY, US; 4Department of Orthopaedic Surgery, UT Southwestern Medical Center, Dallas, TX, US; 5Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 6Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P128. Spinal cord stimulation decreases pain and disability in patients with non-radicular, nonoperative chronic axial low back pain

Benjamin C. Dorenkamp, O1; John M. Popovich Jr., PhD, DPT, AC2; Kaitlin O’Hagan, O3; John N. Flood, O4


FDA Device/Drug Status: Boston Scientific Coverage Lead with Precision Spectra Spinal Cord Stimulator System (Approved for this indication)

P129. Outcome analysis of expandable cage use in transfemoral lumbar interbody fusions

Carolyn Stickley, BS; Travis C. Philipp, MD; Erik Wang, BA; Jack Zhong, BA; Ethan W. Ayres, MPH; Earmán Balouch, MD, PhD; Nicholas O’Malley, BS; Carlos Leon, BS; Constance Maglaras, PhD; Jordan H. Manning, BA; Christopher Varlotta, BS; Aaron J. Buckland, MBBS, FRACS


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P130. Does the utilization of comprehensive surgical planning software improve postoperative sagittal alignment: an interim multicenter analysis

Isaac O. Karikari, MD; Robert K. Eastlack, MD; Adam S. Kanter, MD; Jonathan N. Sembrano, MD; Donald J. Blaskiewicz, MD; Antoine Tohmeh, MD; Oren N. Gottfried, MD; Arash Emami, MD; Jim A. Youssef, MD; Sahir Jabbouri, BS; David O. Okonkwo, MD


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P131. The association of comorbidity burden on lumbar decompression postoperative outcomes

James Parrish, MPH; Nathaniel Jenkins, BS, MS; Evan Sheha, MD; Nadia Hryniewycz, BS; Thomas Brundage, BS; Kern Singh, MD

1Rush University Medical Center, Chicago, IL, US; 2Rush University, Chicago, IL, US; 3Chicago, IL, US; 4Midwest Orthopedics at Rush, Chicago, IL, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P132. Is there a difference in clinical outcomes between single level and two level anterior lumbar interbody fusion for degenerative disc disease?

Bryce Basques, MD, MHS; Garrett Harada, MD; Krishn Khanna, MD; Samuel Rudisill, BS; Zakariah Siyaji, BS; Omar Alam, MD; Frank M. Phillips, MD

1Thomas Jefferson University, Philadelphia, PA, US; 2Los Angeles, CA, US; 3Midwest Orthopedics at Rush, Chicago, IL, US; 4Rush University Medical Center, Chicago, IL, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P133. Does bone morphogenic protein (BMP) use reduce pseudoarthrosis rates in singlelevel TLIF surgeries?

Jack Zhong, BA; Jarid Tareen, MD; Kimberly Ashayeri, MD; Carlos Leon, BS; Eamran Balouch, MD, PhD; Carolyn Stickley, BS; Nicholas O’Malley, BS; Constance Maglaras, PhD; Brooke O’Connell, MS; Ethan W. Ayres, MPH; Aaron J. Buckland, MBBS, FRACS


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P134. Higher rates of medical complications and costs of care following delayed surgical intervention for Cauda Equina Syndrome: a matched-control analysis

Ajit Vakharia, MD; Walter B. Klyce, MD; Yazdan Raji, MD; Jerry Y. Du, MD; Nicholas U. Ahn, MD

1University Hospitals Cleveland Medical Center, Case Western Reserve University, Dept of Orthopaedic Surgery, Cleveland, OH, US; 2University Hospitals, Cleveland, OH, US; 3University Hospitals Cleveland Medical Center, Cleveland, OH, US; 4University Hospitals Cleveland Medical Center/ Case Western Reserve University, Cleveland, OH, US; 5University Hospital of Cleveland, Department of Orthopedic Surgery, Cleveland, OH, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P135. Sagittal balance and outcomes after MIS TLIF for short-segment degenerative spondylolisthesis

Andre Samuel, MD; Yahya A. Othman; Avani S. Vaishnav, MBBS; Steven J. McAnany, MD; Shravishth Iyer, MD; Todd J. Albert, MD; Catherine Himo Gang, MPH; Sheeraz A. Qureshi, MD, MBA

1Hospital for Special Surgery, New York, NY, US; 2Weill Cornell Medicine, Qatar Foundation, Rayyan, Qatar; 3Hospital for Special Surgery, Stamford, CT, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P136. Clinical and radiographic outcomes after lumber decompression with placement of interlaminar spacers versus decompression alone

Eren O. Kuris, MD; Bradley Reeves, BS; Nolan M. Wessell, MD; Christopher Kleck, MD; Vikas V. Patel, MD; Evalina L. Burger, MD

1Brown University Department of Orthopaedics, Providence, RI, US; 2University of Colorado School of Medicine, Aurora, CO, US; 3University of Colorado, Aurora, CO, US; 4Dept of Orthopaedics - UCDenver, Aurora, CO, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P137. Osteoporosis is a predictor of two-year adverse outcomes following short fusion for degenerative lumbar disease

Salem Najjar, BA; Adam J. Wolfert, BA; Alexander Rompala, BA; George A. Beyer, MS; Harleen Kaur, BA; Dillon Sedaghatpour, MD; Neil V. Shah, MD, MS; Peter G. Passias, MD; Virginie Lafage, PhD; Frank J. Schwab, MD; Bassel G. Diebo, MD; Carl B. Paulino, MD

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FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P138. Crossing the junction: effect of fusion length on reoperations for revision thoracolumbar fusion to sacrum

Jack Zhong, BA; Eaman Balouch, MD, PhD; Nicholas O’Malley, BS; Carlos Leon, BS; Carolyn Stickley, BS; Constance Maglaras, PhD; Ethan W. Ayres, MPH; Karan S. Patel, MD; Yong H. Kim, MD; Themistocles S. Protopsaltis, MD; Aaron J. Buckland, MBBS, FRACS


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Trauma ePosters

P139. High rate of mortality after spinal trauma in patients with ankylosing spondylitis

Mitchel Harris, MD, FACS; Abhishek Keraliya, MD; Bharti Khurana, MD; David Sing, MD

1Massachusetts General Hospital, Boston, MA, US; 2Brigham and Women's Hospital, Department of Radiology, Boston, MA, US; 3Boston Medical Center, Boston, MA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P140. Delayed diagnosis impacted on delayed paralysis in spinal fractures with diffuse idiopathic skeletal hyperostosis: prospective nationwide study

Eijiro Okada, MD; Kanichiro Wada, MD, PhD; Tatsuya Yasuda, MD; Kenji Mori, MD, PhD; Junji Matsunaga, MD; Hiroyuki Katoh, MD, PhD; Toshitaka Yoshi, MD; Atsushi Okawa, MD, PhD; Morio Matsumoto, MD; Kota Watanabe, MD

1Saiseikai Central Hospital, Tokyo, Japan; 2Department of Orthopaedic Surgery, Hiroaki University Graduate of Medicine, Hirosaki, Aomori, Japan; 3Hamamatsu Medical Center, Hamamatsu, Japan; 4Shiga University of Medical Science/ Dept of Orthop Surgery, Otsu, Japan; 5Kagoshima, Japan; 6Tokai University School of Medicine, Kanagawa, Japan; 7Tokyo Medical & Dental University, Tokyo, Japan; 8Bunkyo-Ku, Japan; 9Keio University School of Medicine, Tokyo, Japan; 10Keio University, Keio, Japan

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
Innovative Technology Presentations (Non-CME)

1. Comparison between patient-specific interbody devices vs stock devices in achieving the planned correction in the treatment of adult spinal deformity
   Justin L. Esterberg, MD; Niall Casey
   1Mercer Island, WA, US; 2Carlsmed, La Jolla, CA
   FDA Device/Drug Status: The Carlsmed personalized interbody devices presented in this study are not cleared by the US FDA. (Not approved for this indication)

2. Does implant profile matter for SI construct stability?
   Sam Fang
   Lewisville, TX, US
   FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3. Preliminary clinical and radiographic results from a multicenter, prospective lumbar spinal fusion study of the Trinity ELITE Allograft
   Anthony J. Russo, MD; Daniel K. Park, MD; J. Rafe Sales, MD; Timothy Peppers, MD; Joshua Wind, MD; Hamid Hassanzadeh, MD
   FDA Device/Drug Status: Trinity ELITE (Approved for this indication)

4. Improvements of quality of motion and associated patient outcomes: an analysis of two-year clinical results for a novel compressible core artificial cervical disc as compared to anterior cervical disectomy and fusion
   Frank M. Phillips, MD; Rick C. Sasso, MD; Todd H. Lanman, MD; William F. Lavelle, MD; Scott L. Blumenthal, MD; Carl Laurysen, MD; Richard D. Guyer, MD; Todd J. Albert, MD; Jack E. Zigler, MD; Frank P. Cammisa, MD; Robert Milam IV, MD
   FDA Device/Drug Status: M6-C artificial cervical disc (Approved for this indication)

5. Nano-scale surface features of a novel PEEK Titanium Composite (PTC) interbody cage: a morphological and cellular evaluation
   Erik I. Waldorff, PhD; Jiechao Jiang, PhD; Nora Bloise, PhD; Giulia Montagna; Livia Visai, PhD; Sam Fang; Nianli Zhang, PhD; James T. Ryaby, PhD
   1Orthofix, Lewisville, TX, US; 2Materials Science and Engineering Department, Arlington, TX, US; 3University of Pavia, Pavia, Italy; 4Lewisville, TX, US
   FDA Device/Drug Status: FORZA PTC (Approved for this indication), Pillar SA PTC (Approved for this indication), CONSTRUX Mini PTC (Approved for this indication)

6. Viable cellular bone allografts can support angiogenesis in vitro
   Anouska Dasgupta, PhD; Adiba Chowdhury, MS
   FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

7. Brushite coating on 3D printed Ti-porous structures for optimal osteointegration
   Mukesh Kumar, PhD
   Bartlett, TN, US
   FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

8. Can artificial intelligence support or even replace physicians in measuring the sagittal balance? A validation study on preoperative and postoperative images of 170 patients
   Priyanka Grover, MSc; Jakob Siebenwirth; Christina Caspari; Marcel Dreischarf, PhD; Michael Putzier, MD; Jörg Franke, PhD, MD
   1Raylytic GmbH, Leipzig, Germany; 2Klinikum Magdeburg, Magdeburg, Germany; 3Charité – University Berlin, Berlin, Germany
   FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9. Comparative study on biomechanical and water absorption properties of disc tissue particulate
   Shabnam M. Namin, PhD; Renaud Sicard, PhD; Timothy Ganey, PhD
   FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
10. Characterization of amniotic fluid for anti-inflammatory and immunomodulatory properties
Shabnam M. Namin, PhD1; Renaud Sicard, PhD2; Timothy Ganey, PhD3; Tania del Rivero, PhD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11. Co-culture with cryopreserved spine-derived cells attenuates TNF-induced inflammation in nucleus pulposus cells
Shabnam M. Namin, PhD1; Renaud Sicard, PhD2; Timothy Ganey, PhD3; Jonathan Messer, PhD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

12. Understanding the relationship between osteoimmunology and bone response of PEEK, titanium and a novel PEEK-zeolite composite
Sriram Sankar, MSc1; Joseph J. Crudden, MD2; Joseph Bartolacci3
1DiFusion Technologies, Inc., Austin, TX, US; 2Austin, TX, US; 3McGowan Institute for Regenerative Medicine, Pittsburgh, PA, US
FDA Device/Drug Status: PEEK-ZEOLITE COMPOSITE (ZFUZE) (Approved for this indication), NANOLOCK TITANIUM (ENDOSKELETON) (Approved for this indication), PEEK (XIPHOS) (Approved for this indication)

13. 3DRTM printed lumbar interbody fusion system provides an advanced option for circumferential fusion of the lumbar spine
James M. Mok, MD1; Faiz U. Ahmad, MD, M.Ch2; David B. Cain3; Wayne Gray4; Pam Cowart, APRN, MSN4
1DuPage Medical Group, Elmhurst, IL, US; 2Emory University, Emory Faculty Office Building, Atlanta, GA, US; 3Marietta, GA, US; 4MiRus, Marietta, GA, US
FDA Device/Drug Status: MiRus 3DR Lumbar Interbody Fusion Device (Approved for this indication)

14. Comparison of a 3D printed truss-based lateral interbody device to an annular lateral interbody device for resistance to subsidence: a cadaveric study
Ali Kiapour, PhD1; Puya Alikhani, MD2
1Boston, MA, US; 2Tampa, FL, US
FDA Device/Drug Status: LSTS Truss Lateral Interbody System (Approved for this indication)
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