LET’S TALK ABOUT THE ELEPHANT IN THE ROOM

While many spine companies have turned to printing interbody devices, one fact remains – you can’t print scientific integrity. Don’t let gimmicky marketing tactics make a mess of validated science.

Learn more about our 12 published articles in support of our award-winning surface technologies at NASS Booth 1441.
A comprehensive platform that applies three-dimensional solutions across the entire clinical care continuum to help drive quality outcomes for spine patients.

www.BACS.com

Visit us at NASS in Booth #2001
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The Tritanium Family

Built with Tritanium In-Growth Technology

Introducing
Tritanium TL
Curved Posterior Lumbar Cage

Tritanium C
Anterior Cervical Cage

Tritanium PL
Posterior Lumbar Cage

Experience augmented reality and coffee crafted just for you. See you at booth #1401!

Osteoblasts  Tritanium In-Growth Technology

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TRN0450_U1_17F039
We are thrilled that you’re here to participate in the NASS 33rd Annual Meeting. There is ample educational programming for you to attend during the day as well as evening hands-on workshops and events.

Hear the best research during 30 abstract sessions and three best papers sessions with 283 abstracts, including 21 best paper presentations. View 181 ePosters including 50 posters presented in poster grand rounds.

The 18 symposia will address topics such as surgical implants, outpatient surgery, intraoperative neurophysiological monitoring and emerging technologies. The interdisciplinary spine forum sessions will cover topics for non-physician spine specialists including kinematics, patient self-care, opiates, spine value models and fragility fractures.

Put on your comfortable shoes to walk the Technical Exhibition, and view the daily cadaveric demonstrations and product presentations.

On Wednesday, Hugh Hewitt, nationally syndicated talk show host and political analyst, will describe the role health care will play in the upcoming mid-term elections. After the day’s sessions conclude, stop by the Social Hour in the South Lobby of the convention center. This reception is a great time to network, and enjoy food and libations.

Thursday incoming NASS president Jeffrey Wang, MD will deliver some highlights of what’s ahead and current president Daniel Resnick, MD, MS will provide an overview of what transpired during his term. Following Dr. Resnick, Vijay Gupta, LA Philharmonic violinist, will explain how he uses music to uplift the spirits of people from all walks of life.

The International Spine Forum presentations from 16 international organizations will address topics such as minimally invasive spine surgery, trauma, lumbar degeneration, cervical spine and adult spinal deformity on Friday.

The meeting will wrap up on Saturday with symposia that will focus on failed lumbar surgery, medical device innovation, disc replacement and biologics trends, as well as abstract presentations on deformity and opioids.

Gain knowledge and build your network while enjoying the restaurants and nightlife of this vibrant California destination.

QUESTIONS?
Educational Programming: education@spine.org
Registration: registration@spine.org
Housing: meetingservices@spine.org
Exhibits: exhibits@spine.org
Membership: membership@spine.org
NASS Spine Registry: registry@spine.org
Redefine Spinal Fusion Recovery

STIM onTrack™ Mobile App

- Provides remote visibility of patient usage data
- Facilitates patient adherence to their bone growth therapy device prescription

Visit Orthofix booth #1723 at NASS to see our spine portfolio

References: 1. iData Research Inc., U.S. Market for Spinal Implants and VCF (DATA_USSP17_RPT), iData Research Inc (www.idatresearch.net) 2017 2. iData Research Inc., U.S. Market for Orthopedic Trauma Devices (DATA_USTRA17_RMS), iData Research Inc (www.idatresearch.net) 2017

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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.

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.

The North American Spine Society designates this live activity for a maximum of 27 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

The American Medical Association has determined that physicians not licensed in the U.S. to participate in this CME activity are eligible for AMA PRA Category 1 Credits™.

Obtain additional credit by attending the following courses: Coding Update 2018: Conquering Your Coding Hurdles and Hands-On Course: Minimally Invasive Spine Surgery.

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

Annual Meeting 2018 Sessions OnDemand—CME Credit Available!
Order the 2018 Annual Meeting session recordings and get 24/7 access to more than 500 scientific presentations, including electronic posters, scientific sessions, symposia, breakout sessions, abstracts, featured lectures and more. These web-based, fully synchronized audio, video and slide presentations are available anywhere with Internet access. Topics covered include MIS, biomechanics, neuromonitoring, innovation, motion preservation, spinal deformity, diagnostics and imaging, interventions, and much more. Purchase through the online shop at www.spine.org/ondemand.

Members: The session recordings are provided at no charge to NASS members who attended the Annual Meeting.

CME credit is available for watching symposia and the Interdisciplinary Spine Forum. View recordings by visiting www.spine.org/presentations.

The North American Spine Society designates this enduring material for a maximum of 58.25 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

HOW TO CLAIM YOUR CME
On Tuesday evening and Saturday afternoon all attendees will receive an email with a link to www.spine.org/CME to report session attendance each day. You will not be able to submit answers or print a certificate until the meeting has concluded on Saturday, September 29 at noon.
TRUST THE EVIDENCE

Interbody Fusion Outcomes may be Improved with PEEK-OPTIMA™ Polymers

Higher fusion, lower subsidence rates with PEEK-OPTIMA Natural compared to Titanium

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<td>Fusion Rate*</td>
<td>47-93%</td>
<td>88-100%</td>
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<tr>
<td>Subsidence Rate**</td>
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For a full non-metal solution for bone ongrowth, PEEK-OPTIMA HA Enhanced is fully integrated, not coated, with Hydroxyapatite (HA).

Early clinical results for cervical and lumbar fusion indicate potential patient benefits and reveal specific improvements:*  
- Solid fusions as early as 6 months  
- Dense bone apposition at the bone-implant interface  
- Positive clinical outcomes at early time points  
- Improvements in overall pain & neurological function

Visit us at NASS2018 – Booth 2115

Invibio.com


* Based on radiographic outcome
* Testimonials presented have been provided by practicing orthopedic surgeons. Their views and experiences are their own and do not necessarily reflect those of others. Invibio disclaims any liabilities or loss in connection with the information herein.

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Continuing Education (CE) Credit for Allied Health Professionals

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

Accredited sessions for Allied Health Continuing Education are marked with an icon. Look for this icon to make sure you are attending sessions that maximize your accredited educational experience.

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 CME Credit™ 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 Credit™ from organizations accredited by the ACCME.

Chiropractors: NASS has received approval from the Southern California University of Health Sciences to offer continuing education credits to Chiropractors from select states.

Physical Therapists: NASS has received approval to offer continuing education credits to Physical Therapists from select states. Please contact education@spine.org for details.

Nurses: In support of improving patient care, this activity has been planned and implemented by AXIS Medical Education and North American Spine Society. AXIS Medical Education is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Credit Designation for Nursing: AXIS Medical Education designates this continuing nursing education activity for 22.25 contact hours.

Please note that accredited status does not imply endorsement by the provider or ANCC of any commercial products displayed in conjunction with an activity.

AXIS Contact Information: For information about the accreditation of this program, please contact AXIS at info@axismeded.org.

Disclaimer

The material presented at the 33rd 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.

NASS disclaims any and all liability for injury or other damages to any individual attending the meeting and for all claims which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by physicians or any other person.

This Final Program contains confirmed program content, faculty and presenters as of August 16, 2018. Any changes to the published Final Program will be announced at the beginning of each session.
Level I Evidence Is Adding Up.

coflex is the First and Only Lumbar Spinal Device with Level I Evidence:

Prospective, Randomized Studies

Standard Treatments (decompression alone and fusion)

Different Countries

^For Composite Clinical Success (CCS) at 2 years (p=0.017). Claims based on ESCADA data, published in Journal of Neurosurgery: Spine. Volume 28 Issue 4, April 2018. CCS is a binary outcome measure in which all 4 components must be achieved: 1) ODI success with improvement > 15 points; 2) survisorship success with no secondary interventions or lumbar injections; 3) neurologic maintenance or improvement, without worsening; and 4) no device- or procedure-related adverse events. coflex® and Interlaminar Stabilization® are registered trademarks of Paradigm Spine, LLC.
If you are looking for industry innovations, the Technical Exhibition offers you a variety of experiences to continue your professional development. If you’re looking for food, a place to meet, surgical training, interactive learning or a new job, the Technical Exhibition features something for everyone.

With more than 300 exhibitors, you can find the newest products in spine. The mobile event app is the best way to search for what you seek. Search by product category, type in a keyword. Don’t wander; plan your search and find what you need. Our exhibitors would love to put their products into your hands and NASS is the only place all of the spine market gathers for you.

**Hours:**
- Wednesday, September 26: 9:00 a.m.-5:00 p.m.
- Thursday, September 27: 9:00 a.m.-5:00 p.m.
- Friday, September 28: 9:00 a.m.-1:30 p.m.

**DINING OPTIONS**

**Complimentary Boxed Lunches**
Booth 449
Connect with past colleagues or make new connections over lunch. For registered medical attendees, complimentary boxed lunches are available from 12:00-1:00 p.m. on Wednesday, Thursday and Friday.

**Concessions**
Coffee and sandwich concessions are available in the South Lobby outside the Technical Exhibition. In addition, varieties of food options are available in the food court areas located inside the Technical Exhibition at booths 1667 and 2611.

**Lunch and Learn at the Solution Showcase**
The Learning Place, Red Theater
Grab your lunch and take it to the Solution Showcase where industry will present the latest research. Two presentations each day will take place from 12:00-1:00 p.m. Listen to presentations from Stryker, Richard Wolf, Zimmer Biomet and Medicrea USA. Get there early as these presentations are always well attended. Check the mobile event app for the current schedule.

**THE LEARNING PLACE**

**Entrance to Technical Exhibition**
The Learning Place features areas for experiential and independent learning.

**ePosters**
View hundreds of ePosters throughout the meeting. ePosters also are available in the mobile event app and included in the OnDemand meeting recordings.

**Poster Grand Rounds**
During the morning and afternoon networking breaks, you will have the opportunity to meet with and ask questions of selected ePoster authors.

**Internet Station**
Visit the internet station to keep in touch with your home or office while at the Annual Meeting. Several computers with internet access are available.

**Surgical Innovation Lab**
Want to get really hands-on? The Surgical Innovation Labs offer you the opportunity to see the newest products in situ. Cadaveric demonstrations will take place from 8:00 a.m.-4:00 p.m. Wednesday and Thursday and until 10:00 a.m. Friday. Companies offer surgical workshops on Wednesday and Thursday evenings allowing you to scrub in and try out the latest innovations for yourself. The expanded offerings of the Surgical Innovation Lab offer you experiential learning to complement your professional goals. Check the mobile event app for an updated schedule.

Thank you to GE Healthcare, Philips Healthcare, Siemens Healthineers, Ziehm Imaging and Protech Medical for their lab support.
Simulated Surgery Lab Presentation
Learn about and try the latest in virtual reality simulation. Powered by Immersive Touch, the Simulated Surgery Lab allows you to view CT scans in immersive Virtual Reality and feel the latest in haptic technology. What does that mean? It means it actually provides physical resistance when simulating surgery. Virtual reality with a touch factor.

Upload your own patient’s CT imaging files to the HIPAA-compliant drop box at www.immersivetouch.com/nass. You will then be able to view them in full VR.

Presentations occur during morning, lunch and afternoon breaks. Powered by Immersive Touch and Dell.

Practical Theater Presentations
Red Theater (Located by Lunch)
Connect with topics of interest to you and your practice. Presentations occur throughout the week during breaks. With the recent launch of the NASS Spine Registry, this year’s presentations will be NASS Spine Registry Q&A sessions. Come hear about the registry and ask questions you may have.

NASS Spine Registry and Research Booth
Located by Lunch
In June 2018, NASS launched its Spine Registry. Come visit the booth to learn more about the registry, what it does, and how you can participate!

Are you logical? To celebrate, educate and add a little fun to the NASS Spine Registry, we’ve added a game app to this year’s meeting. Take your brainpower and put it to fun use for a series of puzzles, networking challenges and much more in our first ever conference hunt. Use your brain and cell phone to collect points and earn chances to win prizes while competing with your colleagues. Watch for information on how to join!

Website: www.spine.org/Registry
Questions: registry@spine.org

This booth also will house NASS Research information. The NASS Research Council and its committees are dedicated to advancing the science and care of spine on behalf of the NASS membership and spine field. Stop by to see what’s new from these volunteers working on your behalf and pick up information about:

- Clinical Guidelines
- Appropriate Use Criteria and mobile app
- Patient safety alerts
- 2019 Research Grant Application
- Clinical tools and more!

TECHNICAL EXHIBITION HOURS:
Wednesday, September 26
9:00 a.m.-5:00 p.m.

Thursday, September 27
9:00 a.m.-5:00 p.m.

Friday, September 28
9:00 a.m.-1:30 p.m.
**Exercise Booth: How To Save Your Neck When Using Tech**

Developed by the Exercise Committee, this updated interactive booth features patient education tools for your practice. Information about exercises and short videos are available at the Exercise Booth. Interact with colleagues, Exercise Committee members and physical therapists, and learn from ongoing live demonstrations.

**Career Building**

Stop by the Career Building suite to get a professional headshot taken, attend career-related educational sessions, and participate in the onsite recruitment event where you can browse available jobs or arrange appointments/interviews with employers.

**Wednesday, September 26**

9:00 a.m.-5:00 p.m.
Participate in Recruitment Event
12:00-1:00 p.m.
Get a Professional Headshot
1:30-2:00 p.m.
Presentation: An Inside Look at the Job Hunt
2:00-3:00 p.m.
Presentation: Intersecting with NASS

**Thursday, September 27**

9:00 a.m.-5:00 p.m.
Participate in Recruitment Event
12:00-1:00 p.m.
Get a Professional Headshot
3:35-5:05 p.m.
Presentation: Transitioning from Training to Practice

**Friday, September 28**

9:00 a.m.-12:00 p.m.
Participate in Recruitment Event
12:00-1:00 p.m.
Get a Professional Headshot

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activL® Artificial Disc with Intelligent Motion Technology™ is the next generation in lumbar motion preservation, helping to maintain the mechanics of the healthy spine. More and more U.S. payers are seeing that lumbar TDR with activL Artificial Disc should be a standard of care for the active patient subpopulation of DDD sufferers.

Visit Booth 1101 to learn more.
ATTENDEE RESOURCES

Registration
South Lobby

Hours:
- Tuesday, September 25: 6:30 a.m.-4:30 p.m.
- Wednesday, September 26: 6:30 a.m.-5:00 p.m.
- Thursday, September 27: 6:30 a.m.-5:00 p.m.
- Friday, September 28: 7:00 a.m.-5:00 p.m.
- Saturday, September 29: 7:00 a.m.-12:00 p.m.

International Certificate Printing
South Lobby
Visit the certificate printing station next to the registration desk to print your certificate of meeting attendance beginning Thursday, September 27 at 11:00 a.m..

Coat and Luggage Check
Business Center
(Concourse Hallway Near Room 150A)
The Coat and Luggage Check is available for your convenience. The cost is $10 per item for full day service and $5 per item for 1-4 hours only. 
*Please Note: All items must be picked up by closing. NASS and the convention center are not responsible for items left at the close of the day.*

Hours:
- Wednesday, September 26: 7:00 a.m.-5:30 p.m.
- Thursday, September 27: 7:00 a.m.-6:30 p.m.
- Friday, September 28: 7:00 a.m.-6:00 p.m.
- Saturday, September 29: 7:00 a.m.-12:00 p.m.

Photography Orders
Looking for photos from the Annual Meeting? Visit [http://spine.smugmug.com](http://spine.smugmug.com) to view and order photos of the general sessions, symposia, Technical Exhibition, special events and more.

Los Angeles Information Counter
South Lobby
Staff at the information counter will be able to supply you with information on the city and beyond: tourist attractions, places of interest, shopping, dining, tips for tourists, etc. Restaurant reservation services also are available to assist with suggestions and reservations.

Housing Bureau
South Lobby
onPeak is the official NASS housing agency and will have representatives available to answer questions about your hotel, help you with any hotel issues, and help to book your housing for the 2019 Annual Meeting in Chicago.

Chicago 2019 Information
South Lobby
Stop by the information counter to review exciting material for your trip to Chicago, site of the 2019 Annual Meeting.

NASS SOCIAL HOUR

*New this year!* Visit with colleagues from 5:00-6:00 p.m. on Wednesday, September 26 while enjoying hors d’oeuvres and beverages after sessions end. Located in the South Lobby near Registration.

Sponsored by

[NuVasive](https://www.nuvasive.com)
[Siemens Healthineers](https://www.siemens-healthineers.com)
Richard Wolf introduced the first spine endoscopy system 20 years ago with the YESS set, and has been the innovation leader ever since with the introduction of the first endoscopic interlaminar, cervical, central stenosis, and rhizotomy sets.

Now Richard Wolf introduces Riwospine, a new business unit of Richard Wolf, dedicated to the unique needs of spine endoscopy surgeons worldwide.

Visit us at booth #1223 to see the new leader in spine endoscopy, the stunning new ENDOCAM® Logic 4K imaging system, and our new, innovative RF solutions. See now what others will be showing next year.
**Wine and Dine for Spine**
Help fund spine research by booking restaurant reservations through NASS’s partnership with OpenTable. Each reservation made through the NASS website (www.spine.org/opentable) earns 40 cents for the Annual Research Fund (ARF).

**NASS Advocacy and Political Action Committee: SpinePAC**
South Lobby
As the primary voice for spine specialists on Capitol Hill, NASS helps frame the debate in Washington, DC by sponsoring a political action committee. SpinePAC works to help elect candidates for federal office who share the NASS commitment to promoting access to high quality spine care, reducing burdensome regulations and funding spine research. Last election cycle, SpinePAC endorsed more than 50 candidates for Congress, 90% of whom were elected to the U.S. House of Representatives or Senate. These efforts ensure that YOUR voice, and those of all in the spine care community, have champions in Congress who are involved in the important debates that stand to impact our profession. Your funds help make the difference in getting these candidates to Washington, DC to fight on behalf of our patients and practices each election cycle. NASS members are encouraged to visit the SpinePAC booth located in the south lobby to learn more about NASS advocacy initiatives and make their annual donation to the PAC.

**RESIDENT, FELLOW AND PROGRAM DIRECTORS’ RECEPTION**
Thursday, September 27
5:15-6:15 p.m.
The Learning Place, Red Theater

NASS is proud to announce the 16th Annual Resident, Fellow and Program Directors’ Reception at the 33rd Annual Meeting. This reception provides an opportunity for residents, fellows and potential fellows to mingle with each other and the program directors in a casual setting while enjoying beer, wine and hors d’oeuvres with colleagues.

Sponsored by Misonix.

**MOBILE EVENT APP**
Maximize your conference experience by using our interactive mobile event app. From developing your itinerary and connecting with colleagues to locating exhibitors, the app is your comprehensive tool for navigating the meeting. Type www.spine.org/mobile into your phone’s browser, search “NASS 2018” in your app store or scan the QR code.
Is it time to go **BACK TO THE FUTURE**

In the Treatment of Back Pain

1. **NO OPIOIDS!**
2. **NON-ADDICTIVE!**
3. **NON-INVASIVE!**
4. **PROVEN RELIEF!**
5. **COST-EFFECTIVE!**
6. **PATIENT CONTROLLED!**

**IT’S NOT COMPLICATED!**

For more information see us at NASS Booth #1422 or call 800-428-2304.
MEMBER SERVICES

You are encouraged to visit Member Services to take advantage of meeting-only membership offers and promotions including a drawing for an Apple Watch. Stop by the booth for more details, or see our ad on page 36. Pay your 2019 dues, join NASS or purchase logo merchandise at the booth. Attendees may also renew or join through the following links:

Renew: www.spine.org/renew
Join: www.spine.org/jointoday

PUBLICATIONS

NASS Bookstore
Visit the NASS Bookstore for essential clinical, coverage and patient education content, including:
- Clinical Guidelines: Select from 7 essential topics*
- Common Coding Scenarios for Comprehensive Spine Care: Get the 2018 Coding Book at half-price and preorder the 2019 edition
- Coverage eDocuments: Defining Appropriate Coverage Decisions: Select from 27 procedures*
- Compendium of Outcomes Instruments for Assessment & Research of Spinal Disorders, 2nd Edition
- OKU Spine: 5
- Advanced Reconstruction: Spine
- Instructional Course Lectures: Spine 2
- Patient Education Brochures: Select from 31 topics*

*Digital versions are free for NASS members at spine.org

The Spine Journal and SpineLine
TSJ and SpineLine welcome authors, readers, reviewers and editors. Visit the booth for the latest information on submitting manuscripts, Outstanding Paper Award entries for 2019, and pick up the latest issues.

SpineLine 20 under 40: This year, the SpineLine Editorial Board selected its inaugural 20 Under 40 class, recognizing future leaders in the field of spine care. (The list actually reached 21 because there were so many outstanding nominations.) The winners will be featured at the Publications booth all week.

Connection Questions
Questions about how to access your benefits or connect through the many channels available to you and your colleagues? Stop by for updates on the many convenient options for Spine Journal and SpineLine mobile apps, SpineLine podcast, free eBooks, social media, NASS Daily News, and more.
Medical Innovation.

A Hinged Spinal Table For Advanced Surgical Positioning

Through its unique software-driven hinge technology, the ProAxis® Spinal Surgery Table provides dynamic patient positioning which allows the surgeon to adjust spinal alignment intraoperatively. By using a table that can fluidly and effortlessly flex and extend a patient’s lumbar spine, you now have an elegant solution for spinal articulation throughout the course of the surgery. This active hinge technology provides you with unprecedented potential to achieve better sagittal alignment. Visit mizuhosi.com today to learn more.

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SPEAKER INFORMATION CENTER
South Lobby

Course faculty and symposia presenters may upload or amend presentations by visiting the Speaker Information Center near the registration area. Speakers are not permitted to use their own laptops for their presentations. No exceptions will be made.

There is no Speaker Ready Room at this meeting. Podium and ePoster presenters are not permitted to upload or amend their presentations at any time onsite. Exceptions include The Spine Journal Outstanding Paper Awards and Research Grant Award presentations.

Hours:
Tuesday, September 25  12:00-5:00 p.m.
Wednesday, September 26  6:30 a.m.-5:00 p.m.
Thursday, September 27  6:30 a.m.-5:00 p.m.
Friday, September 28  6:30 a.m.-5:00 p.m.
Saturday, September 29  7:00-11:00 a.m.

PRESSROOM
Room 304A

The on-site Pressroom includes a media-only work area with free online access, charging stations and printer access. Snacks and coffee for credentialed journalists will be available.

Only conference staff, credentialed media and presenter interviewees are allowed access to the pressroom. Members of the media, advertising staff and exhibitors may not host meetings in the pressroom.

Hours:
Wednesday, September 26  7:00 a.m.-5:00 p.m.
Thursday, September 27  7:00 a.m.-5:00 p.m.
Friday, September 28  7:00 a.m.-2:00 p.m.

15TH ANNUAL EVIDENCE + TECHNOLOGY SPINE SUMMIT
February 13-16, 2019
Park City’s Canyons Village, UT

Participate in engaging educational discussions in this casual setting and enjoy the mid-day activities of this beautiful mountain environment. Registration and Housing Opens October 9, 2018.
Details at www.spine.org/etss
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The Spine Journal Outstanding Paper Awards Presentations
Thursday, September 27
1:05-2:05 p.m.
Concourse Hall 152
Honor your colleagues as The Spine Journal presents this year’s Outstanding Paper Awards.

2018 Outstanding Paper in Surgical Science:
Andrew Schoenfeld, MD; Daniel J. Sturgeon, MS; Justin A. Blucher, MS; Adil H. Haider, MD, MPH; James D. Kang, MD

2018 Outstanding Paper in Basic Science:
Christy Tomkins-Lane, PhD; Justin Norden, MPhil; Aman Sinha, MPhil; Richard Hu, MD; Matthew Smuck, MD

Research Grant and Fellowship Awards Presentations
NASS presents this year’s research grants and traveling fellowships to those proposing advancements in spine care and research. Grant recipients from 2014, 2015 and 2016 present their research findings during abstract sessions throughout the meeting.

Value Abstract Awards Presentations
Value Abstract Awards foster and recognize efforts to define value in spine care. Award recipients present during abstract sessions throughout the meeting.

Resident and Fellow Research Awards Presentations
Resident and Fellow Research Awards recognize young researchers and clinicians who work in spine care. Award recipients present during abstract sessions throughout the meeting.

Section Best Paper Awards
Awarded by NASS’ specialty sections, these awards recognize research efforts in specific disciplines. Award recipients will present during abstract sessions throughout the meeting.

- Section on Biologics and Basic Research
- Section on Interdisciplinary Spine
- Section on Intraoperative Neurophysiological Monitoring
- Section on Minimally Invasive Procedures
- Section on Radiology
- Section on Rehabilitation, Interventional and Medical Spine (RIMS)
- Section on Robotics and Navigation

NASS Recognition Awards Presentation
Friday, September 28
10:30-10:40 a.m.
Concourse Hall 151
The Recognition Awards are for outstanding society members.
Leon Wiltse Award: Sohail K. Mirza, MD, MPH
Henry Farfan Award: Jeffrey C. Lotz, MD
David Selby Award: Jerome Schofferman, MD
Past President Award: Jean-Jacques Abitbol, MD
Spine Advocacy Award: John G. Finkenberg, MD

See more information on the award recipients on the following pages.
2018 LEON WILTSE AWARD

Sohail K. Mirza, MD, MPH

To recognize excellence in leadership and/or clinical research in spine care.

Dr. Sohail Mirza is a nationally-known orthopaedic surgeon who specializes in treating complex spinal diseases, cancers, and injuries in adults and children. He has worked extensively with the spine community to advocate for measurement of surgical complications and patient-reported outcomes. In addition to his clinical work, he also is an active researcher, studying treatments for spinal trauma and cervical spine malformations, as well as safety and outcomes data for spine surgeries. Dr. Mirza held an endowed chair in spine research at the University of Washington before being recruited as Chair of the Department of Orthopaedics at Dartmouth in 2008. Over the past 10 years, he led transformation of the orthopedics department to team-based care, consistent use of standardized coordinated care paths, and systematic tracking of patient-reported outcomes in the electronic health record, while significantly reducing direct cost of care and improving patient satisfaction scores. He also helped establish the Dartmouth Center for Surgical Innovation (CSI) — a $20M research facility and associated enterprise to promote and enable technology development and innovations across surgical specialties. In 2018, Dr. Mirza transitioned to the private sector and founded PEER (Patient Experience and End Results) Clinic for Back Pain and Spine Surgery in Fairfax, Virginia. PEER Clinic is modeled on using patient reported outcomes for clinical care decisions.

Nominated by Charles Reitman, MD

2018 HENRY FARFAN AWARD

Jeffrey C. Lotz, MD

To recognize outstanding contributions in spine related basic science research.

Professor Jeffrey Lotz, PhD is the David S. Bradford MD Endowed Chair in Orthopaedic Surgery and Vice Chair of Research at University of California San Francisco (UCSF). He has been the Director of the Orthopaedic Bioengineering Laboratory since 1992, and is the founding director of three centers at UCSF: NIH-funded Core Center for Musculoskeletal Biology in Medicine (CCMBM); the NSF-funded Industry/University Cooperative Research Center (CDMI), and the recently formed NIDCR-funded Center for Dental, Oral and Craniofacial Tissue and Organ Regeneration (C-DOCTOR). Dr. Lotz is a recognized national authority in biomechanics with special expertise in spine biomechanics, intervertebral disc biology, and tissue engineering. He has contributed to our understanding of disc biology through laboratory work focusing on identifying mechanisms of disc degeneration, developing novel diagnostics and therapies for low back pain, and the biomechanics of spinal instrumentation. He is an outstanding educator and student of the spine. Dr. Lotz earned a doctorate degree in Medical Engineering from the Harvard/MIT Division of Health Sciences and Technology, a Master Degree in Mechanical Engineering Design from Stanford University, and Bachelor of Science in Mechanical Engineering from UC Berkeley.

Nominated by Michael Heggeness, MD, PhD and Conor O’Neill, MD
2018 DAVID SELBY AWARD

Jerome Schofferman, MD

To recognize contributions to the art and science of spinal disorder management through service to NASS.

Jerome Schofferman, MD trained in internal medicine at Harbor-UCLA Medical Center and remained on the faculty at UCLA and then UCSF for many years. After moving to San Francisco, he became the medical director of Hospice of San Francisco and help found the first AIDS Hospice. He developed an interest in pain medicine and began working with spine pain in the early 1980s. He is certified by both the American Board of Internal Medicine and American Board of Pain Medicine, and served as a member of the Board of Directors of the American Academy of Pain Medicine. He has been a member of NASS since 1988. As a NASS member, among other appointments, he has served as chair of the conservative care committee and section development committee and then co-chair of the combined medical-surgical care committee. He started the Rehabilitation, Interventional and Medical Spine Section. Dr. Schofferman served on the NASS Board of Directors as Chair of both the Section Development Committee and Ethics & Professionalism and Committee. Dr. Schofferman provided critical input on the initial formulation on the society’s position on conflict of interest to put NASS at the forefront of medical societies addressing ethics and professionalism. He has championed medical ethics with thought provoking presentations and seminars.

Nominated by Charles Reitman, MD and F. Todd Wetzel, MD

2018 PAST PRESIDENT AWARD

Jean-Jacques Abitbol, MD

To recognize a NASS past president who has made exceptional contributions to the society and its mission.

JJ Abitbol continues to be a devoted advocate for excellence in spine care through education and research. Dr. Abitbol was NASS President in 2005-2006 and served on the Board for more than 10 years. He rose through the ranks having served on the Coding Committee, Education Council, Industry Relations Committee and acting as Program Chair for numerous programs, including the 1998 Annual Meeting. His vision brought about the Specialty Education & Research Center (SERC) at NASS where he still serves as its medical director. Dr. Abitbol has also played a key role in furthering excellence in spine care internationally through extensive participation in NASS’ international education efforts by serving as faculty or workshop instructor at programs in Dubai, Singapore, Indonesia, China as well as a multitude of other places. Dr. Abitbol has been a great ambassador for NASS and the spine field through his consistently reasonable approach to spine care through his research and his teachings.

Nominated by Jeffrey C. Wang, MD and David R. O’Brien Jr., MD
2018 SPINE ADVOCACY AWARD

John G. Finkenberg, MD

To recognize members of the North American Spine Society who have made exceptional contributions to the federal advocacy efforts on behalf of patients and members of the society.

Dr. John G. Finkenberg served on the Advocacy Council for 13 years, 6 of which he served as Advocacy Council Director and President of the National Association of Spine Specialists (the advocacy arm to NASS’ political involvement on Capitol Hill). In 2014, Dr. Finkenberg successfully sought approval by the NASS Board of Directors to elevate and transform Advocacy from a Committee into a Council and laid the groundwork for the development of the recently established NASS Legislative Committee. An avid advocate for spine care providers and patients, Dr. Finkenberg represented NASS before Congress and visited Washington, DC on numerous occasions, and is well known in the hallways of Congress. Dr. Finkenberg was instrumental in advocacy efforts to replace Medicare’s Sustainable Growth Rate (SGR) formula and repealing the Independent Payment Advisory Board (IPAB). During his tenure as the Chair of the SpinePAC Board of Directors, Dr. Finkenberg oversaw the second highest fundraising cycle in SpinePAC’s history, reaching $185,000 in donations during the 2015-2016 election cycle. In addition to representing NASS before Congress, Dr. Finkenberg oversaw the coordination of several NASS Town Hall events across the country and frequently attended these engagements to provide NASS members an update on the various advocacy and health policy activities of the society.

Dr. Finkenberg has been in private practice with Alvarado Orthopedic Medical Group in San Diego, California since 1992. He is a general orthopaedic surgeon who has obtained fellowship training after his orthopaedic residency in advanced spinal reconstructive surgery. After attending UCLA Medical School, he completed his orthopaedic training at Harbor-UCLA Medical Center in Torrance, California. He has been the Chief of the Orthopedic Department at Alvarado Hospital Medical Center and has served on the Executive Supervisory Committee for many years. In his spare time, he enjoys sports, sculpting bronze figures and advocating for better health care in Washington, DC.

Nominated by the NASS Advocacy Council
The International Spine Forum (formerly the Global Spine Forum) features presentations from international organizations on the following symposia topics:

7:30-9:10 a.m.
Minimally Invasive Spine Surgery

9:10-10:10 a.m.
Trauma

10:30 a.m.-12:10 p.m.
Lumbar Degenerative

1:00-2:40 p.m.
Cervical Spine

3:00-5:05 p.m.
Adult Spinal Deformity

Participating organizations include:
- AOSpine International
- ARABSPINE
- Association of Spine Surgeons of India
- Brazilian Association of Minimally Invasive Spine Surgery
- Brazilian Spine Society
- British Association of Spinal Surgeons
- Brussels International Spine Symposium
- Chinese Association of Orthopaedic Surgeons
- Egyptian Spine Association
- GEER (Spanish Spine Society)
- International Society for Minimal Intervention in Spinal Surgery
- Indonesian Spine Society
- Japanese Society for Spine Surgery and Related Research
- Kuwait Spine Society
- Mexican Spine Society
- Nspine
- Pakistan Spine Society
- Qatar Spine Society
- Russian Association of Spine Surgeons
- Saudi Spine Society
- SILACO
- SpineWeek
- Ukrainian Spine Society
- UKSSB-BASS/BritSpine
- World Congress of Minimally Invasive Surgery and Techniques
A New Kind of Vision for Spinal Navigation. FAST. EFFICIENT. RADIATION-FREE.

The 7D Surgical System is the first and only Machine-vision Image Guided Surgery (MvIGS) platform. The system delivers on the promise of image guided surgery (IGS) and allows surgeons to perform fast, cost-effective, radiation-free IGS. Unlike conventional IGS systems that rely on time-consuming intra-operative radiation emitting devices or laborious point matching techniques, MvIGS uses only visible light to easily register patients in less than 20 seconds.
GUEST SPEAKER

Hugh Hewitt: Exciting and Innovative Prospects for Advanced Payment Models/Bundled Payments in Spine Care and the Impact of the Trump Presidency on the Upcoming Mid-Term Elections
Wednesday, September 26
10:35 a.m.–12:00 p.m.

Hugh Hewitt is an acclaimed talk show host, political analyst/contributor, professor, attorney and author.

Hewitt is the host of The Hugh Hewitt Show on the Salem Radio Network, and also host of Hugh Hewitt, which airs on MSNBC. In addition, Hewitt is an NBC News analyst, a professor of law at Chapman University Fowler School of Law in Orange County, CA, and a partner with the Los Angeles law firm of Larson O’Brien LLP.

Hewitt is the author of a dozen books on politics, public policy, religion and happiness.

Hewitt describes himself on air as an “Evangelical Roman Catholic Presbyterian” and is a frequent commentator on religion in America. He has conducted more than 25,000 interviews in his quarter century of broadcasting. His mid-career memoir The Happiest Life published in 2014 to critical praise.

Hewitt will discuss the upcoming mid-term elections and the role health care will play in their outcome.

PRESIDENTIAL GUEST SPEAKER

Vijay Gupta
Thursday, September 27
11:00 a.m.–12:00 p.m.

Vijay Gupta, Los Angeles Philharmonic violinist, will explain how he uses music to uplift the spirits of people from all walks of life.

Gupta’s interest in neurobiology and mental health issues has made him a world-renowned advocate for the regenerative power of music. A TED Senior Fellow, Gupta founded Street Symphony—a musical engagement program presented by distinguished musicians of various genres. It aims to empower citizen-musicians by engaging with communities experiencing extreme poverty, incarceration, and homelessness.

Gupta joined the Los Angeles Philharmonic in 2007 at age 19, after having completed an undergraduate degree in biology from Marist College and a Master’s degree in violin performance from the Yale School of Music.

In 2015, the University of La Verne presented Gupta with an honorary Doctor of Humane Letters, and at age 29, he received the Leonard Bernstein Lifetime Achievement Award for the Elevation of Music in Society from the Longy School of Music of Bard College.
A Vaccine Research Study for Adults Undergoing Elective Spinal Surgery

- Reducing surgical infections may contribute to the overall reduction in healthcare infections worldwide.

- A global research study is evaluating the safety and efficacy of an investigational *Staphylococcus aureus* 4-antigen vaccine (SA4Ag) when administered to adults undergoing an elective open posterior spinal fusion procedure with multilevel instrumentation.

- The study objective is to assess the safety and efficacy of this vaccine in reducing postoperative *Staphylococcus aureus* infections.

Potential participants for this study must be:

- 18 to 85 years of age,
- scheduled to undergo an elective open posterior spinal fusion procedure with multilevel instrumentation 10 to 60 days after study vaccination, and
- available for the entire duration of the study (approximately 6 to 8 months), and willing and able to comply with study procedures.
Complimentary shuttle service is provided between Los Angeles Convention Center and selected hotels.

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Route</th>
<th>Shuttle Boarding Location at Hotel</th>
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<tbody>
<tr>
<td>1. Courtyard by Marriott L.A. LIVE</td>
<td>Walk</td>
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<tr>
<td>2. Hotel Indigo Downtown</td>
<td>Walk</td>
<td>-</td>
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<tr>
<td>3. InterContinental Downtown</td>
<td>1</td>
<td>Curbside on 7th St.</td>
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<tr>
<td>4. JW Marriott Los Angeles L.A. Live</td>
<td>Walk</td>
<td>-</td>
</tr>
<tr>
<td>5. The L.A. Hotel Downtown</td>
<td>2</td>
<td>Walk to Westin Bonaventure - Curbside on Figueroa St.</td>
</tr>
<tr>
<td>6. Luxe City Center Hotel</td>
<td>Walk</td>
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<tr>
<td>7. Millennium Biltmore Hotel Los Angeles</td>
<td>3</td>
<td>Curbside on Grand Avenue - End of Driveway</td>
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<tr>
<td>8. Omni Los Angeles Hotel at California Plaza</td>
<td>3</td>
<td>Curbside in Front on Olive</td>
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<tr>
<td>9. Residence Inn by Marriott Los Angeles L.A. Live</td>
<td>Walk</td>
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<tr>
<td>10. Ritz-Carlton L.A. LIVE</td>
<td>Walk</td>
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<tr>
<td>11. Sheraton Grand Los Angeles</td>
<td>1</td>
<td>Curbside on Hope Street</td>
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<tr>
<td>12. The Standard DTLA</td>
<td>1</td>
<td>Walk to The Sheraton - Curbside on Hope St.</td>
</tr>
<tr>
<td>13. The Westin Bonaventure</td>
<td>2</td>
<td>Figueroa Street Entrance</td>
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</tbody>
</table>

As of August 15, 2018. Please review shuttle signage on-site for updated route and schedule information.

**Tuesday, September 25**
- 6:30 a.m.–6:00 p.m. Every 30 minutes
- Departs Los Angeles Convention Center on the hour and half-hour.
- Schedule may vary due to traffic and weather conditions.
- Last bus leaves from hotel 60 minutes prior to end time with no return service.

**Wednesday, September 26**
- 6:00 a.m.–2:00 p.m. Every 10-15 minutes
- 2:00 p.m.–4:00 p.m. Every 30 minutes*
- 4:00 p.m.–5:05 p.m. Every 10-15 minutes

**Thursday, September 27**
- 6:30 a.m.–10:30 a.m. Every 10-15 minutes
- 10:30 a.m.–2:30 p.m. Every 30 minutes*
- 2:30 p.m.–5:05 p.m. Every 10-15 minutes

**Friday, September 28**
- 6:00 a.m.–10:30 a.m. Every 10-15 minutes
- 10:30 a.m.–2:30 p.m. Every 30 minutes*
- 2:30 p.m.–5:05 p.m. Every 10-15 minutes

**Saturday, September 29**
- 7:00 a.m.–12:00 p.m. Every 30 minutes*
1. **Courtyard by Marriott L.A. LIVE**  
   901 W. Olympic Blvd.

2. **Hotel Indigo Downtown**  
   899 Francisco St.

3. **InterContinental Downtown**  
   HEADQUARTER HOTEL  
   900 Wilshire Blvd.

4. **JW Marriott Los Angeles L.A. LIVE**  
   900 W. Olympic Blvd.

5. **The L.A. Hotel Downtown**  
   333 S. Figueroa St.

6. **Luxe City Center Hotel**  
   1020 S. Figueroa St.

7. **Millennium Biltmore Hotel Los Angeles**  
   506 S. Grand Ave.

8. **Omni Los Angeles Hotel at California Plaza**  
   251 S. Olive St.

9. **Residence Inn by Marriott Los Angeles L.A. LIVE**  
   901 W. Olympic Blvd.

10. **Ritz-Carlton L.A. LIVE**  
    900 W. Olympic Blvd.

11. **Sheraton Grand Los Angeles**  
    711 S. Hope St.

12. **The Standard DTLA**  
    550 S. Flower St.

13. **The Westin Bonaventure**  
    404 S. Figueroa St.
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Next generation cervical artificial disc

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• MRI compatible*

• Disc heights as low as 4mm

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## MONDAY, SEPTEMBER 24

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>8:00 a.m. - 5:00 p.m.</td>
<td>Two-Day Course: Coding Update 2018: Conquering Your Coding Hurdles</td>
<td>Room 403B</td>
</tr>
<tr>
<td></td>
<td>Exhibitor Registration</td>
<td>South Lobby</td>
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</table>

## TUESDAY, SEPTEMBER 25

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
<th>Location</th>
</tr>
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<tbody>
<tr>
<td>6:30 a.m. - 4:30 p.m.</td>
<td>Attendee Registration</td>
<td>South Lobby</td>
</tr>
<tr>
<td>7:30 a.m. - 4:30 p.m.</td>
<td>Hands-on Course: Minimally Invasive Spine Surgery</td>
<td>Room 403A</td>
</tr>
<tr>
<td>8:00 a.m. - 5:00 p.m.</td>
<td>Two-Day Course (Continued): Coding Update 2018: Conquering Your Coding Hurdles</td>
<td>Room 403B</td>
</tr>
<tr>
<td>8:00 a.m. - 6:00 p.m.</td>
<td>Exhibitor Registration</td>
<td>South Lobby</td>
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</table>

- Requires separate registration fee
- Surgical session
- Medical session
- Multidisciplinary session

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**GET ACCESS TO MEETING-ONLY SPECIALS**

including entry into an Apple Watch drawing!

---

To enter, simply text the word NASS to 33222 to be registered for your chance to win!*

*By entering this drawing through text, you agree to receive automated text messages from NASS (no more than 10 during the week of NASS’ annual meetings, and no more than 1 per month following the meeting) regarding special offers and NASS membership. Message and data rates may apply. Reply STOP to end. Entry via text is limited to United States phone numbers only and is not required for participation in Apple Watch drawing. For further options to enter, stop by the Member Services booth before Friday at noon PST. Offer available to attendees of the 2018 NASS Annual Meeting. Winner will be chosen on Friday at noon PST and will be notified via email that day. Prizes are non-transferable and must be picked up at the Member Services booth by Saturday at noon PST.
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# MEETING AT-A-GLANCE: WEDNESDAY

## WEDNESDAY, SEPTEMBER 26

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>6:30–8:00 a.m.</td>
<td>Continental Breakfast&lt;br&gt;Concourse Hall Foyer</td>
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<tr>
<td>6:30 a.m.–5:00 p.m.</td>
<td>Attendee Registration&lt;br&gt;South Lobby</td>
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<tr>
<td>7:00 a.m.–5:00 p.m.</td>
<td>Exhibitor Registration&lt;br&gt;South Lobby</td>
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<tr>
<td>7:25–7:30 a.m.</td>
<td>Welcome Remarks&lt;br&gt;Concourse Hall 151</td>
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<tr>
<td>7:30–7:35 a.m.</td>
<td>NASS Working for You:&lt;br&gt;NASS Spine Registry&lt;br&gt;Concourse Hall 151</td>
</tr>
<tr>
<td>7:35–9:00 a.m.</td>
<td>Plenary Session:&lt;br&gt;It’s What is On the Surface That Matters&lt;br&gt;Concourse Hall 151</td>
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<tr>
<td>8:00–10:00 a.m.</td>
<td>Surgical Innovation Lab Demos&lt;br&gt;The Learning Place</td>
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<tr>
<td>9:00–10:00 a.m.</td>
<td>Best Papers&lt;br&gt;Concourse Hall 151</td>
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<tr>
<td>9:00 a.m.–12:00 p.m.</td>
<td>Interdisciplinary Spine Forum:&lt;br&gt;Regional/Lower Quarter Kinematics and Impact on the Spine&lt;br&gt;Room 406AB</td>
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<tr>
<td>9:00 a.m.–5:00 p.m.</td>
<td>Technical Exhibition&lt;br&gt;Technical Exhibition</td>
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<td>ePosters&lt;br&gt;The Learning Place</td>
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<td>Career Building Recruitment Event&lt;br&gt;The Learning Place</td>
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<td></td>
<td>Simulated Surgery Lab&lt;br&gt;The Learning Place</td>
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<td></td>
<td>Innovative Technology Posters&lt;br&gt;Technical Exhibition</td>
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<tr>
<td>10:00–10:30 a.m.</td>
<td>Networking Break&lt;br&gt;Beverage Service&lt;br&gt;Technical Exhibition</td>
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<td>Exercise Video Demonstrations&lt;br&gt;The Learning Place</td>
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<td></td>
<td>Simulated Surgery Lab&lt;br&gt;The Learning Place</td>
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<td>Poster Grand Rounds&lt;br&gt;The Learning Place</td>
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<tr>
<td>10:30–10:35 a.m.</td>
<td>NASS Working for You:&lt;br&gt;Coverage Update&lt;br&gt;Concourse Hall 151</td>
</tr>
<tr>
<td>10:35 a.m.–12:00 p.m.</td>
<td>Symposia:&lt;br&gt;Exciting and Innovative Prospects for Advanced Alternative Payment Models/Bundled Payments in Spine Care and the Impact of the Trump Presidency on the Upcoming Mid-Term Elections&lt;br&gt;Concourse Hall 151</td>
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<td>Outpatient Spine Surgery:&lt;br&gt;The Next Frontier&lt;br&gt;Concourse Hall 152</td>
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<td>Implementation of an Alternative Health Care Pathway for Patients with Low Back Pain&lt;br&gt;Room 403B</td>
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<td>Abstract Presentations:&lt;br&gt;Understanding Lumbar Stenosis/Spondylolisthesis&lt;br&gt;Room 403A</td>
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<td>Cervical Spine Trauma&lt;br&gt;Room 404AB</td>
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<tr>
<td>11:00 a.m.–1:00 p.m.</td>
<td>Surgical Innovation Lab Demos&lt;br&gt;The Learning Place</td>
</tr>
<tr>
<td>12:00–1:00 p.m.</td>
<td>Complimentary Boxed Lunch&lt;br&gt;Medical Attendees Only&lt;br&gt;Technical Exhibition, Booth 449</td>
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<td>SpinePAC Luncheon&lt;br&gt;Featuring Hugh Hewitt&lt;br&gt;Concourse Foyer</td>
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<tr>
<td></td>
<td>Spine Fellowship Directors’ Meeting&lt;br&gt;Room 308AB</td>
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<td>Solution Showcase&lt;br&gt;The Learning Place, Red Theater&lt;br&gt;12:00-12:20 p.m.: Stryker&lt;br&gt;12:30-12:50 p.m.: RIWOspine, A Richard Wolf Company</td>
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<td>Career Building Professional Headshots&lt;br&gt;The Learning Place</td>
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<td>Simulated Surgery Lab&lt;br&gt;The Learning Place</td>
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<td>1:00–2:00 p.m.</td>
<td><strong>Abstract Presentations:</strong></td>
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<td>Interventional Pain Management</td>
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<td>Concourse Hall 151</td>
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<td>What’s New in MIS?</td>
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<td>Concourse Hall 152</td>
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<td>Navigation and Intraoperative Monitoring</td>
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<td>Spinal Trauma</td>
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<td><strong>Innovative Technology Presentations (Non-CME)</strong></td>
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<td>Room 404AB</td>
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<tr>
<td>1:00–3:00 p.m.</td>
<td><strong>Interdisciplinary Spine Forum:</strong></td>
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<tr>
<td></td>
<td>Complementary and Alternative Treatments for Low Back Pain:</td>
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<td>What Does the Data Support?</td>
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<td>Room 406AB</td>
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<td>1:30–2:00 p.m.</td>
<td><strong>Career Building Presentation:</strong></td>
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<tr>
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<td>It’s a Jungle Out There: An Inside Look at the Job Hunt</td>
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<td>The Learning Place, Grey Theater</td>
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<td>2:00–3:00 p.m.</td>
<td><strong>Abstract Presentations:</strong></td>
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<td>Integrating Technology into Practice</td>
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<td>Concourse Hall 151</td>
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<td>Increasing Value: Lumbar Spine Surgery</td>
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<td>Concourse Hall 152</td>
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<td>Surgery and Opioids</td>
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<td>Improving Quality of Life for Patients With Tumors</td>
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<td><strong>Innovative Technology Presentations (Non-CME)</strong></td>
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<td><strong>Resident/Fellow Education Pathway:</strong></td>
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<td>Intersecting With NASS</td>
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<td>The Learning Place, Red Theater</td>
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<tr>
<td>2:00–4:00 p.m.</td>
<td><strong>Surgical Innovation Lab Demos</strong></td>
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<td>The Learning Place</td>
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<td>3:00–3:30 p.m.</td>
<td><strong>Networking Break</strong></td>
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<td>Beverage Service</td>
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<td>Technical Exhibition</td>
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<td>3:30–3:35 p.m.</td>
<td><strong>Exercise Video Demonstrations</strong></td>
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<td>The Learning Place</td>
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<td>3:30–3:35 p.m.</td>
<td><strong>Practical Theater:</strong></td>
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<td>NASS Spine Registry Q&amp;A</td>
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<td>The Learning Place, Red Theater</td>
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<tr>
<td>3:35–5:05 p.m.</td>
<td><strong>Symposia:</strong></td>
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<td>Section on Intraoperative Neurophysiological Monitoring:</td>
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<td>Analyzing the Utility, Evidence and Value of Neuromonitoring in Spine</td>
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<td>Surgery</td>
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<td>Concourse Hall 151</td>
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<td>Presurgical Psychological Evaluation:</td>
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<td>Why, Who, How and What Value?</td>
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<td>Concourse Hall 152</td>
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<td>Section on Biologics and Basic Research:</td>
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<td>Current and Cutting-Edge Strategies for Medical Management of Spinal</td>
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<td>Cord Injury</td>
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<td><strong>Abstract Presentations:</strong></td>
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<td>Preserving Spinal Motion</td>
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<td>How to Avoid Complications</td>
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<td><strong>Interdisciplinary Spine Forum:</strong></td>
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<td>Spinal Conditions With Impact of Comorbidities</td>
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<td>Room 406AB</td>
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<tr>
<td>3:35–8:00 p.m.</td>
<td><strong>NASS After Hours:</strong></td>
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<td>The Role of Spinal Cord Stimulators</td>
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<td>The Learning Place</td>
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<tr>
<td>5:00–6:00 p.m.</td>
<td><strong>Social Hour</strong></td>
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<td>South Lobby</td>
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<tr>
<td>5:00–8:00 p.m.</td>
<td><strong>Surgical Innovation Lab Workshops</strong></td>
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<td>The Learning Place</td>
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## THURSDAY, SEPTEMBER 27

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<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>6:30–8:00 a.m.</td>
<td>Continental Breakfast</td>
<td>Concourse Hall Foyer</td>
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<tr>
<td>6:30 a.m.–5:00 p.m.</td>
<td>Attendee Registration</td>
<td>South Lobby</td>
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<tr>
<td>7:25–7:30 a.m.</td>
<td>Announcements</td>
<td>Concourse Hall 151/152</td>
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<tr>
<td>7:30–8:30 a.m.</td>
<td>Plenary Session: Envisioning a Narcotic-Free America: Role of Spine Physicians</td>
<td>Concourse Hall 151/152</td>
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<tr>
<td>7:30–10:00 a.m.</td>
<td>Interdisciplinary Spine Forum: The Lancet Low Back Pain Series and the European Spine Journal Series on the Future of Spine Care</td>
<td>Room 406AB</td>
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<tr>
<td>8:00–10:00 a.m.</td>
<td>Surgical Innovation Lab Demos</td>
<td>The Learning Place</td>
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<td>8:00 a.m.–5:00 p.m.</td>
<td>Exhibitor Registration</td>
<td>South Lobby</td>
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<td>8:30–9:30 a.m.</td>
<td>Best Papers</td>
<td>Concourse Hall 151/152</td>
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<td>9:00 a.m.–5:00 p.m.</td>
<td>Technical Exhibition</td>
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<td>Simulated Surgery Lab</td>
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<td>Career Building Recruitment Event</td>
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<td>Innovative Technology Posters</td>
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<td>9:30–10:00 a.m.</td>
<td>Networking Break</td>
<td>Beverage Service</td>
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<td>Exercise Video Demonstrations</td>
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<td>Practical Theater: NASS Spine Registry Q&amp;A</td>
<td>The Learning Place, Red Theater</td>
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<td>Poster Grand Rounds</td>
<td>The Learning Place</td>
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<tr>
<td>10:00–10:15 a.m.</td>
<td>Incoming Presidential Remarks: Jeffrey C. Wang, MD</td>
<td>Concourse Hall 151/152</td>
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### 10:15–11:00 a.m.

- **2017-2018 Presidential Address:** Daniel K. Resnick, MD, MS
  - Concourse Hall 151/152

### 11:00 a.m.–12:00 p.m.

- **Presidential Guest Speaker:** Vijay Gupta
  - Concourse Hall 151/152

### 11:00 a.m.–1:00 p.m.

- **Surgical Innovation Lab Demos**
  - The Learning Place

### 12:00–1:00 p.m.

- **Complimentary Boxed Lunch**
  - Medical Attendees Only
  - Technical Exhibition, Booth 449

- **Solution Showcase**
  - The Learning Place, Red Theater
  - 12:00-12:20 p.m.: Spinal Balance
  - 12:30-12:50 p.m.: Radius Health

- **Career Building Professional Headshots**
  - The Learning Place

### 1:00–1:05 p.m.

- **NASS Working for You:**
  - NASS Low Back Pain Guideline
  - Concourse Hall 151

### 1:05–2:05 p.m.

- **The Spine Journal Outstanding Paper Awards Presentations**
  - Concourse Hall 152

- **Symposium:**
  - Bone Health Optimization in the Spine Patient
  - Room 403B

- **Abstract Presentations:**
  - Lumbar Spine Surgery: What You Need to Know
  - Room 403A
  - Understanding Anxiety and Depression When Performing Spine Surgery
  - Room 406AB

### 1:05–3:05 p.m.

- **Innovative Technology Presentations** (Non-CME)
  - Room 404AB

### 2:00–4:00 p.m.

- **Symposium:**
  - Section on Minimally Invasive Procedures: Latest Advances in Minimally Invasive Spine Surgery
  - Concourse Hall 151

- **Surgical Innovation Lab Demos**
  - The Learning Place
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<th>Time</th>
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<tr>
<td>2:05–3:05 p.m.</td>
<td><strong>Section Specialty Sessions:</strong> &lt;br&gt;Section on Spinal Cord Injury: Controversies in Management&lt;br&gt;Room 403B &lt;br&gt;Section on Biologics and Basic Research Abstract Presentations&lt;br&gt;Room 404AB &lt;br&gt;Exercise Committee Presents: Muscle Imbalance in Back Pain—Chicken, Egg or Red Herring? &lt;br&gt;Room 406AB</td>
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<td><strong>Innovative Technology Presentations</strong> (Non-CME) &lt;br&gt;Room 403A</td>
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<tr>
<td>3:00–4:00 p.m.</td>
<td><strong>Titan Spine Presentation</strong> (Non-CME) &lt;br&gt;The Learning Place, Orange Lab</td>
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<tr>
<td>3:05–3:35 p.m.</td>
<td><strong>Networking Break</strong> &lt;br&gt;Beverage Service &lt;br&gt;Technical Exhibition &lt;br&gt;<strong>Members’ Business Meeting</strong> &lt;br&gt;Room 308AB &lt;br&gt;<strong>Exercise Video Demonstrations</strong> &lt;br&gt;The Learning Place &lt;br&gt;<strong>Simulated Surgery Lab</strong> &lt;br&gt;The Learning Place &lt;br&gt;<strong>Poster Grand Rounds</strong> &lt;br&gt;The Learning Place</td>
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<tr>
<td>3:35–5:05 p.m.</td>
<td><strong>Section Specialty Sessions:</strong> &lt;br&gt;Section on Posterior Pelvic Girdle Pain: The Sacroiliac Joint—What Do We Know Now? &lt;br&gt;Concourse Hall 151 &lt;br&gt;Section on Radiology: Radiation Reduction Strategies and Technologies for Spine Surgery and Interventional Procedures &lt;br&gt;Concourse Hall 152 &lt;br&gt;Section on Robotics and Navigation: Incorporating Emerging Spine Surgery Technologies into Your Operating Room &lt;br&gt;Room 403A &lt;br&gt;Section on Spine Oncology: Current Essentials of Spine Tumor Management &lt;br&gt;Room 403B &lt;br&gt;Section on Biologics and Basic Research: Injectable Biologic Therapies for Intervertebral Disc &lt;br&gt;Room 404AB &lt;br&gt;<strong>Section on Motion Technology Abstract Presentations</strong> &lt;br&gt;Room 406AB</td>
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<tr>
<td>3:35–8:00 p.m.</td>
<td><strong>NASS After Hours:</strong> Endoscopic Spine Surgery: Current Trends &amp; Evidence of Spinal Endoscopic Procedures &lt;br&gt;The Learning Place</td>
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<td>5:00–8:00 p.m.</td>
<td><strong>Surgical Innovation Lab Workshops</strong> &lt;br&gt;The Learning Place</td>
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<td>5:15–6:15 p.m.</td>
<td><strong>Resident, Fellow and Program Directors’ Reception</strong> &lt;br&gt;The Learning Place, Red Theater</td>
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<td>7:30–8:55 a.m.</td>
<td><strong>Symposia:</strong></td>
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<td>Enhanced Recovery After Spine Surgery (ERASS) A-Z and How to Implement in Your Hospital</td>
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<td>Section on RIMS: Clinical Failure of Lumbar Surgery Part I—Diagnostic Considerations</td>
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<td>7:30-9:10 a.m.</td>
<td>International Spine Forum Symposium: Minimally Invasive Spine Surgery</td>
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<td>8:00–9:00 a.m.</td>
<td>Interdisciplinary Spine Forum: Abstract Presentations</td>
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<td>8:00–10:00 a.m.</td>
<td>Surgical Innovation Lab Demos</td>
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<td>8:00 a.m.–1:00 p.m.</td>
<td>Exhibitor Registration</td>
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<td>8:55–9:00 a.m.</td>
<td>NASS Working for You: Payor Policy Review Committee</td>
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<td>9:00–10:00 a.m.</td>
<td>Best Papers</td>
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<td>9:00 a.m.–12:00 p.m.</td>
<td>Interdisciplinary Spine Forum: Spine Value Models With Economics and Evidence-Based Guidelines</td>
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<td>9:00 a.m.–1:30 p.m.</td>
<td>Technical Exhibition</td>
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<td>Innovative Technology Posters</td>
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<td>9:10–10:10 a.m.</td>
<td>International Spine Forum Symposium: Trauma</td>
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<td>10:00–10:30 a.m.</td>
<td>Networking Break</td>
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<td>Exercise Video Demonstrations</td>
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<td>Poster Grand Rounds</td>
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<td>10:30 a.m.–12:00 p.m.</td>
<td>Recognition/Research Awards and Abstract Presentations</td>
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<td>International Spine Forum Symposium: Lumbar Degenerative</td>
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<td>Deformity: Technical Factors</td>
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<td>Innovation, Surface Technology and Biomechanics</td>
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<td>Exercise Committee Presentation: Nutritional Considerations for Spine Care</td>
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<td>10:30 a.m.–12:10 p.m.</td>
<td>Abstract Presentations</td>
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<td>Complications of Cervical Spine Surgery</td>
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<td>2018 Research Grants and Fellowship Awards Presentations</td>
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<td>How Should We Measure Our Success?</td>
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<td>10:30 a.m.–12:00 p.m.</td>
<td>Abstract Presentations</td>
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<td>Recognition/Research Awards</td>
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<td>International Spine Forum Symposium: Lumbar Degenerative</td>
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<td>11:00 a.m.–1:00 p.m.</td>
<td>Surgical Innovation Lab Demos</td>
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**MEETING AT-A-GLANCE: FRIDAY**
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<tr>
<td>12:00–1:00 p.m.</td>
<td><strong>Complimentary Boxed Lunch</strong>&lt;br&gt;Medical Attendees Only&lt;br&gt;Technical Exhibition, Booth 449</td>
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<td><strong>Career Building Professional Headshots</strong>&lt;br&gt;The Learning Place</td>
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<td><strong>Solution Showcase</strong>&lt;br&gt;12:00-12:20 p.m.: Hans Biomed&lt;br&gt;The Learning Place, Red Theater</td>
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<td><strong>Simulated Surgery Lab</strong>&lt;br&gt;The Learning Place</td>
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<tr>
<td>1:00–1:05 p.m.</td>
<td><strong>NASS Working for You:</strong> Coding Update&lt;br&gt;Concourse Hall 151</td>
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<tr>
<td>1:00–2:30 p.m.</td>
<td><strong>Symposium:</strong> Predatory Publishing: What’s Real and What’s Fake News?&lt;br&gt;Concourse Hall 152</td>
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<td><strong>Abstract Presentations:</strong>&lt;br&gt;Achieving Lumbar Interbody Fusion&lt;br&gt;Room 403A&lt;br&gt;A New Look at Imaging&lt;br&gt;Room 403B</td>
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<td><strong>Interdisciplinary Spine Forum:</strong>&lt;br&gt;Opiates and What Should We Be Doing First?&lt;br&gt;Room 406AB</td>
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<tr>
<td>1:00–2:40 p.m.</td>
<td><strong>International Spine Forum Symposium:</strong> Cervical Spine&lt;br&gt;Room 404AB</td>
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<tr>
<td>1:05–2:30 p.m.</td>
<td><strong>Symposium:</strong> Emerging Technologies in Spine Surgery&lt;br&gt;Concourse Hall 151</td>
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<td>2:30–2:55 p.m.</td>
<td><strong>Networking Break</strong>&lt;br&gt;Beverage Service&lt;br&gt;South Lobby</td>
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<tr>
<td>2:55–3:00 p.m.</td>
<td><strong>NASS Working for You:</strong> AHRQ Registry Outcomes Harmonization&lt;br&gt;Concourse Hall 151</td>
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<tr>
<td>3:00–4:00 p.m.</td>
<td><strong>Symposium:</strong> Quest for Truth: Are Online Databases Reliable and Do They Reflect True Outcomes?&lt;br&gt;Concourse Hall 151</td>
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<td><strong>Abstract Presentations:</strong>&lt;br&gt;Optimizing Lumbar Disc Surgery&lt;br&gt;Concourse Hall 152&lt;br&gt;Spinal Deformity Analysis&lt;br&gt;Room 403A&lt;br&gt;The Gravity of Obesity&lt;br&gt;Room 403B</td>
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<tr>
<td>3:00–5:05 p.m.</td>
<td><strong>International Spine Forum Symposium:</strong> Adult Spinal Deformity&lt;br&gt;Room 404AB&lt;br&gt;<strong>Interdisciplinary Spine Forum:</strong> Impact of Fragility Fractures on the Management of the Elderly Spine&lt;br&gt;Room 406AB</td>
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<tr>
<td>4:05–5:05 p.m.</td>
<td><strong>Abstract Presentations:</strong>&lt;br&gt;Basic Science of Spinal Fusion&lt;br&gt;Concourse Hall 151&lt;br&gt;New Concepts: Cervical Spine&lt;br&gt;Concourse Hall 152&lt;br&gt;Tumor and Deformity&lt;br&gt;Room 403A&lt;br&gt;Cervical Myelopathy and Deformity&lt;br&gt;Room 403B</td>
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### SATURDAY, SEPTEMBER 29

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<th>Time</th>
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| 6:30–8:00 a.m.  | Continental Breakfast  
Concourse Hall Foyer                                                   |
| 7:00 a.m.–12:00 p.m. | Attendee Registration  
South Lobby                                                             |
| 7:25–7:30 a.m.  | Announcements  
Room 403A                                                            |
| 7:30–9:00 a.m.  | **Symposium:**  
Section on RIMS: Clinical Failure of Lumbar Surgery Part II—Treatment Options  
Room 403A  
| 9:00–10:00 a.m. | **Symposium:**  
Medical Device Innovation: What To Do With Your Idea  
Room 403A  
|                | **Abstract Presentations:**  
Impact of Adult Deformity Correction  
Room 403B  
|                | A Fresh Look at Opioids  
Room 403B                                                            |
| 10:00–10:30 a.m.| Networking Break  
Beverage Service  
South Lobby                                                          |
| 10:30 a.m.–12:00 p.m. | **Abstract Presentations:**  
Applying Deformity Concepts in Your Practice  
Room 403A  
|                | **Symposia:**  
State of the Union on Disc Replacement: 15 Years Later—What is the Evidence and Reality?  
Room 403B  
|                | Section on Biologics and Basic Research: Trends in Decision Making for Biologics—A Case-Based Review  
Room 404AB  |
| 12:00 p.m.      | Meeting Adjourns                                                   |
WITH SINCERE
APPRECIATION...

The North American Spine Society thanks the following companies for their support of the NASS 33rd Annual Meeting.
Ticketed Session:
Coding Update 2018: Conquering Your Coding Hurdles
Room 403B
Course Director: Donna M. Lahey, RNFA
Coding Committee Chairs: Scott I. Horn, DO; William Mitchell, MD

Take the pain out of your practice and conquer your coding challenges by attending this timely and highly interactive course led by expert physician faculty who will provide comprehensive coding information you can immediately use to maximize your profits and minimize your losses. Coding Update will take you beyond the basics, covering the latest information on ICD-10, E&M coding, and CPT-4 coding of surgical, medical and radiologic procedures.

You will leave this course with the necessary knowledge and critical tips on how to navigate through the authorization and denial process, identify nuances that affect proper billing and cause rejected/delayed claims, utilize Medicare NCCI edits, and properly document to receive reimbursement.

Additionally, participants will have the opportunity to:
• Meet one-on-one with physician faculty who lead NASS’ CPT, RUC and reimbursement efforts;
• Examine real life cases and perform operative note dissection in the hands-on coding sessions;
• Participate in an interactive panel discussion with leading experts in the spine coding industry.

Upon completion of this course, participants should gain strategies to:
• Improve cash flow by reducing denials and resubmissions;
• Identify problems which cause rejected/delayed claims;
• Correlate correct coding with practice reimbursement ensuring that every procedure is reimbursed at its highest allowable level;
• Recognize the relationship between proper diagnostic (ICD-10) and procedural coding (CPT-4) and how to link them to avoid denials;
• Learn the elements required for complete and accurate documentation for E&M coding and medical and surgical procedure notes;
• Know the accurate use of modifiers and their impact on reimbursement;
• Effectively and accurately code interventional injection procedures and neurologic testing;
• Utilize payer reimbursement policies and guidelines to avoid claim denials and obtain proper authorization;
• Effectively incorporate teachings of this course into their practice.
6:30 a.m.-4:30 p.m.

Attendee Registration
South Lobby

7:30 a.m.-4:30 p.m.

**Ticketed Hands-on Course:**
**Minimally Invasive Spine Surgery**
Room 403A

Co-chairs: Nathaniel P. Brooks, MD; Christoph P. Hofstetter, MD, PhD; Karthik Madhavan, MD; Khoi D. Than, MD

This course will provide a targeted focus on current minimally invasive techniques to the spine, including posterior, lateral, OLIF, navigation, robotic and endoscopy techniques. After a short didactic lecture, there will be guided practice in the hands-on cadaver bioskills lab. Space is limited to maximize hands-on time.

**Upon completion of this course, participants should gain strategies to:**
- Recognize the theories behind MIS spine techniques;
- Describe the benefits of each approach to the spine through minimally invasive techniques;
- Integrate navigation/robotics into a minimally invasive practice setting;
- Avoid complications through anatomic considerations;
- Recognize the common complications of each approach to the spine using minimally invasive techniques;
- Apply the principles and techniques into your patient care of simple and complex spinal disorders.

8:00 a.m.-5:00 p.m.

**Ticketed Session:**
**Coding Update 2018: Conquering Your Coding Hurdles (Continued)**
Room 403B

Course Director: Donna M. Lahey, RNFA
Coding Committee Chairs: Scott I. Horn, DO; William Mitchell, MD

8:00 a.m.-6:00 p.m.

**Exhibitor Registration**
South Lobby
WEDNESDAY, SEPTEMBER 26

6:30-8:00 a.m.
Continental Breakfast
Concourse Hall Foyer

6:30 a.m.-5:00 p.m.
Attendee Registration
South Lobby

7:00 a.m.-5:00 p.m.
Exhibitor Registration
South Lobby

7:25-7:30 a.m.
Welcome Remarks
Concourse Hall 151

2018 Annual Meeting Program Co-chairs:
Zoher Ghogawala, MD and Donna D. Ohnmeiss, PhD

7:30-7:35 a.m.
NASS Working for You:
NASS Spine Registry
Concourse Hall 151

Moderator: Zoher Ghogawala, MD, FACS

7:35-9:00 a.m.
Plenary Session:
It’s What is On the Surface That Matters
Concourse Hall 151

Moderators: Christopher Chaput, MD; Paul J. Slosar, MD

Spine implant materials, design and surface characteristics are topics of growing academic and commercial interest. This symposium will include a scientific panel, all of whom have published on implant materials and surface technologies related to spine implants and bone integration and fusion.

To ensure a clear understanding of the evidence, this scientific panel will discuss the pros and cons of various materials and surfaces as well as competitive technologies. Surgeon participants are encouraged to offer clinical insights and clinical outcome data, if available, for the various surfaces discussed by the scientists.

Agenda
• Introduction
  Christopher Chaput, MD
• PEEK and Porous PEEK Science
  Ken Gall, PhD
• Material Biomechanical Testing and the Pros and Cons of the Various Production Methods: Coatings, 3D Printing, Acid Etching, Salt Subtraction PEEK
  Lisa Ferrara, PhD
• Titanium 3D Printing, Porous Titanium Science
  Wellington Hsu, MD
• Relative Importance of Material versus Surface Topography
  Barbara Boyan, PhD
• The Surgeon/Clinical Perspective on Implant Surface Biotechnologies
  Jean-Jacques Abitbol, MD
• Discussion, Questions and Answers
  Faculty Panel

8:00-10:00 a.m.
Surgical Innovation Lab Demonstrations
(Non-CME)
The Learning Place
Yellow Lab: Private Lab
Blue Lab: Globus Medical

9:00-10:00 a.m.
Best Papers
Concourse Hall 151

Moderator: Donna D. Ohnmeiss, PhD

9:00-9:06 a.m.
1. Effect of Spinal Decompression on Back Pain in Lumbar Spinal Stenosis: Canadian Spine Outcomes Research Network (CSORN) Registry
Shreya Srinivas, FRCS, MBBS; Greg McIntosh; Charles G. Fisher, MD, FRCS, MHS; Nicolas Dea, MD, MSc, FRCS
1Health Education North West, Liverpool, United Kingdom; 2Canadian Back Institute, Oakville, ON, Canada; 3Vancouver General Hospital, Vancouver, BC, Canada; 4Vancouver, BC, Canada

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
9:06-9:12 a.m.
2. Do Cervical Spine Surgery Patients Recall Their Preoperative Status? A Cohort Study of Recall Bias in Patient-Reported Outcomes
Ilyas Aleem, MD, MSc, FRCSC; Mhd Tayseer Shamaa, MD; Bradford L. Currier, MD; Paul M. Huddleston III, MD, MS; John M. Rhee, MD; Mohamad Bydon, MD; Brett A. Freedman, MD; Ahmad N. Nassr, MD
1University of Michigan Health System, Ann Arbor, MI, US; 2Henry Ford Hospital, Detroit, MI, US; 3Mayo Clinic, Rochester, MN, US; 4Mayo Clinic, Department of Orthopedic Surgery, Rochester, MN, US; 5Emory University, Atlanta, GA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:12-9:18 a.m.
3. Epidemiologic and Survival Trends in Primary Malignant Osseous Tumors of the Spine: A NCDB Study
David Kerr; Brian Dial, MD; Alexander L. Lazarides, MD; Anthony Catanzano, MD; Whitney Lane, MD; Dan Blazer III; Will C. Eward, MD, DVM; Melissa Erickson, MD; Sergio Mendoza-Lattes, MD
1Duke University Medical Center, Durham, NC, US; 2Duke University, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:18-9:24 a.m.
4. Physician and Patients Factors Associated with Outcome of Spinal Epidural Abscess Related Malpractice Litigation
Alan H. Daniels, MD; Govind Shantharam, BA; John M. DePasse, MD; Adam Eltorai, MSc; Wesley Durand, BS; Mark A. Palumbo, MD
1Warren Alpert Medical School of BU/RI Hospital, Providence, RI, US; 2Warren Alpert School of Medicine, Providence, RI, US; 3Warren Alpert Brown University, Department of Orthopaedic Surgery, Providence, RI, US; 4Warren Alpert Medical School of Brown University, Providence, RI, US; 5Brown University, Alpert Medical School, Providence, RI, US; 6Warren Alpert School of Medicine at Brown University, Providence, RI, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:24-9:30 a.m.
5. The Significance of Upper Extremity Neuromonitoring Changes in Patients Undergoing Thoracolumbar Surgery
Kivanc I. Atesok, MD, MSc; Walt Smith, BS; Thomas Niemeier, MD; Gerald McGwin, PhD; Jason Pittman, MD, PhD; Sakthivel Rajan Rajaram Manoharan, MD; Steven M. Theiss, MD
1University of Alabama at Birmingham, Division or Orthopedic Surgery, Birmingham, AL, US; 2University of Alabama SOM, Birmingham, AL, US; 3Birmingham, AL, US; 4University of Alabama at Birmingham, Birmingham, AL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:30-9:36 a.m.
6. Diagnostic Accuracy and Clinical Impact of Motor Evoked Potential (MEP) Monitoring during 4425 Posterior Extradural Lumbosacral Procedures Involving the L5 Vertebra
Bryan Wilent, PhD, DABNM; Eric A. Tesdahl, PhD; Jeffrey Cohen, MD, PhD; Anthony K. Sestokas, PhD
1SpecialtyCare, Nashville, TN, US; 2SpecialtyCare, Scottsdale, AZ, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:36-9:42 a.m.
2018 Value Award Winner
7. Predictors of Total Hospital Resource Cost during a 1-2 Level Lumbar Spinal Fusion among Medicare Beneficiaries
Kevin J. McGuire, MD; Kenneth M. Little, MD; Michael J. Schlosser, MD, MBA; David S. Jeysevar, MD; Kevin G. Shea, MD; April W. Simon, MSN, RN; Steven D. Culler, PhD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:42-10:00 a.m.
Discussion
Interdisciplinary Spine Forum: Regional/Lower Quarter Kinematics and Impact on the Spine

Moderators: Rick Placide, MD, PT; Evan K. Johnson, PT, DPT, OCS

The relationship between conditions of the lower quarter and low back pain (LBP) remains unclear despite frequent references in the medical literature. While it is widely recognized that LBP, postural faults and aberrant lower limb motion are interconnected the exact nature of the relationships remains opaque.

A multidisciplinary panel of conservative care clinicians, surgeons and basic science researchers will address some elements involved in lower limb mechanics beyond the hip joint that impact lumbopelvic mechanics and LBP. Additionally, the panel will explain the impact of altered lower quarter mechanics on spinal pain and function as well as review biomechanical considerations, examination techniques and treatment modalities in common conditions arising from concurrent spine and limb pathology.

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

- Recognize distinctive characteristics of the history, functional limitations and physical examination of individuals who present with pain and disability arising from concurrent spine and lower limb conditions;
- Integrate knowledge of lower limb and spine biomechanics with clinical findings to facilitate optimal triage of patients with pain and disability arising from concurrent lower limb and spine conditions in a manner consistent with best practice;
- Identify the advantages and disadvantages of specific clinical examination and treatment techniques for individuals who present concurrent lower limb and spine conditions;
- Enhance the use of best practice examination and treatment techniques of individuals with concurrent lower limb and spine conditions, based on the most current evidence.

Agenda

- Introduction/Welcome
  Evan K. Johnson, DPT
- What Does the Literature Tell Us About Lower Limb Conditions and Low Back Pain?
  Evan K. Johnson, DPT
- Interdependence of Lower Limb Kinematics and Lumbar Spine Alignment
  Virginie Lafage, PhD
- What Does Gait Analysis Tell Us About The Effects of Lower Extremity Mechanics on the Lumbar Spine During Walking?
  D. Casey Kerrigan, MD
- Spinal Masqueraders: Disorders of the Lower Quarter That Mimic Spinal Conditions
  Rick Placide, MD, PT
- Audience Questions and Comments
  Faculty Panel
- Lower Limb and Lumbar Spine Degeneration: Physical Examination of the Patient with Concurrent Spine and Lower Limb Osteoarthritis (OA)
  Rick Placide, MD, PT
- Imaging and Ancillary Testing in Patients with Concurrent Spine and Lower Limb OA
  John Metzler, MD
- Surgical Decision Making: Spinal Fusion or Total Hip Arthroplasty
  Aaron J. Buckland, MBBS, FRACS
- Conservative Care Treatment Strategies for the Patient with Concurrent Spine and Lower Limb Conditions
  Evan K. Johnson, DPT, OCS
- Audience Questions and Comments
  Faculty Panel
10:00-10:30 a.m.

Networking Break Beverage Service
Technical Exhibition, Booths #1667 and #814

Exercise Video Demonstrations
The Learning Place

Simulated Surgery Lab (Non-CME)
The Learning Place

10:00-10:30 a.m.

Poster Grand Rounds
The Learning Place

Grey Theater

10:00-10:10 a.m.
P157. Retrospective Review of Restoration of Lordosis with MIS TLIF
Philip Saville, MD1; Avani S. Vaishnav, MBBS1; Roger Hartl, MD2; Rodrigo Navarro-Ramirez, MD, MSc4; Eliana E. Kim, BA4; Farah Maryam, BS5; Steven J. McAnany, MD6; Catherine Himo Gang, MPH7; Sheeraz A. Qureshi, MD, MBA7
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:10-10:20 a.m.
P158. Correlation Between ODI, PROMIS and SF-12 in Minimally Invasive Transforaminal Lumbar Interbody Fusion (MI-TLIF)
Avani S. Vaishnav, MBBS1; Steven J. McAnany, MD2; Todd J. Albert, MD2; Catherine Himo Gang, MPH3; Sheeraz A. Qureshi, MD, MBA3
1Hospital for Special Surgery, New York, NY, US; 2Stamford, CT, US; 3New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:20-10:30 a.m.
P159. Correlation Between ODI, PROMIS and SF-12 in Minimally Invasive Transforaminal Lumbar Interbody Fusion (MI-TLIF)
Avani S. Vaishnav, MBBS1; Steven J. McAnany, MD2; Todd J. Albert, MD2; Catherine Himo Gang, MPH3; Sheeraz A. Qureshi, MD, MBA3
1Hospital for Special Surgery, New York, NY, US; 2Stamford, CT, US; 3New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Pink Theater

10:00-10:15 a.m.
Mark D. Rahm, MD1; Robert A. Hart, MD2; Daina M. Brooks, BS3; Belin A. Mirable4; Pavan D. Patel5; Jessica L. Hughes, MD6; Brandon Bucklen, PhD3
1Baylor Scott and White Health, Temple, TX, US; 2Swedish Neuroscience Institute, Seattle, WA, US; 3Globus Medical, Audubon, PA, US; 4University of Notre Dame, Notre Dame, IN, US; 5Drexel University, Philadelphia, PA, US
FDA Device/Drug Status: REVERE Stabilization System (Approved for this indication), SILC Fixation System (Not approved for this indication).

10:15-10:30 a.m.
P17. Regional and Segmental Changes of the Spine from Standing to Sitting: A Chain of Compensation
Samantha R. Horn, BA1; Frank A. Segreto, BS2; Cole Bortz, BA3; Dennis Vasquez-Montes, MS, BA1; Peter L. Zhou, BA4; John Y. Moon, BS1; Nicholas J. Frangella, BS5; Nicholas Stekas, BS3; Leah Steinmetz, BA6; Christopher Varlotta, BS1; David H. Ge, BA7; Bradley Johnson, MD1; Shaleen N. Vira, MD1; Bassel G. Diebo, MD4; Chloie Deflorimonte, BS4; Mohamed A. Moawad, MPH5; Renaud Lafage, MSc6; Virginie Lafage, PhD7; Frank J. Schwab, MD8; Michael C. Gerling, MD9; Charla R. Fischer, MD4; Themistocles S. Protopsaltis, MD1; Aaron J. Buckland, MBBS, FRACS5; Thomas J. Errico, MD12; Peter G. Passias, MD11
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
Purple Theater

10:00-10:10 a.m.
P72. Influence of Racial Disparities on Short- and Long-Term Perception of Health Status and Patient-Reported Satisfaction after Elective Lumbar Spine Surgery
Aladine A. Elsamadicy, BS1; Owoicho Adogwa, MD, MPH2; C. Rory Goodwin, MD3; Isaac O. Karikari, MD4; Oren N. Gottfried, MD4
1Duke School of Medicine, Durham, NC, US; 2Rush University Medical Center, Chicago, IL, US; 3Durham, NC, US; 4Duke University Medical Center, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:10-10:20 a.m.
P66. Patient Perceptions of Surgeon-Industry Relationships
Sravisht Iyer, MD1; Benjamin Khechen, BA2; Dil V. Patel, BS1; Brittany E. Haws, BS1; Kaitlyn L. Cardinal, BS1; Jordan Guntin, BS3; Frank M. Phillips, MD2; Kern Singh, MD1
1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopaedics at Rush, Chicago, IL, US; 3Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:20-10:30 a.m.
P65. Validity of PROMIS in Minimally Invasive Transforaminal Lumbar Interbody Fusion: A Preliminary Evaluation
Brittany E. Haws, BS1; Benjamin Khechen, BA2; Dil V. Patel, BS1; Kaitlyn L. Cardinal, BS1; Jordan Guntin, BS3; Daniel D. Bohl, MD, MPH1; Kern Singh, MD1
1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopaedics at Rush, Chicago, IL, US; 3Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

White Theater

10:00-10:15 a.m.
P51. The Efficacy of Spinal Cord Stimulators: A Comparison of Success in the Trial Period versus After Permanent Stimulator Placement
Ajith Malige, MD1; Gbolabo O. Sokunbi, MD2
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:15-10:30 a.m.
P52. Cervical Epidural Steroid Injections: Incidence and Determinants of Subsequent Surgery
John Kleimeyer, MD1; Jayme Koltsov, PhD2; Serena S. Hu, MD2
1Redwood City, CA, US; 2Stanford University School of Medicine, Redwood City, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:30-10:35 a.m.
NASS Working for You: Coverage Update
Concourse Hall 151
Moderator: Gary Ghiselli, MD

10:35 a.m.-12:00 p.m.
Symposium: Exciting and Innovative Prospects for Advanced Alternative Payment Models/Bundled Payments in Spine Care and the Impact of the Trump Presidency on the Upcoming Mid-Term Elections
Concourse Hall 151
Moderator: Philip L. Schneider, MD, Advocacy Council Director

The repeal of the Sustainable Growth Rate and its replacement with the Medicare Access and CHIP [Children’s Health Insurance Program] Reauthorization Act of 2015 (MACRA) accelerated the transition from volume to innovative value-based payment arrangements called Alternative Payment Models (APMs). These new payment models are a form of payment reform that incorporate quality and total cost of care into reimbursement rather than a traditional fee-for-service structure. Presenters will take an in-depth look at the various alternative reimbursement models offered by the Centers for Medicare and Medicaid Services (CMS) and explain how spine specialists can benefit from adopting such models into their practices. The discussion also will focus on how NASS is working with CMS on developing episode cost-based measures in spine for potential use under the Quality Payment Program (QPP). Finally, nationally syndicated radio broadcast journalist Hugh Hewitt will examine the current political landscape and provide his insights on the outcome of the 2018 mid-term elections.
Upon completion of this session, participants should gain strategies to:

- Gain an understanding of NASS’ current federal legislative priorities and emerging trends in healthcare policy in Washington, DC.
- Describe the Advanced Alternative Payment Model participation in 2018.
- Discuss the Advanced Alternative Payment scoring standard and identify scoring differences between year 1 and year 2 of the program.

Agenda

- **Update on NASS Legislative Agenda**
  Philip L. Schneider, MD, Advocacy Council Chair

- **Discussion on Advanced Payment Models and Bundled Payments in Spine Care**
  Robert S. Jasak, JD, Vice President, Coverage and Payment Policy, Hart Health Strategies Inc.

- **The Implications of the 2018 Elections on Health Care**
  Hugh Hewitt, American Radio Talk Show Host

**Symposium Guest Speaker: Hugh Hewitt**, Acclaimed radio talk show host, *The Hugh Hewitt Show*; host, MSNBC’s *Hugh Hewitt*; political analyst and contributor, *NBC News* and MSNBC; lawyer; professor; and author. See full biography on page 30.

10:35 a.m.-12:00 p.m.

**Symposium: Outpatient Spine Surgery: The Next Frontier**

Concourse Hall 152

Moderator: Alok D. Sharan, MD, MHCDS

With increasing cost pressure on health care, surgeons are constantly evaluating unique methods to reduce their cumulative costs over an episode of care. Outpatient surgery performed in ambulatory surgery centers (ASCs) is evolving as one method of reducing surgical costs. The recent announcement by CMS to reimburse total joint replacements performed in ASCs will most likely lead to many traditional inpatient procedures transitioning towards outpatient environments.

Developing an outpatient spine surgery practice requires proper counseling prior to surgery, coordination of care during the perioperative period, an understanding of safe medication management, and close follow-up postoperatively. Faculty will address the challenges along with understanding what resources are required to develop an outpatient spine surgery practice.

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

- Identify the perioperative resources required for outpatient management;
- Determine novel anesthetic techniques used for pain management;
- Discuss the evolution of surgical technique suitable for outpatient surgery.

Agenda

- **Introduction**
  Alok D. Sharan, MD, MHCDS

- **Evolution of Outpatient Spine Surgery**
  Jeffrey S. Roh, MD

- **Using IT Tools to Optimize the Patient Preoperatively**
  Harold Mondschein

- **Regional Anesthetic Techniques for Outpatient Spine Surgery**
  Bhavuk Garg, MD

- **Awake Spinal Fusion Surgery**
  Alok D. Sharan, MD, MHCDS

- **Discussion, Questions and Answers**
  Faculty Panel

10:35 a.m.-12:00 p.m.

**Symposium: Implementation of an Alternative Health Care Pathway for Patients With Low Back Pain**

Room 403B

Moderator: Jake Magel, PhD, PT

Low back pain (LBP) is one of the most common symptoms prompting a health care visit in the United States. Patients may receive escalated care such as advanced imaging or invasive procedures prior to guideline recommended options offered by physical therapists. A concordant alternative care pathway—RapidAccess—was implemented that emphasizes early physical therapy for patients with LBP prior to a consultation with a physiatrist. Faculty will discuss the collaboration between physical therapists and physiatrists in the University of Utah health care system, the principles of value driven health care, and quality improvement. Additional discussion will include the challenges of building a quality improvement infrastructure within a university-based outpatient physical therapy clinic as well as the challenges and lessons learned surrounding real-world implementation of the RapidAccess care pathway. There also will be evaluation of implementing RapidAccess centered within a RE-AIM framework.
Upon completion of this session, participants should gain strategies to:

- Understand the principles of value-based health care, implementation science, and quality improvement;
- Understand the common challenges to building and sustaining quality improvement infrastructure;
- Understand the key elements in planning a quality improvement project;
- Understand the common challenges to implementation of projects aimed at improving patient-centered outcomes.

Agenda

- Principles of Quality Improvement
  Anne Thackeray, PT, PhD, MPH
- Creating a Quality Improvement Infrastructure
  Kim Cohee, DPT, MS, MBA
- Audience Participation: Share Smart Goals
  Jake Magel, PhD, PT
- Introduction of RapidAccess Program
  Jake Magel, PhD, PT
- Results of RapidAccess Program
  Julie Fritz, PhD, PT
- Frontline Clinician Experience (Physical Therapy and Physiatry)
  Whitney Meier, DPT, OCS; Pamela Hansen, MD
- Audience Participation: Share Challenges/Successes of Implementing Care Pathways
  Jake Magel, PhD, PT

**10:35 a.m.-12:00 p.m.**

**Abstract Presentations:**

**Understanding Lumbar Stenosis/Spondylolisthesis**

Room 403A

Moderator: Joseph S. Cheng, MD, MS

**10:35-10:41 a.m.**

8. Spino-Pelvic Parameters and Patient-Reported Outcomes in Low-Grade Degenerative Lumbar Spondylolisthesis

Pablo J. Diaz-Collado, MD1; Taleef R. Khan, BA2; Chase C. Woodward, MD, MPH3; Pooja Salari, MD4; Colleen M. Peters, MA5; Munish C. Gupta, MD6; Michael P. Kelly, MD7; Jacob M. Buchowski, MD, MS8; Keith H. Bridwell, MD9; Lukas P. Zebala, MD10

1Washington University Orthopaedics, St. Louis, MO, US; 2Creve Coeur, MO, US; 3Washington University School of Medicine, St. Louis, MO, US; 4Maryland Heights, MO, US; 5Washington University School of Medicine, Department of Orthopaedics, St. Louis, MO, US; 6Washington University, Saint Louis, MO, US

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

**10:41-10:47 a.m.**

9. The Relationship Between Spinopelvic Parameters and Baseline Pain, Function or Health Related Quality of Life in Degenerative Lumbar Spondylolisthesis

Christopher S. Bailey, MD, FRCSC1; R. Andrew Glennie, MD, MSc, FRCS2; Raja Y. Rampersaud, MD, FRCS3; Greg McIntosh4; Kenneth Thomas, MD5; Edward P. Abraham, MD6; Sean D. Christie, MD7; Neil A. Manson, MD, FRCS8; Raphaëlle Charest-Morin, MD9; Jerome Paquet, MD, FRCS9; John Street, MD, PhD10; Tamir Ailon, MD, MPH11; Nicolas Dea, MD, MSc, FRCS12; Charles G. Fisher, MD, FRCS, MHS12

1University of West Ontario/London Health Sciences Centre, London, ON, Canada; 2Halifax, NS, Canada; 3Toronto Western Hospital, Toronto, ON, Canada; 4Canadian Back Institute, Oakville, ON, Canada; 5University of Calgary, Faculty of Medicine, Calgary, AB, Canada; 6Saint John Regional Hospital, Saint John, NB, Canada; 7QE II Health Sciences Centre, Halifax, NS, Canada; 8Canada East Spine Centre, Saint John, NB, Canada; 9Quebec, QC, Canada; 10Blusson Spinal Cord Center, Vancouver, BC, Canada; 11Vancouver Spine Surgery Institute, Vancouver, BC, Canada; 12Vancouver General Hospital, Vancouver, BC, Canada

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

**10:47-10:53 a.m.**

10. Comparing Surgical Outcomes Between Back Pain Dominant and Leg Pain Dominant Chief Complaint for Adult Isthmic Spondylolisthesis: A CSORN Ambispective Study

Christopher S. Bailey, MD, FRCSC1; Parham Rasoulinejad, MD2; Greg McIntosh3; Jennifer Urquhart, PhD2; Nabeel Alnaghmoosh, MD4

1University of West Ontario/London Health Sciences Centre, London, ON, Canada; 2London, ON, Canada; 3Canadian Back Institute, Oakville, ON, Canada; 4Dammam, Eastern Province, Saudi Arabia

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

**10:53-10:59 a.m.**

11. Does Back Pain Improve in Surgically Treated Degenerative Lumbar Spondylolisthesis: What Can We Tell Our Patients?

Michael Bond, MD1; Hanbing Zhou, MD2; Nicolas Dea, MD, MSc, FRCS3; Christopher S. Bailey, MD, FRCS4; Raphaëlle Charest-Morin, MD4; R. Andrew Glennie, MD, MSc, FRCS5; Neil A. Manson, MD, FRCS6; Raja Y. Rampersaud, MD, FRCS7; Charles G. Fisher, MD, FRCS, MHS8

1Vancouver, BC, Canada; 2University of British Columbia, Vancouver, British Columbia, Canada; 3University of West Ontario/London Health Sciences Centre, London, ON, Canada; 4Quebec, QC, Canada; 5Halifax, NS, Canada; 6Canada East Spine Centre, Saint John, NB, Canada; 7Saskatoon, SK, Canada; 8Victoria, BC, Canada
10:59-11:05 a.m.
12. A Preoperative Score for Predicting 30-Day Readmission after Elective 1-2 Level Posterior Lumbar Fusion
Deeptee Jain, MD1; Paramjit Singh, MD, MA2; Mayur Kardile, MD; Sigurd H. Berven, MD3
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:05-11:18 a.m.
Discussion

11:18-11:24 a.m.
13. Unilateral Laminotomy for Bilateral Decompression versus Decompression with Instrumented Fusion for Lumbar Degenerative Spondylolisthesis at Five-Year Follow-Up
Calvin C. Kuo, MD; Maqdooda A. Merchant, MA, MSc; Mayur Kardile, MD; Alem Yacob, MD, MSc; Kamran Majid, MD; Ravi S. Bains, MD
Kaiser Permanente, Oakland, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:24-11:30 a.m.
Michael T. Nolte, MD1; Philip Louie, MD2; Bryce Basques, MD, MHS3; Victor Lei, BS4; Tarush Khurana, BA4; Justin C. Paul, MD, PhD5; Arya G. Varthi, MD3; Edward J. Goldberg, MD6; Howard S. An, MD1
1Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Yale University School of Medicine, New Haven, CT, US; 4Chicago, IL, US; 5Danbury Orthopedics, Danbury, CT, US; 6Midwest Orthopedics At Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:30-11:36 a.m.
15. Decreased Operative Time and Estimated Blood Loss in Lateral Transpsoas versus Anterior Approach to Lumbar Interbody Fusion for Degenerative Spondylolisthesis
Lawrence H. Goodnough, MD, PhD1; Jayme Koltsov, PhD2; Ivan Cheng, MD3
1Stanford University, Stanford, CA, US; 2Redwood City, CA, US; 3Stanford University, Redwood City, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:36-11:42 a.m.
16. Association of Surgical Invasiveness with Readmission Following Surgery for Lumbar Spondylolisthesis
Brook L. Martin, PhD, MPH1; Kevin J. McGuire, MD2; Tracy Borsinger, MD3; Barbara Gladders, MS4; Jon D. Lurie, MD5; Farrokh Farrokhi, MD6
1University of Utah, Salt Lake City, UT, US; 2Dartmouth Hitchcock Medical Center, Lebanon, NH, US; 3Dartmouth-Hitchcock Orthopaedic Surgery, Lebanon, NH, US; 4High Value Healthcare Collaborative, Lebanon, NH, US; 5Dartmouth College, Lebanon, NH, US; 6Virginia Mason, Seattle, WA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:42-11:48 a.m.
17. Preoperative Lumbar Corticosteroid Injections and Infection Rates in Lumbar Arthrodesis
Alfred J. Pisano, MD1; Melvin D. Helgeson, MD2; Scott Wagner, MD1
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.

11:48 a.m.-12:00 p.m.
Discussion
Abstract Presentations:
Cervical Spine Trauma
Room 404AB

Moderator: Norman B. Chutkan, MD, FACS

10:35-10:41 a.m.
18. The Relationship Between Subacute MRI and Walking Ability, Urinary Function at the Chronic Stage in Patients with Cervical Spinal Cord Injury
Akinobu Matsushita, MD, PhD
Fukuoka, Japan
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:41-10:47 a.m.
19. Efficacy and Safety of Riluzole in Acute Spinal Cord Injury (SCI): Rationale and Design of AOSpine Phase III Multi-Center Double Blinded Randomized Controlled Trial (RISCIS)
Michael G. Fehlings, MD, PhD, FRCSC1; Branko Kopjar, MD, PhD2; Robert G. Grossman, MD3
1Toronto Western Hospital, Toronto, ON, Canada; 2University of Washington, Seattle, WA, US; 3The Methodist Hospital, Houston, TX, US
FDA Device/Drug Status: Riluzole (Not approved for this indication).

10:47-10:53 a.m.
Frank A. Segreti, BS1; Cole Bortz, BA2; Samantha R. Horn, BA3; Dennis Vasquez-Montes, MS, BA4; Tina Raman, MD5; Tomas Kuprys, MD5; Mohamed A. Moawad, MPH6; Bassel G. Diebo, MD7; Shaleen N. Vira, MD7; Renaud Lafage, MSc7; Virginie Lafage, PhD7; Themistocles S. Protopsaltis, MD7; Aaron J. Buckland, MBBS, FRACS7; Thomas J. Errico, MD7; Peter G. Passias, MD8
1NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 2New York, NY, US; 3Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 4Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 5Hospital for Special Surgery, New York, 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.

10:53-10:59 a.m.
21. The Safety and Efficacy of Early Surgery for Traumatic Central Cord Syndrome
Jetan H. Badhiwala, MD1; Jefferson Wilson, MD, PhD, FRCS2; Farshad Nassirip3; Christopher Witwiw, MD4; Saleh Almenawer, MD5; Robert G. Grossman, MD6; Michael G. Fehlings, MD, PhD, FRCS7
1Division of Neurosurgery, Department of Surgery, University of Toronto, Toronto, ON, Canada; 2St. Michaels Hospital, Toronto, ON, Canada; 3Toronto, ON, Canada; 4Toronto Western Hospital, Toronto, Ontario, Canada; 5Hamilton, ON, Canada; 6The Methodist Hospital, Houston, TX, US; 7Toronto Western Hospital, Toronto, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:59-11:05 a.m.
Alexandra Stratton, MD, FRCSC, MSc
Calgary, AB, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:05-11:15 a.m.
Discussion

11:15-11:21 a.m.
Neil V. Shah, MD, MS1; Ryan Scheer, BS1; Jay Rathod, BS1; Jack J. Zhou, BS2; Jared M. Newman, MD3; Jonathan L. Smerling, BA4; Qais Naziri, MD, MBA5; John J. Kelly, BA6; Charles A. Conway, BS7; Brian Ford, BS8; Daniel P. Murray, BA9; Scott C. Pascal10; Ahmed Eldib, MD2; Gregory S. Penny, MD2; Bassel G. Diebo, MD4; Carl B. Paulino, MD5
1SUNY Downstate Medical Center, Brooklyn, NY, US; 2Brooklyn, NY, US; 3St. George’s University School of Medicine, New York, NY, US; 4Department 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.

11:21-11:27 a.m.
24. Cervical Angiograms in Cervical Spine Trauma Patients Five Years after the Data: Has Practice Changed?
Kelsey A. Rebehn, MD1; Howard M. Place, MD2
1St. Louis University Hospital, St. Louis, MO, US; 2St. Louis University, St. Louis, MO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
11:27-11:33 a.m.
25. CT Imaging of the Spine in Pediatric Trauma Patients: Prevalence of Fractures and Mechanisms of Injury
Avionna Baldwin, BS1; Clauden Louis, MD1; Jalea T. Moses, MS2; Addisu Mesfin, MD3
1University of Rochester Medical Center, Rochester, NY, US; 2Hamden, CT, US; 3University of Rochester, Rochester, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:33-11:39 a.m.
Daniel G. Tobert, MD1; Hai V. Le, MD1; Justin A. Blucher, MS2; Mitchel Harris, MD, FACS1; Andrew J. Schoenfeld, MD2
1Massachusetts General Hospital, Boston, 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.

11:39-11:45 a.m.
27. The Utility of In-Hospital Postoperative Radiographs Following Surgical Treatment of Traumatic Cervical Spine Injuries
Vishal A. Khatri, MD1; Alysa Nash, BS2; Noah L. Lessing, BS1; Kelley E. Banagan, MD1; Eugene Y. Koh, MD, PhD4; Daniel E. Gelb, MD5; Steven C. Ludwig, MD2
1Baltimore, MD, US; 2University of Maryland Medical Center, Baltimore, MD, US; 3University of Maryland System, Baltimore, MD, US; 4University of Maryland, Baltimore, MD, US; 5University of Maryland Orthopaedic Associates, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:45-11:51 a.m.
28. Clinical and Radiological Outcome of Odontoid Fractures Treated with Soft Collar Immobilization
Peter R. Loughenbury, MChB, MSc, FRCS1; Maximilian Stephens, MBBS2; David E. Nielsen, MBBS3; Jessica Hall, MBBS4
1Leeds General Infirmary, Leeds, United Kingdom; 2Brisbane, QLD, Australia; 3Woolloongabba, QLD, Australia; 4Princess Alexandra Hospital, Woolloongabba, Australia
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:51 a.m.-12:00 p.m. Discussion
**12:00 p.m.-1:00 p.m. (continued)**

**Simulated Surgery Lab (Non-CME)**
The Learning Place

12:00-12:30:
Evolution of Virtual Reality in Surgical Planning
Ben Roitenberg, MD

**1:00-2:00 p.m.**

**Abstract Presentations:**
**Interventional Pain Management**
Concourse Hall 151

Moderator: Heidi Prather, DO

**1:00-1:06 p.m.**
29. The Use of High Dose Cervical Spinal Cord Stimulation in the Treatment of Chronic Upper Extremity and Neck Pain
Trey A. Baird\(^1\); Chris Karas, MD\(^2\)
\(^1\)Grant Medical Hospital, Columbus, OH, US; \(^2\)Westerville Medical Campus, Westerville, OH, US

FDA Device/Drug Status: Medtronic Spinal Cord Stimulator
(Approved for this indication)

**1:06-1:12 p.m.**
30. Two-Year Outcomes of Patients Treated with BVN Ablation for the Relief of Chronic Low Back Pain: Results of the SMART Trial
Jeffrey Fischgrund, MD\(^1\); Rick C. Sasso, MD\(^2\); Hyun W. Bae, MD\(^3\); Alfred L. Ryhne, MD\(^4\)
\(^1\)Beaumont Health, Royal Oak, MI, US; \(^2\)Indiana Spine Group, Carmel, IN, US; \(^3\)Spine Institute St. John’s Health Center, Los Angeles, CA, US; \(^4\)OrthoCarolina, Charlotte, NC, US

FDA Device/Drug Status: Intracept System
(Approved for this indication)

**1:12-1:18 p.m.**
31. Epidural Perineural Injection of Autologous Conditioned Serum is Better Than Methylprednisolone in Unilateral Cervical Radiculopathy at Longer Duration: A Prospective Randomized Comparative Study
Vijay G. Goni, MB, MD, PhD
Pgnimer, Chandigarh, India

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

**1:18-1:24 p.m.**
32. Spinal Anesthesia and Thoracolumbar Interfascial Plane Block Provide Optimum Analgesia for Lumbar Fusion Surgery
Matthew Morris, MD\(^1\); Sandip Tarpada, BA\(^1\); Alok D. Sharan, MD, MHCD\(^2\)
\(^1\)Bronx, NY, US; \(^2\)Westmed, Yonkers, NY, US

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

**1:24-1:30 p.m.**
33. Improving Spinal Fusion Patient-Reported Outcomes with a Single Preoperative Education Session
Donna M. Eastwood, RN\(^1\); Neil A. Manson, MD, FRCS\(^1,2,3\); Erin Bigney, MA\(^2\); Mariah A. Darling, BS\(^2\); Eden A. Richardson, BA\(^2\); Richard M. Paixao, MPT\(^1\); Tracy M. Underwood, OT\(^1\); Kate Ellis, BA\(^2\); Edward P. Abraham, MD\(^1,2,3\)
\(^1\)Saint John Regional Hospital, Horizon Health Network, Saint John, NB, Canada; \(^2\)Canada East Spine Centre, Saint John, NB, Canada; \(^3\)Dalhousie University, Department of Surgery, Saint John, NB Canada

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

**1:30-1:36 p.m.**
34. What Are the Costs of Cervical Radiculopathy in the Year Prior to Anterior Cervical Discectomy and Fusion?
Cameron Barton, MD\(^1\); Nicholas A. Bedard, MD\(^2\); Piyush Kalakoti, MD\(^2\); Nathan R Hendrickson, MD\(^2\); Comron Saifi, MD\(^3\); Andrew J. Pugely, MD\(^2\)
\(^1\)University of Iowa Hospitals and Clinics, Iowa City, IA, US; \(^2\)University of Iowa, Iowa City, IA, US; \(^3\)William Dyson, Philadelphia, PA, US

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

**1:36-1:42 p.m.**
35. Rate of Conversion to Surgery and Risk Factors Analysis Following Fluoroscopically-Guided Facet Cyst Rupture
Michael Hadeed, MD\(^1\); Nicholas C. Nacey, MD\(^1\); Adam L. Shimer, MD\(^2\)
\(^1\)University of Virginia, Charlottesville, VA, US; \(^2\)University of Virginia Department of Orthopaedic Surgery, Charlottesville, VA, US

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

**1:42-2:00 p.m.**
Discussion
1:00-2:00 p.m.

Abstract Presentations:
What’s New in MIS?
Concourse Hall 152
Moderator: Michael Y. Wang, MD

1:00-1:06 p.m.
36. Static versus Expandable Interbody Devices in Minimally Invasive Transforaminal Lumbar Interbody Fusion: Comparison of Radiographic and Functional Outcomes
Benjamin Khechen, BA1; Brittany E. Haws, BS2; Dil V. Patel, BS2; Jordan Guntin, BS3; Kaitlyn L. Cardinal, BS2; Kern Singh, MD2
1Midwest Orthopaedics at Rush, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:06-1:12 p.m.
37. Transforaminal Percutaneous Endoscopic Lumbar Discectomy for Upward Migration of Upper Lumbar Foraminal Discherniation: Clinical and Radiological Outcomes and Technical Considerations
Dong-Geun Lee, MD1; Dong-Hwa Heo, MD, PhD2; Choon-Keun Park, MD, PhD3
1Gyeonggido Sung Nam, Republic of Korea; 2The Leon Wiltse Memorial Hospital, Neurosurgery, Spine Center, Suwon-si, South Korea; 3The Leon Wiltse Memorial Hospital, Suwon, Republic of Korea
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:12-1:18 p.m.
Section on Minimally Invasive Procedures Best Paper
38. Retrospective Analysis of Sacroiliac Joint (SIJ) Fusions Comparing the Percutaneous Transtutal Equine to the Posterior Oblique Approach
Mohammad E. Majd, MD
Floyd Orthopaedic Group, New Albany, IN, US
FDA Device/Drug Status: Rialto (Approved for this indication), Grafton Bone Paste (Investigational/Not approved).

1:18-1:24 p.m.
39. Minimally Invasive Posterior Cervical Foraminotomy (mis-PCF) with Tubes Prevents Undesired Fusion with Long Term Follow-Up
Conor Dunn, MD1; Kimona Issa, MD2; Jeff Moore, MD3; Nikhil K. Sahai, MD, MPh3; Michael J. Faloon, MD4; Kumar G. Sinha, MD4; Ki S. Hwang, MD4; Arash Emami, MD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:24-1:30 p.m.
40. Clinical and Radiological Outcomes of Unilateral Biportal Endoscopic Decompression by 30° Endoscopy in Lumbar Spinal Stenosis: Minimum 2-Years Follow-Up
Ju Eun Kim, MD
Andong-si, Gyeongsangbuk-do, Republic of Korea
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:30-1:36 p.m.
41. Complication Risk in Primary and Revision Minimally Invasive Lumbar Interbody Fusion: A Comparable Alternative to Conventional Open Techniques?
Cole Bortz, BA1; Frank A. Segreto, BS2; Samantha R. Horn, BA3; Christopher Variotta, BS4; David H. Ge, BA4; Nicholas J. Frangella, BS5; Nicholas Stekas, BS2; Leah Steinmetz, BA1; Dennis Vasquez-Montes, MS, BA2; Mohamed A. Moawad, MPh3; Chloe Deflorimonte, BS1; Virginie Lafage, PhD6; Renaud Lafage, MSCh; Charla R. Fischer, MD2; Michael C. Gerling, MD2; Themistocles S. Protopsaltis, MD2; Thomas J. Errico, MD2; Aaron J. Buckland, MBBS, FRACS2; Peter G. Passias, MD8
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
WEDNESDAY, SEPTEMBER 26

1:36-1:42 p.m.
42. Diminishing Clinical Returns of Multilevel
Minimally Invasive Lumbar Interbody Fusion
Peter G. Passias, MD1; Cole Bortz, BA2; Samantha R. Horn,
BA3; Frank A. Segreto, BS4; Nicholas Stekas, BS2; David H.
Ge, BA5; Christopher Varlotta, BS3; Nicholas J. Frangella, BS6;
Virginie Lafage, PhD7; Renaud Lafage, MSc7; Leah Steinmetz,
BA2; Dennis Vasquez-Montes, MS, BA3; Mohamed A. Moawad,
MPH3; Chloe Deflorimonte, BS2; Charla R. Fischer, MD2;
Themistocles S. Protopsaltis, MD3; Aaron J. Buckland, MBBS,
FRACS3; Thomas J. Errico, MD3; Michael C. Gerling, MD8
1NY Spine Institute, NYU Langone Health, New York, NY, US;
2New York, NY, US; 3Department of Orthopedic Surgery, NYU
Langone Orthopedic Hospital, NYU Langone Health, New
York, NY, US; 4NYU Langone Medical Center - Orthopaedic
Hospital, Manhattan, NY, US; 5NYU Langone Spine Research
Institute, New York, NY, US; 6NYU Langone Health, New York,
NY, US; 7Hospital for Special Surgery, New York, NY, US; 8NYU
Langone, Brooklyn, Brooklyn, NY, US
FDA Device/Drug Status: This abstract does not discuss or
include any applicable devices or drugs.

1:42-2:00 p.m.
Discussion
1:00-2:00 p.m.

Abstract Presentations:
Navigation and Intraoperative Monitoring
Room 403A

Moderators: Richard Vogel, PhD, DABNM; Adam Doan, DC,
DABNM

1:00-1:06 p.m.
43. Direct Nerve Root Stimulation: A Novel Approach
to Neuromonitoring for Reduction of High Grade
Spondylolisthesis
Christopher Nielsen, FRCSC, MD1; Stephen J. Lewis, MD2;
Samuel Strantzas, MSN1; Laura Holmes1; Mahesh R. Akula,
MBBS, MS, FRCS (Tr & Orth)3

WEDNESDAY, SEPTEMBER 26

1Toronto, ON, Canada; 2Toronto Western Hospital, Toronto,
ON, Canada; 3NHS, Basildon, Essex, UK
FDA Device/Drug Status: This abstract does not discuss or
include any applicable devices or drugs.

1:06-1:12 p.m.
Section on Intraoperative Neurophysiological
Monitoring Best Paper
44. A Novel MRI-Based Classification of Spinal
Cord Shape and CSF Presence at the Curve Apex to
Assess Risk of Intraoperative Neuromonitoring Data
Loss with Thoracic Spinal Deformity Correction

60

John A. Sielatycki, MD1; Melvin C. Makhni, MD, MBA1; Ronald
A. Lehman Jr, MD2; Lawrence G. Lenke, MD3
1Columbia University Medical Center, New York, NY, US; 2The
Spine Hospital, Columbia University/New York Presbyterian,
FDA Device/Drug Status: This abstract does not discuss or
include any applicable devices or drugs.

1:12-1:18 p.m.
45. Neuromonitoring Signal Changes in Cervical
Spine Surgery: When Is It Significant?
Joshua Decruz, MD1; Kevin H. Wong, MBBS2; Jacob Y. Oh,
MD3; Kumar Aravind, FRCS1; Shree Dinesh Kumar, FRCS,
MBBS4; Eugene Yang, FRCS2; Colum P. Nolan, MD, FRCSI4;
Hamilton Hall, MD, FRCSC5
1Khoo Teck Puat Hospital, Singapore, Singapore; 2Changi
General Hospital, Singapore; 3Tan Tock Seng Hospital,
Singapore; 4National Neuroscience Institute, Singapore;
5Markdale, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or
include any applicable devices or drugs.

1:18-1:24 p.m.
46. Robotic-Assisted Lumbar Fusion Fails to Reduce
Perioperative Complications
Alexander M. Lieber, BA1; Gregory J. Kirchner, MPH1; Yehuda
E. Kerbel, MD2; Venkat Kavuri, MD3; Amrit Khalsa, MD4
1Drexel University College of Medicine, Philadelphia, PA,
US; 2Drexel University College of Medicine, Department of
4Hahnemann/Drexel Department of Orthopaedic Surgery,
Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or
include any applicable devices or drugs.

1:24-1:30 p.m.
47. The Utility of Intraoperative Electromyography
and Computer-Assisted Navigation for Lumbar
Pedicle Screw Placement
Remi M. Ajiboye, MD, MPH1; Jayme Koltsov, PhD2; Brian A.
Karamian, MD3; Alexander H. Arzeno4; Chason Ziino, MD5;
Ivan Cheng, MD6
1UCLA Medical Center, Department of Orthopaedic Surgery,
Los Angeles, CA, US; 2Redwood City, CA, US; 3Department of
Orthopaedic Surgery, Stanford, CA, US; 4New Haven, CT, US;
5Stanford Department of Orthopedic Surgery, Stanford, CA,
US; 6Stanford University, Redwood City, CA, US
FDA Device/Drug Status: This abstract does not discuss or
include any applicable devices or drugs.


1:30-1:36 p.m.  
Nathan R Hendrickson, MD; Brandon Wilkinson, MD; Cameron Barton, MD; J. Joseph Gholson, MD; Yubo Gao, PhD; Piyush Kalakoti, MD; Andrew J. Pugely, MD

1:36-1:42 p.m.  
49. Novel Technology for C-Arm Based Pedicle Navigation  
James F. Marino, MD; Jamil Elbanna, MS

1:42-2:00 p.m.  
Discussion

1:00-2:00 p.m.  
Abstract Presentations: Spinal Trauma  
Room 403B  
Moderator: Darrel S. Brodke, MD

1:00-1:06 p.m.  
50. Military Lumbar Injuries from Vertical Loading Are More Unstable Than Civilian Automobile Trauma: Field and Biomechanical Studies  
Jamie Baisden, MD, FACS; Narayan Yoganandan, PhD; Frank A. Pintar, PhD

1:06-1:12 p.m.  
51. Epidemiology and Trends of 39,296 Fractures of the Lumbar Spine from 2007 to 2016 in the United States  
Neil V. Shah, MD, MS; Jack J. Zhou, BS; Jay Rathod, BS; Ryan Scheer, BS; Qais Naziri, MD, MBA; Jared M. Newman, MD; Daniel P. Murray, BA; Ahmed Eldib, MD; John J. Kelly, BA; Charles A. Conway, BS; Sarah Stroud, BA; Gregory S. Penny, MD; Scott C. Pascal, MD; Bassel G. Diebo, MD; Carl B. Paulino, MD

1:12-1:18 p.m.  
52. Spine Fractures in Pediatric Population: Causes, Comorbidities, and Complications. A Review of the National Trauma Data Bank (NTDB)  
Vishal Sarwahi, MD; Jesse M. Galina, BS; Stephen Wendolowski; Jose M. Prince; Nate Christopherson; Terry D. Amaral, MD

1:18-1:24 p.m.  
53. Correlation of PROMIS Physical Function and Pain Interference CAT Instruments with Oswestry Disability Index and Neck Disability Index in Spine Trauma Patients  
Alexander S. Greenstein, MD; Taylor D’Amore; David N. Bernstein, MBA, MA; Addisu Mesfin, MD

1:24-1:30 p.m.  
54. Non-Surgical Management versus Cement Augmentation versus Transpedicular Instrumented Stabilization for the Treatment of Osteoporotic Compression Fractures: A Cost Effectiveness Analysis  
Kenneth Nwosu, MD; Amandeep Bhalla, MD; Hany Bedair, MD; Thomas D. Cha, MD, MBA

1:30-1:36 p.m.  
Nathan R Hendrickson, MD; Brandon Wilkinson, MD; Cameron Barton, MD; J. Joseph Gholson, MD; Yubo Gao, PhD; Piyush Kalakoti, MD; Andrew J. Pugely, MD

1:36-1:42 p.m.  
49. Novel Technology for C-Arm Based Pedicle Navigation  
James F. Marino, MD; Jamil Elbanna, MS

1:42-2:00 p.m.  
Discussion

1:00-2:00 p.m.  
Abstract Presentations: Spinal Trauma  
Room 403B  
Moderator: Darrel S. Brodke, MD

1:00-1:06 p.m.  
50. Military Lumbar Injuries from Vertical Loading Are More Unstable Than Civilian Automobile Trauma: Field and Biomechanical Studies  
Jamie Baisden, MD, FACS; Narayan Yoganandan, PhD; Frank A. Pintar, PhD

1:06-1:12 p.m.  
51. Epidemiology and Trends of 39,296 Fractures of the Lumbar Spine from 2007 to 2016 in the United States  
Neil V. Shah, MD, MS; Jack J. Zhou, BS; Jay Rathod, BS; Ryan Scheer, BS; Qais Naziri, MD, MBA; Jared M. Newman, MD; Daniel P. Murray, BA; Ahmed Eldib, MD; John J. Kelly, BA; Charles A. Conway, BS; Sarah Stroud, BA; Gregory S. Penny, MD; Scott C. Pascal, MD; Bassel G. Diebo, MD; Carl B. Paulino, MD

1:12-1:18 p.m.  
52. Spine Fractures in Pediatric Population: Causes, Comorbidities, and Complications. A Review of the National Trauma Data Bank (NTDB)  
Vishal Sarwahi, MD; Jesse M. Galina, BS; Stephen Wendolowski; Jose M. Prince; Nate Christopherson; Terry D. Amaral, MD

1:18-1:24 p.m.  
53. Correlation of PROMIS Physical Function and Pain Interference CAT Instruments with Oswestry Disability Index and Neck Disability Index in Spine Trauma Patients  
Alexander S. Greenstein, MD; Taylor D’Amore; David N. Bernstein, MBA, MA; Addisu Mesfin, MD

1:24-1:30 p.m.  
54. Non-Surgical Management versus Cement Augmentation versus Transpedicular Instrumented Stabilization for the Treatment of Osteoporotic Compression Fractures: A Cost Effectiveness Analysis  
Kenneth Nwosu, MD; Amandeep Bhalla, MD; Hany Bedair, MD; Thomas D. Cha, MD, MBA
1:30-1:36 p.m.  
55. Aggravation of Spinal Cord Compromise Following New Osteoporotic Vertebral Compression Fracture Prevented by Teriparatide in Patients with Surgical Contraindications  
Yuan Xue, MD, PhD  
The Department of Orthopaedic Surgery, Tianjin Medical University General Hospital, Tianjin, China  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:36-1:42 p.m.  
56. Two Nation Comparison of Surgical Treatment of Traumatic Thoracolumbar Spinal Fractures: Posterior Only versus Circumferential Stabilization  
Inez Curfs, MD; Wouter van Hemert, MD, PhD; Philipp Kobbe, MD, PhD; Paul Willems, MD  
1Maastricht University Medical Centre, Maastricht, Netherlands; 2AtriumMC Heerlen, Heerlen, Netherlands; 3Uniklinik RWTH Aachen, Aachen, Germany; 4Maastricht University Medical Center, Maastricht, Netherlands  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:42-2:00 p.m.  
Discussion

1:00-2:00 p.m.  
Innovative Technology Presentations (Non-CME)  
Room 404AB  
Moderator: Scott Blumenthal, MD  
All innovative Technology Presentations also are available as posters in the Exhibit Hall.

1:00-1:07 p.m.  
Philips Healthcare: Radiation Exposure During Spine Surgery Using Cone-Beam CT Imaging With Augmented Reality Navigation in a Hybrid Operating Room  
Gustav Burstrom, MD; Rami Nachabe, PhD; Paul Gerdhem, MD, PhD; Erik Edström, MD, PhD; Adrian Elmi Terander, MD, PhD  
1Karolinska Institute, Stockholm, Sweden; 2Philips Healthcare, Cincinnati, OH, US; 3Karolinska University Hospital, Huddinge, Stockholm, Sweden; 4Karolinska University Hospital, Department of Neurosurgery, Solna, Sweden

1:07-1:14 p.m.  
Spinal Balance: Reducing Bacterial Dose During Instrumented Spine Surgery: A Clinical Study on a Novel and Effortless Method  
Aakash Agarwal, PhD; Boren Lin, PhD; Neel Anand, MD; Jeffrey C. Wang, MD; Anand Agarwal, MD; Christian Schultz, MD, MBA; Hossein K. Elgafy, MD, FRCS, FRCS; Vijay K. Goel, PhD; Steven R. Garfin, MD; Dennis P. McGowan, MD; Chris Karas, MD  
1Toledo, OH, US; 2Cedars-Sinai Spine Center, Los Angeles, CA, US; 3USC Spine Center, Los Angeles, CA, US; 4University of Toledo, Toledo, OH, US; 5Munich, Germany; 6University of Toledo Medical Center, Toledo, OH, US; 7UC San Diego, Department of Orthopaedic Surgery, San Diego, CA, US; 8Spine & Orthosurgery, Kearney, NE, US; 9Westerville Medical Campus, Westerville, OH, US

1:14-1:21 p.m.  
Amedica: Inherently Bactericidal Biomaterials for Spinal Fusion Surgery  
Giuseppe Pezzotti, PhD; Bryan J. McEntire, PhD, MBA  
1Kyoto Institute of Technology, Kyoto, Kyoto Prefecture, Japan; 2Amedica Corporation, Salt Lake City, UT, US

1:21-1:28 p.m.  
MiRus: Validation of a Wireless, Non-Optical System for Measurement of Intraoperative Spine Alignment  
Thomas J. Morrison III, MD; Eric W. Nottmeier, MD; Jeffrey J. Larson, MD; Kevin N. Ammar, MD; Jahangir Asghar, MD; Tapan K. Daftari, MD; Ashutosh A. Pradhan, MD; Jeffrey D. Coe, MD; Angad Singh; Daniel S. Burnham; Alex Panter; David Harrison  

1:28-1:35 p.m.  
DePuy-Synthes: Mechanomyography (MMG) is Superior to EMG in Mapping and Locating Nerves at Risk During Spinal Surgery  
Stephen Bartol, MD, MBA, FRCS; Christopher Wybo, MS; Courtney Henderson DVM, MS, DACVS  
1Windsor, ON, Canada; 2Detroit, Michigan, US; 3Blue Ash, Ohio, US
1:35-1:42 p.m.
DePuy-Synthes: Comparative Ethnographic Study of the UNLEASH™ MIS TLIF Procedural Solution in a Cadaveric Lab
Chadi Tannoury, MD1; Stuart H. Hershman, MD2; Ann M. Menzie3; Michael Erb, MSc4; Hassan A. Serhan, PhD3
1Boston University Medical Center, Boston, MA, US; 2Massachusetts General Hospital, Boston, MA, US; 3Raynham, MA, US; 4Johnson & Johnson Medical Devices, Markham, ON, Canada

1:42-1:49 p.m.
Medtronic: Use of A Low-Thermal Injury Dissection Device Reduces Tissue Temperature Change in Anterior Lumbar Interbody Fusion Spine Surgery
Darvin J. Griffin, PhD1; Joshua G. Vose, MD, MBA2; Michael A. Gallizzi, MD, MS; Brandon T. Garland, MD3

1:49-2:00 p.m.
Discussion

1:00-3:00 p.m.
Moderator: Eric H. Buchl, MPAS, PA-C

Eighty percent of people experience acute back pain at some point in their lives making it the second most common reason people visit a care provider and is the leading cause of disability worldwide. Back pain and spine injuries are a significant economic burden. Notwithstanding the direct medical cost, many patients utilize alternative treatments to relieve their symptoms. Many complementary and alternative treatments for low back pain have little to no evidence, and in some instances can be counterproductive and even harmful. The purpose of the session is to review the different complementary and alternative treatments that are effective.

Upon completion of this session, participants should gain strategies to:
- Understand and be able to discuss the evidence of complementary and alternative treatments for low back pain;
- Become an advocate for your patient to utilize appropriate complementary and alternative treatments;
- Become familiar with coverage guidelines;

• Understand counterproductive complementary and alternative treatments and how to redirect individuals to more effective modalities.

Agenda
- Literature Review of Cost of Spine Care and Changing Trends
  Eric Buchl, PA-C
- Coverage Guidelines for Self-Care
  Brian Justice, DC
- Nutrition, Supplements, Obesity and Smoking Cessation
  Carrie Diulus, MD
- Core/Yoga and Other Self-Care for the Spine
  Robert Turner, PT, DPT, OCS
- Chiropractor Self-Referral
  Michael Schneider, DC, PhD
- Acupuncture/Massage
  Xinru Qian, MD
- Psych Factors and How to Address Them in the Clinical Practice
  Marco Campello, PhD, PT
- Questions and Answers

1:30-2:00 p.m.
Career Building Presentation: It’s a Jungle Out There: An Inside Look at the Job Hunt
The Learning Place, Grey Theater
Moderators: Russell DeMicco, DO; Tagreed Khalaf, MD

Presenters will provide an insider’s look at the search and recruitment process of new employees. You will benefit from the different perspective and advice, whether you are specifically looking for a new position or a new colleague to join your team. This presentation also will help you determine when and if it is time to make a change in your career. It is never too soon or too late to learn strategies on how to survive the work force!

Upon completion of this session, participants should gain strategies to:
- Identify key attributes of an ideal practice partner;
- Complete a job search and utilize related recruitment tools.
Agenda
- Introductions
- What to Look for in a Partner
- Is the Grass Really Greener? Job Search Beyond Your Initial Job
- Discussion, Questions and Answers

2:00-3:00 p.m.

Abstract Presentations:
Integrating Technology into Practice
Concourse Hall 151
Moderator: Erica F. Bisson, MD

2:00-2:06 p.m.
57. The Impact of Online Physician Rating Websites on Orthopaedic Clinical Practice
Michael R. Conti Mica, MD1; Susan Odum, PhD2; Michael P. Silverstein, MD; Todd M. Chapman Jr., MD; P. Bradley Segebarth, MD; Leo R. Spector, MD; Robert Milam, MD; Alfred L. Rhyne, MD; Bruce V. Darden II, MD; Eric B. Laxer, MD
1Loyola University Medical Center, Maywood, IL, US; 2OrthoCarolina Research Institute, Charlotte, NC, US; 3Charlotte, NC, US; 4OrthoCarolina Spine Center, Charlotte, NC, US; 5OrthoCarolina, Charlotte, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:06-2:12 p.m.
58. Validity of the Fundamental of Spinal Surgery (FOSS) Simulator as a Teaching Tool for Orthopaedic and Neurosurgical Trainees
Winnie A. Palispis, MD1; Nitin N. Bhatia, MD2; Justin Haghiyerdian, BA3; Timur Urakov, MD4; Jordan A. Gruskay, MD5; Daniel Tarazona, MD6; Todd J. Albert, MD7; Alexander R. Vaccaro, MD, PhD8; Allan D. Levi, MD, PhD, FRCS9; Ranjan Gupta, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:12-2:18 p.m.
Section on Robotics and Navigation Best Paper
59. Natural Language Processing of Electronic Medical Records can Identify Sepsis Following Orthopedic Surgery
Varun Arvind, MD1; Brian Cho, BS2; Chierika O. Ukogu3; Jun Kim, MD4; Samuel K. Cho, MD5
1New York, NY, US; 2Icahn School of Medicine, New York, NY, US; 3Icahn School of Medicine at Mount Sinai, New York, NY, US; 4Mount Sinai Medical Center, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:18-2:24 p.m.
60. Utilization of Artificial Intelligence-Based Hierarchical Cluster Analysis of Patient Baseline Characteristics and Surgical Invasiveness Provides Novel Insights on 2-Year Outcomes and Complications through Pattern Recognition
Christopher P. Ames, MD1; Ferran Pellise, MD, PhD2; Justin S. Smith, MD, PhD3; Michael P. Kelly, MD4; Ahmet Alanay, MD5; Emre Acaroglu, MD6; Francisco J. Perez-Grueso, MD7; Frank Kleinstuck, MD8; Ibrahim Obeid, MD9; Virginie Lafage, PhD10; Frank J. Schwab, MD11; Christopher I. Shaffrey, MD11; Douglas C. Burton, MD12; Shay Bess, MD13; Alba Vila-Casademunt, MSc14; ESSG European Spine Study Group15; International Spine Study Group16
1University of California, San Francisco, San Francisco, CA, US; 2Barcelona, Spain; 3Icahn School of Medicine, Charlotte, VA, US; 4Washington University, Saint Louis, MO, US; 5Acibadem University, School of Medicine, Istanbul, Atasehir, Turkey; 6Ankara, Turkey; 7H. De La Paz (Madrid), Madrid, Spain; 8Switzerland; 9Bordeaux, France; 10Hospital for Special Surgery, New York, NY, US; 11University of Virginia, Charlottesville, VA, US; 12University of Kansas Medical Center, Kansas City, KS, US; 13Denver, CO, US; 14Vall Hebron Institute of Research, Barcelona, Barcelona, Spain; 15Barcelona, Spain; 16Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:24-2:30 p.m.
61. Clinical Photographs in the Assessment of Adult Spinal Deformity: A Comparison to Radiographic Parameters
Devon J. Ryan, MD1; Nicholas Stekas, BS2; Mohamed A. Moawad, MPH1; Charla R. Fischer, MD2; Aaron J. Buckland, MBBS, FRACS1; Thomas J. Errico, MD1; Themistocles S. Protopsaltis, MD1
1Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 2New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
2:30-2:36 p.m.
2015 Research Grant
Development of a Virtual Reality Graded Exposure Intervention for Chronic Low Back Pain: Initial Findings and Future Directions
Zina Trost, PhD¹; Christopher France, PhD²; Marjorie A. Zielke, PhD³; Gary M. Hardee, MA, PhD⁴
¹Department of Psychology, University of Alabama at Birmingham, Birmingham, AL, US; ²Department of Psychology, Ohio University, Athens, OH, US; ³Department of Arts and Technology, University of Texas at Dallas, Dallas, TX, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:36-2:42 p.m.
2016 Research Grant
Effects of Telemedicine Triage on Efficiency and Cost-Effectiveness in Spinal Care
Shari Cui, MD¹; Scott D. Daffner, MD²; Leslie Crossley, BSN³; Cara Sedney, MD⁴; John C. France, MD⁵
¹West Virginia University Spine Center, Morgantown, WV, US; ²West Virginia University School of Medicine, Morgantown, WV, US; ³West Virginia University Medicine, Morgantown, WV, US; ⁴West Virginia University, Morgantown, WV, US; ⁵Robert C. Byrd Health Sciences Center, Morgantown, WV, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:42-3:00 p.m.
Discussion

2:00-3:00 p.m.
Abstract Presentations:
Increasing Value: Lumbar Spine Surgery
Concourse Hall 152
Moderator: John G. Finkenberg, MD

2:00-2:06 p.m.
Brook I. Martin, PhD, MPH¹; Sohail K. Mirza, MD, MPH²; Nicholas Spina, MD³; W. Ryan Spiker, MD⁴; Brandon D. Lawrence, MD⁵; Darrel S. Brodke, MD⁶
¹University of Utah, Salt Lake City, UT, US; ²PEER Clinic for Back Pain and Spine Surgery, Fairfax, VA, US; ³University of Washington, Seattle, WA, US; ⁴University of Utah Orthopaedics, Salt Lake City, UT, US; ⁵University Orthopaedic Center, Salt Lake City, UT, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:06-2:12 p.m.
63. Assessing Variation in Cost- and Episode-Based Outcomes Between Surgical Services for Patients Undergoing Posterior Lumbar Fusion
Daniel J. Snyder, BS¹; Sean N. Neifer²; Brian Deutsch, BS³; Samuel Hunter, MD²; Samuel DeMaria, MD²; John M. Caridi, MD⁴; Jonathan S. Gal, MD⁵
¹New York, NY, US; ²Icahn School of Medicine at Mount Sinai, New York, NY, US; ³Mount Sinai Medical Center, Closter, NJ, US; ⁴Mount Sinai Medical Center, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:12-2:18 p.m.
64. Propensity-Matched Index Episode of Care Cost Comparison Between Minimally Invasive Midline Lumbar Interbody Fusion (MIDLIF) versus Traditional Open Transforaminal Interbody Fusion (tlIF)
Jeffrey L. Gum, MD¹; Charles H. Crawford III, MD²; Mladen Djurasovic, MD²; R. Kirk Owens II, MD²; Morgan Brown, MS³; Leah Y. Carreon, MD, MSc⁴
¹Norton Leatherman Spine Center, Louisville, KY, US; ²Norton Healthcare, Louisville, KY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:18-2:24 p.m.
65. Cost Effectiveness of Vancomycin Powder in Lumbar Laminectomy
Gregory J. Kirchner, MPH¹; Alexander M. Lieber, BA¹; Yehuda E. Kerbel, MD²; Anisha R. Sunkerneni, BS²; Venkat Kavuri, MD³; Vincent M. Moretti, MD, MSc⁴; Amrit Khalsa, MD⁵
¹Drexel University College of Medicine, Philadelphia, PA, US; ²Drexel University College of Medicine, Department of Orthopaedics, Philadelphia, PA, US; ³San Jose, CA, US; ⁴Philadelphia, PA, US; ⁵Hahnemann University Orthopaedic Institute, Philadelphia, PA, US; ⁶Hahnemann/Drexel Department of Orthopaedic Surgery, Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:24-2:30 p.m.
66. Cost-Benefit Analysis of Intraoperative EMG for Pedicle Screw Placement in Routine Lumbar Fusions
R. Kirk Owens II, MD¹; Charles H. Crawford III, MD²; Mladen Djurasovic, MD²; Jeffrey L. Gum, MD²; Morgan Brown, MS³; Leah Y. Carreon, MD, MSc⁴
¹Norton Leatherman Spine Center, Louisville, KY, US; ²Norton Healthcare, Louisville, KY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
2:30-2:36 p.m.
67. The Impact of Diabetes Mellitus on Length of Stay and Direct Hospital Costs after Minimally Invasive Transforaminal Lumbar Interbody Fusion
Benjamin Khechen, BA1; Brittany E. Haws, BS2; Dil V. Patel, BS2; Ankur S. Narain, BA2; Kaitlyn L. Cardinal, BS2; Jordan Guntin, BS4; Kern Singh, MD2
1Midwest Orthopaedics at Rush, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Rush University Medical Center-Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:36-2:42 p.m.
68. Iliac Crest Bone Graft for Minimally Invasive Transforaminal Lumbar Interbody Fusion: A Prospective Analysis of Inpatient Pain, Narcotics Consumption and Costs
Brittany E. Haws, BS1; Benjamin Khechen, BA2; Dil V. Patel, BS1; Ankur S. Narain, BA2; Fady Y. Hijji, BS1; Kaitlyn L. Cardinal, BS1; Jordan Guntin, BS4; Kern Singh, MD1
1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopaedics at Rush, Chicago, IL, US; 3Rush University Medical Center-Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:42-3:00 p.m.
Discussion

2:00-3:00 p.m.
Abstract Presentations:
Surgery and Opioids
Room 403A
Moderator: Daniel J. Hoh, MD

2:00-2:06 p.m.
69. Immediate Postoperative Narcotic Use Is Not Associated with Preoperative Opiate Use or Surgery Invasiveness
Portia Steele, ACNP-BC1; Jeffrey L. Gum, MD1; Charles H. Crawford III, MD1; R. Kirk Owens II, MD1; Mladen Djurasovic, MD1; Morgan Brown, MS2; 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.
2:24-2:30 p.m.
73. Narcotic Consumption Following Minimally Invasive Lumbar Decompression: A Comparison Between Hospital and Ambulatory-Based Surgery Centers
Benjamin Khechen, BA1; Brittany E. Haws, BS2; Dil V. Patel, BS2; Dustin H. Massel, MD1; Benjamin Mayo, BA2; Kaitlyn L. Cardinal, BS2; Jordan Guntin, BS2; Kern Singh, MD2
1Midwest Orthopaedics at Rush, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Chicago, IL, US

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

2:30-2:36 p.m.
74. Opioid Utilization Following Cervical Spine Surgery: Trends and Factors Associated with Long-Term Use
Andrew J. Pugely, MD1; Piyush Kalakoti, MD1; Nicholas A. Bedard, MD1; Nathan R Hendrickson, MD1; Comron Saifi, MD1; Ronald A. Lehman Jr., MD1; K. Daniel Riew, MD

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

2:36-2:42 p.m.
75. Opioid Utilization Following Lumbar Arthrodesis: Trends and Factors Associated with Long-Term Use
Piyush Kalakoti, MD1; Nicholas A. Bedard, MD1; Nathan R Hendrickson, MD1; Comron Saifi, MD1; Andrew J. Pugely, MD1
1University of Iowa, Iowa City, IA, US; 2William Dyson, Philadelphia, PA, US

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

2:42-3:00 p.m.
Discussion
2:18-2:24 p.m.
79. The Impact of Chemotherapy on Primary Bone Tumors of the Vertebral Column: A National Cancer Database Review
Alexander L. Lazarides, MD1; David Kerr1; Brian Dial, MD2; Anthony Catanzano, MD1; Whitney Lane, MD1; Dan Blazer III1; Melissa Erickson, MD1; Sergio Mendoza-Lattes, MD1
1Duke University Medical Center, Durham, NC, US; 2Duke University, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:24-2:30 p.m.
80. High Facility Volume May Improve Survival in Patients with Primary Bone Tumors of the Vertebral Column
Alexander L. Lazarides, MD1; Brian Dial, MD2; David Kerr1; John Steele1; Whitney Lane, MD1; Dan Blazer III1; Melissa Erickson, MD1; Sergio Mendoza-Lattes, MD1
1Duke University Medical Center, Durham, NC, US; 2Duke University, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:30-2:36 p.m.
81. Choice of Treatment in Spinal Metastatic Disease with Indeterminate Instability (SINS 7-12): Impact on Survival and Preservation of Ambulatory Status
Brian Dial, MD1; Anthony Catanzano, MD2; Sean P. Ryan, MD2; Valentine R. Esposito, BS3; Alexander L. Lazarides, MD2; Sergio Mendoza-Lattes, MD2
1Duke University, Durham, NC, US; 2Duke University Medical Center, Durham, NC, US; 3Duke University, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:36-2:42 p.m.
82. Implication of Biomarker Mutations for Predicting Survival in Patients with Metastatic Lung Disease to the Spine
Bryan Choi, MD1; Ganesh M. Shankar, MD, PhD1; Ahilan Sivaganesan, MD2; Vijay Yanamadala, MD1; John H. Shin, MD3
1Boston, MA, US; 2Vanderbilt University Medical Center, Nashville, TN, US; 3Massachusetts General Hospital, Boston, MA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:42-3:00 p.m.
Discussion

2:00-3:00 p.m.
Innovative Technology Presentations (Non-CME)
Room 404AB
Moderator: Wellington Hsu, MD
All Innovative Technology Presentations also are available as posters in the Exhibit Hall.

2:00-2:07 p.m.
RTI Surgical: Evaluation of Three Design Materials in an Ovine Bone Defect Model
Boyle C. Cheng, PhD1; Rasa Zhukauskas, MD2
1Allegheny General Hospital, Pittsburgh, PA, US; 2RTI Surgical, Alachua, FL, US

2:07-2:14 p.m.
MiRus: Molybdenum Rhenium (MoRe®) Alloy Provides Superior Biomechanical and Wear Properties for a New Generation of Spine Implants
Kornelis A. Poelstra, MD, PhD1; Jorge E. Isaza, MD2; Raphel R. Roybal, MD1; Cyrus Ghavam, MD4; Samuel A. Joseph Jr., MD6; Matthew J. McGirt, MD, MS5; Joanna Bauman8; Mahesh S. Krishnan, MBA9; Pam Cowart, APRN

2:14-2:21 p.m.
4Web Medical: Biologic Alternatives: Significant Cost Savings Through the Use of an Innovative Truss-Based Interbody Fusion Device
Safdar N. Khan, MD1; Cameron N. Carmody, MD2
1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Texas Spine Consultants, Addison, TX, US

2:21-2:28 p.m.
Medtronic: 3D-Printed Rough Titanium Implant for Intervertebral Body Fusion: An In Vitro Evaluation Using Osteoblast Precursor Cells
Ping Li, PhD1; Jeremy Rawlinson, PhD2; Cindy Ogden; William Armstrong; Brian Murrell; Virginia Richardson
Medtronic Spine, Memphis, TN, US
2:28-2:35 p.m.
**Medtronic: Biological Response to Additive Titanium Implants in an Ovine Model**
Jeremiah T. Easley, DVM¹; Jeremy Rawlinson, PhD²; Christian M. Puttltiz, PhD³; Howard B. Seim III, DVM³; Kirk C. McGilvray, PhD³
¹Preclinical Surgical Research Laboratory, Colorado State University, Fort Collins, CO, US; ²Medtronic Spine, Memphis, TN, US; ³Colorado State University, Fort Collins, CO, US

2:35-2:42 p.m.
**MiRus: Mechanically Superior Molybdenum-Rhenium (MoRe®) Alloy Allows for New Generation of Spinal Implants Embedded With SMART™ Sensor Technology for Remote Real-Time Monitoring of Bone Growth Across a Fixated Motion Segment**
Matthew J. McGirt, MD¹; Jorge E. Isaza, MD²; Raphael R. Roybal, MD²; Cyrus Ghavam, MD³; Samuel A. Joseph Jr., MD³; Kornelis A. Poelstra, MD, PhD⁴; Noah Roth, JD⁵; Jordan Bauman⁶; Mahesh S. Krishnan, MBA⁷; Pam Cowart, APRN, MSN

2:42-2:49 p.m.
**Aziyo: ViBone® Viable Bone Matrix: Assessment of Cell Health and Early Evidence of Spine Fusion**
Dean E. Smith, MD¹; Abby Sukarto, PhD²; Dana Yoo, PhD³; Frank Fan, PhD²
¹Spine Center, El Paso, TX, US; ²Richmond, CA, US; ³Silver Spring, MD, US

2:49-3:00 p.m.
**Discussion**

2:00-3:00 p.m.
**Resident/Fellow Education Pathway: Intersecting With NASS**
The Learning Place, Red Theater
Moderator: Michael Stauff, MD

Presenters will help you understand ways to improve participation with NASS; including committee involvement, leadership opportunities, successfully reviewing for *The Spine Journal* and increasing the likelihood of success with abstract submissions to the NASS Annual Meeting.

**Upon completion of this session, participants should gain strategies to:**
- Increase the likelihood of successful abstract submission to the annual meeting;
- Describe ways to increase committee involvement and engage in leadership opportunities through NASS;
- Refer to best practices in completing ad-hoc reviews of original research articles for *The Spine Journal*.

**Agenda**
- **How to Write an Abstract That Will Get Accepted at NASS Annual Meeting**
  Andrew J. Schoenfeld, MD
- **Committee Involvement and Leadership Opportunities in NASS**
  Christopher M. Bono, MD
- **Reviewing Articles for *The Spine Journal***
  Michael Stauff, MD
- **Discussion, Questions and Answers**
  Faculty Panel

2:00-4:00 p.m.
**Surgical Innovation Lab Demonstrations**
(Non-CME)
The Learning Place

**Yellow Lab: Private Lab**

**Green Lab: Spineology, Inc.—Invitation Only**
Anatomy-Conserving LLIF Using a Novel, Deployable Device and MIS Tubular Retractor
Speaker: Pierce Nunley, MD

**Blue Lab: Globus Medical**

**Orange Lab: Relievant Medsystems**
The Intracept® Procedure for the Relief of Chronic Low Back Pain
Speakers: Jeffrey Lotz, PhD; Jeffrey Fischgrund, MD; Ray Baker, MD; Alfred Rhyne, MD
3:00-3:30 p.m.

**Networking Break Beverage Service**
Technical Exhibition, Booths #1667 and #814

**Exercise Video Demonstrations**
The Learning Place

**Practical Theater:**
**NASS Spine Registry Q&A**
The Learning Place, Red Theater

**Simulated Surgery Lab (Non-CME)**
The Learning Place

3:00-3:30 p.m.

**Poster Grand Rounds**
The Learning Place

Pink Theater

3:00-3:08 p.m.

**P24. Matched-Pair Cohort Study of Spinal Surgery in HIV-Infected Patients: Minimum One-Year Follow-Up**

Wataru Ishida, MD; Seba Ramhmdani, MD; Alexander Perdomo-Pantoja, MD; Benjamin D. Elder, MD, PhD; Christina Holmes, PhD; Nicholas Theodore, MD; Ziya L. Gokaslan, MD, FACS; Jean-Paul Wolinsky, MD; Daniel M. Scibubba, MD; Ali Bydon, MD; Timothy F. Witham, MD, FACS; Sheng-fu L. Lo, MD, MHS

1Johns Hopkins Hospital, Baltimore, MD, US; 2Baltimore, MD, US; 3The Johns Hopkins University School of Medicine, Baltimore, MD, US; 4Rochester, MN, US; 5Columbia University College of Physicians and Surgeons, New York, NY, US

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

3:08-3:15 p.m.

**P22. Single-Center, Matched-Pair Comparative Study of Spine Surgery in Patients with Solid Organ Transplantation: Short- and Long-Term Clinical Outcomes**

Wataru Ishida, MD; Seba Ramhmdani, MD; Alexander Perdomo-Pantoja, MD; Benjamin D. Elder, MD, PhD; Christina Holmes, PhD; Nicholas Theodore, MD; Ziya L. Gokaslan, MD, FACS; Jean-Paul Wolinsky, MD; Daniel M. Scibubba, MD; Ali Bydon, MD; Timothy F. Witham, MD, FACS; Sheng-fu L. Lo, MD, MHS

1Johns Hopkins Hospital, Baltimore, MD, US; 2Baltimore, MD, US; 3The Johns Hopkins University School of Medicine, Baltimore, MD, US; 4Rochester, MN, US; 5Columbia University College of Physicians and Surgeons, New York, NY, US

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

3:15-3:23 p.m.


Katherine H. Sullivan; Swamy Kurra, MD; Prisco J. DeMercurio, BS; Mike H. Sun, MD; Warren E. Wulff, MD; William F. Lavelle, MD

1Syracuse, NY, US; 2SUNY Upstate Medical University, Syracuse, NY, US; 3Upstate Medical University Orthopedics, East Syracuse, NY, US; 4Syracuse Orthopedic Specialists, East Syracuse, NY, US; 5Upstate Orthopedics, East Syracuse, NY, US

**FDA Device/Drug Status:** Vancomycin (Approved for this indication), spinal cord stimulator (Approved for this indication).

3:15-3:30 p.m.

**P176. Positive Margin Status is Prognostic of Poorer Survival in Primary Bone Tumors of the Spine: An NCDB Study**

Brian Dial, MD; Alexander L. Lazarides, MD; David Kerr; Dan Blazer III; Whitney Lane, MD; Melissa Erickson, MD; Sergio Mendoza-Lattes, MD

1Duke University, Durham, NC, US; 2Duke University Medical Center, Durham, NC, US

**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.
3:23-3:30 p.m.
P23. Trends in Complications in Operative Adolescent and Adult Idiopathic Scoliosis from the SRS Morbidity and Mortality Database
Swamy Kurra, MD1; Baron S. Lonner, MD2; Katherine H. Sullivan; Isador H. Lieberman, MD, FRCSC, MBA3; Shay Bess, MD4; William F. Lavelle, MD5
1Syracuse, NY, US; 2Mount Sinai Beth Israel Medical Center, New York, NY, US; 3Scoliosis and Spine Tumor Center, Texas Back Institute, Texas Health Presbyterian Hospital Plano, Plano, TX, US; 4Denver, CO, US; 5Upstate Orthopedics, East Syracuse, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Purple Theater

3:00-3:15 p.m.
P11. The Regional Effects of Lumbosacral Anterior Column Support on Rod and Screw Strain in a Pedicle Subtraction Osteotomy Model: An In Silica Investigation
Ehsan Jazini, MD1; Daniel E. Gelb, MD2; Jarid Tareen, MD3; Steven C. Ludwig, MD4; Jonathan Harris5; Wenhai Wang, PhD6; Brandon Bucklen, PhD5
1Medstar Georgetown University Hospital, Washington, DC, US; 2University of Maryland Orthopaedic Associates, Baltimore, MD, US; 3Baltimore, MD, US; 4University of Maryland Medical Center, Baltimore, MD, US; 5Globus Medical Inc., Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:15-3:30 p.m.
P59. XRay Vision: The Performance of a Technology that Allows Clinicians to See Spinal X-Rays Superimposed on a Patient’s Back
Jacob F. Aaskov1; Greg N. Kawchuk, DC, MSc, PhD2; Kenton D. Hamaluik; Pierre Boulanger, PhD2
1University of Southern Denmark, Odense, Denmark; 2University of Alberta, Edmonton, AB, Canada
FDA Device/Drug Status: Microsoft Hololens (Investigational/Not approved)

White Theater

3:00-3:15 p.m.
P77. Adult Spinal Deformity Surgery in Patients 75 Years and Older: How Do the Outcomes Compare with Younger Patients?
Zac Lovato, DO1; Andrew S. Chung, DO2; Dennis G. Crandall, MD1; Jan Revelia, RN1; Michael S. Chang, MD1
1Sonoran Spine, Tempe, AZ, US; 2Mayo Clinic - Arizona, Phoenix, AZ, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:15-3:30 p.m.
P79. Patient Frailty is an Important Contributor to Disability in Adult Spinal Deformity (ASD): Rationale for Routine Frailty and Deformity Assessment
Shay Bess, MD1; Breton Line, BS2; Christopher P. Ames, MD3; Renaud Lafage, MSc4; Virginie Lafage, PhD4; Douglas C. Burton, MD4; Richard A. Hostin Jr., MD4; Gregory M. Mundis Jr., MD4; Robert K. Eastlack, MD5; Robert A. Hart, MD5; Munish C. Gupta, MD10; Michael P. Kelly, MD11; Eric O. Klineberg, MD12; Han Jo Kim, MD4; Frank J. Schwab, MD4; Christopher I. Shaffrey, MD13; Justin S. Smith, MD, PhD14; International Spine Study Group15
1Denver, CO, US; 2Denver International Spine Center, Denver, CO, US; 3University of California, San Francisco, San Francisco, CA, US; 4Hospital for Special Surgery, New York, NY, US; 5University of Kansas Medical Center, Kansas City, KS, US; 6Southwest Scoliosis Institute, Plano, TX, US; 7Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 8Scripps Clinic, San Diego, CA, US; 9Swedish Neuroscience Institute, Seattle, WA, US; 10Washington University School of Medicine, St. Louis, MO, US; 11Washington University, St. Louis, MO, US; 12UC, Davis School of Medicine, Sacramento, CA, US; 13University of Virginia, Charlottesville, VA, US; 14UVA Health System, Charlottesville, VA, US; 15Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:30-3:35 p.m.
NASS Working for You:
NASS Advocacy Update on the Brain Technology & Innovation Park (BTIP) Initiative
Concourse Hall 151
Moderator: Babak Kateb, Chairman/CEO SBMT & President of Brain Mapping Foundation, Research Scientist, Maxine Dunitz Neurosurgical Institute
Symposium: Section on Intraoperative Neurophysiological Monitoring: Analyzing the Utility, Evidence and Value of Neuromonitoring in Spine Surgery
Concourse Hall 151

Moderators: Richard Vogel, PhD, DABNM; Adam Doan, DC, DABNM

Somatosensory evoked potentials were first introduced to spine surgery in order to identify and correct impending spinal cord dysfunction under general anesthesia, thereby reducing neurologic deficits and negating the need for routine wake-up testing. This technique paved the way for the emergence of intraoperative neurophysiological monitoring (IONM) as a basic science and clinical practice focused on reducing the incidence and/or severity of neurologic deficits following surgery. The use of IONM has spread to include both routine and complex surgical and interventional procedures throughout the body. Additionally, new techniques have emerged to permit monitoring of specific structures and functions throughout the nervous system. Despite widespread use and continued growth, the utility and value of neuromonitoring in spine surgery remain matters of debate. Spine surgeons, neurophysiologists, a neurologist and an economist will discuss evidence, cost-effectiveness, research challenges, and barriers to quality in the performance of IONM in spine surgery.

Upon completion of this session, participants should gain strategies to:
- Practice evidence- and value-based medicine relative to neuromonitoring in spine care;
- Recognize contexts where neuromonitoring may be more or less cost-effective;
- Differentiate between levels of evidence for neuromonitoring;
- Identify barriers to quality and safety in neuromonitoring.

Agenda
- Point-Counterpoint: On the Utility of Neuromonitoring in Spine Surgery
  Joshua E. Heller, MD; Steven M. Theiss, MD
- What Represents Good Study Design and Good Evidence in Neuromonitoring and Why?
  Robert N. Holdefer, PhD
- Cost-Effectiveness Modeling and Surgical Risk in Neuromonitoring
  John P. Ney, MD, MPH; David N. van der Goes, PhD
- Barriers to Quality and Safety in the Performance of Neuromonitoring
  Richard Vogel, PhD
- Neuromonitoring and Precision Medicine: The Problem of Heterogeneity
  Anthony K. Sestokas, PhD
- International Speaker IONM Experience
  Abdul Karim Msaddi, MD

Concourse Hall 152

Moderator: Andrew R. Block, PhD, ABPP

Presenters will familiarize participants with the rationale for, and the process of presurgical psychological evaluation (PPE) of spine surgery candidates. While many spine surgeons still do not make use of PPE, extensive research demonstrates that psychosocial issues can impact surgery results, for better or worse. Thus, this symposium will demonstrate the importance of PPE to the diagnostic process in spine surgery candidates.

Upon completion of this session, participants should gain strategies to:
- Make use of PPE;
- Understand the indications for referring a patient for PPE;
- Appreciate the process involved in PPE;
- Recognize how PPE can identify patient strengths in surgery candidates;
- Understand the psychosocial risk factors that can adversely impact surgery outcomes;
- Integrate PPE findings to identify a prognosis for spine surgery results;
- Improve surgical outcomes based on PPE.

Agenda
- Introduction
  Andrew R. Block, PhD, ABPP
- Who Should Be Referred for PPE, and Why?
  Isador H. Lieberman, MD, MBA, FRCSC
- Psychological Factors Leading to Improved Surgical Outcomes
  Richard L. Skolasky, ScD
- Incorporating Patient-Reported Outcome Measures: The Role of Psychological Screening in Spine Surgery
  Brian J. Neuman, MD
- Psychosocial Risk Factors Associated with Reduced Surgery Results
  Andrew R. Block, PhD, ABPP
- Discussion, Questions and Answers
  Faculty Panel
Symposium:
Section on Biologics and Basic Research:
Current and Cutting-Edge Strategies for Medical Management of Spinal Cord Injury

Room 403B

Moderators: Christina L. Goldstein, MD, FRCSC; Scott D. Daffner, MD; Gregory D. Schroeder, MD

More than 1.3 million North Americans are affected by a traumatic spinal cord injury (SCI), leading to significant physical, psychological and social morbidity. With the increase in understanding pathophysiology of SCI, investigations into the use of neuroprotective therapies to decrease the secondary injury associated with SCI, as well as neuroregenerative interventions aimed at promoting axonal and neural circuit repair, have increased. Faculty will introduce the pathophysiology of traumatic SCI and introduce the evidence behind current and cutting-edge neuroprotective and neuroregenerative therapies for traumatic SCI.

Upon completion of this session, participants should gain strategies to:
- Describe pathophysiology of the secondary injury associated with traumatic SCI;
- Describe the rationale for the use of systemic methylprednisolone, the evidence supporting its use, and the appropriate dosing schedule supported by the literature;
- Describe the rationale for, and best methods for achieving, blood pressure support in traumatic SCI;
- Describe novel neuroprotective strategies for SCI and underlying rationale for each based on our understanding of the pathophysiology of the secondary injury of SCI;
- Describe the role of therapeutic hypothermia as a neuroprotective strategy for SCI;
- Outline the cutting-edge research into neuroregenerative techniques for SCI including cell-based therapies and modulation of molecular signaling.

Agenda
- Pathophysiology of Traumatic Spinal Cord Injury
  Christina L. Goldstein, MD, FRCSC
  Michael Fehlings, MD, PhD, FRCSC
- Blood Pressure Augmentation: Why, How and How Long?
  Gregory Schroeder, MD
- Therapeutic Hypothermia: Why and How?
  Jefferson Wilson, MD, PhD
- Cutting-Edge Neuroprotective Strategies
  Scott Daffner, MD
- Cutting-Edge Neuroregenerative Strategies
  Jason Savage, MD
- Discussion, Questions and Answers
  Faculty Panel

Abstract Presentations:
Preserving Spinal Motion
Room 403A

Moderator: Richard D. Guyer, MD

3:35-3:41 p.m.
83. Outcomes of 3- and 4-Level Cervical Disc Arthroplasty
Matthew F. Gornet, MD1; Francine W. Schranck, RN, BSN2; Anne G. Copay, PhD3; Katrine M. Sorensen, MS3
1The Orthopedic Center of St. Louis, St. Louis, MO, US; 2SPIRITT Research, St. Louis, MO, US; 3St. Louis, MO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:41-3:47 p.m.
84. 10-Year Adverse Events after Randomization to BRYAN Cervical Disc Arthroplasty versus Anterior Cervical Discectomy and Fusion
Swamy Kurra, MD1; K. Daniel Riew, MD2; Allan D. Levi, MD, PhD, FRCSC3; Jeffrey E. Florman, MD4; Travis Loidolt, DO, MBA1; William F. Lavelle, MD5
1Syracuse, NY, US; 2The Spine Hospital/Columbia Doctors/New York-Presbyterian/The Allen Hospital, New York, NY, US; 3University of Miami, Department of Neurosurgery, Miami, FL, US; 4Maine Medical Partners, Scarborough, ME, US; 5Upstate Orthopedics, East Syracuse, NY, US
FDA Device/Drug Status: BRYAN cervical disc (Approved for this indication).

3:47-3:53 p.m.
85. The Incidence of Subsequent Cervical Spine Surgery after Cervical Disc Arthroplasty: A Minimum Two-Year Follow-Up
Alexander M. Satin, MD1; Dean C. Perfetti, MD, MPH2; Deepak Kaji, BA3; Jeff S. Silber, MD, DC4; David A. Essig, MD5
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
3:53-3:59 p.m.
86. Successful Clinical Outcomes Following Surgery for Severe Cervical Deformity are Dependent Upon Achieving Sufficient Cervical Sagittal Alignment
Themistocles S. Protopsaltis, MD; Nicholas Stekas, BS; Justin S. Smith, MD, PhD; Alexandra Soroceanu, MD, MPH; Renaud Lafage, MSc; Alan H. Daniels, MD; Han Jo Kim, MD; Peter G. Passias, MD; Gregory M. Mundis Jr., MD; Eric O. Klineberg, MD; D. Kojo Hamilton, MD; Munish C. Gupta, MD; Virginie Lafage, PhD; Robert A. Hart, MD; Frank J. Schwab, MD; Douglas C. Burton, MD; Shay Bess, MD; Christopher I. Shaffrey, MD; Christopher P. Ames, MD; International Spine Study Group
1Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3UVA Health System, Charlottesville, VA, US; 4University of Calgary, Calgary, Canada; 5Hospital for Special Surgery, New York, NY, US; 6Warren Alpert Medical School of BU/RI Hospital, Providence, RI, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US; 8Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 11Washington University School of Medicine, St. Louis, MO, US; 12Swedish Neuroscience Institute, Seattle, WA, US; 13University of Kansas Medical Center, Kansas City, KS, US; 14Denver, CO, US; 15University of Virginia, Charlottesville, VA, US; 16University of California, San Francisco, San Francisco, CA, US; 17Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:59-4:05 p.m.
87. Posterior Cervical Foraminotomy for Cervical Radiculopathy: Should Cervical Sagittal Alignment be Considered?
Seokwon Chung, MD; Minsoo Kang, MD; Sang Ho Lee, MD, PhD; Shinyoung Lee, MD; Yonghwan Shin, PhD
1Spine Health Wooriul Hospital, Daegu, Daegu, Republic of Korea; 2Spine Health Wooriul Hospital Daegu, Daegu, Republic of Korea; 3Wooriul Spine Hospital, Seoul, Republic of Korea
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:05-4:11 p.m.
88. Cervical Artificial Disc Replacement with Prodisc-C: 10-Year Clinical and Radiographic Results of Prospective Observational Study in a Single Institute
Jung-Woo Hur, MD; Jin-Sung L. Kim, MD, PhD
Seoul St. Mary's Hospital, The Catholic University of Korea, Seoul, Republic of Korea
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:11-4:29 p.m.
89. Impact of Range of Motion on Patient Outcomes Five Years Following Lumbar TDR at L5-S1
Scott L. Blumenthal, MD
Texas Back Institute, Plano, TX, US
FDA Device/Drug Status: ActivL, ProDisc-L, Charité (Approved for this indication).

4:29-4:35 p.m.
90. Seven-Year Outcomes of Lumbar Total Disc Replacement Systems on Patient Lifestyle and Quality of Life
Scott L. Blumenthal, MD; Donna D. Ohnmeiss, PhD
1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US
FDA Device/Drug Status: activL, ProDisc-L, Charite artificial discs (Approved for this indication).

4:35-4:41 p.m.
91. Interlaminar Stabilization versus PLF in the ≤ 65 Year-Old Patient: Five-Year Follow-Up
Antonio T. Brecevich, MD; Christina Dow, BS; Frank P. Cammisa, MD; Celeste Abjornson, PhD
Hospital for Special Surgery, New York, NY, US
FDA Device/Drug Status: Coflex (Approved for this indication).

4:41-4:47 p.m.
92. A Prospective, Multicenter Evaluation of the Relationship Between Standing and Recumbent Surgical Lumbar Lordosis
Mir H. Ali, MD, PhD; Todd M. Chapman Jr., MD; Isaac O. Karikari, MD; Eric B. Laxer, MD; P. Bradley Segebarth, MD; John Pollina Jr., MD; Oren N. Gottfried, MD; Greg A. Howes, DO; Nitin Khanna, MD; Anuj Prasher, MD; Samuel R. Schroerlucke, MD; Jonathan N. Sembrano, MD; Juan S. Uribe, MD; Steven J. Tresser, MD
FDA Device/Drug Status: NuvaMap (Approved for this indication), NuvaMap OR (Approved for this indication).

4:53-5:05 p.m.
Discussion
3:35-5:05 p.m.

**Abstract Presentations: How to Avoid Complications**

Room 404AB

Moderator: Reginald Q. Knight, MD, MS

3:35-3:41 p.m.

**93. Perioperative Hypoalbuminemia is an Independent Risk Factor for Surgical Site Infection Following Lumbar Fusion Surgery**

Jason A. Horowitz, BA1; Amit Jain, MD2; Varun Puvanesarajah, MD3; Xudong J. Li, MD, PhD4; Adam L. Shimer, MD5; Francis H. Shen, MD6; Hamid Hassanzadeh, MD1

1University of Virginia, Department of Orthopaedic Surgery, Charlottesville, VA, US; 2Baltimore, MD, US; 3Johns Hopkins Medicine, Baltimore, MD, US; 4University of Virginia School of Medicine, Department of Orthopaedic Surgery, Charlottesville, VA, US

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

3:41-3:47 p.m.

**94. Postoperative Deep Wound Infections: Do the Implants Really Need to be Removed?**

Viral R. Patel, MD1; John M. Dawson, PhD1; Benjamin Mueller, MD, PhD1; Amir A. Mehbood, MD1; Manuel R. Pinto, MD1; James D. Schwender, MD2; Timothy A. Garvey, MD2; Joseph H. Perra, MD2

1Twin Cities Spine Center, Minneapolis, MN, US; 2Twin Cities Spine Center - Piper Building, Minneapolis, MN, US

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

3:47-3:53 p.m.

**95. Factors Associated with the Decision to Culture and Positive Growth in Aseptic Revision Spine Surgery**

Michael E. Steinhaus, MD1; Stephan Salzmann, MD1; Grant Shifflett, MD2; Jingyan Yang, PhD3; Janina Kueper4; Andrew A. Sama, MD1; Federico P. Girardi, MD1; Frank P. Cammisa, MD1; Alexander P. Hughes, MD1

1Hospital for Special Surgery, New York, NY, US; 2DISC Sports and Spine Center, Marina Del Rey, CA, US; 3Charite-University of Medicine, Berlin, Berlin, NY, Germany

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

3:53-3:59 p.m.

**96. Incidence of Staphylococcus Aureus Infection after Elective Spine Surgeries in U.S. Hospitals**

Jill Dreyfus, PhD1; Holly Yu, MSC2; Elizabeth Begier, MD, MPH3; Alvaro Quintana, MD2; Julie Gayle, MPH4; Margaret Olsen, PhD, MPH5

1Premier, Charlotte, NC, US; 2Collegeville, PA, US; 3Pfizer Vaccines, Pearl River, NY, US; 4Charlotte, NC, US; 5Washington University, St. Louis, MO, US

**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.
4:26-4:32 p.m.
99. Vertebral Augmentation is Superior to Nonoperative Care at Reducing Lower Back Pain for Symptomatic Osteoporotic Compression Fractures
Sina Pourtaheri, MD1; Christina Cui, BS2; William Y. Luo, BS3; Alicia M. Asturias, BS4; Steven R. Garfin, MD4
1San Diego, CA, US; 2La Jolla, CA, US; 3UCSD School of Medicine, La Jolla, CA, US; 4UC San Diego, Department of Orthopaedic Surgery, San Diego, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:32-4:38 p.m.
100. Anterior versus Posterior Decompression for Degenerative Thoracic Spine Diseases: A Comparison of Complications
Aidin Abedi, MD1; Blake G. Formanek, BA1; Rattanaporn Chamnan, MD2; Kunlavat Chantarasingrat, MD3; Zorica Buser, PhD4; Jeffrey C. Wang, MD5
1Los Angeles, CA, US; 2Songklanagarind University, Songkla Province, Thailand, Hat Yai, Songkla, Thailand; 3Somdejphrapinklao Hospital, Bangkok, Thailand; 4Norris Research Tower, Keck School of Medicine, USC, 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.

4:38-4:44 p.m.
101. Rod Fracture Following Apparently Solid Radiographic Fusion in Adult Spinal Deformity Patients
Alan H. Daniels, MD1; Wesley Durand, BS2; D. Kojo Hamilton, MD3; Peter G. Passias, MD4; Han Jo Kim, MD5; Themistocles S. Protopsaltis, MD6; Virginie Lafage, PhD7; Justin S. Smith, MD, PhD8; Christopher I. Shaffrey, MD9; Munish C. Passias, MD10; Eric O. Klineberg, MD11; Robert A. Hart, MD12; Breton Line, BS3; Christopher I. Shaffrey, MD4; Douglas C. Burton, MD5; Christopher P. Ames, MD6; Robert A. Hart, MD14; International Spine Study Group15
1Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 2Brown University, Alpert Medical School, Providence, RI, US; 3University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 4NY Spine Institute, NYU Langone Health, New York, NY, US; 5Hospital for Special Surgery, New York, NY, US; 6Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 7UVA Health System, Charlottesville, VA, US; 8University of Virginia, Charlottesville, VA, US; 9Washington University School of Medicine, St. Louis, MO, US; 10UC, Davis School of Medicine, Sacramento, CA, US; 11University of Kansas Medical Center, Kansas City, KS, US; 12Denver, CO, US; 13University of California, San Francisco, San Francisco, CA, US; 14Swedish Neuroscience Institute, Seattle, WA, US; 15Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:44-4:50 p.m.
102. The Offset of the Upper Instrumented Vertebrae to the Gravity Line is a Risk Factor for PJK Onset after Six Weeks
Jonathan Elysee1; Renaud Lafage, MSc1; Han Jo Kim, MD2; Robert A. Hart, MD2; Breton Line, BS3; Christopher I. Shaffrey, MD4; Douglas C. Burton, MD5; Christopher P. Ames, MD6; Gregory M. Mundis Jr., MD7; Richard A. Hostin Jr., MD8; Shay Bess, MD9; Eric O. Klineberg, MD10; Frank J. Schwab, MD11; Virginie Lafage, PhD12; International Spine Study Group13
1Hospital for Special Surgery, New York, NY, US; 2Swedish Neuroscience Institute, Seattle, WA, US; 3Denver International Spine Center, Denver, CO, US; 4University of Virginia, Charlottesville, VA, US; 5University of Kansas Medical Center, Kansas City, KS, US; 6University of California, San Francisco, San Francisco, CA, US; 7Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 8Southwest Scoliosis Institute, Plano, TX, US; 9Denver, CO, US; 10UC, Davis School of Medicine, Sacramento, CA, US; 11UC, Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:50-5:05 p.m.
Discussion

3:35-5:05 p.m.
Interdisciplinary Spine Forum: Spinal Conditions With Impact of Comorbidities
Room 406AB
Moderator: Michael Halasy, PhD, MS, PA-C
As our population ages and has increasing difficulty with spine related conditions, it is more imperative that spine surgeons and other spine providers understand how comorbidities relate to the treatments they prescribe. Faculty will address the impact of comorbidities on the care spine surgeons/providers deliver.

Upon completion of this session, participants should gain strategies to:
- Understand how medical comorbidities affect treatments given to spine patients;
- Identify spinal treatments to limit effect on comorbidities and maximize outcomes;
- Utilize strategies to temper patient expectations given multiplier effect of multiple conditions.
Agenda

- **Neurologic Disorders**  
  Rani Nasser, MD

- **Nutritional Considerations**  
  Carrie Diulus, MD

- **Oncologic**  
  Joseph H. Schwab, MD

- **Endocrine/Burden of Disease**  
  Ron Alkalay, PhD

- **Developing a Treatment Approach for the Patient With Comorbidities**  
  Heidi Prather, DO

### 3:35-8:00 p.m.

**NASS After Hours** *(Non-CME)*  
The Learning Place, Pink Theater and Blue Lab

- Requires separate registration fee

**The Role of Spinal Cord Stimulators for Spine Related Pain** *(Registration required)*

Sponsored by: NuVectra Medical; Boston Scientific Neuromodulation; Medtronic Neuromodulation; Stimwave LLC; Abbott Neuromodulation; Nevro

Speakers: Scott Kreiner, MD; Sunil Panchal, MD; David Fish, MD, MPH

### 5:00-8:00 p.m.

**Surgical Innovation Lab Workshops** *(Non-CME)*  
The Learning Place

- **Yellow Lab: Private Lab**
- **Green Lab: Providence Medical Technology—Invitation Only**
  Posterior Cervical Fusion using the DTRAX® Spinal System

### 5:00-6:00 p.m.

**Social Hour**  
South Lobby

Ready to meet a few new faces at this year’s meeting? Or just reconnect with your colleagues? The Social Hour is the perfect opportunity to do so! This great networking event takes place after sessions conclude so you have time to grab a bite, have a drink and chat before heading off to dinner. Please note that your meeting badge is required for entry. New committee members are encouraged to attend! Thank you to NuVasive and Siemens Healthineers for its support.
UNITED STATES

THE LATEST MINIMALLY INVASIVE TECHNIQUES FOR THE TREATMENT OF LUMBAR & CERVICAL SPINE DISORDERS
October 12-13, 2018, St. Louis, MO

2018 FUNDAMENTALS OF SPINE SURGERY FOR RESIDENTS AND FELLOWS
October 19-20, 2018, Burr Ridge, IL

BIOLOGIC INTERVENTIONS FOR SPINAL PATHOLOGIES: STEM CELLS, GROWTH FACTORS & NOVEL THERAPEUTICS
October 19, 2018, Chicago, IL

CONTEMPORARY MANAGEMENT OF SPINAL TUMORS
November 9-10, 2018, Burr Ridge, IL

LUMBAR SPINAL INJECTIONS
January 25-26, 2019, Phoenix, AZ

15TH ANNUAL EVIDENCE + TECHNOLOGY SPINE SUMMIT
February 13-16, 2019, Park City, UT

ADULT SPINAL DEFORMITY: USING RESEARCH TO TRANSFORM YOUR PRACTICE AND IMPROVE OUTCOMES
March 22-23, 2019, Burr Ridge, IL

CODING UPDATE 2019: CONQUERING YOUR CODING HURDLES
April 5-6, 2019, New Orleans, LA

EMERGING TECHNOLOGIES IN SPINE SURGERY
May 17-18, 2019, Burr Ridge, IL

LUMBAR SPINAL INJECTIONS
June 21-22, 2019, Burr Ridge, IL

SUMMER SPINE MEETING
July 31-August 3, 2019, Honolulu, HI

34TH ANNUAL MEETING
September 25-28, 2019, Chicago, IL

2019 FUNDAMENTALS OF SPINE SURGERY FOR RESIDENTS AND FELLOWS
October 11-12, 2019, Burr Ridge, IL

INTERNATIONAL

NASS SILACO ADVANCED LUMBAR SPINAL INJECTION TECHNIQUES
October 27, 2018, Bogota, Colombia

2ND SAUDI SPINE SOCIETY ANNUAL CONFERENCE
November 17-19, 2018, Jeddah, Saudi Arabia

ARABSPINE COURSE DIPLOMA
December 3-5, 2018, Dubai, United Arab Emirates

2ND COMBINED MEETING WITH NASS, SOSSOP, APSS, OASAC-SAARC AND POS
March 26-28, 2019, Lahore, Pakistan

DETAILS AT WWW.SPINE.ORG
Continental Breakfast
Concourse Hall Foyer

Attendee Registration
South Lobby

Announcements
Concourse Hall 151/152

Plenary Session:
Envisioning a Narcotic-Free America: Role of Spine Physicians
Concourse Hall 151/152
Moderators: Nathaniel P. Brooks, MD and Joseph S. Cheng, MD, MS

The management of surgical pain is often with a shotgun approach leading to an estimated 15% to 45% chronic postsurgical pain that is physically and psychologically exhausting. Effective postoperative pain control is critical to speedy recovery, early mobilization, short hospital stays, and eventually translating to reduced health care costs. Internationally renowned faculty with extensive experience in non-narcotic pain management and prospective trials will present varying perspectives about how to reduce pain through various methods, including modifications of surgical technique, regional analgesia, ancillary staff training, prehab, use of non-narcotic pharmaceuticals and patient counseling. Faculty also will discuss the mechanisms, merits and demerits of each approach.

Upon completion of this session, participants should gain strategies to:
- Appraise their knowledge about multimodal postoperative pain management;
- Determine non-narcotic interventions for pain control including deform bupivacaine and low dose ketamine;
- Compare the use of minimally invasive methods for reducing tissue trauma and postoperative pain;
- Review the use of regional analgesia for reducing postoperative patient discomfort;
- Know the role of physical therapy and management of post-discharge pain issues.

Agenda
- Epidemiology of Postoperative Pain and Opioid-Related Adverse Events
  Karthik Madhavan, MD
- Upside and Downfalls of NSAIDs to Manage Postoperative Pain
  Christoph P. Hofstetter, MD, PhD
- The Opioid Pendulum: An Equilibrium Position
  Jerome Schofferman, MD
- Use of Epidural Steroids to Minimize Narcotic Use
  Fred Geisler, MD, PhD
- Use of Long Acting Local Anesthetics to Manage Postoperative Pain
  Michael Y. Wang, MD
- Use of Minimally Invasive Surgical Techniques to Minimize Postoperative Pain
  Choll W. Kim, MD, PhD
- Role of Physical Therapy in Mitigating Pain Symptoms
  Ryan A. Tauzell, PT, MA, Cert. MDT
- Discussion, Questions and Answers
  Faculty Panel

Interdisciplinary Spine Forum:
The Lancet Low Back Pain Series and the European Spine Journal Series on the Future of Spine Care
Room 406AB
Moderators: Brian Justice, DC; Eric Buchl, PA-C

The Lancet Low Back Pain series may represent the most thorough review and summarization of the world spine literature every attempted. Involving 31 authors from 15 countries, The Lancet outlines why there is an urgent need to halt the increasing burden of low back pain and what actions to take. Since much of the low back pain care is low value and making the problem worse, improving the clinician, patient and general public understanding of back pain is a key issue.

The Lancet’s “call to action” was outlined in a special edition of the European Spine Journal. These 15 papers, including a consensus document from 68 clinicians and scientists from 24 countries defines how to implement a model of care based on the evidence and defines the roles of primary, secondary and tertiary spine care.
Upon completion of this session, participants should gain strategies to:

- Recognize the burden of low back pain across the world, the number one cause of disability worldwide;
- Appreciate surprising world data that demonstrates that non-evidence-based practice is apparent across all income settings and is causing harm;
- Embrace a culture change in spine care, focusing on a positive health concept as the overarching strategic approach to the prevention of long-term disability from low back pain;
- Prepare for the changing landscape of spine management policies and the rising role of data transparency, the patient as consumer and employer-driven health care systems.

Agenda

**The Lancet Spine Series**

- **Why the Global Tsunami (or Epidemic) of Back Pain Disability Needs Our Urgent Attention**
  Martin Underwood, MD
- **What Do We Know About How to Reverse the Global Epidemic of Back Pain Disability**
  Chris Maher, PhD
- **Reversing the Epidemic (or Tide): A Call to Action**
  Rachelle Buchbinder, MBBS, PhD
- **Discussion, Questions and Answers**
  Faculty Panel

**European Spine Journal and the Global Spine Care Initiative**

- **Answering the Call to Action: World Spine Care and the Global Spine Care Initiative**
  Scott Haldeman, MD, PhD, DC
- **The Burden of Spinal Disorders In LMICs and at the Personal and Community Level**
  Eric Hurwitz, DC, PhD
- **Comorbidities, Risk Factors and Public Health Interventions for Spinal Disorders**
  Bart Green, DC, MS, PhD
- **Assessing a Person with Spine-Related Symptoms, Avoiding Unnecessary Testing and Treatment**
  Margareta Nordin, MD
- **The GSCI Classification and Care Pathway**
  Scott Haldeman, MD, PhD, DC
- **The GSCI Model of Care: Resources and Implementation**
  Claire Johnson, PhD, DC, MS
- **Common Messages from The Lancet and European Spine Journal Series of Articles: What is the Next Step?**
  Margareta Nordin, MD
- **Discussion, Questions and Answers**
  Faculty Panel

**8:00-10:00 a.m.**

**Surgical Innovation Lab Demonstrations**

(Non-CME)

**The Learning Place**

**Yellow Lab: DePuy Synthes, A Johnson & Johnson Company**
Opioid Minimizing Multi-Modal Pain Management with EXPAREL® (bupivacaine liposome injectable suspension)

**Green Lab: Terumo BCT**
Autologous Biologics: A Novel Treatment Option in Spinal Fusion
Speaker: Peter Passias, MD

**Blue Lab: Life Spine**
Sacroiliac Joint Fixation with $\text{SImpact}^\text{®}$
Speaker: Ali Mesiwala, MD

**8:00 a.m.-5:00 p.m.**

**Exhibitor Registration**

South Lobby

**8:30-9:30 a.m.**

**Best Papers**

Concourse Hall 151/152

Moderator: Zoher Ghogawala, MD, FACS

**8:30-8:36 a.m.**

103. Half of Unplanned Readmissions Following One- or Two-Level Anterior Cervical Decompression and Fusion are Unrelated to Surgical Site

David Sing, MD1; Molly Vora, BA2; John Yue, BA, CCRC3; Luke A. Silveira, BS4; Chadi Tannoury, MD5

1Boston Medical Center, Boston, MA, US; 2Boston, MA, US; 3University of California San Francisco, San Francisco, CA, US; 4Boston University School of Medicine, Boston, MA, US; 5Boston University Medical Center, Boston, MA, US

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

**8:36-8:42 a.m.**

104. Ambulatory Anterior Cervical Discectomy and Fusion is Associated with a Higher Risk of Perioperative Complications

Don Y. Park, MD1; Armin Arshi, MD2; Howard Y. Park, MD3; Christopher Wang, BS2; Zorica Buser, PhD4; Jeffrey C. Wang, MD5; A. Nick Shamie, MD2
8:42-8:48 a.m.
105. In Vivo Biomechanics of Cervical Spine Manipulation
William Anderst1; Michael J. Schneider, DC, PhD2
1Pittsburgh, PA, US; 2School of Health and Rehabilitation Sciences, Pittsburgh, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

8:48-8:54 a.m.
106. Do Preoperative Epidural Steroid Injections Increase the Risk of Infection After Lumbar Spine Surgery?
Tyler M. Kreitz, MD1; William L. Crutcher2; Gregory D. Schroeder, MD3; John J. Mangan III, MD, MHA4; Christopher K. Kepler, MD, MBA2; Mark F. Kurd, MD2; Kris E. Radcliff, MD6; D. Greg Anderson, MD7, Alexander R. Vaccaro, MD, PhD7; Alan S. Hilibrand, MD7
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

8:54-9:00 a.m.
107. Analysis of Lumbar Total Disc Replacement Removals and Revisions: A 17-Year Experience
Richard D. Guyer, MD1; Donna D. Ohnmeiss, PhD2; Scott L. Blumenthal, MD1; Jack E. Zigler, MD1
1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US
FDA Device/Drug Status: TDR, 1-level (Approved for this indication), TDR, 2-level (Not approved for this indication).

9:00-9:06 a.m.
108. Spinopelvic Compensatory Mechanisms for Reduced Hip Motion (ROM) in the Setting of Hip Osteoarthritis
Leah Steinmetz, BA1; Peter L. Zhou, BA1; Nicholas J. Frangella, BS2; Nicholas Stekas, BS1; Christopher Variotta, BS4; David H. Ge, BA2; Dennis Vasquez-Montes, MS, BA4; Virginie Lafage, PhD4; Renaud Lafage, MSc4; Jonathan M. Vigdorchik, MD7
THURSDAY, SEPTEMBER 27
9:30-10:00 a.m.

**Networking Break Beverage Service**
Technical Exhibition, Booths #1667 and #814

**Exercise Video Demonstrations**
The Learning Place

**Practical Theater:**
**NASS Spine Registry Q&A**
The Learning Place, Red Theater

**Simulated Surgery Lab** (Non-CME)
The Learning Place

9:30-10:00 a.m.

**Poster Grand Rounds**
The Learning Place

Grey Theater

9:30-9:40 a.m.

P175. ODI Can Predict PROMIS Physical Function, Pain Intensity and Pain Interference Domain Scores in Thoracolumbar Patients
Samantha R. Horn, BA1; Frank A. Segreto, BS2; Cole Bortz, BA3; Dennis Vasquez-Montes, MS, BA4; Leah Steinmetz, BA5; Christopher Varlotta, BS1; Nicholas J. Frangella, BS6; Nicholas Stekas, BS7; David H. Ge, BA8; Edward M. DeSole, MD9; Renaud Lafage, MSc7; Virginie Lafage, PhD7; Michael C. Gerling, MD6; Themistocles S. Protopsaltis, MD1; Aaron J. Buckland, MBBS, FRACS1; Charla R. Fischer, MD2; Thomas J. Errico, MD1; Peter G. Passias, MD9


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

9:40-9:50 a.m.

P93. Preoperative Hemoglobin Levels and Risk for Transfusion After Adult Spinal Deformity Surgery: Analysis of Predictive Factors
Tina Raman, MD1; Peter L. Zhou, BA2; Dennis Vasquez-Montes, MS, BA3; Aaron J. Buckland, MBBS, FRACS3; Thomas J. Errico, MD1

1New York, NY, US; 2SUNY Downstate Medical Center, Brooklyn, NY, US; 3Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US

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

9:40-9:50 a.m.

P131. The Duration of Lumbar Radicular Symptoms Does Not Impact Clinical Outcomes Following Lumbar Decompression Surgery
Bryce Basques, MD, MHS1; Philip Louie, MD2; Michael T. Nolte, MD3; Jonathan Markowitz, BS4; Victor Lei, BS4; Justin C. Paul, MD, PhD5; Arya G. Varthi, MD1; Edward J. Goldberg, MD6; Howard S. An, MD3

1Yale School of Medicine, New Haven, CT, US; 2Rush University Medical Center, Chicago, IL, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Chicago, IL, US; 6Rush Medical College, Chicago, IL, US

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

9:50-10:00 a.m.

P148. The "Soft Landing": Proximal Laminar Hooks are Associated with Decreased Rate of Proximal Junctional Kyphosis in Spinal Fusion for Adult Spinal Deformity Compared to Pedicle Screw Fixation
Bryce Basques, MD, MHS1; Philip Louie, MD2; Michael T. Nolte, MD3; Kamran Movassagh4; Jonathan Markowitz, BS5; Joseph F. Michalski, MPH, MS6; Dong Gue Oh, BS2; Howard S. An, MD3; Christopher J. DeWald, MD5

1Yale University School of Medicine, New Haven, CT, US; 2Rush University Medical Center, Chicago, IL, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Chicago, IL, US; 5Danbury Orthopedics, Danbury, CT, US; 6Midwest Orthopedics at Rush, Chicago, IL, US

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

Pink Theater

9:30-9:40 a.m.

P90. Touched Vertebra (TV) on Standing XR is a Good Predictor for LIV: TV on Prone XR is Better
Vishal Sarwahi, MD1; Stephen Wendolowski2; Jesse M. Galina, BS3; Beverly Thornhill, MD4; Yungtai Lo, PhD4; Kathleen Maguire, MD5; Terry D. Amaral, MD6


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

9:40-9:50 a.m.

P90. Touched Vertebra (TV) on Standing XR is a Good Predictor for LIV: TV on Prone XR is Better
Vishal Sarwahi, MD1; Stephen Wendolowski2; Jesse M. Galina, BS3; Beverly Thornhill, MD4; Yungtai Lo, PhD4; Kathleen Maguire, MD5; Terry D. Amaral, MD6


**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.
9:50-10:00 a.m.
P89. Risk Factors for Proximal Junction Kyphosis (PJK) in Scheuermann’s Kyphosis (SK)
Vishal Sarwahi, MD1; Jesse M. Galina, BS2; Stephen Wendolowski2; Adam Benton, MBBS3; Sean Molloy Orth, MSc, FRCS2; Darren Lui, FRCS4; Terry D. Amaral, MD7

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

Purple Theater

9:30-9:45 a.m.
P3. Recruitment of Mesenchymal Stem Cells to the Intervertebral Disc via Local Chemokine Delivery from an Injectable Hydrogel
Sapan D. Gandhi, MD1; Michael D. Newton, MS1; Mackenzie M. Fleischer, MS1; Meagan R. Salisbury, MS2; Samantha Hartner, MS3; Jeffrey Fischgrund, MD1; Kevin Baker, PhD1
1Beaumont Health, Royal Oak, MI, US; 2Chesterfield, MI, US; 3Beaumont Health - Research Institute, Royal Oak, MI, US

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

9:45-10:00 a.m.
P2. Methylene Blue is an Effective Disclosing Agent for Identification of Bacterial Biofilms on Spinal Implants
Jeremy D. Shaw, MD1; Nicholas N. Ashton, PhD2; Jeremy M. Gilliland, MD2; Darrel S. Brodke, MD4; Brandon D. Lawrence, MD4; Erik N. Hansen, MD5; Dustin L. Williams, PhD3
1University of Utah Orthopaedics, Salt Lake City, UT, US; 2Salt Lake City, UT, US; 3University of Utah, Salt Lake City, UT, US; 4University Orthopaedic Center, Salt Lake City, UT, US; 5UCSF, San Francisco, CA, US

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

White Theater

9:30-9:45 a.m.
P110. The Impact of Chronic Steroid and DMARD Therapy on Atlanto-Axial Fusion Rates in Patients with Rheumatoid Arthritis: A Multicenter Review
Christopher J. Elia, DO1; Sanjay C. Rao, MD2
1Riverside University Health System, Moreno Valley, CA, US; 2Kaiser Permanente Medical Center, Fontana, CA, US

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

10:00-10:15 a.m.
Incoming Presidential Remarks:
Jeffrey C. Wang, MD
Concourse Hall 151/152

10:15-11:00 a.m.
2017-2018 Presidential Address:
Daniel K. Resnick, MD, MS
Concourse Hall 151/152

11:00 a.m.-12:00 p.m.
Presidential Guest Speaker:
Vijay Gupta
Concourse Hall 151/152

Vijay Gupta, Los Angeles Philharmonic violinist, will explain how he uses music to uplift the spirits of people from all walks of life. See full biography on page 30.

11:00 a.m.-1:00 p.m.
Surgical Innovation Lab Demonstrations (Non-CME)
The Learning Place

Yellow Lab: Camber Spine
Second Generation Technology: Enza-A Titanium ALIF

Green Lab: Misonix

Blue Lab: Life Spine
Micro-Invasive TLIF with Expandable Technology PROLIFT®
Speaker: Peter Whang, MD, FACS
12:00-1:00 p.m.
**Complimentary Boxed Lunch**
Medical Attendees Only
Technical Exhibition, Booth 449

**Solution Showcase** (Non-CME)
The Learning Place, Red Theater

12:00-12:20 p.m.: Spinal Balance
Better Practices in Implant Handling and Delivery
Speaker: Steve Garfin, MD

12:30-12:50 p.m.: Radius Health
Fragility Fracture Alert: Treating Postmenopausal Patients with Osteoporosis at High Risk for Fracture With an Anabolic Agent

**Career Building Professional Headshots**
The Learning Place
Stop by the Career Building suite to get an updated professional headshot taken for online networking or to enhance your CV.

**Simulated Surgery Lab** (Non-CME)
The Learning Place

1:00-1:05 p.m.
**NASS Working for You:**
NASS Low Back Pain Guideline
Concourse Hall 151
Moderator: Scott Kreiner, MD

1:05-2:05 p.m.
**The Spine Journal Outstanding Paper Awards Presentations**
Concourse Hall 152
Moderator: Christopher M. Bono, MD

1:05-1:25 p.m.
Introduction from Christopher M. Bono, MD

1:25-1:35 p.m.
**Outstanding Paper: Surgical Science**
Alterations in 90-Day Morbidity, Mortality and Readmission Rates Following Spine Surgery in Medicare Accountable Care Organizations (2009-2014)
Andrew J. Schoenfeld, MD; Daniel Sturgeon, MS; Justin Blucher, MS; Adil Haider, MD, MPH; James Kang, MD

**Symposium:**
Bone Health Optimization in the Spine Patient
Room 403B
Moderator: Paul A. Anderson, MD

Less than optimum care of bone health in the United States and inadequate bone status can influence outcomes of spine diseases. The American Orthopedic Association created the Own The Bone® quality improvement program for patients with fragility fractures to receive osteoporotic care. This year, presenters will review the importance of bone health optimization and provide best medical evidence on how to identify patients who require testing, recommendations for life style changes, and direction regarding pharmacologic therapy in those at-risk patients.
Upon completion of this session, participants should gain strategies to:

- Determine the linkage between complications of spine surgery and poor bone health;
- Apply the best medical evidence to identify patients at risk for osteoporosis who are undergoing spine surgery;
- Provide access to care for spine patients with low bone mass;
- Gain knowledge of how to introduce bone health optimization into spine practices;
- Obtain ability to make recommendations regarding supplements and medications used for osteoporosis.

Agenda

- What is the Ongoing Crisis in Osteoporosis Care and How Do We Overcome It?
  Neil Binkley, MD
- What is Linkage Between Poor Bone Health and Poor Outcomes in Spine Patients
  Ronald A. Lehman, Jr., MD
- How Do We Diagnose Osteoporosis in Spine Patients?
  Paul A. Anderson, MD
- Principles of Nutritional Supplement and Pharmacologic Management of Osteoporosis
  Neil Binkley, MD
- Strategies for a Preoperative Bone Health Optimization Program
  Serena S. Hu, MD

1:05-2:05 p.m.

Abstract Presentations:
Lumbar Spine Surgery: What You Need to Know
Room 403A
Moderator: Christina L. Goldstein, MD, FRCSC

1:05-1:11 p.m.
Richard L. Skolasky, ScD1; Lee H. Riley III, MD2
1Johns Hopkins University, Baltimore, MD, US; 2Johns Hopkins Outpatient Center/Department Orthopedic Surgery, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:11-1:17 p.m.
111. Fibular Allograft as a Salvage Option in Revision Pedicle Screw Fixation
Hossein K. Elgary, MD, FRCSC, FRCS; Nathaniel Lempert, MD; Jacob B. Stirton, MD; Peter W. Zak, MD

1:17-1:23 p.m.

112. Patient-Reported Functional Outcome (PRFO) Following MIS Decompression Without Fusion in Potentially Unstable Lumbar Conditions
Reginald Q. Knight, MD, MS1; Scott D. Grainger, BSN2
1Bassett Health Care - Department of Surgery, Cooperstown, NY, US; 2Bassett Medical Center, Cooperstown, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:23-1:29 p.m.

113. Routine Microscope Use Does Not Increase Operative Time or Affect Short-Term Outcomes in Single-Level Lumbar Microdecompression
Patrick Morrissey, MD1; Scott Wagner, MD2; Arjun S. Sebastian, MD, MSc3; Ian D. Kaye, MD4; Joseph S. Butler, PhD, FRCS (Tr & Orth)5; Christopher K. Kepler, MD, MBA6
1United States Navy, San Diego, CA, US; 2Walter Reed National Military Medical Center, Bethesda, MD, US; 3Rothman Institute, Rochester, MN, US; 4Rothman Institute, Philadelphia, PA, US; 5National Spinal Injuries Unit, Mater Misericordiae University Hospital, Dublin 7, Ireland; 6Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:29-1:35 p.m.

114. No Difference in Reoperation Rates or Outcomes for a Two-Level Posterolateral Fusion Augmented with Single- versus Two-Level Transforaminal Lumbar Interbody Fusion
Ian D. Kaye, MD1; Taolin Fang, MD, PhD2; Alex J. Girden, BA3; Christopher K. Kepler, MD, MBA4; Gregory D. Schroeder, MD5; D. Greg Anderson, MD1; Mark F. Kow, MD6; Barrett I. Woods, MD6; Kris E. Radcliff, MD7; Jeffrey A. Rihn, MD8; Alexander R. Vaccaro, MD, PhD1; Alan S. Hilibrand, MD1
FDA Device/Drug Status: All devices were FDA approved and used as instructed.
1:35-1:41 p.m.
115. Matched Cohort Analysis of Elective Lumbar Spinal Fusion in Patients With and Without Parkinson’s Disease
Justin E. Kleiner, BS1; Adam Eltorai, MSc2; Alan H. Daniels, MD3
1Providence, RI, US; 2Warren Alpert Medical School of Brown University, Providence, RI, US; 3Warren 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.

1:41-1:47 p.m.
116. Preoperative Lumbosacral Alignment and its Correlation to Lordosis Change in One- and Two-Level Degenerative Fusions
Donald J. Blaskiewicz, MD1; Mir H. Ali, MD, PhD2; James B. Bills, MD4; Michael J. Dors, MD4; Arash Emami, MD5; Isaac O. Karikari, MD6; Nitin Khanna, MD7; Eric B. Laxer, MD8; Douglas G. Orndorf, MD2; John Pollina Jr., MD10; Anuj Prasher, MD11; Samuel R. Schroerluche, MD12; P. Bradford Segebarth, MD8; Todd M. Chapman Jr., MD8; Antoine Tohmeh, MD13; Juan S. Uribe, MD14; Jim A. Youssef, MD9
FDA Device/Drug Status: NuvaMap (Approved for this indication).

1:47-2:05 p.m.
Discussion

1:05-2:05 p.m.
Abstract Presentations:

Understanding Anxiety and Depression When Performing Spine Surgery
Room 406AB
Moderator: Erica F. Bisson, MD

1:05-1:11 p.m.
117. Psychiatric Diagnosis Impacts Outcomes in Surgical Treatment of Cervical Myelopathy
Rocco P. Morra Jr., BA1; Brian Deutsch, BS1; Sean N. Neifert1; John M. Caridi, MD2
1New York, NY, US; 2Mount Sinai Medical Center, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

118. Depression Symptoms are Associated with Poor Functional Status Among Operative Spinal Deformity Patients
Renaud Lafage, MSc1; Jingyan Yang, PhD2; Frank J. Schwab, MD2; Han Jo Kim, MD2; Justin S. Smith, MD, PhD2; Christopher I. Shaffrey, MD2; Douglas C. Burton, MD3; Christopher P. Ames, MD3; Gregory M. Mundis Jr., MD6; Richard A. Hostin Jr., MD7; Shay Bess, MD8; Eric O. Klineberg, MD9; Peter G. Passias, MD10; Virginie Lafage, PhD11; International Spine Study Group11
1Hospital for Special Surgery, New York, NY, US; 2UVA Health System, Charlottesville, VA, US; 3University of Virginia, Charlottesville, VA, US; 4University of Kansas Medical Center, Kansas City, KS, US; 5University of California, San Francisco, San Francisco, CA, US; 6Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 7Southwest Scoliosis Institute, Plano, TX, US; 8Denver, CO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10NY Spine Institute, NYU Langone Health, New York, NY, US; 11Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:17-1:23 p.m.
119. Impact of Psychiatric Comorbidities on Short-Term Outcomes Following Intervention for Lumbar Degenerative Disc Disease
Piyush Kalakoti, MD1; Andrew J. Pugely, MD1; Daniel M. Sciubba, MD2; Kanika Sharma, MD3; Karthik Madhavan, MD4; Richard P. Menger, MD5; Matthew J. McGirt, MD6; Anil Nanda, MD, MPH5; Hai Sun, MD, PhD5
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:23-1:29 p.m.
120. Preoperative Psychological Factors Significantly Add to the Predictability of Chronic Narcotic Use: A Two-Year Prospective Study
Neil A. Manson, MD, FRCSC1,2,3; Kate Ellis, BA1; Erin Bigney, MA1; Eden A. Richardson, BA1; Dean A. Tripp, PhD4; Edward P. Abraham, MD1,2,3
1Canada East Spine Centre, Saint John, NB, Canada; 2Saint John Regional Hospital, Saint John, NB, Canada; 3Dalhousie University, Department of Surgery, Saint John, NB, Canada; 4Departments of Psychology, Anesthesiology & Urology, Queen’s University, Kingston, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
1:29-1:35 p.m.
121. Patient Activation Buffers the Adverse Impact of Psychosocial Risk Factors on Spine Surgery and Spinal Cord Stimulation
Andrew R. Block, PhD\(^1\); Yossef S. Ben-Porath, PhD\(^2\); Ryan J. Marek, PhD\(^3\)
\(^1\)Texas Back Institute, Plano, TX, US; \(^2\)Copley, OH, US; \(^3\)University of Houston - Clear Lake, Houston, TX, US
FDA Device/Drug Status: Spinal Cord Stimulator (Approved for this indication).

1:35-1:41 p.m.
122. The Engaged Patient: Patient Activation Can Predict Satisfaction with Surgical Treatment of Lumbar and Cervical Spine Disorders
Richard L. Skolasky, ScD\(^1\); Brian J. Neuman, MD\(^2\); Khaled M. Kebaish, MD\(^2\); David B. Cohen, MD, MPH\(^1\); Lee H. Riley III, MD\(^3\)
\(^1\)Johns Hopkins University, Baltimore, MD, US; \(^2\)Baltimore, MD, US; \(^3\)Johns Hopkins Outpatient Center/Department Orthopedic Surgery, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:41-1:47 p.m.
123. Is a Physical Therapist-Delivered Cognitive-Behavioral Intervention Effective for Improving Surgical Spine Outcomes?
Kristin R. Archer, PhD, DPT\(^1\); Richard L. Skolasky, ScD\(^2\); Rogelio A. Coronado, PT, PhD\(^1\); Christine Haug, BA\(^3\); Jacquelyn S. Pennings, PhD\(^1\); Susan Vanston, MS, PT\(^1\); Lee H. Riley III, MD\(^4\); Brian J. Neuman, MD\(^5\); Joseph S. Cheng, MD, MS\(^6\); Oran S. Aaronson, MD\(^7\); Clinton J. Devin, MD\(^1\); Stephen Wegener, PhD\(^2\)
\(^1\)Vanderbilt University Medical Center, Nashville, TN, US; \(^2\)Johns Hopkins University, Baltimore, MD, US; \(^3\)Vanderbilt Orthopaedic Institute, Nashville, TN, US; \(^4\)Johns Hopkins Outpatient Center/Department Orthopedic Surgery, Baltimore, MD, US; \(^5\)Baltimore, MD, US; \(^6\)University of Cincinnati College of Medicine, Cincinnati, OH, US; \(^7\)Howell Allen Clinic, Nashville, TN, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:47-2:05 p.m.
Discussion

1:05-2:05 p.m.
Innovative Technology Presentations
(Non-CME)
Room 404AB
Moderator: Zoher Ghogawala, MD, FACS

All innovative Technology Presentations also are available as posters in the Exhibit Hall.

1:05-1:12 p.m.
DiFusion: Evaluation of the Inflammatory Response of PEEK-Zeolite Implants in an Ovine Fusion Model
Boyle C. Cheng, PhD\(^1\); Isaac Swink, MS\(^2\); Thomas Muzzonigro, BA\(^3\); John J. Carbone, BS\(^4\); Daniel A. Diehl, MS\(^5\); Joseph J. Crudden, MD\(^6\)
\(^1\)Allegheny General Hospital, Pittsburgh, PA, US; \(^2\)Pittsburgh, PA, US; \(^3\)Allegheny Health Network, Pittsburgh, PA, US; \(^4\)Austin, TX, US

1:12-1:19 p.m.
Promimic: Improving the Osseointegration on PEEK with Nanosized Hydroxylapatite
Per Kjellin, PhD
Promimic AB, Molndal, Sweden

1:19-1:26 p.m.
Tyber Medical: Improved Bone Cell Responses on Titanium Integrated PEEK Surfaces
Daniel J. Hickey, PhD\(^1\); Bess Lorman, BS\(^1\); Gordon D. Donald, MD, FACS\(^2\)
\(^1\)Tyber Medical, Bethlehem, PA, US; \(^2\)NJ Ortho Group, LLC, Red Bank, NJ, US

1:26-1:33 p.m.
SpineSource: L-Varlock Lumbar Cage: An Expandable Lordotic All-Titanium Implant for Lumbar Interbody Fusion
Michael A. Lefkowitz, MD

1:33-1:40 p.m.
Amedica: Comparison of Allograft Spacers versus Silicon Nitride Cages in Cervical Fusion
Micah W. Smith, MD\(^1\); Daniel R. Romano, BS\(^1\); Bryan J. McEntire, PhD, MBA\(^2\); Bhananjit Bai, MD\(^2\)
\(^1\)Fort Wayne, IN, US; \(^2\)Amedica Corporation, Salt Lake City, UT, US
1:40-1:47 p.m.  
Camber Spine: Biomechanical Fatigue Evaluation of Anterior Lumbar Interbody Fusion Devices with Respect to Flexion-Extension Loading  
Boyle C. Cheng, PhD1; Isaac Swink, MS2; Thomas Muzzonigro, BA3; John J. Carbone, BS3; Daniel A. Diehl, MS1  
1Allegheny General Hospital, Pittsburgh, PA, US; 2Pittsburgh, PA, US; 3Allegheny Health Network, Pittsburgh, PA, US

1:47-1:54 p.m.  
CoreLink: Segmental Lordosis Increment on Single Level Lumbar Fusion Using a 3D Expandable Cage  
G.A. Skidmore; M. Weaver  
Neurosurgical Specialists, Inc., Norfolk, VA, US

1:54-2:05 p.m.  
Discussion

1:05-3:05 p.m.  
Symposium:  
Section on Minimally Invasive Procedures: Latest Advances in Minimally Invasive Spine Surgery  
Concourse Hall 151  
Moderators: Michael P. Steinmetz, MD; Michael Y. Wang, MD  
Faculty will describe the latest advances in MIS surgery with case-based discussions of different procedures including TLIF, OLIF, LLIF, spinal tumor, endoscopy and trauma.  
Up on completion of this session, participants should gain strategies to:  
- Identify the latest advances in minimally invasive spine surgery;  
- Know the risks and benefits of newer MIS approaches;  
- Determine patient selection and candidacy for MIS surgery;  
- Recognize complications unique to MIS surgery;  
- Be familiar with the role of MIS in trauma and tumor.  
Agenda  
- Introduction  
  Karthik Madhavan, MD  
- Advances in MIS Surgery  
  Sheeraz A. Qureshi, MD, MBA  
- Case Presentations: TLIF  
  Choll W. Kim, MD  
- Case Presentation: OLIF/Pre-Psoas Approach  
  Nathaniel P. Brooks, MD

- Case Presentation: LLIF/XLIF  
  Juan S. Uribe, MD  
- Spine Trauma: MIS Stabilization Options  
  Seth K. Williams, MD  
- Is There a Role for MIS in Tumor Resection?  
  Daniel M. Sciubba, MD  
- Best Five Papers on MIS Spine  
  Christoph P. Hofstetter, MD, PhD  
- Discussion, Questions and Answers  
  Faculty Panel

2:00-4:00 p.m.  
Surgical Innovation Lab Demonstrations  
(Non-CME)  
The Learning Place  
Yellow Lab: TeDan Surgical Innovations  
Green Lab: Anchor Orthopedics—Invitation Only  
The Future of Herniated Disc Repair Procedures: A demonstration on the design and clinical application of the AnchorKnot® Tissue Approximation Kit.  
Speaker: Scott Blumenthal, MD

2:05-3:05 p.m.  
Section on Spinal Cord Injury: Controversies in Management  
Room 403B  
Moderators: Karthik Madhavan, MD; Christoph P. Hofstetter, MD, PhD  
The annual incidence of spinal cord injury from the 2016 census is 17,000 each year, and about 282,000 of the current population have a spinal cord injury. The estimated average age is 42, with 80% being male patients.  
Despite tremendous advances in rapid resuscitation and stabilization of patients with acute spinal cord injury, transfer of patients with acute spinal cord injury to tertiary hospital centers in delayed fashion remains a concern. In addition, there are several aspects of spinal cord injury that have been quite controversial with respect to operative versus nonoperative management and timing of surgery. Faculty will discuss their experiences with establishing urgent care for spinal cord injury.
Upon completion of this session, participants should gain strategies to:

- Appraise their knowledge about the latest nuances on acute spinal cord injury;
- Quote evidence-based analysis of timing of spinal cord injury;
- Establish the ideal community services for spinal cord injury to world class care for patients;
- Optimize operative strategy for patients with spine fractures with normal neurological exam;
- Prevent delayed unexpected deterioration of spinal cord injury patients;
- Implement physical therapy for conditioning of spine patients.

Agenda

- Bench to Bedside: Miami Project and Beyond
  Barth A. Green, MD

- Central Cord Syndrome: Timing of Surgery
  Karthik Madhavan, MD

- Updates in Traumatic Spinal Cord Injury
  Yi Lu, MD

- Optimal Time for Surgery in Spinal Cord Injury and Outcomes
  Christoph P. Hofstetter, MD, PhD

- Early Involvement of the Rehabilitation Team in the Acute Care Setting
  Matthew W. Smuck, MD

2:05-3:05 p.m.

Section on Biologics and Basic Research Abstract Presentations
Room 404AB

Moderator: Wellington K. Hsu, MD

2:05-2:11 p.m.

124. NF-κB Dependent Unfolded Protein Response in the Survival and Proliferation of Nucleus Pulposus Cells Under TNF-α Stimulation

Lu Chen, PhD
Department of Spine Surgery, Zhongda Hospital, School of Medicine, Southeast University, Nanjing, China

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

2:11-2:17 p.m.

125. NTG-101: A Novel, Molecular Therapeutic for the Treatment of Degenerative Disc Disease

William Mark Erwin, DC, PhD1; Ajay Matta, PhD2; Muhammad Zia Karim, DVM3; Hoda Gerami, BS4; Alyssa V. Goldstein, DVM3; Warren Foltz, PhD3; Marshall S. Sussman, PhD4; Peter Y. Jun, MSc5; Martha Funabashi, PT, MSc, PhD7; Greg N. Kawchuk, DC, MSc, PhD5; Bjorn Eek, MD7

1Notogen/University of Toronto, Toronto, ON, Canada; 2Notogen Inc., Toronto, ON, Canada; 3Toronto, ON, Canada; 4University Health Network, Toronto, Toronto, Canada; 5University of Alberta, Edmonton, AB, Canada; 6University of Alberta, Edmonton, Canada; 7Spinal Diagnostics & Treatment Center, Daly City, CA, US

FDA Device/Drug Status: NTG-101 (Investigational/Not approved)

2:17-2:23 p.m.

126. Systemic Effects on Intervertebral Disc Aging: Increased Disc Degeneration in Young Mice When They Shared Blood Circulation with Old Mice

Changbin Lei, MD1; Prashanti Patil, BS2; Vivian Li3; Kevin Ngo4; Gwendolyn A. Sowa, MD, PhD2; Derek M. Huffman, PhD5; Nam Vo, PhD6

1Affiliated Hospital of Xiangnan University, Chenzhou, Hunan, China; 2University of Pittsburgh, Pittsburgh, PA, US; 3Berkeley, CA, US; 4Pittsburgh, PA, US; 5Bronx, NY, US; 6LJPMC/ Ferguson Lab, Pittsburgh, PA, US

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

2:23-2:29 p.m.

Section on Biologics and Basic Research Best Paper

127. Peptide Amphiphiles NanoFiber Scaffolds Promote Spine Fusion in Rats Treated with Particulate Phase Extract

Soyeon Jeong, MS1; Chawon Yun, PhD1; John A. Driscoll, BS2; Kevin Y. Chang, BS3; Meraaj S. Haleem, BS1; Ryan Lubbe, BS3; Richard R. Pahapill, BS3; Wellington K. Hsu, MD1; Erin L. Hsu, PhD1

1Northwestern University, Chicago, IL, US; 2Department of Orthopaedic Surgery, Northwestern University, Chicago, IL, US; 3Chicago, IL, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
2:29-2:35 p.m.

128. Comparative Study of Cellular Bone Matrices for Posterolateral Spinal Fusion
Clifford Lin, MD1; Paolo Antonio R. Punsalan, MD1; Nianli Zhang, PhD2; Jung U. Yoo, MD1; Eric Semler, PhD2; Erik I. Waldorf, PhD2; James T. Ryaby, PhD2; Brian Johnstone, PhD1
1Oregon Health & Science University, Portland, OR, US; 2Orthofix, Lewisville, TX, US; 3Musculoskeletal Transplant Foundation, Edison, NJ, US

FDA Device/Drug Status: Trinity ELITE (Approved for this indication), Osteocel Pro (Approved for this indication), ViviGen (Approved for this indication), Cellentra (Approved for this indication), Bio4 (Approved for this indication), map3 (Approved for this indication).

2:35-2:41 p.m.

129. Plastrum Testudinis Treating Glucocorticoid-Induce Osteoporosis by Down-Regulating TNFR2
Xiang Yu, PhD1; Hui Ren; Gengyang Shen; Qi Shang, MD2; De Liang, MD1; Jiang Xiaobing, PhD4
1Guangzhou University of Chinese Medicine, Guangzhou, Guang dong Provence, China; 2Guangzhou, China; 3The First Affiliated Hospital of Guangzhou University of Chinese Medicine Department of Spinal Surgery, Guangzhou, China; 41st Affiliated Hospital of Guangzhou University of Chinese Medicine, Guang Zhou City, China

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

2:41-2:47 p.m.

130. Driving Osteogenesis in ASCs by Targeting BMP Antagonists with CRISPR Epigenome Editing
Jacob Weston, BS1; Darrel S. Brodke, MD2; Robby Bowles, PhD3; Brandon D. Lawrence, MD2
1University of Utah, Salt Lake City, UT, US; 2University Orthopaedic Center, Salt Lake City, UT, US; 3Salt Lake City, UT, US

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

2:05-3:05 p.m.

Exercise Committee Presents: Muscle Imbalance in Back Pain—Chicken, Egg or Red Herring?
Room 406AB

Moderator: Ryan A. Tauzell, PT, MA, Cert. MDT

“You have tight hamstrings…You have tight hip flexors…Your core is weak…,” are phrases so commonly heard by low back pain patients along with many other similar phrases (insert your favorite muscle). Muscle imbalances are assessed for, diagnosed and treated as the culprit of low back pain by spine care providers on a global scale. Additionally, muscle imbalance is taught as a common generator of pain in all of healthcare and is entrenched in conventional “wisdom.” Yet, is there enough evidence to determine if the muscle imbalance caused the pain or the pain caused the muscle imbalance? Is the imbalance a normal state for that patient or even a symptom that is distracting us from the root generator of the problem? Is the suspected muscle imbalance a muscle at all? Could muscle imbalance have nothing to do with a patient’s low back pain? Faculty discuss this topic through the ADTO model of subgroup validation to help answer these important questions.

Upon completion of this session, participants should gain strategies to:
- Distinguish the exercise approach that is the most appropriate for this patient population;
- Appreciate the ADTO model of subgroup validation as it relates to muscle imbalance;
- Recognize the reliability and diagnostic accuracy of common assessment methods;
- Identify comparative effectiveness of common treatments for this problem.

Agenda
- Introduction
  Ryan A. Tauzell, PT, MA, Cert MDT
- What is Muscle Imbalance? The Biomechanics of Muscle Imbalance
  Ram Haddas, PhD, MSc, MEng
- Introduction to ADTO
  Ronald G. Donelson, MD, MS
- Reliability of Assessing and Diagnosing Muscle Imbalance (A-D)
  Donald R. Murphy, DC, FRCC
- Common Treatments for Muscle Imbalance (D-T)
  Ryan A. Tauzell, PT, MA, Cert MDT
- Outcomes of Comparative Effectiveness (T-O)
  John M. Mayer, PhD, DC, FACSM
- Discussion, Questions and Answers
  Faculty Panel
2:05-3:05 p.m.  
Innovative Technology Presentations  
(Non-CME)  
Room 403A  
Moderator: Philip Schneider, MD

All innovative Technology Presentations also are available as posters in the Exhibit Hall.

2:05-2:12 p.m.  
Medicrea: Analysis of Pre-Contoured Patient Specific Rods in Adolescent Idiopathic Scoliosis Using Computer Software: Does Rod Flattening Occur After Implantation?  
Andrew G. King, MD, FACS1; Afshin Aminian, MD2  
1Childrens Hospital Department of Orthopaedics, New Orleans, LA, US; 2Pediatric Orthopaedic Specialists of Orange County, Orange, CA, US

2:12-2:19 p.m.  
Medicrea: Patient-Specific Rods Show a Reduction in Rod Breakage Incidence  
Stephane Fuentes, MD1; Benjamin Blondel, MD2; Patrick Tropiano, MD, PhD3; Peter G. Passias, MD4; Themistocles S. Protopsaltis, MD5; Todd M. Raabe, MD6  
1Marseille, France; 2New York University Medical Center, New York, NY, US; 3CHU Hôpital La Timone, Department of Orthopedic Spine Surgery, Marseille, France; 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; 6Azalea Orthopedics and Sports Medicine Associates, P.A., Tyler, TX, US

2:19-2:26 p.m.  
EOS imaging: Biomechanical Spine Surgery Planning  
Pierre-Yves Lagace, PhD  
EOS imaging, Cambridge, MA, US

2:26-2:33 p.m.  
Simplify Medical: Clinical Outcomes of the PEEK-on-Ceramic Simplify® Disc: Preliminary Data from One Site Participating in the Single-Level Cervical FDA IDE Trial  
Richard D. Guyer, MD1; Donna D. Ohnmeiss, PhD2  
1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US

2:33-2:40 p.m.  
Spinendos GmbH: Bilateral Full-Endoscopic Spinal Decompression for Degenerative Lumbar Stenosis with 7.1mm Endoscope via Unilateral Approach: Technique Note and Initial Experience  
Dong Jianwen; Rong Limin; Liu Bin; Xie Pegen; Chen Ruiqiang  
Department of Spine Surgery, The 3rd Affiliated Hospital of Sun Yet-sen University, GuangZhou, China

2:40-2:47 p.m.  
Anchor Orthopedics: Intraoperative Assessment to Select the Appropriate Patient for Herniated Disc Repair: Lessons Learned  
Kenneth S. Yonemura, MD  
Salt Lake Center for Spine & Peripheral Nerve Surgery, Salt Lake City, UT, US

2:47-2:54 p.m.  
Empirical Tech: Comparison of Static Testing per ASTM F2077 Using a Constrained, Semi-Constrained and Unconstrained Test Setups  
Stacey L. Barber, MS1; John G. DeVine, MD2; David M. Gloystein, MD3; Dennis Buchanan, BS1; Dawn A. Lissy, MS1  

2:54-3:05 p.m.  
Discussion

3:00-4:00 p.m.  
Titan Spine Presentation  
(Non-CME)  
The Learning Place, Orange Lab  
nanoLOCK® Real World Evidence Symposium: Highlighting Improved Clinical Outcomes and Reduced Post-operative Opiate Use  
Speakers: Paul Slosar, MD; Barrett Woods, MD
3:05-3:35 p.m.

**Networking Break Beverage Service**
Technical Exhibition, Booths #1667 and #814

**Members’ Business Meeting**
Room 308AB

Find out the latest news, and come to vote on important NASS matters. Open to members only.

**Exercise Video Demonstrations**
The Learning Place

**Simulated Surgery Lab (Non-CME)**
The Learning Place

3:05-3:35 p.m.

**Poster Grand Rounds**
The Learning Place

**Grey Theater**

3:05-3:15 p.m.

**P145. Risk Factors, Additional Length of Stay and Cost Associated with Postoperative Ileus Following Anterior Lumbar Interbody Fusion in the Elderly**
Jason A. Horowitz, BA; Amit Jain, MD; Varun Puvanesarajah, MD; Rabiya Qureshi, BS; Joseph P. Gjolaj, MD; Emmanuel N. Menga, MD; Hamid Hassanzadeh, MD

1University of Virginia, Department of Orthopaedic Surgery, Charlottesville, VA, US; 2Baltimore, MD, US; 3Johns Hopkins Medicine, Baltimore, MD, US; 4Charlottesville, VA, US; 5University of Miami & Jackson Memorial Hospital Department of Orthopaedic Surgery, Miami, FL, US; 6University 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.

3:15-3:35 p.m.

**P130. Obese Patients May Experience Worse Back Pain and Less Improvement in Back Pain Compared to Non-Obese Patients Following Lumbar Decompression-Only Surgery**
Philip Louie, MD; Bryce Basques, MD, MHS; Michael T. Nolte, MD; Kamran Movassaghi; Steven T. Heidt, BS; Jannat M. Khan, BS; Arya G. Varthi, MD; Edward J. Goldberg, MD; Justin C. Paul, MD, PhD; Howard S. An, MD

1Rush University Medical Center, Chicago, IL, US; 2Yale School of Medicine, New Haven, CT, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Rush Medical College, Chicago, IL, US; 6Midwest Orthopaedics at Rush, Chicago, IL, US; 7Yale University School of Medicine, New Haven, CT, US; 8Yale University School of Medicine, New Haven, CT, US; 9Danbury Orthopedics, Danbury, CT, US; 10Rush 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.

Pink Theater

3:05-3:20 p.m.

**P87. Determination of Clinically Meaningful PROMIS Severity Ranges for Adult Spinal Deformity**
Raf A Rahman; Alvaro Ibaseta, MS; Jay S. Reider, MD, MPH; Richard L. Skolasky, ScD; David B. Cohen, MD, MPH; Daniel M. Scibba, MD; Khaled M. Kebaish, MD; Brian J. Neuman, MD

1Johns Hopkins University School of Medicine, Baltimore, MD, US; 2Baltimore, MD, US; 3Johns Hopkins Hospital, Baltimore, MD, US; 4Johns Hopkins University, Baltimore, MD, US

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

3:20-3:35 p.m.

**P91. Lenke 1 Adolescent Idiopathic Scoliosis: Effects of TK Restoration on Regional and Global Alignment**
Jonathan Elysee; Renaud Lafage, MSc; Brice Henry, MD; Colleen Wixted, BS; Manon Bozlinger, MD; Han Jo Kim, MD; Matthew E. Cunningham, MD, PhD; Elie Choufani, MD; Virginie Lafage, PhD; John S. Blanco, MD; Roger F. Widmann, MD; Jean-Luc Jouve, MD; Sebastien Pesenti, MD

1Hospital for Special Surgery, New York, NY, US; 2Hôpital Timone Enfants, Marseille, Provence-Alpes-Côte d’Azur, France; 3Toulouse, US; 4Marseille, France; 5Hospital for Special Surgery, New York, New York, US

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

3:05-3:20 p.m.
P41. Agreement of Degenerative Spondylolisthesis Definitions on Standing and Supine Lateral Radiographs in Consecutive Patients

Tyler P. Montgomery, BS1; Austin R. Thompson, BS2; Sawyer Smith3; J. Cai Gillis, MPH4; Hans L. Carlson, MD2; Nels L. Carlson, MD2; Jung U. Yoo, MD5

1Boca Raton, FL, US; 2Oregon Health and Science University, Portland, OR, US; 3Happy Valley, OR, US; 4Harvard T.H. Chan School of Public Health, Boston, MA, US; 5Oregon Health & Science University, Phoenix, AZ, US

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

3:20-3:35 p.m.
P36. Influence of Lumbar Spine Pathology on Bone Mineral Density Measurement by Quantitative Computed Tomography (QCT)

Stephan Salzmann, MD1; Brandon B. Carlson, MD, MPH2; Toshiyuki Shirahata, MD, PhD3; Courtney Ortiz Miller, BA1; John A. Carrino, MD, MPH1; Jingyan Yang, PhD1; Jennifer Shue, MS1; Andrew A. Sama, MD1; Frank P. Cammisa, MD1; Federico P. Girardi, MD1; Alexander P. Hughes, MD1

1Hospital for Special Surgery, New York, NY, US; 2New York, NY, US; 3Showa University School of Medicine, Department of Orthopedic Surgery, Tokyo, Japan

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

White Theater

3:05-3:20 p.m.
P119. Prospective Randomized Clinical Controlled Trial Comparing Clinical Outcomes of Nunec versus Prestige Cervical Disc Replacement with Five-Year Follow-Up

Shoaib Khan, MBBS1; Chandra K. Bhatia, MD2; Mangattil Rajesh3; Tai S. Friesem, MD4

1North Tees and Hartlepool NHS Trust, Stockton on Tees, Durham, United Kingdom; 2University Hospital of North Tees, Stockton on Tees, United Kingdom; 3United Kingdom; 4Spinal Unit, Stockton-on-Tees, United Kingdom

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

3:20-3:35 p.m.
P116. Changes in Radiographic Alignment Do Not Influence the Development of Postoperative C5 Palsy

Ian D. Kaye, MD1; Andrew Sinensky, BS2; Scott Wagner, MD3; Arjun S. Sebastian, MD, MSC4; Joseph S. Butler, PhD, FRCS (Tr & Orth)5; Patrick Morrissey, MD6; Gregory D. Schroeder, MD7; Christopher K. Kepler, MD, MBA8; Mark F. Kurd, MD9; D. Greg Anderson, MD1; Jeffrey A. Rihn, MD9; Barrett I. Woods, MD10; Kris E. Radcliff, MD11; Alexander R. Vaccaro, MD, PhD1; Alan S. Hilibrand, MD1


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

3:35-5:05 p.m.
Section on Posterior Pelvic Girdle Pain: The Sacroiliac Joint: What Do We Know Now?

Concourse Hall 151

Moderators: David Polly, MD; Heidi Prather, DO

In this session, faculty will discuss the diagnosis and treatment of the sacroiliac joint, including physical therapy, manual therapy, RFA and surgical treatments. During the diagnosis section, faculty will address confounders including hip disease labral tears, FAI, piriformis syndrome, spine disease facet disease, and upper lumbar root radiation (Maigne’s syndrome). When discussing revisions, faculty will cover issues about failure beyond loosening and surgical technique problems. Speakers will present information on fixed implants with persisting pain relieved by caudal joint injection and why some providers have given up on doing fusions in ankylosing spondylitis patients.

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

- State the physical exam diagnostic criteria for sacroiliac joint pain;
- Give a comparator condition to describe the burden of disease;
- Identify the components of an optimal diagnostic injection;
- State the average Oswestry Disability Index change with surgical intervention based upon the two randomized controlled trials.
Section on Radiology: Radiation Reduction Strategies and Technologies for Spine Surgery and Interventional Procedures
Concourse Hall 152
Moderator: Joseph P. Gjolaj, MD

Radiation exposure is a significant concern for the spine specialist. This is especially true given the advances in minimally invasive spine surgery techniques, which may rely heavily on fluoroscopy. In addition to exposing the spine surgery patient to radiation, those specialists affected include orthopaedic and neurosurgeons, interventional radiologists, interventional pain specialists, and anesthesiologists. Other medical professionals, such as physician assistants, nurses and operating room technicians, may frequently be exposed to radiation as well. Faculty will discuss the current strategies for decreasing radiation exposure during spine surgery and other interventional procedures, while also exploring future directions to reduce the radiation burden to both spine specialist and patient.

Upon completion of this session, participants should gain strategies to:
- Counsel patients and staff on the risks of radiation exposure;
- Choose the most appropriate radiation reduction techniques for your practice;
- Differentiate the magnitude of radiation from fluoroscopy versus x-ray versus computed tomography and know risks and benefits of each modality.

Section on Robotics and Navigation: Incorporating Emerging Spine Surgery Technologies into Your Operating Room
Room 403A
Moderators: Eric W. Nottmeier, MD; Chetan K. Patel, MD

Faculty will explore the latest spine surgical technologies being deployed in today’s operating rooms, including robotics, 3D printing, vision image guided systems and wearable computing devices.

Participants will gain knowledge about the pros and cons of these technologies. Additionally, there will be a discussion on the financial implications of acquiring new technology.

Upon completion of this session, participants should gain strategies to:
- Discuss the latest spine surgical technologies being deployed in the operating room;
- Delineate the pros and cons of the new technologies being deployed in the operating room;
- Review the outcome of the new technology reported in the literature.
Agenda

- How to Incorporate Robotics in Your Operating Room: Mazor X  
  Ronald A. Lehman, MD
- How to Incorporate Robotics in Your Operating Room: ExcelsiusGPS  
  Srinivas K. Prasad, MD
- The Ideal Use of 3-D Printed Custom Navigation Guides in Spine Surgery  
  Rajiv Sethi, MD
- Should a Machine Vision Image Guided System be Part of Your Armamentarium?  
  Iain H. Kalfas, MD
- Achieving the Highest Accuracy With Navigation and Robotics  
  Eric W. Nottmeier, MD
- Potential of Wearable Computing Devices in Spine Surgery  
  Jang W. Yoon, MD, MSc
- Making a Financial Case for Acquiring New Technology in the Hospital  
  Andrew J. Fabiano, MD
- Discussion, Questions and Answers  
  Faculty Panel

3:35-5:05 p.m.

Section on Spine Oncology: Current Essentials of Spine Tumor Management  
Room 403B

Moderators: Daniel M. Scuibba, MD; Joseph H. Schwab, MD

Patients with spine tumors present complex and unique challenges to providers that are ideally diagnosed and treated in a multidisciplinary fashion, leveraging input from radiologists, radiation oncologists, surgeons, pain management physicians and physiatrists. Faculty will review state-of-the-art evaluation and treatment option for patients with spine tumors.

Upon completion of this session, participants should gain strategies to:
- Review initial evaluation of a patient with a spine tumor;
- Evaluate options for spine tumor treatment;
- Integrate surgical and nonsurgical interventions for spinal tumors into practice.

3:35-5:05 p.m.

Section on Biologics and Basic Research: Injectable Biologic Therapies for Intervertebral Disc  
Room 404AB

Moderators: W. Mark Erwin, DC, PhD; Zorica Buser, PhD

Stem cell and PRP injections for degenerative disc disease have gained popularity in the last years. Although the use of these injections is increasing, there is very limited supporting basic science and clinical evidence. Faculty will evaluate the current evidence, discuss the costs and FDA regulatory hurdles. In addition, faculty will summarize the mechanisms by which stem cells or other injectable materials could contribute to the biological treatment of disc degeneration. Further discussion will describe how to identify the best candidates for such treatments. Assembled faculty are surgeons and researchers, the experts in the field of intervertebral disc regeneration.

Upon completion of this session, participants should gain strategies to:
- Identify the basic science of injectable agents for the treatment of DDD: Stem cells, protein and PRP injections;
- Analyze the current clinical evidence, strengths and weaknesses;
- Select the right patients and how we identify them;
- Explain the down side and how to measure success (lack of objective analytics);
- Recognize the current costs and FDA regulatory hurdles.
Agenda

- State-of-the-Art of LBP and DDD
  Dino Samartzis, PhD, DSc
- The Good, the Bad and the Ugly: Injectable Agents for Treatment of DDD
  Bjorn Meij, DVM, PhD
- What is Truth and What is Fiction: Current Evidence for Stem Cell Injections
  Jeffrey Lotz, PhD
- “Discogenic” Pain, Steroids, PRP: Are They the Greatest — or Just the Best Available?
  Howard An, MD
- Who Are the Right Patients and Why: What About Costs?
  James Kang, MD
- Discussion, Questions and Answers
- Faculty Panel

3:35-5:05 p.m.

Section on Motion Technology Abstract Presentations
Room 406AB
Moderator: Lisa A. Ferrara, PhD

3:35-3:41 p.m.
131. Analysis of Reoperations After Cervical Total Disc Replacement in a Consecutive Series of 504 Patients
Jack E. Zigler, MD1; Richard D. Guyer, MD1; Scott L. Blumenthal, MD1; Donna D. Ohnmeiss, PhD2
1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US
FDA Device/Drug Status: Centinel ProDisc-C 1-level (Approved for this indication), ProDisc-C multi-level (Not approved for this indication).

3:41-3:47 p.m.
132. Subsequent Cervical Spine Surgery After Cervical Disc Arthroplasty and Anterior Cervical Discectomy and Fusion
Alexander M. Satin, MD1; Dean C. Perfetti, MD, MPH2; Deepak Kaji, BA3; Jeff S. Silber, MD, DC4; David A. Essig, MD5
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:47-3:53 p.m.
133. Cervical Disc Arthroplasty: 10-Year Results
Matthew F. Gornet, MD1; J. Kenneth Burkus, MD2; Mark E. Shaffrey, MD3
1The Orthopedic Center of St. Louis, St. Louis, MO, US; 2The Hughston Clinic, PC, Columbus, GA, US; 3UVA Health System Department of Neurosurgery, Charlottesville, VA, US
FDA Device/Drug Status: Prestige LP Artificial Disc (Approved for this indication)

3:53-3:59 p.m.
134. 10-Year Radiographic Analysis of One- and Two-Level Cervical Disc Arthroplasty in a U.S. Multicenter Study
Kee D. Kim, MD1; Hyun W. Bae, MD2; Michael S. Hisey, MD3; Andy Redmond, MD4; A. David Taherinejad, MD5; Robert J. Jackson, MD, FACS6
1UC Davis School of Medicine, Sacramento, CA, US; 2Spine Institute St. John’s Health Center, Los Angeles, CA, US; 3Texas Back Institute, Denton, TX, US; 4Precision Spine Care, Tyler, TX, US; 5Desert Orthopaedic Center, Rancho Mirage, CA, US; 6Laguna Hills, CA, US
FDA Device/Drug Status: Mobi-C (Approved for this indication).

3:59-4:05 p.m.
135. Influence of Preoperative Segmental Range of Motion on Postoperative Motion After Cervical Disc Arthroplasty Using Fixed-Core, Mobile-Core, and Restricted Compressible-Core Prostheses
Robert M. Havey, MS1; Saeed Khayatzadeh, PhD2; Avinash G. Patwardhan, PhD3
1IL, US; 2Orthopedic Biomechanics Lab, Hines, IL, US; 3Loyola University Medical Center Department of Orthopaedic Surgery, Maywood, IL, US
FDA Device/Drug Status: PRODISC® C (Approved for this indication), DISCOVER™ (Approved for this indication), PCM® (Approved for this indication), Mobi-C® (Approved for this indication), M6® C (Investigational/Not approved).

4:05-4:20 p.m.
Discussion

4:20-4:26 p.m.
136. Difference in Patient Cohorts for Cervical Disc Arthroplasty (CDA) and Anterior Cervical Discectomy and Fusion (ACDF)
W. Ryan Spiker, MD1; Darrel S. Brodke, MD2; Nicholas Spina, MD3; Brandon D. Lawrence, MD2; Vadim Goz, MD4; Brook I. Martin, PhD, MPH5
1University of Utah Orthopaedics, Salt Lake City, UT, US; 2University Orthopaedic Center, Salt Lake City, UT, US; 3University of Washington, Seattle, WA, US; 4University of Utah, Salt Lake City, UT, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
137. How Do Patients With Predominant Chronic Neck Pain Experience Cervical Disc Replacement? Results from a Prospective Study at Five-Year Follow-Up

Jacques Beaurain, MD°; Thierry Dufour, MD°; Jean Huppert, MD°; Pierre Bernard, MD°; Jean-Marc Vital, MD°; Phong Dam Hieu, MD, PhD°; Eric Lioret, MD°; Jean-Paul Steib, MD°

1Neurochirurgie CHU Hôpital Général, Dijon, France; 2Institut Parisien du Dos - Spine Center of Paris, Paris, France; 3Service De Neurochirurgie, Saint Priest En Jarez, France; 4Centre Aquitain du Dos, Merignac, France; 5Hôpital Pellegrin Tripode, Bordeaux, France; 6University Medical Center Brest France, Brest, France; 7Sce Neurochirurgie, Tours Cedex 9, France; 8Chirurgie du rachis, Chirurgie B, Strasbourg, France

FDA Device/Drug Status: Mobi-C (Approved for this indication).


Gregory J. Kirchner, MPH°; Alexander M. Lieber, BA°; Yehuda E. Kerbel, MD°; Venkat Kavuri, MD°; Amrit Khalsa, MD°

1Drexel University College of Medicine, Philadelphia, PA, US; 2Drexel University College of Medicine, Department of Orthopaedics, Philadelphia, PA, US; 3Philadelphia, PA, US; 4Hahnemann/Drexel Department of Orthopaedic Surgery, Philadelphia, PA, US

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

139. Artificial Disc Replacement Adjacent to a Multilevel Fusion in the Cervical Spine: A Biomechanical Study

Dale Segal, MD°; Zachary J. Grabel, MD°; Jacob M. Wilson, MD°; Andrew H. Milby, MD°; Weilong J. Shi, MD°; William C. Hutton, MD°; John M. Rhee, MD°

1Atlanta, GA, US; 2Emory Orthopedics, Atlanta, GA, US; 3University of Pennsylvania, Philadelphia, PA, US; 4Emory Orthopaedics, Duluth, GA, US; 5Emory University, Atlanta, GA, US

FDA Device/Drug Status: NuVasive PCM (Not approved for this indication).

140. Impact of Range of Motion on Progression of Adjacent Segment Disease: Disc versus Disc

Scott L. Blumenthal, MD°; Richard D. Guyer, MD°; Jack E. Zigler, MD°; Donna D. Ohnmeiss, PhD°

1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US

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

4:30-5:05 p.m.

Discussion

3:35-5:05 p.m.

Resident/Fellow Education Pathway: What Happens Now? Transitioning from Training to Practice

The Learning Place, Red Theater

Moderators: Andrew J. Schoenfeld, MD; Elizabeth Yu, 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—pitfalls seem to present at every turn. This symposium is ideal for residents, fellows and individuals within the first five years of clinical practice.

Faculty will describe how to ease some of the anxiety and provide insight into navigating the period spanning the end of clinical training and the start of independent practice. Additionally, faculty will present useful information for all interested parties and those also looking to transition to a new position in the near future.

Upon completion of this session, participants should gain strategies to:
- Recognize best practices to employ, 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
- Introduction/Finding a Job
  - Andrew J. Schoenfeld, MD
- Negotiating I: Position and Salary
  - Academic
    - Saad B. Chaudhary, MD, MBA
  - Private Practice
    - Sandeep N. Gidvani, MD
- Negotiating II: Ancillaries, Insurance and Surgical Center Considerations
  - Don K. Moore, MD
- Starting Your Practice
  - Khoi D. Than, MD
- Networking
  - Marilyn L. Gates, MD
• Pitfalls: How to Ruin Your Life in Your First Year of Practice
  William F. Lavelle, MD

• Discussion, Questions and Answers
  Faculty Panel

3:35-8:00 p.m.

NASS After Hours (Non-CME)
The Learning Place, Pink Theater and Blue Lab

Blue Lab: Endoscopic Spine Surgery: Current Trends & Evidence of Spinal Endoscopic Procedures
(Registration required)

Sponsored by: Elliquence; Joimax; RIWOSpine, A Richard Wolf Company

Speaker(s): Choll Kim, MD, PhD; Martin Komp, MD, PhD; Paul Houle MD; Jin-Sung Kim, MD, PhD; Gun Choi, MD

5:00-8:00 p.m.

Surgical Innovation Lab Workshops
(Non-CME)
The Learning Place

Green Lab: SI-Bone
Primary Surgeon Training
Speakers: Joshua Heller, MD; Genne McDonald

Yellow Lab: DePuy Spine, A Johnson & Johnson Company
Hands-on Cadaveric Course on The Unleash™ Solution: A data backed Solution for MIS TLIF Procedures, Coupled With Introduction to Novel Enabling Technologies
Speakers: Hyun Bae, MD; Stephen Bartol, MD, MBA, FRCSC; John Hall, MD

5:15-6:15 p.m.

Resident, Fellow and Program Directors' Reception
The Learning Place, Red Theater

NASS is proud to announce the 16th Annual Resident, Fellow and Program Directors’ Reception at the 33rd Annual Meeting. This reception provides an opportunity for residents, fellows and potential fellows to mingle with each other and the program directors in a casual setting while enjoying beer, wine and hors d’oeuvres with colleagues. Thank you to Misonix for its support.
At a cellular level, every surgery is treated as a disruption of the body’s physiology leading to a neuro-humoral stress response. ERASS was established to improve outcomes after colorectal surgery. It was designed to “cheat” the body of its stress response by a series of interventions. These multimodal interventions begin from the time of consultation for surgical scheduling to post discharge. Early mobilization, thromboembolism prophylaxis, MIS approaches, opioid based pain management are common practice. Preadmission counselling and education, preoperative carbohydrate loading, standardized anesthetic methods, epidural analgesia, perioperative fluid management, insulin resistance are often disregarded.

Faculty will discuss various ERASS protocols, their physiologic importance, preoperative optimization, non-narcotic pain management, optimal monitoring in patients with goal directed fluid management, checklist for patients with specific goals, ileus management, and finally pathway to setup a multidisciplinary team. In addition, faculty will describe various strategies for ambulatory care centers to manage same day surgery in coordination with insurance companies.

Upon completion of this session, participants should gain strategies to:
- Identify ERASS concepts;
- Recognize important physiological responses to surgery and strategies to minimize them;
- Distinguish anesthesia protocols to minimize redundancy;
- Know preoperative counseling and create target check list for patient involved tasks;
- Use perioperative fluid management and monitor tailored interventions;
- Discern pain and minimize narcotic consumption;
- Implementing an ERASS program at their institution;
- Be familiar with data management and outcomes analysis.

Agenda
- Introduction to Concepts of Enhanced Recovery After Spine Surgery
  Michael Y. Wang, MD
- Neurohumoral Response to Surgery and Perioperative Fluid and Nutrition Management
  Karthik Madhavan, MD
- Preoperative Considerations for Adult Deformity Surgery
  Christopher I. Shaffrey, MD
- Role of Anesthesia in Minimizing Redundancy
  Ajit A. Krishnaney, MD
- Perioperative Pain Management with Non-Narcotic Analgesia
  Christoph P. Hofstetter, MD, PhD
- Perioperative Blood Management
  Michael P. Steinmetz, MD
- Role of Minimally Invasive Surgery in ERASS
  Sheeraz A. Qureshi, MD, MBA
- The Role of Physical Therapy on Same Day Mobilization
  Matthew Smuck, MD
- Role of Advanced Practice Provider: Preoperative and Post Discharge Counselling to Minimize Hospital Visits
  Erin Anderson, PAC
- Discussion, Questions and Answers
  Faculty Panel
Failed back surgery includes a diverse group diagnoses with many different treatment options besides reoperation. There is not, however, a clear best practice for diagnosis and treatment of these conditions. There are specific diagnostic tools that provide more clear utility then others. With a more specific diagnosis, patients can and often do improve substantially once their treatment is matched to their diagnosis. Faculty will present an evidence-based approach that helps provide a means for more specific diagnosis with the most specific combination of clinical tools and to understand how different types of treatments have evidence for these patients.

**Upon completion of this session, participants should gain strategies to:**
- Appreciate how to use specific diagnostic tools to reach a more specific diagnosis for patients who have failed back surgery;
- Describe which tests are most helpful to reach a diagnosis;
- Distinguish specific treatments that have evidence with specific diagnoses related to failed back surgery.

**Agenda**
- **Differential Diagnosis Introduction**
  Alison A. Stout, DO
  - Axial Pain
  - Radicular Pain
  - Extra-Spinal Causes
- **Use of Pain History**
  Jerome Schofferman, MD
  - Comparison to Preoperative
  - Topography and Mechanical Response
- **Physical Examination**
  Santhosh A. Thomas, DO, MBA
  - Neurologic
  - SIJ
  - Movement Patterns
  - Evaluation of Strength and Body Mechanics: PT Evaluation Considerations
- **Surgical Considerations**
  F. Todd Wetzel, MD
  - Good Surgery
  - Wrong Indication

**Diagnosis Testing: Indications and Interpretation**
- **Radiology**
  Charles H. Cho, MD, MBA
  - Plain X-Rays; Hips
  - MRI: Use of Contrast, Examples of Inadequate Decompression, Recurrent, Non-Fusion
  - CT Scan if Needed, Especially to Evaluate Fusion and Placement of Internal Fixation
- **Electrodiagnostics**
  Alison A. Stout, DO
  - EMG, Especially to Differentiate Spinal Problem versus Peripheral Neuropathy/Post-Surgical Plexopathy/Diabetic Amyotrophy and/or Entrapment
- **Diagnostic Injections: Clinical Pearls**
  Bryon J. Schneider, MD
  - Medial Branch Blocks
  - SIJ injections
  - “Selective” Nerve Blocks, How Selective

**International Spine Forum Symposium: Minimally Invasive Spine Surgery**
Room 404AB

Moderators: Reginald Q. Knight, MD, MS; Andreas Demetriades, FRCS

**Agenda**
- **Welcome Remarks**
  Norman B. Chutkan, MD
  Overall Program Moderator and NASS International Education Committee Chair
- **The Effectiveness of Mechanical Denervation of Facet Joints Under Endoscopic Control in the Treatment of Patients with Lumbar Facet Syndrome**
  Vladimir Radchenko, MD, PhD; Alexandr Perfiliev, MD
  Ukrainian Spine Society
- **A Feasibility Study of Percutaneous Endoscopic Interlaminar Lumbar Discectomy Under Local Anesthesia for L5-S1 Disc Herniation and Superiority Analysis Compared with General Anesthesia**
  Yansong Wang, MD
  Chinese Association of Orthopaedic Surgeons (CAOS)
Interdisciplinary Spine Forum: Abstract Presentations

8:00-8:06 a.m.
141. Global Spine Care Initiative: Model of Care and Implementation Plan
Claire Johnson, PhD, DC, MS1; Scott Haldeman, MD, PhD, DC2; Roger Chou, MD3; Bart Green, DC, MS, PhD4; Eric Hurwitz, DC, PhD5; Margaretta Nordin, MD6; Pierre Cote, DC, PhD7; Deborah Kopansky-Giles, DC, MSc8
1Escondido, CA, US; 2World Spine Care, Tustin, CA, US; 3Portland, OR, US; 4Brightwall, Escondido, CA, US; 5University of Hawaii at Manoa, Honolulu, HI, US; 6Romorantin Lantenay, France; 7University of Ontario Institute of Technology, Oshawa, ON, Canada; 8St. Michael’s Hospital, Toronto, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

8:06-8:12 a.m.
Section on Interdisciplinary Spine Best Paper
142. Integrating Multidisciplinary Knowledge of Low Back Pain Through Collaborative Modeling: Results from the NASS Think Tank Workshop
Jacek Cholewicki, PhD1; Payam Aminpor, PhD2; John M. Popovich Jr., PhD, DPT, ATC3; Paul Hodges, PhD4; Steven Gray, PhD5
1Michigan State University, East Lansing, MI, US; 2East Lansing, MI, US; 3MSU Center for Orthopedic Research, Lansing, MI, US; 4The University of Queensland, Brisbane, QLD, Australia
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

8:12-8:18 a.m.
143. Categorizing the Hip-Spine Syndrome: A Step Toward a Collaborative Multidisciplinary Classification
Bassel G. Diebo, MD1; Louis M. Day, MD1; Renaud Lafage, MSc2; Peter G. Passias, MD3; Carl B. Paulino, MD4; Qais Naziri, MD, MBA4; Michael A. Mont, MD5; Thomas J. Errico, MD6; Frank J. Schwab, MD2; Virginie Lafage, PhD2
1Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 2Hospital for Special Surgery, New York, NY, US; 3NY Spine Institute, NYU Langone Health, New York, NY, US; 4SUNY Downstate Medical Center, Brooklyn, NY, US; 5Cleveland Clinic, Cleveland, OH, US; 6Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

8:18-8:24 a.m.
Jiang Xiaobing, PhD
1st Affiliated Hospital of Guangzhou University of Chinese Medicine, Guang Zhou City, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
8:24-8:30 a.m.  
**2018 Resident & Fellow Research Award Winner**  
145. The Impact of Postoperative Physical Therapy on Patient-Reported Outcomes in Patients Undergoing Spine Surgery  
Kristin R. Archer, PhD, DPT1; Silky Chotai, MD1; Ashley Simone Maybin, MD1; Inamullah Khan, MD1; Rogelio A. Coronado, PT, PhD1; Clinton J. Devin, MD1; Jacquelyn S. Pennings, PhD1  
1Vanderbilt University Medical Center, Nashville, TN, US; 2Vanderbilt Stallworth Rehabilitation Hospital, Nashville, TN, US  
**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.

8:30-8:36 a.m.  
146. Return to Recreational Sport Following Lumbar Fusion  
Nickul S. Jain, MD1; Charles Lin, BS2; Alexander Halim, MD2; Brian Knight2; Connor T. Byrne2; Nitin N. Bhatia, MD2; Yu-Po Lee, MD2  
1Southern California Orthopedic Institute, Bakersfield, CA, US; 2Department of Orthopaedic Surgery, UC Irvine Medical Center, Orange, CA  
**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.

8:36-8:42 a.m.  
**2016 Research Grant**  
Comparative Effectiveness of Multimodal Pain Management versus Standard Postoperative Analgesia: Randomized Controlled Clinical Trial to Reduce Postoperative Pain and Opioid Use Among Patients Undergoing Lumbar Spine Surgery  
Richard L. Skolasky, ScD1; Alyson Russo, MD2; Allan Gottschalk, MD, PhD1; Brian J. Neuman, MD2  
1Johns Hopkins University, Baltimore, MD, US; 2Baltimore, MD, US  
**FDA Device/Drug Status:** All drugs used for FDA approved indications.

8:42-9:00 a.m.  
**Discussion**
103 FRIDAY, SEPTEMBER 28

9:06-9:12 a.m.
148. Biological and Clinical Outcomes of Chiropractic Spinal Manipulative Therapy in the Treatment of Patients with Acute Inflammatory Radiculopathy Secondary to Lumbar Disc Herniation: A Pilot Study
Paul B. Bishop, MD, PhD, DC1; John Street, MD, PhD2; Jeffrey A. Quon, DC, MHSc, PhD, FCSS(C)3; Brian E. Arthur, DC, MSc2; Gabriella M. Petrollini, BSc3; Melissa Nadeau, MD, MHS, FRCCS1; Tamir Ailon, MD, MPH4; Nicolas Dea, MD, MSc, FRCCS1; Charles G. Fisher, MD, FRCCS, MHS5; Brian K. Kwon, MD, PhD, FRCCS1
1Blusson Spine Centre, Vancouver, BC, Canada; 2Vancouver, BC, Canada; 3UBC School of Population and Public Health, Vancouver, BC, Canada; 4Vancouver Spine Surgery Institute, Vancouver, BC, Canada; 5Vancouver General Hospital, Vancouver, BC, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:12-9:18 a.m.
149. Comparison of Minimal Invasive and Open Transforaminal Lumbar Interbody Fusion in the Treatment of Single-Level Lumbar Spine Degenerative Diseases with Minimum Six-Year Follow-Up
Biao Wang, MD1; Dingjun Hao, MD1; Lingbo Kong, MD, PhD2
1Honghui Hospital, Xi’an, Shaanxi, China; 2Xi’an, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:18-9:24 a.m.
150. Single-Center, Randomized Controlled Trial of Intravenous versus Oral Acetaminophen Administration in Perioperative Care of Circumferential Lumbar Fusion: A Comparative Effectiveness Study
Christina Dowe, BS1; Antonio T. Breecevich, MD; Samuel Grinberg, BA; Tucker C. Callanan, BS; Frank P. Cammisa, MD; Andrew A. Sama, MD; Alexander P. Hughes, MD; Matthew E. Cunningham, MD, PhD; Darren R. Lebl, MD; Federico P. Girardi, MD; Russel C. Huang, MD; Celeste Abjornson, PhD; Chad M. Craig, MD, FACP
Hospital for Special Surgery, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:24-9:30 a.m.
2018 Value Award Winner
151. Evaluating Risk Factors for Nonhome Discharge and the Impact of Disposition on Postdischarge Outcomes for Patients Undergoing Posterior Cervical Decompression and Fusion
Daniel J. Snyder, BS1; Sean N. Neifert1; Brian Deutsch, BS1; Jonathan S. Gal, MD2; John M. Caridi, MD3
1New York, NY, US; 2Icahn School of Medicine at Mount Sinai, New York, NY, US; 3Mount Sinai Medical Center, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:36-9:42 a.m.
153. Intravenous and Oral Tranexamic Acid are Equivalent at Reducing Blood Loss in Thoracolumbar Spinal Fusion: A Prospective Randomized Trial
Charles C. Yu, MD1; Jacob A. Pawloski, BS2; Ayodele Buraimoh, MD3; Stephen Bartol, MD, MBA, FRCCS4
1Henry Ford Health System, Detroit, MI, US; 2Wayne State University School of Medicine, Detroit, MI, US; 3University of Maryland, Baltimore, Maryland, US; 4Windsor, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:42-10:00 a.m.
Discussion
Interdisciplinary Spine Forum:
Spine Value Models With Economics and Evidence-Based Guidelines
Room 406AB
Moderator: Robert Turner, PT, DPT, OCS

This multidisciplinary panel will present the economic drivers in spinal care from the nonoperative and operative perspectives with cost-benefit analysis compared to evidence-based guidelines. Operational excellence is often based in the value perceived by an institution and often does not consider the evidence behind cost driving interventions. Additionally, the panel will address the unique spine care pathways with an analysis of the cost benefit and patient satisfaction of their individual approaches.

Upon completion of this session, participants should gain strategies to:
• Strategically analyze their current spine care model and recognize where cost savings may be implemented;
• Understand drivers for spine care costs from an operative and nonoperative perspective;
• Recognize and implement alternative cost effective spine care models to their current practice.

Agenda
• Introduction of Panel and Topic
  Robert Turner, PT, DPT, OCS
• Nonoperative Cost Drivers
  Joel Press, MD
• Operative Cost Drivers
  Christopher Bono, MD
• Maximizing Value in the Treatment of Spinal Disorders
  Catherine MacLean, MD, PhD
• Spine Value Models
  Craig Liebenson, DC
• Mayo Spine Model
  Michael Halasy, PhD, MS, PA-C
• Direct Access and Spinal Triage Models
  Robert Turner, PT, DPT, OCS
• Discussion, Questions and Answers
  Faculty Panel

Technical Exhibition
Technical Exhibition

EPosters
The Learning Place

Career Building Recruitment Event
The Learning Place

Jobseekers are encouraged to participate in this event to review a copy of the Recruitment Guide containing employers looking to fill open positions. Opportunities to meet with select employers onsite also are available. Stop by the Recruitment Event kiosk outside the Career Building suite to sign up with your CV or resume.

Simulated Surgery Lab (Non-CME)
The Learning Place

Innovative Technology Posters
Technical Exhibition

International Spine Forum Symposium:
Trauma
Room 404AB
Moderators: Abdulrazzaq Alobaid, MD, FRCSC; Hani Mhaidli, MD, PhD

Agenda
• Cervical Spine Clearance in Trauma Patients
  Nasser Mehrab Khan, MBBS
  Qatar Spine
• Reported Outcomes in Spine Trauma
  Steven M. Theiss, MD
  AOSpine International
• Recent Updates on the Management of Odontoid Fractures
  Abdulaziz Al-Mutair, MD, FRCSC
  Kuwait Spine Society
• Short Segment Fixation for Thoracolumbar Fractures
  Abdulrazzaq Alobaid, MD, FRCSC
  Kuwait Spine Society
• Challenges of Neglected Spinal Trauma
  H.S. Chhabra, MD
  Association of Spinal Surgeons of India (ASSI)
• Treatment Strategy for Osteoporotic Vertebral Fractures based on MRI Studies in Japan
  Hiroaki Nakamura, MD; Shinji Takahashi, MD
  Japanese Society for Spine Surgery and Related Research (JSSR)
• Discussion, Questions and Answers
  Faculty Panel
10:00-10:30 a.m.

**Networking Break Beverage Service**
Technical Exhibition, Booths #1667 and #814

**Exercise Video Demonstrations**
The Learning Place

**Simulated Surgery Lab** (Non-CME)
The Learning Place

**Immersive Virtual Reality Journey Inside of a Patient's CT Scan**
Steven Hwang, MD

10:00-10:30 a.m.

**Poster Grand Rounds**
The Learning Place

**Grey Theater**

10:00-10:10 a.m.

P102. A Comparison of Three Different Positioning Techniques on Surgical Corrections and Postoperative Alignment in Cervical Deformity (CD) Surgery
Brandon B. Carlson, MD, MPH; Renaud Lafage, MSc; Tejbir S. Pannu, MD, MS; Peter G. Passias, MD; Christopher P. Ames, MD; Robert A. Hart, MD; Christopher I. Shaffrey, MD; Gregory M. Mundis Jr., MD; Themistocles S. Protopsaltis, MD; Munish C. Gupta, MD; Eric O. Klineberg, MD; Douglas C. Burton, MD; Virginie Lafage, PhD; Han Jo Kim, MD; International Spine Study Group

1New York, NY, US; 2Hospital for Special Surgery, New York, NY, US; 3NY Spine Institute, NYU Langone Health, New York, NY, US; 4University of California, San Francisco, San Francisco, CA, US; 5Swedish Neuroscience Institute, Seattle, WA, US; 6University of Virginia, Charlottesville, VA, US; 7Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 8Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 9Washington University School of Medicine, St. Louis, MO, US; 10UC, Davis School of Medicine, Sacramento, CA, US; 11University of Kansas Medical Center, Kansas City, KS, US; 12Brighton, CO, US

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

10:10-10:20 a.m.

P105. Limited Morbidity and Possible Radiographic Benefit of C2 versus Subaxial Cervical Upper-Most Instrumented Vertebrae
Peter G. Passias, MD; Cole Bortz, BA; Renaud Lafage, MSc; Virginie Lafage, PhD; Justin S. Smith, MD, PhD; Breton Line, BS; Robert K. Eastlack, MD; Samantha R. Horn, BA; Frank A. Segreto, BS; Daniel M. Sciubba, MD; Eric O. Klineberg, MD; Alexandra Soroceanu, MD, MPH; Douglas C. Burton, MD; Frank J. Schwab, MD; Shay Bess, MD; Christopher I. Shaffrey, 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.

10:20-10:30 a.m.

Peter G. Passias, MD; Frank A. Segreto, BS; Renaud Lafage, MSc; Virginie Lafage, PhD; Justin S. Smith, MD, PhD; Breton Line, BS; Cole Bortz, BA; Samantha R. Horn, BA; Eric O. Klineberg, MD; Brian J. Neuman, MD; Han Jo Kim, MD; Michael P. Kelly, MD; Basell G. Diebo, MD; Shaleen N. Vira, MD; Douglas C. Burton, MD; Robert A. Hart, MD; Frank J. Schwab, MD; Aaron Hockley, MD, FRCSC; Christopher I. Shaffrey, MD; Christopher P. Ames, MD; International Spine Study Group

1NY Spine Institute, NYU Langone Health, New York, NY, US; 2NY Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 3Hospital for Special Surgery, New York, NY, US; 4UVA Health System, Charlottesville, VA, US; 5Denver International Spine Center, Denver, CO, US; 6UC, Davis School of Medicine, Sacramento, CA, US; 7UC, Davis School of Medicine, Sacramento, CA, US; 8UC, Davis School of Medicine, Sacramento, CA, US; 9Baltimore, MD, US; 10Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 11UC, Davis School of Medicine, Sacramento, CA, US; 12UC, Davis School of Medicine, Sacramento, CA, US; 13University of Virginia, Charlottesville, VA, US; 14University of California, San Francisco, San Francisco, CA, US; 15University of Virginia, Charlottesville, VA, US; 16UC, Davis School of Medicine, Sacramento, CA, US; 17SUNY Downstate Medical Center, Brooklyn, NY, US; 18University of Kansas Medical Center, Kansas City, KS, US; 19Swedish Neuroscience Institute, Seattle, WA, US; 20NYU Langone Health, New York, NY, US; 21University of California, San Francisco, San Francisco, CA, US; 22Brighton, CO, US

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

10:00-10:15 a.m.
Bayard C. Carlson, MD; William A. Robinson, MD; Nathan R. Wanderman, MD; Ahmad N. Nassr, MD; Brett A. Freedman, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:15-10:30 a.m.
P180. Epidemiology and Treatment of Central Cord Syndrome in the United States
Amit Jain, MD; Daniel J. Blizzard, MD; Zachary J. Grabel, MD; John G. Heller, MD; John M. Rhee, MD; Keith W. Michael, MD; S. Tim Yoon, MD, PhD
1Baltimore, MD, US; 2Duke University, Durham, NC, US; 3Atlanta, GA, US; 4Emory Orthopaedics & Spine Center, Atlanta, GA, US; 5Emory University, Atlanta, GA, US; 6The Emory Spine Center, Atlanta, GA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Purple Theater

10:00-10:15 a.m.
P10. Infant Positioning Impacts Neck and Back Muscle Activity: A Pilot Study Exploring Implications for Spinal Development
Erin M. Mannen, PhD; Akshay R. Krishnan; Stewart A. Tackett, BS; Richard E. McCarthy, MD; David B. Bumpass, MD
1University of Arkansas for Medical Sciences, Little Rock, AR, US; 2Arkansas Children’s Hospital, Little Rock, AR, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:15-10:30 a.m.
P12. The Interaction of Satellite Rod Reconstruction, Rod Material and Rod Diameter on Posterior Rod Strain in Pedicle Subtraction Osteotomies for Adult Spinal Deformity Correction: A Finite Element Analysis
Daniel E. Gelb, MD; Jarid Tareen, MD; Ehsan Jazini, MD; Steven C. Ludwig, MD; Jonathan Harris; Wenhai Wang, PhD; Brandon Bucklen, PhD
1University of Maryland Orthopaedic Associates, Baltimore, MD, US; 2Baltimore, MD, US; 3Medstar Georgetown University Hospital, Washington, DC, US; 4University of Maryland Medical Center, Baltimore, MD, US; 5Globus Medical Inc., Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

White Theater

10:00-10:10 a.m.
P129. True Percutaneous Transforaminal Lumbar Interbody Fusion (pTLIF) with an Expandable Interbody Cage Using the Endoscopic Posterolateral Approach: A Long-Term Follow-Up Report of 50 Cases
Rudolf Morgenstern, MD, PhD; Christian Morgenstern, MD, PhD, MSc
Centro Médico Teknon, Barcelona, Spain
FDA Device/Drug Status: DePuy Synthes Concorde Lift (Approved for this indication), Globus RISE (Approved for this indication).

10:10-10:20 a.m.
P146. Postoperative Sick Leave is Correlated to the Length of Preoperative Sick Leave in Patients with Herniated Lumbar Disc Treated with Discectomy
Mikkel Andersen, MD; Søren Dahl, MD; Jesper Rasmussen, MD; Leah Y. Carreon, MD, MSc
1Middelfart, Denmark; 2Arbejdsmedicinsk Afd. Sydvestjysk Sygehus, Esbjerg, Denmark; 3Sygehus Lillebælt - Rygkirurgi Middelfart, Middelfart, Denmark
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:20-10:30 a.m.
Corey Walker, MD; David S. Xu, 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; 4University of South Florida, Tampa, FL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
10:30-10:45 a.m.
**Awards and Abstract Presentations**
Concourse Hall 151

10:30-10:40 a.m.
**NASS Recognition Awards Presentation**
Outstanding society members will receive these prestigious Recognition Awards.

- **2018 Leon Wilte Award**: Sohail K. Mirza, MD, MPH
- **2018 Henry Farfan Award**: Jeffrey C. Lotz, MD
- **2018 David Selby Award**: Jerome Schofferman, MD
- **2018 Past President Award**: Jean-Jacques Abitbol, MD
- **2018 Spine Advocacy Award**: John G. Finkenberg, MD

See more information about the award winners on pages 25-27.

10:40-10:45 a.m.
**2018 Research Grants and Fellowship Awards Presentations**
Honor your colleagues as NASS presents this year’s research grants and traveling fellowships to those proposing advancements in spine care and research. Grant recipients from 2014, 2015 and 2016 present their research findings during abstract sessions throughout the meeting.

10:30 a.m.-12:00 p.m.
**Abstract Presentations**:
**Complications of Cervical Spine Surgery**
Concourse Hall 152
Moderator: Reginald Q. Knight, MD, MS

10:30-10:36 a.m.
**154. Preoperative Factors Associated with Extended Length of Stay and 90-Day Readmission Following Anterior Cervical Discectomy and Fusion**
Brian Dial, MD1; Valentine R. Esposito, BS2; Daniel J. Blizzard, MD1; Melissa Erickson, MD3
1Duke University, Durham, NC, US; 2Durham, NC, US; 3Duke University Medical Center, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:36-10:42 a.m.
**155. Same Day Discharge after Anterior Cervical Discectomy and Fusion in Suitable Patients has Similarly Low Readmission Rates as Admitted Patients**
Kartik Shenoy, MD1; Abidemi Adenikinju, MD2; Ezra Dweck, MD2; Aaron J. Buckland, MBBS, FRACS1; John A. Bendo, MD3
1Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3NYU Langone Orthopedic Hospital, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:42-10:48 a.m.
**156. Indicators for Non-Routine Discharge Following Cervical Deformity-Corrective Surgery: Radiographic, Surgical, and Patient-Related Predictors**
Cole Bortz, BA1; Peter G. Passias, MD2; Virginie Lafage, PhD3; Justin S. Smith, MD, PhD4; Breton Line, BS5; Gregory M. Mundis Jr., MD6; Khaled M. Kebaish, MD7; Michael P. Kelly, MD8; Themistocles S. Protopsaltis, MD9; Daniel M. Sciuabba, MD10; Alexandra Soroceano, MD, MPH11; Eric O. Klineberg, MD12; Douglas C. Burton, MD13; Robert A. Hart, MD14; Frank J. Schwab, MD15; Shay Bess, MD16; Christopher I. Shaffrey, MD16; Christopher P. Ames, MD17; International Spine Study Group18
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:48-10:54 a.m.
**157. Risk Factors Associated with Failure to Reach Minimum Clinically Important Difference in Patient-Reported Outcomes After Anterior Cervical Discectomy and Fusion**
Benjamin Khechen, BA1; Brittany E. Haws, BS2; Dil V. Patel, BS3; Ankur S. Narain, BA1; Fady Y. Hijji, BS3; Kaitlyn L. Cardinal, BS2; Jordan Guntin, BS2; Noah Shoshana1; Kern Singh, MD2
1Midwest Orthopaedics at Rush, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Rush University Medical Center-Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
10:54-11:00 a.m.
158. The Role of Anterior Cervical Discectomy and Fusion on Relieving Axial Neck Pain: A Systematic Review and Meta-Analysis
Colby T. Oitment, MD1; Tracy Watson, PA2; Victor Lam, MD3; Jetan H. Badhiwala, MD4; Mohammed H. Aref, MD, FRSCS5; Edward Kachur, MD4; Saleh Almenawer, MD6; Aleksa Cenic, MD8
1McMaster University, Hamilton, Ontario, Canada; 2Ancaster, ON, Canada; 3Division of Neurosurgery, Department of Surgery, University of Toronto, Toronto, ON, Canada; 4Aurora, Co, US; 5Spine Clinic-Neuroscience Ambulatory Centre (NAC), Hamilton, ON, Canada; 6Hamilton, ON, Canada; 7Hamilton General Hospital, Hamilton, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:00-11:15 a.m.
Discussion

11:15-11:21 a.m.
159. Comparing Predictors of Complications Following Anterior Cervical Discectomy and Fusion (ACDF), Total Disc Replacement (TDR), and Combined ACDF-TDR with Minimum Two-Year Follow-Up
Neil V. Shah, MD, MS1; Ishaan Jain, BS2; Cameron R. Moattari, BS2; George A. Beyer, MS1; John J. Kelly, BA1; Sarah Stroud, BA1; Jared M. Newman, MD1; Vincent Challier, MD4; Hiroyuki Yoshihara, MD, PhD1; Peter G. Passias, MD5; Frank J. Schwab, MD6; Virginie Lafage, PhD6; Carl B. Paulino, MD1; Bassel G. Diebo, MD7
1SUNY Downstate Medical Center, Brooklyn, NY, US; 2Brooklyn, NY, US; 3*St. George’s University School of Medicine, New York, NY, US; 4Spine Unit, Clinique Francheville, Perigueux, France; 5NY Spine Institute, NYU Langone Health, New York, NY, US; 6Hospital for Special Surgery, New York, NY, 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.

11:21-11:27 a.m.
160. Obstructive Sleep Apnea Increases the Risk of Postoperative Pulmonary Complications Following One- or Two-Level Cervical Fusion: A Retrospective Database Review Study
Blake G. Formanek, BA1; Christopher Wang, BS1; Jeffrey C. Wang, MD2; Zorica Buser, PhD3
1Los Angeles, CA, US; 2USC Spine Center, Los Angeles, CA, US; 3Norris Research Tower, Keck School of Medicine, USC, Los Angeles, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
10:30 a.m.-12:00 p.m.

Abstract Presentations:
Deformity: Technical Factors
Room 403A

Moderator: Patrick C. Hsieh, MD, MS

10:30-10:36 a.m.
164. Incidence, Risk Factors and the Natural History of Proximal Junctional Kyphosis: Review of Long-Term Surgical Outcomes using Hybrid Fusion Constructs for Adolescent Idiopathic Scoliosis
Andrew J. Pugely, MD1; Luca Labianca, MD, PhD2; Piyush Kalakoti, MD1; Pawin Gajaseni, MD3; Stuart L. Weinstein, MD2
1University of Iowa, Iowa City, IA, US; 2Iowa City, IA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:36-10:42 a.m.
165. Sagittal Imbalance in Degenerative Scoliosis Can Be Corrected by Addressing Only the Symptomatic Levels in Carefully Selected Patients: A Retrospective Radiographic Study
Steven M. Presciutti, MD1; Philip Louie, MD2; Comron Saifi, MD3; Christopher J. DeWald, MD4; Howard S. An, MD1
1Decatur, GA, US; 2Rush University Medical Center, Chicago, IL, US; 3William Dyson, Philadelphia, PA, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:42-10:48 a.m.
166. The Effect of Surgical Alignment on Standing Balance in Adult Deformity Patients: Invariant Density Approach
Pilwon Hur, PhD1; Yi-tsien Pan, MS1; Theodore A. Belanger, MD2; Isador H. Lieberman, MD, FRSCS, MBA3; Rajesh G. Arakal, MD4; Ram Haddas, PhD, MSC, Meng5
1Texas A&M University, College Station, TX, US; 2Texas Back Institute, Rockwall, TX, US; 3Scoliosis and Spine Tumor Center, Texas Back Institute, Texas Health Presbyterian Hospital Plano, Plano, TX, US; 4Plano, TX, US; 5Texas Back Institute, Plano, TX, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:48-10:54 a.m.
Miquel Serra-Burriel, PhD1; Michael P. Kelly, MD2; Justin S. Smith, MD, PhD3; Ferran Pellise, MD, PhD1; Ahmet Alanay, MD4; Emre Acaroglu, MD5; Francisco J. Perez-Grueso, MD6; Frank Kleinstuck, MD7; Ibrahim Obeid, MD8; Samrat Yeramaneni, MBBS, MS, PhD9; Richard A. Hostin Jr., MD10; Jeffrey L. Gurn, MD11; Corinna Zygourakis, MD12; Virginie Lafage, PhD13; Frank J. Schwab, MD13; Christopher I. Shaffrey, MD14; Douglas C. Burton, MD15; Shay Bess, MD16; Christopher P. Ames, MD12; ESSG European Spine Study Group17; International Spine Study Group18
1Barcelona, Spain; 2Washington University, Saint Louis, MO, US; 3UVA Health System, Charlottesville, VA, US; 4Acibadem University, School of Medicine, Istanbul, Ataşehir, Turkey; 5Ankara, Turkey; 6De La Paz (Madrid), Madrid, Spain; 7Switzerland; 8Bordeaux, France; 9Baylor Scott & White Health Research Institute, Dallas, TX, US; 10Southwest Scoliosis Institute, Plano, TX, US; 11Norton Leatherman Spine Center, Louisville, KY, US; 12University of California, San Francisco, San Francisco, CA, US; 13Hospital for Special Surgery, New York, NY, US; 14University of Virginia, Charlottesville, VA, US; 15University of Kansas Medical Center, Kansas City, KS, US; 16Denver, CO, US; 17European Spine Study Group, Barcelona, Spain; 18Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:54-11:00 a.m.
168. The Implementation of HRQOL Instruments in Appropriateness Criteria of Surgery for Degenerative Lumbar Scoliosis
Eva Jacobs, MD1; Paul Willems, MD2
1Maastricht, Netherlands; 2Maastricht University Medical Center, Maastricht, Netherlands
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:00-11:15 a.m.
Discussion

11:15-11:21 a.m.
169. Minimally Invasive versus Standard Surgery in Idiopathic Scoliosis Patients: A Comparative Study
Vishal Sarwahi, MD1; Jesse M. Galina, BS2; Stephen Wendolowski3; Charlotte de Bodman, MD4; Yungtai Lo, PhD5; Romain Dayer, MD6; Terry D. Amaral, MD7; Alexandre Ansorge, MD8
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
11:21-11:27 a.m.
170. Comparison of Three Lumbopelvic Fixation Techniques in Long Fusion to the Sacrum in Osteoporotic Adult Spinal Deformity Patients (>60 Years): Clinical and Radiological Outcomes
Emel Kaya, MD1; Sinan Kahraman, MD1; IsiK Karalok, MD2; Cem Sever, MD3; Yunus Emre Akman, MD1; Tunay Sanli, MA1; Meric Enercan, MD1; Selhan Karadereler, MD1; Azmi Hamzaoglu, MD1
1Istanbul Spine Center, Istanbul, Turkey; 2Istanbul Spine Center, Istanbul, Turkey
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:27-11:33 a.m.
171. The Amount of Curve Correction is More Important than Upper Instrumented Vertebra Selection for Ensuring Postoperative Shoulder Balance in Lenke Type 1 Adolescent Idiopathic Scoliosis
John A. Sielatycki, MD1; Eduardo C. Beauchamp, MD2; Suthipas Pongmanee, MD3; Ronald A. Lehman Jr., MD4; Lawrence G. Lenke, MD5
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:33-11:39 a.m.
172. Is Achieving Optimal Spinopelvic Parameters Necessary to Obtain Substantial Clinical Benefit? Analysis of Patients Who Underwent Circumferential MIS or Hybrid Surgery with Open Posterior Instrumentation
Paul Park, MD1; Robert K. Eastlack, MD2; Kai Fu3; Stacie Nguyen, MPH4; Gregory M. Mundis Jr., MD5; Juan S. Uribe, MD6; Michael Y. Wang, MD7; Khoi D. Than, MD8; David O. Okonkwo, MD9; Adam S. Kanter, MD10; Pierce D. Nunley, MD11; Neel Anand, MD12; Richard G. Fessler, MD, PhD13; Dean Chou, MD14; International Spine Study Group15
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
10:42-10:48 a.m.
176. Novel Rapid Application Antimicrobial Spine Implant Coating Protects Against Bacterial Infection
Howard Y. Park, MD1; Weixian Xi, PhD2; Vishal Hegde, MD3; Stephen Zoller, MD1; William Sheppard, BS4; Joshua D. Proal5; Christopher Hamad, BS2; Samuel J. Clarkson, BA2; Gideon W. Blumstein, MD, MS5; Zachary Burke, MD4; Nicholas Bernthal, MD7

1UCLA Medical Center, Department of Orthopaedic Surgery, Los Angeles, CA, US; 2University of California Los Angeles, Los Angeles, CA, US; 3University of California, Los Angeles, Los Angeles, CA, US; 4University of California, Los Angeles, Los Angeles, CA, US; 5UCLA Orthopaedic Surgery Residency Program, Los Angeles, CA, US; 6UCLA, Santa Monica, CA, US

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

10:48-10:54 a.m.
177. Non-Invasive, PET Imaging with Zirconium Probes Accurately Localizes Staphylococcus Aureus Spine Implant Infections
Howard Y. Park, MD1; Stephen Zoller, MD1; Zachary Burke, MD2; William Sheppard, BS3; Christopher Hamad, BS4; Joshua D. Proal5; Samuel J. Clarkson, BA2; Rachel M. Borthwell, BS, BA2; Gideon W. Blumstein, MD, MS5; Nicholas Bernthal, MD6

1UCLA Medical Center, Department of Orthopaedic Surgery, Los Angeles, CA, US; 2Los Angeles, CA, US; 3UCLA Department of Orthopaedic Surgery, Los Angeles, CA, US; 4University of California, Los Angeles, Los Angeles, CA, US; 5UCLA Orthopaedic Surgery Residency Program, Los Angeles, CA, US; 6UCLA, Santa Monica, CA, US

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

10:54-11:00 a.m.
178. Excising the Guesswork: Fluorescence-Guided Infection Debridement Surgery within a Mouse Model of Spine Infection
Howard Y. Park, MD1; Stephen Zoller, MD1; Zachary Burke, MD2; William Sheppard, BS3; Christopher Hamad, BS2; Ryan Smith, BS4; Samuel J. Clarkson, BA2; Joshua D. Proal5; Gideon W. Blumstein, MD, MS5; Zachary Burke, MD3; Rachel M. Borthwell, BS, BA2; Nicholas Bernthal, MD7

1UCLA Medical Center, Department of Orthopaedic Surgery, Los Angeles, CA, US; 2Los Angeles, CA, US; 3UCLA Department of Orthopaedic Surgery, Los Angeles, CA, US; 4University of California, Los Angeles, Los Angeles, CA, US; 5UCLA Orthopaedic Surgery Residency Program, Los Angeles, CA, US; 6UCLA, Santa Monica, CA, US

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

11:00-11:15 a.m.
Discussion

11:15-11:21 a.m.
179. Alignment Targets, Curve Proportion and Mechanical Loading: Preliminary Analysis of an Ideal Shape Toward Reducing Proximal Junctional Kyphosis
Renaud Lafage, MSc1; Frank J. Schwab, MD1; Han Jo Kim, MD1; Justin S. Smith, MD, PhD2; Breton Line, BS3; Christopher I. Shaffrey, MD4; Douglas C. Burton, MD5; Christopher P. Ames, MD6; Gregory M. Mundis Jr., MD7; Richard A. Hostin Jr., MD8; Shay Bess, MD9; Eric O. Klineberg, MD10; Peter G. Passias, MD11; Virginie Lafage, PhD12; International Spine Study Group12


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

11:21-11:27 a.m.
180. Effects of Added Compression on Sagittal Plane Lumbosacral Junction Rod Strain and Sacral Screw Bending Moment During In Vitro Loading
Anna G. Newcomb, MS1; Jennifer Lehrman, MS2; Bernardo De Andrade Pereira, MD3; Randall J. Hlubek, MD4; Jakub Godzik, MD4; Jay D. Turner, MD, PhD5; Brian Kelly, PhD2


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

11:27-11:33 a.m.
181. In Vivo Assessment of Spinal Cord Elasticity Using Shear Wave Ultrasound in Dogs
Abdulrahman Albakr, MD1; Amro F. Al-Habib, MD, FRCSC, MPH2

1Riyadh, Saudi Arabia; 2King Saud University, College of Medicine, Department of Surgery, Riyadh, Saudi Arabia

FDA Device/Drug Status: Ultrasound Elastography (Investigational/Not approved).
11:33-11:39 a.m.
182. In Vivo Synergistic Effect of Checkpoint Blockade and Radiation Therapy Against Chordomas in a Humanized Mouse Model

Wataru Ishida, MD1; Hui Wang, PhD, MD2; Kyle L. McCormick, BA3; Aayushi Mahajan, MS3; Eric M. Feldstein, BS4; Sheng-fu L. Lo, MD, MHS5


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

11:39-11:45 a.m.
183. Correlation of Intervertebral Disc TNFα Concentration with Clinical Characteristics of Patients with Acute and Chronic Inflammatory Radiculopathy Secondary to Lumbar Disc Herniation

Paul B. Bishop, MD, PhD, DC1; John Street, MD, PhD2; Jeffrey A. Quon, DC, MHSc, PhD, FCCS(C)3; Brian E. Arthur, DC, MSc4; Gabriella M. Petrollini, BSc5; Melissa Nadeau, MD, MHS, FRSCS5; Tamir Ailon, MD, MPH6; Nicolas Dea, MD, MSc, FRSCS6; Charles G. Fisher, MD, FRSCS, MHS6; Brian K. Kwon, MD, PhD, FRSCS6

1Blusson Spine Centre, Vancouver, BC, Canada; 2Vancouver, BC, Canada; 3UBC School of Population and Public Health, Vancouver, BC, Canada; 4Vancouver Spine Surgery Institute, Vancouver, BC, Canada; 5Vancouver General Hospital, Vancouver, BC, Canada

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

11:45 a.m.-12:00 p.m.
Discussion

10:30 a.m.-12:10 p.m.
International Spine Forum Symposium: Lumbar Degenerative
Room 404AB

Moderators: Clifford Everett, MD, MPH; Bhavuk Garg, MD

Agenda
• Role of Weekly Administered Teriparatide in Bony Union Enhancement After Posterior or Transforaminal Lumbar Interbody Fusion for Osteoporosis-Associated Lumbar Degenerative Disorders: A Multicenter, Prospective, Randomized Study
Hirotaka Haro, MD, PhD
Japanese Society for Spine Surgery and Related Research (JSSR)

• True Percutaneous Transforaminal Lumbar Interbody Fusion (pTLIF) With an Expandable Interbody Cage Using the Endoscopic Trans-Kambin Approach: A Long-Term Follow-Up Report of 50 Cases
Rudolf Morgenstern, MD, PhD
ISMISS

• Preserving Spine Motion in the Treatment of Late Cascade and Multilevel Lumbar Degeneration
Bambang Darwono, MD, PhD
Indonesian Spine Society

• Radiation Reduction With 2D Navigation in Lumbar Spine Fusion
Mark Thomas, FRCS
British Association of Spinal Surgeons (BASS)

• Posterior Reduction and Pedicle Screw Augmented Interbody Fusion in the Management of High Grade Adult Lumbar Spondylolisthesis: An Institutional Review of 41 Patients
Ali Abou-Madawi, MD
Egyptian Spine Association

• UKSSB-BASS/BRITSPINE

• Complex Lumbar Canal Stenosis
Gururaj Sangondimath, MBBS
Association of Spinal Surgeons of India (ASSI)

• Lumbar Stenosis: Decompression Alone or Associated with Fusion?
Murilo Tavares Daher, MD
Brazilian Spine Society

• Discussion, Questions and Answers
Faculty Panel

10:30 a.m.-12:00 p.m.
Exercise Committee Presentation:
Nutritional Considerations for Spine Care
The Learning Place, Red Theater

Moderator: Ryan A. Tauzell, PT, MA, Cert. MDT

Nutrition plays an important role in health, wellness, and prevention and treatment of various disorders. Numerous factors and comorbidities are apparent in patients with spinal pain disorders that may be responsive to nutritional interventions, ranging from physiological processes (e.g. inflammation) to general health (e.g. obesity). However, specific information is largely unavailable to assist spine care practitioners with clinical decision-making processes for implementation of nutritional approaches for their patients. Faculty will discuss nutritional considerations for management of spinal pain disorders.
10:05 a.m.-12:00 p.m.

Abstract Presentations:
How Should We Measure Our Success?
Concourse Hall 151

Moderator: Andrew J. Schoenfeld, MD

10:45-10:51 a.m.
184. Clinical Outcomes Research in Spine Surgery: What are Appropriate Follow-Up Times?
Nicolas Dea, MD, MSc, FRCSC1; Charles G. Fisher, MD, FRCS, MHS2; Tamir Ailon, MD, MPH3
1Blusson Spinal Cord Center, Vancouver, BC, Canada; 2Vancouver General Hospital, Vancouver, BC, Canada; 3Vancouver Spine Surgery Institute, Vancouver, BC, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:51-10:57 a.m.
185. Perioperative Depression and Anxiety Correlate with Patient-Reported Outcomes in Spine Surgery
Rafa Rahman1; Alvaro Ibaseta, MS2; Jay S. Reidelr, MD, MPh3; Richard L. Skolasky, ScD4; David B. Cohen, MD, MPh4; Daniel M. Scibb, MD1; Khaled M. Kebatish, MD2; Brian J. Neuman, MD2
1Johns Hopkins University School of Medicine, Baltimore, MD, US; 2Baltimore, MD, US; 3Johns Hopkins Hospital, Baltimore, MD, US; 4Johns Hopkins University, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

10:57-11:03 a.m.
186. Determination of Clinically Meaningful PROMIS Severity Ranges for Cervical Degenerative Patients
Rafa Rahman1; Alvaro Ibaseta, MS2; Jay S. Reidelr, MD, MPh3; Richard L. Skolasky, ScD4; David B. Cohen, MD, MPh4; Daniel M. Scibb, MD1; Khaled M. Kebatish, MD2; Brian J. Neuman, MD2
1Johns Hopkins University School of Medicine, Baltimore, MD, US; 2Baltimore, MD, US; 3Johns Hopkins Hospital, Baltimore, MD, US; 4Johns Hopkins University, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

11:03-11:09 a.m.
187. PROMIS Correlates with Patient Satisfaction and VAS Back Pain Scores
Samantha R. Horn, BA1; Frank A. Segreto, BS2; Cole Bortz, BA3; Dennis Vasquez-Montes, MS, BA2; Leah Steinmetz, BA3; Nicholas Stekas, BS3; Christopher Varlotta, BS1; Nicholas J. Frangella, BS4; David H. Ge, BA5; Bradley Johnson, MD1; Renaud Lafage, MSc6; Virginie Lafage, PhD7; Michael C. Gerling, MD8; Themistocles S. Protopsaltis, MD1; Thomas J. Errico, MD1; Charla R. Fischer, MD3; Peter G. Passias, MD8
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**11:34-11:40 a.m.**

**190. Correlation Between ODI and PROMIS in Minimally Invasive Lumbar Decompression Surgery**

Avani S. Vaishnav, MBBS\(^1\); Steven J. McAnany, MD\(^2\); Catherine Himo Gang, MPH\(^3\); Todd J. Albert, MD\(^1\); Sheeraz A. Qureshi, MD, MBA\(^3\)

\(^1\)Hospital for Special Surgery, New York, NY, US; \(^2\)Stamford, CT, US; \(^3\)New York, NY, US

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

**11:40-11:46 a.m.**

**191. Correlation Between ODI and PROMIS in Minimally Invasive Microdiscectomy**

Avani S. Vaishnav, MBBS\(^1\); Steven J. McAnany, MD\(^2\); Catherine Himo Gang, MPH\(^3\); Todd J. Albert, MD\(^1\); Sheeraz A. Qureshi, MD, MBA\(^3\)

\(^1\)Hospital for Special Surgery, New York, NY, US; \(^2\)Stamford, CT, US; \(^3\)New York, NY, US

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

**11:46 a.m.-12:00 p.m.**

**Discussion**

**11:00 a.m.-1:00 p.m.**

**Surgical Innovation Lab Demonstrations**

(Non-CME)

The Learning Place

**Blue Lab: Private Lab**

**12:00-12:20 p.m.**

**Solution Showcase** (Non-CME)

The Learning Place, Red Theater

**Hans Biomed:** Clinical Use of Demineralized Cancellous Bone Block (D-Sure Block)

Speaker: Seong Sun, MD

**12:00-1:00 p.m.**

**Complimentary Boxed Lunch**

(Medical Attendees Only)

Technical Exhibition, Booth 449

**Career Building Professional Headshots**

The Learning Place

Stop by the Career Building suite to get an updated professional headshot taken for online networking or to enhance your CV.

**Simulated Surgery Lab** (Non-CME)

The Learning Place

**1:00-1:05 p.m.**

**NASS Working for You:**

**Coding Update**

Concourse Hall 151

**1:00-2:30 p.m.**

**Symposium:**

**Predatory Publishing: What’s Real and What’s Fake News?**

Concourse Hall 152

Moderator: Donna D. Ohnmeiss, PhD

Published literature has been the primary source of spine care education and the basis for evidence-based medicine that drives decisions by payers and regulatory agencies. Electronic media is changing the face of medical education, including journals. Online access is now the norm. Open access publishing continues to become more common since there are more options for incorporating videos, slides, additional data in appendices, etc. with the articles. Unfortunately, the promise of open access publishing has given rise to abuse such as predatory journals.

With the rapidly increasing number of non-print publishing vehicles, there will be greater demand for disclosure, transparency, and accountability for article content, in addition to enforcement of policy for registering studies as a criterion for publication. Faculty will provide updates in these areas and explore how these factors come together to improve the access and quality of spine literature.
Upon completion of this session, participants should gain strategies to:
- Provide updates on publishing in spine with respect to formats available and current trends;
- Describe the evolving role of open access journals including the unfortunate development of predatory journals;
- Discuss the role of study registries in evaluating publications.

**Agenda**

- **Introduction**
  Donna D. Ohnmeiss, PhD
- **New Direction of The Spine Journal**
  Christopher M. Bono, MD
- **Trends in Publishing: Avoiding Predatory Journals and Increasing Transparency**
  Donna D. Ohnmeiss, PhD
- **Slicing and Dicing Big Data: Quality Research versus Fake News**
  Andrew J. Schoenfeld, MD
- **Introduce NASS Open Access Journal**
- **Discussion, Questions and Answers**
  Faculty Panel

### 1:00-2:30 p.m.

**Abstract Presentations:**

#### Achieving Lumbar Interbody Fusion

**Room 403A**

Moderator: Chris Steyn, MD

### 1:00-1:06 p.m.

192. Clinical Evaluation of a New Allograft Cage Designed for TLIF: A Minimal One-Year Follow-Up

Wen jie Wu, MD; Jianzhong Xu, MD

1Southwest Hospital, Chongqing, Chongqing, China; 2Department of Orthopaedics, Southwest Hospital, Third Military Medical University, Chongqing, Chongqing, China

**FDA Device/Drug Status:** Allograft cage (Approved for use in China).

### 1:06-1:12 p.m.

193. Comparative Analysis of Three Transforaminal Lumbar Interbody Fusion (TLIF) Techniques: Open, Midline MIS and Wiltse

David H. Ge, BA; Christopher Variotta, BS; Nicholas Stekas, BS; Leah Steinmetz, BA; Dennis Vasquez-Montes, MS, BA; Tomas Kuprys, MD; Kolawole A. Jegede, MD; Jeffrey M. Spivak, MD, MSc; Yong H. Kim, MD; Afshin E. Razi, MD; Charla R. Fischer, MD; Thomas J. Errico, MD; Anthony Petrizzo, DO; John A. Bendo, MD; Jeffrey A. Goldstein, MD, FACS; 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.

### 1:12-1:18 p.m.

194. The Effect of Preoperative Symptom Duration on Postoperative Outcomes Following Transforaminal Lumbar Interbody Fusion

Benjamin Khechen, BA; Brittany E. Haws, BS; Dil V. Patel, BS; Jordan Guntin, BS; Kaitlyn L. Cardinal, BS; Kern Singh, MD

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

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

### 1:18-1:24 p.m.

195. Preoperative PROMIS Score is not Predictive of Postoperative Pain, Narcotics Consumption, or Patient-Reported Outcomes after Minimally Invasive Transforaminal Lumbar Interbody Fusion

Brittany E. Haws, BS; Benjamin Khechen, BA; Dil V. Patel, BS; Ankur S. Narain, BA; Jordan Guntin, BS; Kaitlyn L. Cardinal, BS; Kern Singh, MD

1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopaedics at Rush, Chicago, IL, US; 3Rush University Medical Center-Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US

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

### 1:24-1:30 p.m.

196. Preoperative Disc Height Predicts TLIF Cage Subsidence

Alfred J. Pisano, MD; Theodore Steelman, MD; Scott Wagner, MD; Melvin D. Helgeson, MD; Daniel G. Kang, MD

1Walter Reed National Military Medical Center, Bethesda, MD, US; 2North Potomac, MD, US; 3Madigan Army Medical Center, Tacoma, WA, US

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

### 1:30-1:45 p.m.

Discussion
1:45-1:51 p.m.
197. Expandable Graft-Containing Fabric Mesh System for Single-Level Lumbar Interbody Stabilization: One-Year Clinical and Radiographic Results from a Prospective Clinical IDE Trial
Ziev B. Moses, MD1; Kevin T. Huang, MD2; Martin H. Krag, MD3; Pierce D. Nunley, MD4; Mohamad Bydon, MD5; John H. Chi, MD1
1Brigham and Women’s Hospital, Boston, MA, US; 2Brigham and Women’s Hospital - Department of Neurosurgery, Boston, MA, US; 3Department of Orthopaedics & Rehab University of Vermont, Burlington, VT, US; 4Spine Institute of Louisiana, Shreveport, LA, US; 5Mayo Clinic, Rochester, MN, US
FDA Device/Drug Status: OptiMesh® Graft Containment (Investigational/Not approved).

2:09-2:15 p.m.
201. Safe Posterior Thoracic Discectomy Through a Modified Transforaminal Thoracic Interbody Fusion (TTIF) Approach: Technique Description and Case Series
Michael Millgram, MD1; William Beutler, MD, FACS2; Richard D. Guyer, MD3; Ely Ashkenazi, MD4
1Israel Spine Center, Tel Aviv, Israel; 2Pennsylvania Spine Institute, Harrisburg, PA, US; 3Texas Back Institute, Plano, TX, US; 4Israel Spine Center, Assuta Hospital, Tel Aviv, Israel
FDA Device/Drug Status: The Dreal Tissue Removal Device (Approved for this indication).

1:51-1:57 p.m.
198. The Changes of Volume of Psoas Muscle after Oblique Lateral Interbody Fusion L4-5 for Treatment of Degenerative Lumbar Disease: The Observation of the Effect on Atrophic Changes and Correlation with Clinical Outcomes
Jin-Sung L. Kim, MD, PhD
Seoul St Mary's Hospital, Seocho gu, Seoul
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:57-2:03 p.m.
199. Use of Motor Evoked Potentials during Lateral Lumbar Interbody Fusion Reduces Postoperative Deficits
Michael R. Riley, MS, CNIM1; Adam Doan, DC, DABNM1; Richard Vogel, PhD, DABNM1; Alexander O. Aguirre2; Kayla S. Pieri2; Edward H. Scheid, MD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

2:03-2:09 p.m.
200. The Oblique Lumbar Interbody Fusion (OLIF), Including the L5S1 Level: Early Postoperative Safety Profile in a Multicenter Review
Richard A. Hynes, MD1; Kamal R. Woods, MD2; Alexander Yu, MD3; James B. Blyths, MD1
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
1:12-1:18 p.m.
204. Comparison of Supine Lateral X-Ray and CT Images with Standing Lateral X-Ray in Predicting Kyphosis Flexibility with Apex at T10-L2 in Adult Degenerative Spinal Deformity
Xianglong Meng, MD1; Ronald A. Lehman Jr., MD2; Lawrence G. Lenke, MD3
1Chaoyang Hospital of Capital Medical University, Beijing, China; 2The Spine Hospital -Columbia University/New York Presbyterian, New York, NY, US; 3New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:18-1:24 p.m.
205. Supine versus Weight Bearing MRI in the Evaluation of Patients with Lumbar Spondylolisthesis
Richard D. Guyer, MD1; Donna D. Ohnmeiss, PhD2
1Texas Back Institute, Plano, TX, US; 2Texas Back Institute Research Foundation, Plano, TX, US
FDA Device/Drug Status: Esaote MRI scanner (Approved for this indication).

1:24-1:30 p.m.
206. Utility of Routinely Repeated Magnetic Resonance Imaging in Surgical Patients with Lumbar Stenosis
Bryan S. Lee, MD1; Rod J. Nault, BA2; Matthew M. Grabowski, MD2; Benjamin B. Whiting, MD2; Joseph E. Tanenbaum, BA4; Matthew Poturalski, MD1; Todd M. Emch, MD5; Thomas E. Mroz, MD6; Michael P. Steinmetz, MD5
1Cleveland Clinic Foundation, Cleveland, OH, US; 2Case Western Reserve University SOM, Cleveland, OH, US; 3Cleveland, OH, US; 4Cleveland Clinic Center for Spine Health, Cleveland, OH, US; 5Cleveland Clinic, Cleveland, OH, US; 6Cleveland Clinic Departments of Orthopaedic and Neurological Surgery, Cleveland, OH, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

1:30-1:36 p.m.
207. Noninvasive MR Spectroscopy (MRS) of Lumbar Discs Correlates with Surgery Outcomes in Discogenic Low Back Pain (DLBP) Patients
Matthew F. Gornet, MD1; Jeffrey C. Lotz, PhD2; Robert K. Eastlack, MD3; James C. Peacock III, JD, BS4; Francine W. Schranck, RN, BSN4; John Claude4; Anne G. Copay, PhD5
1The Orthopedic Center of St. Louis, St. Louis, MO, US; 2University of California, San Francisco, San Francisco, CA, US; 3Scripps Clinic, San Diego, CA, US; 4Nocimed, Redwood City, CA, US; 5SPIRITT Research, Saint Louis, MO, US
FDA Device/Drug Status: NOCISAN-LS (Investigational/Not approved).

1:36-1:54 p.m.
Discussion
2:12-2:18 p.m.
211. The Feasibility of Transcutaneous Transabdominal Stimulation of the Lumbosacral Nerve Roots in Lumbar Spine Surgery
Juan S. Uribe, MD1; Antoine Tohmeh, MD2; William D. Smith, MD3; Jeffrey R. Balzer, PhD4; James B. Billsy, MD5; Adam S. Kanter, MD6; David O. Okonkwo, MD7; Robert K. Eastlack, MD8; Douglas G. Orndorff, MD9; Jim A. Yousef, MD9
FDA Device/Drug Status: XLIF (Approved for this indication), TMAP (Approved for this indication).

2:18-2:30 p.m.
Discussion

1:00-2:30 p.m.
Interdisciplinary Spine Forum: Opiates and What Should We Be Doing First?
Room 406AB
Moderator: Robb Russell, DC

A historic number of governmental, professional and trade organizations, including the FDA, CDC, Joint Commission and Association of US Attorneys General, have recommended less use of opioids for the management of pain than currently practiced in the United States. Specifically related to back pain, treatment guidelines published by the American College of Physicians as well as diagnosis and treatment guidelines jointly issued by the VA and Department of Defense, have similarly advised against use of opioids. Both guidelines recommended several non-pharmaceutical approaches.

This multidisciplinary panel will review the clinical problems associated with the over-prescribing of opioid medications and present evidence-based options for nonoperative care of patients suffering from such pain. Emerging spine care pathways that advocate alternative pharmacological approaches, as well as early use of pain psychology, acupuncture, spinal manipulation and patient self-care, will be presented within the context of patient satisfaction and improved clinical outcomes.

Upon completion of this session, participants should gain strategies to:
- Understand the history and drivers that have led to the overuse of opioids for spine pain and the clinical and social ramifications;
- Recognize the evidence for inclusion of non-opioid procedures and practices;
- Be aware of how diagnosis-based clinical decision-making can lead to incorporation of non-opioid spine care for acute and chronic back pain.

Agenda
- Introduction of Panel and Topic
  Robb Russell, DC
- Opioid versus Non-Opioid Medications for Chronic Back Pain: The SPACE Trial
  Erin Krebs, MD
- Psychological Assessment and Treatment of Chronic Back Pain: Alternatives to Opioids
  Daniel Bruns, PhD
- Integrating Complementary and Alternative Management Using Diagnosis-Based Decisions
  Melissa Nagare, DC, LAc
- Discussion, Questions and Answers
  Faculty Panel

1:00-2:40 p.m.
International Spine Forum Symposium: Cervical Spine
Room 404AB
Moderators: Sandeep Gidvani, MD; Hani Mhaidli, MD, PhD

Agenda
- Clinical and Radiological Outcomes of Anterior Cervical Decompression and Fusion ACDF in Patient with Multilevel Cervical Degenerative Disc Disease
  Abdul Moeen Baco, FRCS, MSc, MbChB
  Qatar Spine
- Modified Kurokawa Laminoplasty for Cervical Spine Pathologies
  Prof. Muhammad Tariq Sohail
  Pakistan Spine Society
- Lateral Mass Screw: Another Point of View
  Máximo-Alberto Díez-Ulloa, MD, PhD
  GEER (Spanish Spine Society)
- The Lateral Notch-Referred Technique for Subaxial Cervical Spine Pedicle Screw Placement
  Kai Cao, MD, PhD
  Chinese Association of Orthopaedic Surgeons (CAOS)
- MI Posterior Decompression in Cervical Myelopathy: Technical Note and Preliminary Results
  Jose Antonio Soriano-Sanchez, MD
  Mexican Spine Society (Asociacion Mexicana de Cirujanos de Columna, A.C.) (AMCICO)
As spine surgery and associated technology continues to rapidly advance, methods of improving patient outcomes through surgical interventions and perioperative imaging modalities remain controversial. Due to the vast new technologies available, there remains a tremendous need for continued education in the training of current and future spinal surgeons regarding knowledge and surgical application in the field.

Faculty will explore the new advances in the field of emerging technologies in spine surgery and provide the current state of the art in the use of technology for treating spinal pathology. Some topics include, intraoperative imaging, navigation, robotics, next generation microscopes and surgical instruments, combinatorial technologies, augmented reality, and surgical simulators.

Upon completion of this session, participants should gain strategies to:
- Develop an understanding of the role of emerging technologies in improving the care of neurosurgical patients with spinal disorders;
- Identify the indications to use and the expected outcomes of utilizing navigation and emerging technologies in the treatment of spinal disorders.
- Develop a strategy to implement new technologies providing beneficial spinal care for patients with spinal disorders.

**Agenda**

1:05-2:30 p.m.

**Symposium:**

**Emerging Technologies in Spine Surgery**

Concourse Hall 151

Moderators: Erica F. Bisson, MD; Doniel Drazin, MD, MA

As spine surgery and associated technology continues to rapidly advance, methods of improving patient outcomes through surgical interventions and perioperative imaging modalities remain controversial. Due to the vast new technologies available, there remains a tremendous need for continued education in the training of current and future spinal surgeons regarding knowledge and surgical application in the field.

Faculty will explore the new advances in the field of emerging technologies in spine surgery and provide the current state of the art in the use of technology for treating spinal pathology. Some topics include, intraoperative imaging, navigation, robotics, next generation microscopes and surgical instruments, combinatorial technologies, augmented reality, and surgical simulators.

Upon completion of this session, participants should gain strategies to:
- Develop an understanding of the role of emerging technologies in improving the care of neurosurgical patients with spinal disorders;
- Identify the indications to use and the expected outcomes of utilizing navigation and emerging technologies in the treatment of spinal disorders.
- Develop a strategy to implement new technologies providing beneficial spinal care for patients with spinal disorders.

2:30-2:55 p.m.

**Networking Break Beverage Service**

South Lobby

2:55-3:00 p.m.

**NASS Working for You:**

**AHRQ Registry Outcomes Harmonization**

Concourse Hall 151

Moderator: Zoher Ghogawala, MD, FACS
Symposium:
Quest for Truth: Are Online Databases Reliable and Do They Reflect True Outcomes?
Concourse Hall 151
Moderator: Daniel M. Sciubba, MD

In the recent past, several publications have been published based on the resources available online like the national inpatient sample (NIS), national re-admission rate (NRD), Pearl Diver, State Ambulatory Surgery and Services Databases (SASD), Market Scan, SPARKS (NY database), Medicare/Medicaid, National Surgical Quality Improvement Program—NSQUIP and Quality and Outcomes Database—(previously N2QOD). Some of the databases like QOD and NASS registry are comprised of data entered directly by the researcher associated with the spine surgeon. This data appears to be more granular and answers specific questions required for scientific progress. On the other hand, databases like the NIS, NRD, SPARKS, SASD have been accumulated by HCUP based on the ICD and CPT codes used for billing by the hospital based on the diagnosis established. This can be during inpatient stay, follow up or readmission period. Pearl Diver accumulates similar data based on Medicare and Humana.

Spine surgeons/ARNP/PA rely on the publications based on these databases. For the authors working on the databases within these publications, it is important that the audience is presented with the question of authenticity of the data discussed. There are several vital parameters like racial disparity in outcome, length of stay, and cost analysis that can be extracted from the database. This information can profoundly influence the management in diverse ways. Although these databases have a very large number of population, the level of evidence has to be ascertained. In this symposium, faculty who have used these databases for publications will include a summary of each database and describe data extraction, reliability, advantage, limitation and granularity.

Upon completion of this session, participants should gain strategies to:
• Ask why do we need big data?;
• Know these online databases’ granularity, reliability and level of evidence;
• Assess each database and their limitations;
• Choose the right database for your research;
• Adopt a database for your own institution.

Agenda
• Introduction
  Daniel M. Sciubba, MD
• Why NASS Registry and How It Can Influence Your Practice
  Zoher Ghogawala, MD, FACS
• QOD (N2QOD) - ODI, EQ-5D, VAS: How to Include in Your Institution
  Damian Brusko, BS
• NIS/NRD Length of Stay/Discharge/Cost Analysis/Readmission
  Karthik Madhavan, MD
• NRD: Why Readmission Data Matters
  Piyush Kalakoti, MD, MBBS
• Pearl Diver/SPARCS: Is Longitudinal Database for Everyone?
  Lee Onn Chieng, MD
• Market Scan
  Anand Veeravagu, MD
• NSQUIP: How to Use the Surgeons’ Database
  Nikita Lakomkin
• Discussion, Questions and Answers
  Faculty Panel

Abstract Presentations:
Optimizing Lumbar Disc Surgery
Concourse Hall 152
Moderator: Carrie A. Diulus, MD

212. Surgery versus Standardized Nonoperative Care for the Treatment of Lumbar Disc Herniations with 4-12 Months of Symptoms
Christopher S. Bailey, MD, FRCSC; Jennifer Urquhart, PhD; Keith Sequeira, MD; Thomas A. Miller, MD; Kevin R. Gurr, MD; Fawaz Siddiqi, MD; Joanne P. Collie; Richard Rosedale, PT, Dip.MDT; Shauna L. Dehens, RN; Stewart I. Bailey, MD; Parham Rasoulinejad, MD

1University of West Ontario/London Health Sciences Centre, London, ON, Canada; 2London, ON, Canada; 3Western University, London, ON, Canada; 4London Health Sciences Centre, London, ON, Canada; 5Ilderton, ON, Canada; 6The Hospital for Sick Children, Toronto, ON, Canada

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
3:06-3:12 p.m.
213. The Impact of Lumbar Discectomy on Patient-Reported Outcomes: A Matched Cohort Study
David S. Jevotovsky, BA1; Caroline P. Thirukumaran, MBBS, MHA, PhD2; Paul T. Rubery Jr., MD1
1Rochester, NY, US; 2University of Rochester Medical Center, Rochester, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:12-3:18 p.m.
214. Application of Gelatin Sponge Impregnated with a Mixture of Three Drugs to Intraoperative Nerve Root Block to Promote Early Postoperative Recovery of Lumbar Disc Herniation
Jin Peng Du, MD1; Yong Fan, MD2
1Xi’an HongHui Hospital, Xi’an, China; 2Xi’an, China
FDA Device/Drug Status: ropivacaine (Approved for this indication), dexamethasone (Approved for this indication), vitamin B12 injection (Approved for this indication).

3:18-3:24 p.m.
215. Patients Presenting with a Lumbar Far-Lateral Herniated Nucleus Pulposus Can Expect Similar Postoperative Outcomes to Those Presenting with a Central or Paracentral Herniation
Bryce Basques, MD, MHS1; Philip Louie, MD2; Deven Carroll, MS3; Michael T. Nolte, MD4; Steven T. Heidt, BS5; Justin C. Paul, MD, PhD6; Edward J. Goldberg, MD7; Howard S. An, MD8
1Yale School of Medicine, New Haven, CT, US; 2Rush University Medical Center, Chicago, IL, US; 3North Chicago, IL, US; 4Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 5Rush Medical College, Chicago, IL, US; 6Danbury Orthopedics, Danbury, CT, US; 7Yale University School of Medicine, New Haven, CT, US; 8Midwest Orthopedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:24-3:30 p.m.
216. Resolution and Factors Associated with Low Back Pain After Lumbar Discectomy: A CSORN Registry Study
Christian Iorio-Morin, MD, PhD1; Charles G. Fisher, MD, FRCS, MHS2; Nicolas Dea, MD, MSc, FRCS3
1Université de Sherbrooke, Sherbrooke, QC, Canada; 2Vancouver General Hospital, Vancouver, BC, Canada; 3Vancouver, BC, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:30-3:36 p.m.
217. Increasing Reoperation Rates and Inferior Outcome with Prolonged Symptom Duration in Lumbar Disc Herniation Surgery
Christian C. Stoetttrup, MD1; Andreas K. Andresen, MD2; Mikkel Andersen, MD3; Leah Y. Carreon, MD, MSc4
1Lillebaelt Hospital, Middelfart, Denmark; 2Spine Center of Southern Denmark, Middelfart, Denmark; 3Middelfart, Denmark; 4Sygehus Lillebaelt - Rygkirurgi Middelfart, Middelfart, Middelfart, Denmark
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:36-3:42 p.m.
218. Patients Undergoing Revision Microdiscectomy for Recurrent Lumbar Disc Herniation Experience Worse Clinical Outcomes and More Reoperations Compared to Patients Undergoing a Primary Microdiscectomy
Philip Louie, MD1; Bryce Basques, MD, MHS2; Michael T. Nolte, MD3; Kamran Movassaghi4; Jonathan Markowitz, BS5; Arya G. Varthi, MD6; Justin C. Paul, MD, PhD7; Edward J. Goldberg, MD8; Howard S. An, MD3
1Rush University Medical Center, Chicago, IL, US; 2Yale School of Medicine, New Haven, CT, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Chicago, IL, US; 6Yale University School of Medicine, New Haven, CT, US; 7Danbury Orthopedics, Danbury, CT, US; 8Midwest Orthopedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

3:42-4:00 p.m.
Discussion
3:00-4:00 p.m.

Abstract Presentations:
Spinal Deformity Analysis
Room 403A

Moderator: Christopher I. Shaffrey, MD

3:00-3:06 p.m.

219. Surgical Outcomes in Rigid versus Flexible Cervical Deformities

Themistocles S. Protopsaltis, MD1; Nicholas Stekas, BS2; Justin S. Smith, MD, PhD3; Alexandra Soroceanu, MD, MPH4; Renaud Lafage, MSc5; Alan H. Daniels, MD6; Han Jo Kim, MD7; Peter G. Passias, MD7; Gregory M. Mundis Jr., MD8; Eric O. Klineberg, MD9; D. Kojo Hamilton, MD10; Munish C. Gupta, MD11; Virginie Lafage, PhD12; Robert A. Hart, MD13; Frank J. Schwab, MD14; Douglas C. Burton, MD15; Shay Bess, MD16; Christopher I. Shaffrey, MD17; Christopher P. Ames, MD18; International Spine Study Group17

1Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3UVA Health System, Charlottesville, VA, US; 4University of Calgary, Calgary, Canada; 5Hospital for Special Surgery, New York, NY, US; 6Warren Alpert Medical School of BU/RH Hospital, Providence, RI, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US; 8Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 11Washington University School of Medicine, St. Louis, MO, US; 12Swedish Neuroscience Institute, Seattle, WA, US; 13University of Kansas Medical Center, Kansas City, KS, US; 14Denver, CO, US; 15University of Virginia, Charlottesville, VA, US; 16University of California, San Francisco, San Francisco, CA, US; 17Brighton, CO, US

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

3:12-3:18 p.m.

221. Cervical Deformity in Adolescent Idiopathic Scoliosis Patients: Is It Clinically Significant?

Isador H. Lieberman, MD, FRCS, MBA; Xiaobang Hu, PhD

Scoliosis 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.

3:18-3:24 p.m.

222. The Effects of Chronic Preoperative Steroid Therapy on Perioperative Complications Following Elective Surgery for Adult Spinal Deformity

Samuel J. White, BA1; William A. Ranson, MD2; Brian Cho, BS3; Zoe B. Cheung, MD1; Ivan B. Ye, BA1; Oscar A. Carrillo, BS2; Samuel K. Cho, MD2

1New York, NY, US; 2Icahn School of Medicine at Mount Sinai, New York, NY, US; 3Icahn School of Medicine, New York, NY, US

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

3:24-3:30 p.m.

223. The Consequence of Nonoperative Management in Adult Spinal Deformity: Long-Term Durability of Alignment in Nonoperative Adult Spinal Deformity Treatment Relative to Those Undergoing Correction

Peter G. Passias, MD1; Cole Bortz, BA2; Renaud Lafage, MSc3; Justin S. Smith, MD, PhD4; Breton Line, BS5; Vedat Deviren, MD6; Gregory M. Mundis Jr., MD6; Jeffrey L. Gum, MD7; Samantha R. Horn, BA8; Frank A. Segreto, BS9; Daniel M. Sciubba, MD10; Eric O. Klineberg, MD11; Douglas C. Burton, MD12; Frank J. Schwab, MD13; Shay Bess, MD14; Christopher I. Shaffrey, MD14; Christopher P. Ames, MD15; Virginie Lafage, PhD16; International Spine Study Group17

1Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3Spine Institute of Louisiana, Shreveport, LA, US; 4Department of Orthopedics, NYU Langone Hospital, New York, NY, US; 5Denver International Spine Center, Denver, CO, US; 6Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 7Norton Leatherman Spine Center, Louisville, KY, US; 8Department of Orthopedic Surgery, NYU Langone

Orthopedic Hospital, NYU Langone Health, New York, NY, US; 9NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 10John Hopkins University/School of Medicine, Baltimore, MD, US; 11UC, Davis School of Medicine, Sacramento, CA, US; 12University of Kansas Medical Center, Kansas City, KS, US; 13Denver, CO, US; 14University of Virginia, Charlottesville, VA, US; 15University of California, San Francisco, San Francisco, CA, US; 16Brighton, CO, US

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

3:00-4:00 p.m.

Abstract Presentations:
The Gravity of Obesity
Room 403B
Moderator: Ali Araghi, DO

3:00-3:06 p.m.

226. Prior Bariatric Surgery Lowers Complication Rates Following Spine Surgery in Obese Patients
Peter G. Passias, MD1; Samantha R. Horn, BA2; Dennis Vasquez-Montes, MS, BA2; Frank A. Segreto, BS3; Cole Bortz, BA4; Gregory W. Poorman5; Cyrus M. Jala15; Charles Wang, MD6; Nicholas J. Frangella, BS6; Nicholas Stekas, BS6; Chloe Deflorimonte, BS5; Micheal Raad, MD7; Bassel G. Diebo, MD7; Shaleen N. Vira, MD7; Jason A. Horowitz, BA5; Hamid Hassanzadeh, MD10; Renaud Lafage, MS11; John Aftihnos, MD12; Virginie Lafage, PhD11; Michael C. Gerling, MD13


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

3:30-3:36 p.m.

224. Patients with Osteoporosis Undergoing Deformity Correction Spinal Fusion for Adult Spinal Deformity are at Greater Risk of Developing Proximal Junctional Kyphosis
Michael T. Nolte, MD1; Bryce Basques, MD, MHS2; Philip Louie, MD3; Kamran Movassaghi4; Jonathan Markowitz, BS5; Dennis P. McKinney5; Oscar Chen, MD5; Howard S. An, MD1; Christopher J. DeWald, MD5

1Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 2Yale School of Medicine, New Haven, CT, US; 3Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Chicago, IL, US

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

3:36-3:42 p.m.

225. The Correlation of Spinopelvic Parameters with Biomechanical Parameters Measured by Gait and Balance Analyses in Patients with Adult Degenerative Scoliosis
Ram Haddas, PhD, MSc, MEng1; Xiaobang Hu, PhD2; Isador H. Lieberman, MD, FRSCS, MBA2

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.

3:42-4:00 p.m.

Discussion
3:06-3:12 p.m.
227. Bariatric Surgery Population at Significantly Increased Risk of Spinal Disorders and Surgical Intervention Compared to Morbidly Obese Patients

Samantha R. Horn, BA1; Dennis Vasquez-Montes, MS, BA1; Cole Bortz, BA2; Frank A. Segreto, BS3; Gregory W. Poorman4; Cyrus M. Jalali4; Charles Wang, MD5; John A. Buza III, MD, MS1; Tiffany C. Liu, BA6; Leah Steinmetz, BA2; Christopher Varlotta, BS1; Shaleen N. Vira, MD1; Bassel G. Diebo, MD7; Jason A. Horowitz, BA8; Hamid Hassanzadeh, MD9; Renaud Lafage, MSc10; Virginie Lafage, PhD10; John Afthinos, MD11; Peter G. Passias, MD12


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

3:12-3:18 p.m.
228. Rapid Bodyweight Reduction Prior to Lumbar Fusion Surgery Associated with Poorer Postoperative Outcomes

Sandip Tarpada, BA1; Woojin Cho, MD, PhD2; Jayson Lian, BA1; Julian S. Haimovich, BS3

1Bronx, NY, US; 2Hartsdale, 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.

3:18-3:24 p.m.
229. Risk Factors for Readmission and Complications in Obese and Severely Obese Patients Undergoing Elective Posterior Lumbar Spine Fusion

Deeptee Jain, MD1; Jeremy D. Shaw, MD2; Vedat Deviren, MD1; Alan Zhang, MD1; Sigurd H. Berven, MD3

1University of California, San Francisco, San Francisco, CA, US; 2University of Utah Orthopaedics, Salt Lake City, UT, US; 3UCSF, Department of Orthopaedic Surgery, San Francisco, CA, US

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

3:24-3:30 p.m.
230. Open versus Minimally Invasive Transforaminal Lumbar Interbody Fusion in Obese Patients: A Systematic Review and Meta-Analysis

Abduljabbar Alhammoud, MD1; Catherine Himo Gang, MPH2; Osama M. Aldahamseh, MbChB3; Yahya A. Othman4; Avani S. Vaishnav, MBBS5; Sheeraz A. Qureshi, MD, MBA2

1Doha, Qatar; 2New York, NY, US; 3Hamad Medical Corporation, Doha, Qatar; 4Weill Cornell Medicine, Qatar Foundation, Rayan, Qatar; 5Hospital for Special Surgery, New York, NY, US

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

3:30-3:36 p.m.
231. The Five-Item Modified Frailty Index is Predictive of 30-Day Postoperative Complications in Patients Undergoing Kyphoplasty Vertebral Augmentation

Dale Segal, MD1; Jacob M. Wilson, MD2; Keith W. Michael, MD1

1Atlanta, GA, US; 2Emory Orthopedics, Atlanta, GA, US

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

3:36-3:42 p.m.
232. The Impact of Body Mass Index on Severity of Cervical Spine Fracture

Stephanie L. Choo, BS1; Nikhil Jain, MBBS, MD2; Tania Gennell, BA3; Elizabeth Yu, MD2

1Department of Orthopaedics: The Ohio State University Wexner Medical Center, Columbus, OH, US; 2The Ohio State University Wexner Medical Center, Columbus, OH, US; 3Columbus, OH, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
3:00-5:05 p.m.

**International Spine Forum Symposium: Adult Spinal Deformity**
Room 404AB

Moderators: Woojin Cho, MD, PhD; Michael Faloon, MD

**Agenda**
- Management Strategies for the Kyphotic Deformity in TB Spine
  Prof. Muhammad Tariq Sohail
  Pakistan Spine Society
- Neurological Involvement with the Alteration of the Adjacent Level in the Degenerative Deformity of the Adult
  Antonio Martin-Benlloch, MD
  GEER (Spanish Spine Society)
- S2 Alar Iliac Screw in Severe Neuromuscular Scoliosis; The Outcome in Deformity Correction and Restoring Pelvic Obliquity
  Fahad AlHelal, MD
  Saudi Spine Society
- **UKSS-BASS/BRTSPINE**
- Multilevel ALIF for Degenerative Lumbar Scoliosis
  Yasser Elbanna, MD
  Egyptian Spine Association
- Multimodal Approach to Overcome the Kyphotic Deformity Post Neglected Treatment Spine Infection
  Ahmad Jabir Rahyussalim, PhD
  Indonesian Spine Society
- The Sagittal Balance in the Degenerative Disease of the Lumbar Spine
  Baron Zarate-Kalfopulos, MD
  Mexican Spine Society (Asociacion Mexicana de Cirujanos de Columna, A.C.) (AMCICO):
- The Possibilities of Minimally Invasive Techniques in Correcting of the Lumbar Spine Segment Angle
  Alexander Krutko MD, PhD
  Russian Association of Spine Surgeons:
- Complications of Surgery for Degenerative Scoliosis
  Mohamed Wafa, MD, PhD
  ArabSpine
- Accuracy of Iliac Screws Insertion Using Spine Navigation
  Abdul Karim Msaddi, MD
  ArabSpine
- Final Remarks
  Norman B. Chutkan, MD
  Overall Program Moderator and NASS International Education Committee Chair
- Discussion, Questions and Answers
  Faculty Panel

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3:00-5:05 p.m.

**Interdisciplinary Spine Forum: Impact of Fragility Fractures on the Management of the Elderly Spine**
Room 406AB

Moderators: Ron Alkalay, PhD; Michael Groff, MD

As our population ages and longevity increases, orthopedic surgeons are facing increasing incidence of fragility fractures with concomitant hyperkyphosis in the female population. It is imperative those spine surgeons and other spine providers understand the role of demographics, etiology and biomechanics of these fractures in order to better direct the pharmaceutical, augmentation and if necessary surgical treatments they prescribe. Participants will gain a better understanding of unique challenges associated with the osteopenic spine on the care they deliver.

**Agenda**
- Demographics an Increasing Incidence of Osteoporosis and Metabolic Bone Disease and Social Impact of Clinic Fractures
- Biomechanical Consequences of Progressive Spinal Kyphosis
  Stuart H. Hershman, MD
- Fragility Fractures and Method of Augmentation: Biomechanics
  Ron Alkalay, PhD
- Pharmacological Treatments for Preventing Vertebral Fractures: Efficacy and Controversy
- Cement Augmentation Treatments (Vertebroplasty and Kyphoplasty) and Their Outcomes
  Charles H. Cho, MD, MBA
- Surgical Treatments in Neurologically Impaired Patients and Biomechanical Pitfalls Due to Soft Bone and Realignment of the Spine
  Michael Groff, MD
- Discussion, Questions and Answers
  Faculty Panel
4:05-5:05 p.m.

Abstract Presentations:
Basic Science of Spinal Fusion
Concourse Hall 151
Moderator: Barbara D. Boyan, PhD

4:05-4:11 p.m.
233. Opioids Delay Healing of Spinal Fusion: A Rabbit Posterolateral Lumbar Fusion Model
Nikhil Jain, MBBS, MD1; Khaled Himed, BS2; Jeffrey M. Toth, PhD3; Karen C. Briley, PhD4; Frank M. Phillips, MD5; Safdar N. Khan, MD1
1The Ohio State University Wexner Medical Center, Columbus, OH, US; 2Columbus, OH, US; 3Milwaukee, WI, US; 4The Ohio State University, Columbus, OH, US; 5Midwest Orthopaedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:11-4:17 p.m.
234. Phytochemicals Combat the Detrimental Effects of Cigarette Smoke on Osteogenic Differentiation
Soyeon Jeong, MS1; Chawon Yun, PhD1; Jonghwa Yun1; Richard R. Pahapill, BS2; Kevin Y. Chang, BS3; Meraaj S. Haleem, BS1; Minho Cho2; Janavi Kotamathi1; Wellington K. Hsu, MD1; Erin L. Hsu, PhD1
1Northwestern University, Chicago, IL, US; 2Chicago, IL, US; 3Department of Orthopaedic Surgery, Northwestern University, Chicago, IL, US; 4Northwestern University, Feinberg School of Medicine, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:17-4:23 p.m.
235. Peptide Amphiphile Nanoscaffolds Potentiates the Delivery of rh-BMP2 in a Rabbit Spine Fusion Model
Kevin Y. Chang, BS1; Mark McClendon, PhD2; John A. Driscoll, BS3; Ryan Lubbe, BS1; Meraaj S. Haleem, BS2; Chawon Yun, PhD2; Richard R. Pahapill, BS3; Stuart R. Stock, PhD4; Samuel I. Stupp, PhD5; Erin L. Hsu, PhD2; Wellington K. Hsu, MD2
1Chicago, IL, US; 2Northwestern University, Chicago, IL, US; 3Department of Orthopaedic Surgery, Northwestern University, Chicago, IL, US; 4Northwestern University, Feinberg School of Medicine, Chicago, IL, US; 5Simpson Querrey Institute, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:23-4:29 p.m.
236. Composition of Hyperelastic Bone Composite Scaffolds Affects De Novo Bone Formation
Ryan Lubbe, BS1; Adam E. Jakus, PhD2; John A. Driscoll, BS3; Kevin Y. Chang, BS1; Meraaj S. Haleem, BS2; Chawon Yun, PhD2; Soyeon Jeong, MS1; Xin Li, PhD2; Jonghwa Yun2; Kevin Baker, PhD4; Stuart R. Stock, PhD5; Ramille N. Shah, PhD1; Wellington K. Hsu, MD2; Erin L. Hsu, PhD2
1Chicago, IL, US; 2Northwestern University, Chicago, IL, US; 3Department of Orthopaedic Surgery, Northwestern University, Chicago, IL, US; 4Beaumont Health, Royal Oak, MI, US; 5Northwestern University, Feinberg School of Medicine, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:29-4:35 p.m.
237. Effect of a Systemic Postoperative Cannabinoid Receptor Agonist on Spine Fusion in Rat Model
Chawon Yun, PhD1; John A. Driscoll, BS2; Kevin Y. Chang, BS3; Meraaj S. Haleem, BS1; Soyeon Jeong, MS1; Ryan Lubbe, BS3; Richard R. Pahapill, BS3; Wellington K. Hsu, MD1; Erin L. Hsu, PhD1
1Northwestern University, Chicago, IL, US; 2Department of Orthopaedic Surgery, Northwestern University, Chicago, IL, US; 3Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:35-4:41 p.m.
2018 Resident & Fellow Research Award Winner
238. The Effects of Varenicline (Chantix®) on Lumbar Spinal Fusion in a Rat Model
Jason R. Kang, MD1; Juliane Glaeser, PhD2; Brian A. Karamian, MD3; Lea Kanim, MA4; Anthony Behn, MS5; Zachary M. NaPier, MD6; Timothy Thio, MS7; Khosrowdad Salehi, BS8; Hyun W. Bae, MD9; Ivan Cheng, MD10
1Rochester, MN, US; 2Cedars-Sinai Medical Center, Board of Governors Regenerative Medicine Institute, Department of Orthopedics, Department of Surgery, Los Angeles, CA, US; 3Department of Orthopaedic Surgery, Stanford, CA, US; 4Spine Center, Cedars-Sinai Medical Center, Los Angeles, CA, US; 5Stanford University, Stanford, CA, US; 6Cedars Sinai Orthopaedic Surgery, Los Angeles, CA, US; 7Stanford University School of Medicine, Palo Alto, CA, US; 8Cedars Sinai Medical Center, Los angeles, CA, US; 9Spine Institute St. John’s Health Center, Los Angeles, CA, US; 10Stanford University, Redwood City, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
4:41-4:47 p.m.
239. Architectural and Geometric Considerations in the Development of a 3D-Printed Hyperelastic "Bone" Composite Scaffold as Bone Graft Substitute for Spinal Arthrodesis
Adam E. Jakus, PhD; Meraaj S. Haleem, BS; John A. Driscoll, BS; Kevin Y. Chang, BS; Ryan Lubbe, BS; Richard R. Pahapill, BS; Soyeon Jeong, MS; Chawon Yun, PhD; Stuart R. Stock, PhD; Ramille N. Shah, PhD; Wellington K. Hsu, MD; Erin L. Hsu, PhD
1Northwestern University, Chicago, IL, US; 2Department of Orthopaedic Surgery, Northwestern University, Chicago, IL, US; 3Chicago, IL, US; 4Northwestern University, Feinberg School of Medicine, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:47-5:05 p.m.
Discussion

4:05-5:05 p.m.
Abstract Presentations:
New Concepts: Cervical Spine
Concourse Hall 152
Moderator: Sheeraz A. Qureshi, MD, MBA

4:05-4:11 p.m.
240. The Influence of Surgical Intervention and Sagittal Alignment on Frailty in Adult Cervical Deformity
Frank A. Segreto, BS; Peter G. Passias, MD; Renaud Lafage, MSc; Virginie Lafage, PhD; Justin S. Smith, MD, PhD; Breton Line, BS; Bassel G. Diebo, MD; Michael P. Kelly, MD; Gregory M. Munds Jr., MD; Themistocles S. Protopsaltis, MD; Alexandra Soroceanu, MD, MPH; Han Jo Kim, MD; Eric O. Klineberg, MD; Douglas C. Burton, MD; Robert A. Hart, MD; Frank J. Schwab, MD; Shay Bess, MD; Christopher I. Shaffrey, 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.

4:11-4:17 p.m.
241. Improvements in Pain and Physical Function After Cervical Spine Surgery Predict Betterment in Other Areas of Health and Wellness
Nicholas S. Andrade, BS; Brian J. Neuman, MD; Khaled M. Kebaish, MD; Lee H. Riley III, MD; David B. Cohen, MD, MPH; Richard L. Skolasky, ScD
1NYU Langone Medical Center, Chicago, IL, US; 2Johns Hopkins Outpatient Center/Department Orthopedic Surgery, Baltimore, MD, US; 3Johns Hopkins University, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:17-4:23 p.m.
242. Rigid Cervical Plate Fixation is Associated with Greater Restoration and Maintenance of Cervical Lordosis Compared to Semi-Rigid Plate Fixation in Anterior Cervical Discectomy and Fusion
Philip Louie, MD; Arya G. Varthi, MD; Bryce Basques, MD, MHS; Justin C. Paul, MD, PhD; Michael T. Nolte, MD; Jonathan Markowitz, BS; Jeremy D. Mormol, BS; Edward J. Goldberg, MD; Howard S. An, MD
1Rush University Medical Center, Chicago, IL, US; 2Yale University School of Medicine, New Haven, CT, US; 3Danbury Orthopedics, Danbury, CT, US; 4Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 5Chicago, IL, US; 6Midwest Orthopedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

4:23-4:29 p.m.
243. Rigid Plating and Cortico-Cancellous Allograft are Effective for Three-Level Anterior Cervical Discectomies and Fusion: A Radiographic Study
Philip Louie, MD; Steven M. Presciutti, MD; Daniel D. Bohl, MD, MPH; Benjamin Mayo, BA; Sravisht Iyer, MD; Peter B. Derman, MD, MBA; Brandon P. Hirsch, MD; Howard S. An, MD
1Rush University Medical Center, Chicago, IL, US; 2Decatur, GA, US; 3Chicago, IL, US; 4Midwest Orthopaedics 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.
244. Which is Better for C2 Involved Ossification of Posterior Longitudinal Ligament (OPLL): Dome-Like Laminoplasty or Double-Door Laminoplasty?
Suomao Yuan, MD
Qilu Hospital of Shandong University, Jinan, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

245. Risk of Atlantooccipital Joint Injury during C1 Pedicle Screw Insertion: A CT-Based Morphology Study of Atlas
Dageng Huang, MD1; Dingjun Hao, MD2
1Honghui Hospital, Xi’an Jiaotong University Health Science Center, Xian, China; 2Xi’an Honghui Hospital, Xi’an, Shaanxi, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

246. C5 Palsy after Single- and Multi-Level Anterior Cervical Discectomy and Fusion
Scott Wagner, MD1; Arjun S. Sebastian, MD, MSc2; Joseph S. Butler, PhD, FRCS (Tr & Orth)3; Ian D. Kaye, MD4; Patrick Morrissey, MD5; Alan S. Hillbrand, MD6; Alexander R. Vaccaro, MD, PhD4; Christopher K. Kepler, MD, MBA6
1Walter Reed National Military Medical Center, Bethesda, MD, US; 2Rothman Institute, Rochester, MN, US; 3National Spinal Injuries Unit, Mater Misericordiae University Hospital, Dublin 7, Ireland; 4Rothman Institute, Philadelphia, PA, US; 5United States Navy, San Diego, CA, US; 6Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

247. Is Frailty Responsive to Surgical Correction of Adult Spinal Deformity? An Investigation of Sagittal Realignment and Frailty Component Drivers
Peter G. Passias, MD1; Frank A. Segreto, BS2; Renaud Lafage, MSc3; Justin S. Smith, MD, PhD4; Breton Line, BS5; Juan S. Uribe, MD6; Bassel G. Diebo, MD7; D. Kojo Hamilton, MD8; Robert K. Eastlack, MD9; Jeffrey L. Gum, MD10; Munish C. Gupta, MD11; Eric O. Klineberg, MD12; Douglas C. Burton, MD13; Robert A. Hart, MD14; Frank J. Schwab, MD15; Shay Bess, MD16; Christopher I. Shaffrey, MD17; Virginie Lafage, PhD17; International Spine Study Group17
1NY Spine Institute, NYU Langone Health, New York, NY, US; 2NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 3Hospital for Special Surgery, New York, NY, US; 4UVA Health System, Charlottesville, VA, US; 5Denver International Spine Center, Denver, CO, US; 6University of South Florida, Tampa, FL, US; 7Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 8University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 9Scripps Clinic, San Diego, CA, US; 10Norton Leatherman Spine Center, Louisville, KY, US; 11Washington University School of Medicine, St. Louis, MO, US; 12UC, Davis School of Medicine, Sacramento, CA, US; 13University of Kansas Medical Center, Kansas City, KS, US; 14Swedish Neuroscience Institute, Seattle, WA, US; 15Denver, CO, US; 16University of Virginia, Charlottesville, VA, US; 17Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

248. Can Postoperative cSVA, C2 Slope and T1 Slope be Predicted Accurately in Cervical Deformity Surgery?
Nicholas Stekas, BS1; Themistocles S. Protopsaltis, MD2; Justin S. Smith, MD, PhD3; Alexandra Soroceanu, MD, MPH4; Renaud Lafage, MSc5; Brian J. Neuman, MD6; Han Jo Kim, MD7; Peter G. Passias, MD7; Gregory M. Mundis Jr., MD8; Eric O. Klineberg, MD9; D. Kojo Hamilton, MD10; Munish C. Gupta, MD11; Virginie Lafage, PhD12; Robert A. Hart, MD13; Frank J. Schwab, MD14; Douglas C. Burton, MD15; Shay Bess, MD16; Christopher I. Shaffrey, MD17; Christopher P. Ames, MD18; International Spine Study Group18
1New York, NY, US; 2Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, New York, NY, US; 3UVA Health System, Charlottesville, VA, US; 4University of Calgary, Calgary, Canada; 5Hospital for Special Surgery, New York, NY, US; 6Baltimore, MD, US; 7NY Spine Institute, NYU Langone Health, New York, NY, US; 8Scripps Clinic Medical Group, Department of Orthopedics, La Jolla,
FRIDAY, SEPTEMBER 28

4:17-4:23 p.m.
249. Cervical, Thoracic and Spinal pelvic Compensation After Proximal Junctional Kyphosis: Does Location of PJK Matter?
Han Jo Kim, MD1; Renaud Lafage, MSc1; Jonathan Elysee1; Christopher I. Shaffrey, MD2; Douglas C. Burton, MD3; Christopher P. Ames, MD4; Gregory M. Mundis Jr., MD5; Richard A. Hostin Jr., MD6; Shay Bess, MD7; Eric O. Klineberg, MD8; Justin S. Smith, MD, PhD9; Peter G. Passias, MD10; Frank J. Schwab, MD1; Virginie Lafage, PhD1; International Spine Study Group11

1Hospital for Special Surgery, New York, NY, US; 2University of Virginia, Charlottesville, VA, US; 3University of Kansas Medical Center, Kansas City, KS, US; 4University of California, San Francisco, CA, US; 5University of California, San Francisco, CA, US; 6Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 7Southwest Scoliosis Institute, Plano, TX, US; 8Denver, CO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10University of California, San Francisco, CA, US; 11Brighton, CO, US

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

4:23-4:29 p.m.
250. Safety and Efficacy of Fenestrated Pedicle Screws with Cement Augmentation for Spinal Metastases: Early Experience with 292 Screws
John H. Shin, MD1; Ganesh M. Shankar, MD, PhD2

1Massachusetts General Hospital, Boston, MA, US; 2Boston, MA, US

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

4:29-4:35 p.m.
251. Is Anterior Column Support Needed Following Transpedicular Decompression for Metastatic Epidural Compression?
Addisu Mesfin, MD1; Eric L. Emanski, MD2; Avionna Baldwin, BS3; Robert W. Molinari, MD1

1University of Rochester, Rochester, NY, US; 2University of Rochester Orthopaedics, Rochester, NY, US; 3University of Rochester Medical Center, Rochester, NY, US

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

4:35-4:41 p.m.
252. Value of Routine-Biopsy in Pathologic Fractures of Vertebral Bodies in Patients with Known Primary Tumor: Predictive Value and Necessity of Histological Proof
Frederic Bludau, MD
Medical Faculty Mannheim of the University of Heidelberg, Orthopaedic and Trauma, Mannheim, Germany

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

4:41-4:47 p.m.
2014 Research Grant
The Role of Myeloid-Derived Suppressor Cells and T-Lymphocytes in Human Vertebral Metastasis
David B. Bumpass, MD1; Aude-Helene Capietto, PhD2; Lucia D’Amico, PhD3; Roberta Faccio, PhD4

1University of Arkansas for Medical Sciences, Little Rock, AR, US; 2Genentech, South San Francisco, CA, US; 3TargImmune, Basel, Switzerland; 4Washington University School of Medicine, St. Louis, MO, US

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

4:47-5:05 p.m.
Discussion
FRIDAY, SEPTEMBER 28

4:05-5:05 p.m.

Abstract Presentations:

Cervical Myelopathy and Deformity

Room 403B

Moderator: David E. Fish, MD, MPH

4:05-4:11 p.m.


Jetan H. Badhiwala, MD1; Farshad Nassiri2; Christopher Witiw, MD3; Saleh Almenawer, MD4; Michael G. Fehlings, MD, PhD, FRCSC5; Jefferson Wilson, MD, PhD, FRCSC6

1Division of Neurosurgery, Department of Surgery, University of Toronto, Toronto, ON, Canada; 2Toronto, ON, Canada; 3Toronto Western Hospital, Toronto, ON, Canada; 4Hamilton, ON, Canada; 5St. Michaels Hospital, Toronto, ON, Canada

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

4:11-4:17 p.m.

254. Altered Balance in Cervical Spondylotic Myelopathy Patients Compared to Controls

Ram Haddas, PhD, MSc, MEng1; Isador H. Lieberman, MD, FRCSC, MBA2; Theodore A. Belanger, MD3; Stephen H. Hochschuler, MD1; Rajesh G. Arakal, MD4; Akwasi Boah, MD5; Kevin L. Ju, MD6

1Texas Back Institute, Plano, TX, US; 2Scoliosis and Spine Tumor Center, Texas Back Institute, Texas Health Presbyterian Hospital Plano, Plano, TX, US; 3Texas Back Institute, Rockwall, TX, US; 4Plano, TX, US; 5Texas Back Institute - Denton, Denton, TX, US

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

4:17-4:23 p.m.

255. Neuromuscular Activity during Gait in Patients with Cervical Spondylotic Myelopathy

Ram Haddas, PhD, MSc, MEng1; Joseph T. Cox, MD2; Theodore A. Belanger, MD3; Akwasi Boah, MD4; Rajesh G. Arakal, MD5; Kevin L. Ju, MD6

1Texas Back Institute, Plano, TX, US; 2Biloxi, MS, US; 3Texas Back Institute, Rockwall, TX, US; 4Texas Back Institute - Denton, Denton, TX, US; 5Plano, TX, US

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

4:23-4:29 p.m.

256. The Morphology of Cervical Deformities: A Two-Step Cluster Analysis to Identify Cervical Deformity Patterns

Han Jo Kim, MD1; Renaud Lafage, MSc2; Jonathan Elysee3; Peter G. Passias, MD2; Christopher P. Ames, MD4; Robert A. Hart, MD4; Christopher I. Shaffrey, MD5; Gregory M. Mundis Jr., MD6; Themistocles S. Protopsaltis, MD7; Munish C. Gupta, MD8; Eric O. Klineberg, MD9; Douglas C. Burton, MD10; Frank J. Schwab, MD11; Virginie Lafage, PhD12; International Spine Study Group13

1Hospital for Special Surgery, New York, NY, US; 2NY Spine Institute, NYU Langone Health, New York, NY, US; 3University of California, San Francisco, San Francisco, CA, US; 4Swedish Neuroscience Institute, Seattle, WA, US; 5University of Virginia, Charlottesville, VA, US; 6Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 7Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 8Washington University School of Medicine, St. Louis, MO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10University of Kansas Medical Center, Kansas City, KS, US; 11Brighton, CO, US

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

4:29-4:35 p.m.

257. Development of a Modified Cervical Deformity Frailty Index: A Streamlined Clinical Tool for Preoperative Risk Stratification

Peter G. Passias, MD1; Frank A. Segreto, BS2; Cole Bortz, BA3; Renaud Lafage, MSc4; Virginie Lafage, PhD5; Justin S. Smith, MD, PhD6; Breton Line, BS7; Han Jo Kim, MD8; Robert K. Eastlack, MD9; D. Kojo Hamilton, MD10; Themistocles S. Protopsaltis, MD11; Richard A. Hostin Jr., MD12; Eric O. Klineberg, MD13; Douglas C. Burton, MD14; Robert A. Hart, MD15; Frank J. Schwab, MD16; Shay Bess, MD17; Christopher I. Shaffrey, MD18; Christopher P. Ames, MD19; International Spine Study Group20


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
4:35-4:41 p.m.

258. The C5-T3 Angle: A Novel Parameter of the Cervicothoracic Junction

Sang-Hun Lee, MD, PhD¹; Micheal Raad, MD²; Brian J. Neuman, MD³; Munish C. Gupta, MD⁴; Hamid Hassanzadeh, MD; Virginie Lafage, PhD⁶; Peter G. Passias, MD⁷; Themistocles S. Protopsaltis, MD⁵; D. Kojo Hamilton, MD²; Justin S. Smith, MD, PhD¹⁰; Christopher I. Shaffrey, MD¹¹; Eric O. Klineberg, MD¹²; Jeffrey L. Gum, MD¹³; Shay Bess, MD¹⁴; Richard A. Hostin Jr., MD¹⁵; Christopher P. Ames, MD¹⁶; Khaled M. Kebaish, MD³; International Spine Study Group¹⁷

¹Johns Hopkins University, Department of Orthopedic surgery, Baltimore, MD, US; ²Johns Hopkins, Baltimore, MD, US; ³Baltimore, MD, US; ⁴Washington University School of Medicine, St. Louis, MO, US; ⁵University of Virginia, Department of Orthopedic Surgery, Charlottesville, VA, US; ⁶Hospital for Special Surgery, New York, NY, US; ⁷NY Spine Institute, NYU Langone Health, New York, NY, US; ⁸Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; ⁹University of Pittsburgh School of Medicine, Pittsburgh, PA, US; ¹⁰UVA Health System, Charlottesville, VA, US; ¹¹University of Virginia, Charlottesville, VA, US; ¹²UC, Davis School of Medicine, Sacramento, CA, US; ¹³Norton Leatherman Spine Center, Louisville, KY, US; ¹⁴Denver, CO, US; ¹⁵Southwest Scoliosis Institute, Plano, TX, US; ¹⁶University of California, San Francisco, San Francisco, CA, US; ¹⁷Brighton, CO, US

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

4:41-4:47 p.m.

259. The Influence of Cervical Spondylolisthesis on Clinical Presentation and Surgical Outcome in Patients with Degenerative Cervical Myelopathy: Analysis of a Global Cohort

Aria Nouri, MD, MSc¹; So Kato, MD;² Michael W. Robinson, MD, PhD; Jeong, Juan C. Mejia Munne, MD; George Yang; William Jeong; Rani Nasser, MD;² Joseph S. Cheng, MD, MS; Michael G. Fehlings, MD, PhD, FRCCS²

¹Cincinnati, OH, US; ²The University of Tokyo Hospital, Bunkyo-ku, Tokyo, Japan; ³University of Cincinnati Medical Center, Cincinnati, OH, US; ⁴Montefiore Medical Center, Department of Neurosurgery, Spine Research Group, Bronx, NY, US; ⁵University of Cincinnati College of Medicine, Cincinnati, OH, US; ⁶Toronto Western Hospital, Toronto, ON, Canada

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

4:47-5:05 p.m.

Discussion
Failed back surgery includes a diverse group diagnoses with many different treatment options besides reoperation. There is not, however, a clear best practice for diagnosis and treatment of these conditions. There are specific diagnostic tools that provide more clear utility than others. With a more specific diagnosis, patients can and often do improve substantially once their treatment is matched to their diagnosis. Faculty continue to present an evidence-based approach that helps provide a means for more specific diagnosis with the most specific combination of clinical tools and to understand how different types of treatments have evidence for patients.

**Upon completion of this session, participants should gain strategies to:**
- Appreciate how to use specific diagnostic tools to reach a more specific diagnosis for patients who have failed back surgery;
- Describe which tests are most helpful to reach a diagnosis;
- Distinguish specific treatments that have evidence with specific diagnoses related to failed back surgery.

**Agenda**
- **Introduction**
  H. Michael Guo, MD
- **Intensive Rehabilitation Following Unsuccessful Lumbar Spine Surgery**
  Carol Hartigan, MD
- **Facet IA Injection/RFN**
  Byron J. Schneider, MD
- **SIJ RFN versus Serial Injections**
  Alison A. Stout, DO
- **Medications**
  Jerome Schofferman, MD
  - Opioids
  - Non-Opioid Analgesics
- **Spinal Cord Stimulators**
  Sanjog Pangarkar, MD
- **Reoperation**
  Jeffrey C. Wang, MD
- **Discussion, Questions and Answers**
  Faculty Panel

Spine treatment technology has experienced major advances over the past 30 years. Due to the maturation of the discipline, there is more evolutionary development than there are revolutionary advances. Societal changes and communication methodology changes make for the potential of a major disruptive paradigm shift in the future of product development. An understanding of how to proceed and implement your ideas, for the betterment of your patients, will become necessary to a greater degree than ever before. Faculty will educate caregivers about the steps in developing technology through their daily dealings with patient care. Also, faculty will present traditional and more innovative pathways for future technology development in addition to venture capitalist perspectives when examining new ideas and explaining how regulators unintentionally hinder product acceptance and development.

**Upon completion of this session, participants will gain strategies to:**
- Recognize the options available to develop innovative spine technology;
- Educate participants in the steps of innovation development;
- Learn how venture capitalists view new products;
- Appreciate the fundamental differences between product approval and insurance reimbursement;
- Gain knowledge about how to optimize arrangements with employers and co-developers.
Agenda

- Facilitating Innovation through Peer Collaboration, Evaluation and Investment
  Allen L. Carl, MD

- Connecting Medical Startups with Physicians, Investors, and Industry
  Mark Mescher

- How the Money Works: Funding and Exit Strategies (Investor Relations)
  Marek Ciszewski, JD

- Dealing with Academics or Co-Developers
  Michael H. Heggeness, MD, PhD

- Navigating Product Approvals and Reimbursement
  Eric J. Muehlbauer, MJ, CAE

- Discussion, Questions and Answers
  Faculty Panel

9:00-10:00 a.m.

Abstract Presentations: Impact of Adult Deformity Correction
Room 403B

Moderator: Dilip K. Sengupta, MD, PhD

9:00-9:06 a.m.

260. The Surgical Volume, More Than the Number of Surgeons or Surgeon Experience, Drives Patient Outcomes in Pediatric Scoliosis
Vishal Sarwahi, MD1; Jesse M. Galina, BS2; Stephen Wendolowski3; Jon-Paul DiMauro4; Yungtai Lo, PhD5; Terry D. Amaral, MD6


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

9:06-9:12 a.m.

261. Can We Define Clinically Relevant DJK in Cervical Deformity Surgery?
Themistocles S. Protopsaltis, MD1; Nicholas Stekas, BS2; Renaud Lafage, MSc3; Justin S. Smith, MD, PhD4; Alexandre Soroceanu, MD, MPH5; Daniel M. Scibba, MD6; D. Kojo Hamilton, MD7; Robert K. Eastlack, MD8; Gregory M. Mundis Jr., MD9; Khaled M. Kebaish, MD10; Eric O. Klineberg, MD11; Munish C. Gupta, MD12; Virginia Lafage, PhD13; Robert A. Hart, MD13; Frank J. Schwab, MD14; Douglas C. Burton, MD15; Shay Bess, MD15; Christopher I. Shaffrey, MD15; International Spine Study Group17; Christopher P. Ames, MD18

1Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; 2New York, NY, US; 3Hospital for Special Surgery, New York, NY, US; 4UVA Health System, Charlottesville, VA, US; 5University of Calgary, Calgary, Canada; 6John Hopkins University/School of Medicine, Baltimore, MD, US; 7University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 8Scripps Clinic, San Diego, CA, US; 9Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 10Baltimore, MD, US; 11UC, Davis School of Medicine, Sacramento, CA, US; 12Washington University School of Medicine, St. Louis, MO, US; 13Swedish Neuroscience Institute, Seattle, WA, US; 14University of Kansas Medical Center, Kansas City, KS, US; 15Denver, CO, US; 16University of Virginia, Charlottesville, VA, US; 17Brighton, CO, US; 18University of California, San Francisco, San Francisco, CA, US

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

9:12-9:18 a.m.

262. The Effect of Surgical Alignment on Gait Complexity in Adult Deformity Patients: A Neuromuscular Synergy Approach
Mohammad Moein Nazifi, BS1; Piliwon Hur, PhD2; Theodore A. Belanger, MD2; Akwasi Boah, MD3; Ram Haddas, PhD, MSc, MEng4; Isador H. Lieberman, MD, FRSCS, MBA5

1Texas A&M University, College Station, TX, US; 2Texas Back Institute, Rockwall, TX, US; 3Texas Back Institute - Denton, Denton, TX, US; 4Texas Back Institute, Plano, TX, US; 5Scoliosis 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.

9:18-9:24 a.m.

263. Development of Deployable Predictive Models for MCID of 2-Year Outcomes Across All Commonly used HRQOL Instruments in Adult Spinal Deformity Surgery: Results in 570 Patients from 17 Hospitals
Miquel Serra-Burriel, PhD1; Michael P. Kelly, MD2; Justin S. Smith, MD, PhD3; Jeffrey L. Gum, MD4; Ferran Pellise, MD, PhD5; Ahmet Alanay, MD6; Emre Acaroglu, MD6; Francisco J. Perez-Grueso, MD7; Frank Kleinstuck, MD8; Ibrahim Obeid, MD9; Virginie Lafage, PhD10; Frank J. Schwab, MD10; Christopher I. Shaffrey, MD11; Douglas C. Burton, MD12; Shay Bess, MD13; Christopher P. Ames, MD14; ESSG European Spine Study Group15; International Spine Study Group16

1Barcelona, Spain; 2Washington University, Saint Louis, MO, US; 3UVA Health System, Charlottesville, VA, US; 4Norton Leatherman Spine Center, Louisville, KY, US; 5Acibadem University, School of Medicine, Istanbul, Ataşehir, Turkey; 6Ankara, Turkey; 7H. De La Paz (Madrid), Madrid, Spain; 8Switzerland; 9Bordeaux, France; 10Hospital for Special Surgery, New York, NY, US; 11University of Virginia, Charlottesville, VA, US; 12University of Kansas Medical Center, Kansas City, KS, US; 13Denver, CO, US; 14University of California, San Francisco, San Francisco, CA, US; 15Brighton, CO, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
9:24-9:30 a.m.

264. Incidence of Acute, Progressive, and Delayed Proximal Junctional Kyphosis over an Eight-Year Period in Adult Spinal Deformity Patients

Frank A. Segreto, BS1; Peter G. Passias, MD2; Renaud Lafage, MSc3; Virginie Lafage, PhD4; Justin S. Smith, MD, PhD5; Breton Line, BS6; Gregory M. Mundis Jr., MD6; Pierce D. Nunley, MD7; Alan H. Daniels, MD8; Munish C. Gupta, MD9; Jeffrey L. Gum, MD10; D. Kojo Hamilton, MD11; Eric O. Klimeberg, MD12; Douglas C. Burton, MD13; Robert A. Hart, MD14; Frank J. Schwab, MD15; Shay Bess, MD15; Christopher I. Shaffrey, MD16; Christopher P. Ames, MD17; International Spine Study Group18

1NYU Langone Medical Center – Orthopaedic Hospital, Manhattan, NY, US; 2NY Spine Institute, NYU Langone Health, New York, NY, US; 3Hospital for Special Surgery, New York, NY, US; 4UVA Health System, Charlottesville, VA, US; 5Denver International Spine Center, Denver, CO, US; 6Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 7Spine Institute of Louisiana, Shreveport, LA, US; 8Warren Alpert Medical School of BU/Ri Hospital, Providence, RI, US; 9Washington University School of Medicine, St. Louis, MO, US; 10Norton Leatherman Spine Center, Louisville, KY, US; 11University of Pittsburgh School of Medicine, Pittsburgh, PA, US; 12UC, Davis School of Medicine, Sacramento, CA, US; 13University of Kansas Medical Center, Kansas City, KS, US; 14Swedish Neuroscience Institute, Seattle, WA, US; 15Denver, CO, US; 16University of Virginia, Charlottesville, VA, US; 17University of California, San Francisco, San Francisco, CA, US; 18Brighton, CO, US

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

9:30-9:36 a.m.

265. Comparison of the Incidence and Risk Factors for Proximal Junctional Failure (PJF) in Surgically Treated Patients with Adult Spinal Deformity (ASD) Between Patients from Japan and the United States: Series of 509 Patients with Two-Year Follow-Up

Mitsuru Yagi, MD, PhD1; Christopher P. Ames, MD2; Naobumi Hosogane3; Justin S. Smith, MD, PhD4; Christopher I. Shaffrey, MD5; Frank J. Schwab, MD6; Virginie Lafage, PhD6; Morio Matsumoto, MD7; Shay Bess, MD8; Kota Watanabe, MD9; International Spine Study Group10

1National Hospital Organization Murayama Medical Center, Tokyo, Japan; 2University of California, San Francisco, San Francisco, CA, US; 3Saitama, Japan; 4UVA Health System, Charlottesville, VA, US; 5University of Virginia, Charlottesville, VA, 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.

9:36-9:42 a.m.

266. Durability of Satisfactory Functional Outcomes Following Surgical Adult Spinal Deformity Correction: A Three-Year Survivorship Analysis

Peter G. Passias, MD1; Cole Bortz, BA2; Virginie Lafage, PhD3; Renaud Lafage, MSc3; Justin S. Smith, MD, PhD4; Breton Line, BS5; Robert K. Eastlack, MD6; Munish C. Gupta, MD7; Richard A. Hostin Jr., MD8; Samantha R. Horn, BA9; Daniel M. Sciubba, MD10; Jeffrey L. Gum, MD11; Khaled M. Kebaish, MD12; Eric O. Klimeberg, MD13; Douglas C. Burton, MD14; Frank J. Schwab, MD15; Christopher I. Shaffrey, MD16; Christopher P. Ames, MD17; International Spine Study Group18


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

9:42-10:00 a.m.

Discussion

9:00-10:00 a.m.

Abstract Presentations: A Fresh Look at Opioids Room 404AB

Moderator: Sanjog Pangarkar, MD

9:00-9:06 a.m.


Kevin L. Ong, PhD1; Kirsten E. Stoner, PhD2; Edmund Lau1; Av Edidin, PhD3


FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
9:06-9:12 a.m.
268. Narcotic Use Trends in Elective Thoracolumbar Spinal Surgery Patients
Alexandra Stratton, MD, FRCS; Greg McIntosh
1Calgary, AB, Canada; 2Canadian Back Institute, Oakville, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:12-9:18 a.m.
Section on Rehabilitation, Interventional & Medical Spine Best Paper
269. Baseline and Post-Fusion Opioid Burden for Low Back Pain Patients
Kevin L. Ong, PhD; Kirsten E. Stoner, PhD; Brian M. Yun, PhD; Edmund Lau; Av Edidin, PhD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:18-9:24 a.m.
270. Comparing Posterior Approach Lumbar and Neck Surgery With and Without Multimodal Methadone
Andrew F. Walker, MD
Saint Francis Medical Center, Cape Girardeau, MO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:24-9:30 a.m.
271. Inpatient Pain and Narcotics Utilization Based on Preoperative PHQ-9 Scores After Minimally Invasive Transforaminal Lumbar Interbody Fusion
Brittany E. Haws, BS; Benjamin Khechen, BA; Dil V. Patel, BS; Ankur S. Narain, BA; Fady Y. Hijji, BS; Jordan Guntin, BS; Kaitlyn L. Cardinal, BS; Jonathan Markowitz, BS; Kern Singh, MD
1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopaedics at Rush, Chicago, IL, US; 3Rush University Medical Center-Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

9:36-9:42 a.m.
Damian Brusko, BS; Karthik Madhavan, MD; John Paul Kolcun; Michael Y. Wang, MD
1Miami, FL, US; 2Miami, FL, US; 3University of Miami, Department of Neurosurgery, Miami, FL, US
FDA Device/Drug Status: Working channel endoscope (Approved for this indication), Anesthesia without intubation (Approved for this indication), expandable cage (Not approved for this indication), BMP (Not approved for this indication), Small caliber percutaneous screws (Approved for this indication), Liposomal bupivacaine (Not approved for this indication).

9:42-10:00 a.m.
Discussion

10:00-10:30 a.m.
Networking Break Beverage Service
South Lobby

10:30 a.m.-12:00 p.m.
Abstract Presentations: Applying Deformity Concepts in Your Practice
Room 403A
Moderator: Paul Park, MD

10:30-10:36 a.m.
274. A New Classification for Scheuermann’s Kyphosis
David B. Bumpass, MD; Lawrence G. Lenke, MD; Michael P. Kelly, MD; Ronald A. Lehman Jr., MD; Richard E. McCarthy, MD
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
10:36-10:42 a.m.
Don Y. Park, MD; Seth A. Ahlquist, BS; Howard Y. Park, MD; Jonathan Gatto; A. Nick Shamie, MD
1UCLA, Santa Monica, CA, US; 2Santa Monica, CA, US; 3UCLA Medical Center, Department of Orthopaedic Surgery, Los Angeles, CA, US; 4David Geffen School of Medicine, Los Angeles, CA, US; 5Los Angeles, CA, US

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

10:42-10:48 a.m.
276. Lumbar Spine Degeneration and Flatback Deformity Alter Sitting-Standing Spinopelvic Mechanics: A Detailed Analysis of Segmental Spinal Alignment Change
Aaron J. Buckland, MBBS, FRACS; Peter L. Zhou, BA; Leah Steinmetz, BA; Nicholas J. Frangella, BS; Dennis Vasquez-Montes, MS, BA; Nicholas Stekas, BS; Christopher Variotta, BS; David H. Ge, BA; Renaud Lafage, MSc; Virginie Lafage, PhD; Peter G. Passias, MD; Themistocles S. Protopsaltis, MD; Jonathan M. Vigdorchik, MD

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

10:48-10:54 a.m.
277. Unaltered Upper Instrumented Vertebra Reduces Risk of Proximal Junctional Failure Following Surgery for Adult Spinal Deformity
Alan H. Daniels, MD; Breton Line, BS; Peter G. Passias, MD; Han Jo Kim, MD; Themistocles S. Protopsaltis, MD; Justin S. Smith, MD, PhD; Christopher I. Shaffrey, MD; Daniel Reid, MD, MPH; D. Kojo Hamilton, MD; Munish C. Gupta, MD, MPH; Eric O. Klineberg, MD; Frank J. Schwab, MD; Douglas C. Burton, MD; Shay Bess, MD; Christopher P. Ames, MD; Virginie Lafage, PhD; Robert A. Hart, MD; International Spine Study Group

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
DO10; Adam S. Kanter, MD11; Isaac O. Karikari, MD12; Gregory M. Mundis Jr., MD13; David O. Okonkwo, MD14; Douglas G. Ondorff, MD15; John Pollina Jr., MD16; David W. Polly Jr., MD17; Jonathan N. Sembrano, MD17; Antoine Tohmeh, MD18; Jim A. Youssef, MD19


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

11:33-11:39 a.m.

282. Complications After Spinepelvic Fixation with Iliac Screws in 260 Adult Patients with 2-Year Minimum Follow-Up

James H. Nguyen, MD1; Thomas Buell, MD2; Tony R. Wang, MD3; Jeffrey P. Mullin, MD4; Marcus D. Mazur, MD5; Juanita Garces, MD6; Chun-Po Yen, MD7; Christopher I. Shaffrey, MD7; Justin S. Smith, MD, PhD8

1University of Virginia, Charlottesville, VA, US; 2University of Virginia Neurosurgery, Charlottesville, VA, US; 3University of Virginia Health System, Department of Neurological Surgery, Charlottesville, VA, US; 4Shaker Heights, OH, US; 5University of Utah, Department of Neurosurgery, Salt Lake City, UT, US; 6Tulane Medical Center, New Orleans, LA, US; 7University of Virginia, Charlottesville, VA, US; 8UVA Health System, Charlottesville, VA, US

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

11:39-11:45 p.m.

283. Reciprocal Changes of Mild and Severe Cases of Proximal Junctional Kyphosis After Lumbopelvic Spinal Fusions

Peter G. Passias, MD1; Nicholas J. Frangella, BS2; Renaud Lafage, MSc3; Virginie Lafage, PhD4; Justin S. Smith, MD, PhD5; Breton Line, BS6; D. Kojo Hamilton, MD4; Bassel G. Diebo, MD7; Khaled M. Kebaish, MD8; Frank A. Segreto, BS9; Alexandra Sorocoaneu, MD, MPH10; Jeffrey L. Gum, MD11; Munish C. Gupta, MD12; Eric O. Klineberg, MD13; Douglas C. Burton, MD14; Robert A. Hart, MD15; Christopher P. Ames, MD16; Shay Bess, MD17; Christopher I. Shaffrey, MD18; Frank J. Schwab, MD19


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

11:45 a.m.-12:00 p.m.

Discussion

10:30 a.m.-12:00 p.m.

Symposium:

State of the Union on Disc Replacement: 15 Years Later—What is the Evidence and Reality? Room 403B

Moderators: Celeste Abjornson, PhD; Jack E. Zigler, MD

Over the past 15 years, there have been numerous Level 1 clinical trials and robust debate to establish total disc replacements (TDRs) in the care continuum of degenerative disc disease (DDD). However, TDR has not overtaken fusion as the treatment decision as originally anticipated. The Triple R’s—Regulatory, Results and Reimbursement—have dominated the discussion but what progress has been achieved? Faculty will present a value-based analysis of TDR compared to fusion alternatives over the decade following surgery, discuss the best clinical outcomes to measure long-term sustainability of the surgical options, and review the reimbursement landscape and coding updates.

Upon completion of this session, participants will gain strategies to:

- Discuss the value analysis of the surgical options;
- Review the clinical evidence, related complications and postoperative pathway;
- Focus on the clinical data analysis: Are we utilizing the right outcome measures or just applying the same old ones? How do we measure success?;
- Present the current changes to reimbursement and coding for cervical and lumbar disc replacements.
Agenda

- **Introduction: What Were We Afraid Of?**
  Jack Zigler, MD
- **Timeline of Cervical and Lumbar Total Disc Replacement 2000 to Present**
  Thierry Marnay, MD
- **Cervical TDR - Indications and Outcomes**
  Rick Guyer, MD
- **Lumbar TDR - Indications and Outcomes**
  Scott Blumenthal, MD
- **Reimbursement and Coding: Is it Getting Better?**
  Kimberly Norton
- **What's on the Horizon?**
  Pierce Nunley, MD
- **Health Economics: Does Arthroplasty Make Economic Sense?**
  Jack Zigler, MD
- **Discussion, Questions and Answers**
  Faculty Panel

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**Symposium: Section on Biologics and Basic Research: Trends in Decision Making for Biologics — A Case-Based Review**

Room 404AB

Moderators: Christopher Chaput, MD; Joseph Butler, MD; Safdar N. Khan, MD

Panelists: Jason Savage, MD; Harvinder Sandhu, MD

Presenters will use three common spine surgical case scenarios for specific diagnoses and discuss the rationale for biologic use. The cases will be single-level and multilevel ACDF, single-level posterolateral fusion (without TLIF) and single-level lumbar PSF using MIS technique. The discussion will cover what biologic each faculty member chose in each scenario, his/her rationale, experience and pros versus cons of the approach. Faculty will bring surgical preoperative cases and postoperative films.

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

- Explore and discuss a variety of biologic options for common spinal cases;
- Identify pros versus cons for using various preferred biologics;
- Discuss rationale and cost considerations.
P1. NF-κB Inhibitor Suppresses Edema and Promotes rhBMP-2-Mediated Bone Formation in Spinal Fusion
Juliane Glaeser, PhD; Phillip H. Behrens, MD; Khosrowdad Salehi, BS; Lea Kanim, MA; Dmitriy Sheyn, PhD, MSC; Zachary M. NaPier, MD; Jason M. Cuellar, MD, PhD; Hyun W. Bae, MD
1Cedars-Sinai Medical Center, Board of Governors Regenerative Medicine Institute, Department of Orthopedics, Department of Surgery, Los Angeles, CA, US; 2Cedars-Sinai Medical Center, Los Angeles, CA, US; 3Spine Center, Cedars-Sinai Medical Center, Los Angeles, CA, US; 4Cedars-Sinai Medical Center, West Hollywood, CA, US; 5Cedars Sinai Orthopaedic Surgery, Los Angeles, CA, US; 6Los Angeles, CA, US; 7Spine Institute St. John’s Health Center, Los Angeles, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P2. Methylene Blue is an Effective Disclosing Agent for Identification of Bacterial Biofilms on Spinal Implants
Jeremy D. Shaw, MD; Nicholas N. Ashton, PhD; Jeremy M. Gilliland, MD; Darrel S. Brodke, MD; Brandon D. Lawrence, MD; Erik N. Hansen, MD; Dustin L. Williams, PhD
1University of Utah Orthopaedics, Salt Lake City, UT, US; 2Salt Lake City, UT, US; 3University of Utah, Salt Lake City, UT, US; 4University Orthopaedic Center, Salt Lake City, UT, US; 5UCSF, San Francisco, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P3. Recruitment of Mesenchymal Stem Cells to the Intervertebral Disc via Local Chemokine Delivery from an Injectable Hydrogel
Sapan D. Gandhi, MD; Michael D. Newton, MS; Mackenzie M. Fleischer, MS; Meagan R. Salisbury, MS; Samantha Hartner, MS; Jeffrey Fischgrund, MD; Kevin Baker, PhD
1Beaumont Health, Royal Oak, MI, US; 2Chesterfield, MI, US; 3Beaumont Health - Research Institute, Royal Oak, MI, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P4. Extracts from Plastrum Testudinis Promote BMSCs Proliferation and Osteogenic Differentiation via Let-7f-5p Targeting TNFR2/PI3k/Akt Signaling Pathway
Gengyang Shen; Jiang Xiaobing, PhD
11st Affiliated Hospital of Guangzhou University of Chinese Medicine, Guang Zhou City, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P5. Effect of Glucocorticoid Withdrawal on Glucocorticoid-Inducing Bone Impairment
Gengyang Shen; Jiang Xiaobing, PhD; Hui Ren
11st Affiliated Hospital of Guangzhou University of Chinese Medicine, Guang Zhou City, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P6. Chondrogenic Differentiation of Adipose Tissue for Nucleus Pulposus Regeneration
Claudia Eder, MD, PhD
Orthopädisches Hospital Speising, Vienna, Austria
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P7. Gravity Line and Sagittal Alignment are Both Risk Factors for Increased Rod Stresses in Long Lumbopelvic Fixation: A Biomechanics Study
Woojin Cho, MD, PhD; Wenhai Wang, PhD; Brandon Bucklen, PhD
1Hartsdale, NY, US; 2Globus Medical Inc., Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P8. Is the Assessment of the Sagittal Vertical Axis in Patients with Lumbar Spinal Stenosis Possible Using Motion Analysis System?
Michael Grelat, MD; Anne-Sophie Guinot, MD; Rachid Madkouri, MD; Mathieu Gueugnon, PhD; Jacques Beaurnais, MD; Davy Laroche, PhD; Jean-Marie Casillas, MD, PhD
1University Hospital of Dijon, Dijon, Burgundy, France; 2Physical Medicine and Rehabilitation Department, Dijon, France; 3Dijon, France; 4Neurochirurgie CHU Hôpital Général, Dijon, France; 5CIC INSERM 1432, Dijon, Burgundy Franche-comté, France
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Mark D. Rahm, MD; Robert A. Hart, MD; Daina M. Brooks, BS; Belin A. Mirabile; Pavan D. Patel; Jessica L. Hughes, MD; Brandon Bucklen, PhD
1Baylor Scott and White Health, Temple, TX, US; 2Swedish Neuroscience Institute, Seattle, WA, US; 3Globus Medical, Audubon, PA, US; 4University of Notre Dame, Notre Dame, IN, US; 5Drexel University, Philadelphia, PA, US
FDA Device/Drug Status: REVERE Stabilization System (Approved for this indication), SILC Fixation System (Not approved for this indication).
P10. Infant Positioning Impacts Neck and Back Muscle Activity: A Pilot Study Exploring Implications for Spinal Development
Erin M. Mannen, PhD1; Akshay R. Krishnan1; Stewart A. Tackett, BS1; Richard E. McCarthy, MD2; David B. Bumpass, MD1
1University of Arkansas for Medical Sciences, Little Rock, AR, US; 2Arkansas Children’s Hospital, Little Rock, AR, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P11. The Regional Effects of Lumbosacral Anterior Column Support on Rod and Screw Strain in a Pedicle Subtraction Osteotomy Model: An In Silica Investigation
Ehsan Jazini, MD1; Daniel E. Gelb, MD2; Jarid Tareen, MD3; Steven C. Ludwig, MD4; Jonathan Harris5; Wenhai Wang, PhD6; Brandon Bucklen, PhD6
1Medstar Georgetown University Hospital, Washington, DC, US; 2University of Maryland Orthopaedic Associates, Baltimore, MD, US; 3Baltimore, MD, US; 4University of Maryland Medical Center, Baltimore, MD, US; 5Globus Medical Inc., Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P12. The Interaction of Satellite Rod Reconstruction, Rod Material and Rod Diameter on Posterior Rod Strain in Pedicle Subtraction Osteotomies for Adult Spinal Deformity Correction: A Finite Element Analysis
Daniel E. Gelb, MD1; Jarid Tareen, MD2; Ehsan Jazini, MD3; Steven C. Ludwig, MD4; Jonathan Harris5; Wenhai Wang, PhD6; Brandon Bucklen, PhD6
1University of Maryland Orthopaedic Associates, Baltimore, MD, US; 2Baltimore, MD, US; 3Medstar Georgetown University Hospital, Washington, DC, US; 4University of Maryland Medical Center, Baltimore, MD, US; 5Globus Medical Inc., Audubon, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Damon E. Mar, PhD; Douglas C. Burton, MD; Terence E. McIff, PhD, MBA
University of Kansas Medical Center, Kansas City, KS, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P14. Variations Among Human Spine Segments and Their Relationships to In Vitro Kinematics: A Retrospective Analysis of Experimental Data Including 581 Cervical Motion Segments from 147 Donor Spines
Anna G. Newcomb, MS1; Jennifer Lehrman, MS2; Bernardo De Andrade Pereira, MD3; Neil Crawford, PhD4; Brian Kelly, PhD5
1BNI Spinal Biomechanics Lab, Phoenix, AZ, US; 2Barrow Neurological Institute, Phoenix, AZ, US; 3Saint Joseph Hospital and Medical Center - Barrow Neurological Institute, Phoenix, AZ, US; 4Globus Medical, Tempe, AZ, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P15. Pelvic Incidence is Associated with Sacral Curvature, Sacroiliac Joint Angulation and Sacral ALA Width
Matthew V. Abola, BA1; Jason Teplensky, BA1; Daniel R. Cooperman, MD1; Jennifer M. Bauer, MD2; Raymond W. Liu, MD1
1Cleveland, OH, US; 2Seattle, WA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P16. Iliac Screws May Not Be Necessary in Long Segment Constructs with L5-S1 ALIF: Cadaveric Study of Instrumentation Strain
Randall J. Hlubek, MD1; Jakub Godzik, MD1; Anna G. Newcomb, MS2; Jennifer Lehrman, MS3; Bernardo De Andrade Pereira, MD4; Brian Kelly, PhD5; Jay D. Turner, MD, PhD5
1Phoenix, AZ, US; 2BNI Spinal Biomechanics Lab, Phoenix, AZ, US; 3Barrow Neurological Institute, Phoenix, AZ, US; 4Saint Joseph Hospital and Medical Center - Barrow Neurological Institute, Phoenix, AZ, US; 5Barrow Brain and Spine, Phoenix, AZ, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P17. Regional and Segmental Changes of the Spine from Standing to Sitting: A Chain of Compensation
Samantha R. Horn, BA1; Frank A. Segreto, BS2; Cole Bortz, BA3; Dennis Vasquez-Montes, MS, BA4; Peter L. Zhou, BA4; John Y. Moon, BS5; Nicholas J. Frangella , BS6; Nicholas Stekas, BS7; Leah Steinmetz, BA8; Christopher Variotta, BS9; David H. Ge, BA10; Bradley Johnson, MD11; Shaleen N. Vira, MD11; Bassel G. Diebo, MD11; Chloe Defflorimonte, BS2; Mohamed A. Moawad, MPH3; Renaud Lafage, MSc4; Virginie Lafage, PhD9; Frank J. Schwab, MD9; Michael C. Gerling, MD10; Charla R. Fischer, MD3; Themistocles S. Protopsaltis, MD1; Aaron J. Buckland, MBBS, FRACS1; Thomas J. Errico, MD1; Peter G. Passias, MD11
1Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 2NYU
P18. Four-Rod Construct is Needed to Maximally Decrease Rod Strain Across Lumbosacral Junction With TLIF But Not ALIF in Long Segment Fixation
Jakub Godzik, MD1; Randall J. Hlubek, MD1; Anna G. Newcomb, MS2; Jennifer Lehrman, MS3; Bernardo De Andrada Pereira, MD4; Lawrence G. Lenke, MD5; Juan S. Uribe, MD6; Brian Kelly, PhD7; Jay D. Turner, MD, PhD7
1Phoenix, AZ, US; 2BNI Spinal Biomechanics Lab, Phoenix, AZ, US; 3Barrow Neurological Institute, Phoenix, AZ, US; 4Saint Joseph Hospital and Medical Center - Barrow Neurological Institute, Phoenix, AZ, US; 5New York, NY, US; 6University of South Florida, Tampa, FL, US; 7Barrow Brain and Spine, Phoenix, AZ, AZ
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P19. Outpatient Posterior Lumbar Fusion: A Population-Based Analysis of Trends and Complication Rates
Don Y. Park, MD1; Armin Arshi, MD2; Howard Y. Park, MD3; Christopher Wang, BS2; Zorica Buser, Phd4; Jeffrey C. Wang, MD5; A. Nick Shamie, MD2
1UCLA, Santa Monica, CA, US; 2Los Angeles, CA, US; 3UCLA Medical Center, Department of Orthopaedic Surgery, Los Angeles, CA, US; 4Norris Research Tower, Keck School of Medicine, USC, 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.

P20. Morphometrics Predicts Overall Survival in Patients with Lung, Breast, Prostate or Myeloma Spine Metastases, Independent of Histology
Hesham M. Zakaria, MD1; Lara W. Massie, MD1; Azam Basheer, MD2; Lonni R. Schultz, PhD3; Brent Griffith, MD4; Farzan Siddiqui, MD, PhD2; Victor Chang, MD4
1Henry Ford Hospital, Detroit, MI, US; 2Henry Ford Health System, Detroit, MI, US; 3Detroit, MI, US; 4Henry Ford West Bloomfield Hospital, West Bloomfield, MI, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Katherine H. Sullivan; Swamy Kurra, MD1; Prisco J. DeMercurio, BS2; Mike H. Sun, MD3; Warren E. Wuiff, MD4; William F. Lavelle, MD5
1Syracuse, NY, US; 2SUNY Upstate Medical University, Syracuse, NY, US; 3Upstate Medical University Orthopedics, East Syracuse, NY, US; 4Syracuse Orthopedic Specialists, East Syracuse, NY, US; 5Upstate Orthopedics, East Syracuse, NY, US
FDA Device/Drug Status: Vancomycin (Approved for this indication), spinal cord stimulator (Approved for this indication).

P22. Single-Center, Matched-Pair Comparative Study of Spine Surgery in Patients with Solid Organ Transplantation: Short- and Long-Term Clinical Outcomes
Wataru Ishida, MD1; Seba Ramhmdani, MD2; Alexander Perdomo-Pantoja, MD3; Benjamin D. Elder, MD, PhD4; Christina Holmes, PhD; Nicholas Theodore, MD5; Ziya L. Gokaslan, MD, FACS; Jean-Paul Wolinsky, MD1; Daniel M. Sciubba, MD5; Ali Bydon, MD1; Timothy F. Witham, MD, FACS5; Sheng-fu L. Lo, MD, MHS5
1Johns Hopkins Hospital, Baltimore, MD, US; 2Baltimore, MD, US; 3The Johns Hopkins University School of Medicine, Baltimore, MD, US; 4Rochester, MN, US; 5Columbia University College of Physicians and Surgeons, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P23. Trends in Complications in Operative Adolescent and Adult Idiopathic Scoliosis from the SRS Morbidity and Mortality Database
Swamy Kurra, MD1; Baron S. Lonner, MD2; Katherine H. Sullivan; Isador H. Lieberman, MD, FRCS, MBA3; Shay Bess, MD4; William F. Lavelle, MD5
1Syracuse, NY, US; 2Mount Sinai Beth Israel Medical Center, New York, NY, US; 3Scoliosis and Spine Tumor Center, Texas Back Institute, Texas Health Presbyterian Hospital Plano, Plano, TX, US; 4Denver, CO, US; 5Upstate Orthopedics, East Syracuse, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P24. Matched-Pair Cohort Study of Spinal Surgery in HIV-Infected Patients: Minimum One-Year Follow-Up
Wataru Ishida, MD1; Seba Rahmmdani, MD2; Alexander Perdomo-Pantoja, MD3; Benjamin D. Elder, MD, PhD4; Christina Holmes, PhD5; Nicholas Theodore, MD2; Ziya L. Gokaslan, MD, FACS; Jean-Paul Wolinsky, MD1; Daniel M. Scibba, MD2; Ali Bydon, MD1; Timothy F. Witham, MD, FACS3; Sheng-fu L. Lo, MD, MHS6
1Johns Hopkins Hospital, Baltimore, MD, US; 2Baltimore, MD, US; 3The Johns Hopkins University School of Medicine, Baltimore, MD, US; 4Rochester, MN, US; 5Columbia University College of Physicians and Surgeons, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P25. Updated Imaging Does Not Affect Revision Rates in Adults Undergoing Spine Surgery for Lumbar Degenerative Disease
Zachary Ries, MD1; Steven D. Glassman, MD2; Ivan Vasilyev3; Leanne Metcalf, PhD4; Leah Y. Carreon, MD, MSc2
1Louisville, KY, US; 2Norton Leatherman Spine Center, Louisville, KY, US; 3HCSC, Chicago, IL, US; 4Health Care Services Co., Richardson, TX, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P26. Quantification and Comparison of Static Balance in Normal versus Cervical Spondylotic Myelopathy Patients
Mikhail Lew P. Ver, MD1; Jeffrey L. Gum, MD; Steven D. Glassman, MD; Portia Steele, ACNP-BC; Leah Y. Carreon, MD, MSc
Norton Leatherman Spine Center, Louisville, KY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P27. The Phenomenon of Temporary Increase of Herniated Disc on Dynamic MRI Control
Alexander Tkachev, MD, PhD1; Alina V. Smirnova, MD2; Daniil Archakov, MD1
1TMM-Clinic, Volgograd, Russian Federation; 2Saint Petersburg, Russian Federation
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P28. Does Diabetes Mellitus Affect Lumbar Paraspinal Muscle Morphometry?
Scott Wagner, MD1; James McKenzie, MD2; Arjun S. Sebastian, MD, MSc3; John J. Mangan III, MD, MHA4; David Casper, MD5; Christopher K. Kepler, MD, MBA6
1Walter Reed National Military Medical Center, Bethesda, MD, US; 2Philadelphia, PA, US; 3Rothman Institute, Rochester, MN, US; 4Thomas Jefferson University Hospital, Department of Orthopaedic Surgery, Philadelphia, PA, US; 5Rothman Institute, Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P33. The Prevalence of L4-5 Degenerative Spondylolisthesis in Females: Role of Spinal Sagittal Alignment and Lumbopelvic Morphology
Issei Senoo, MD, PhD
Asahikawa Medical University, Asahikawa, Hokkaido, Japan
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P34. Axial Rotation Correction in Adolescent Idiopathic Scoliosis with Pedicle Screw Construct
James T. Bennett, MD
Tulane University School of Medicine, New Orleans, LA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P35. Implant Sonication versus Tissue Culture for the Detection of Spinal Implant Infection
Bayard C. Carlson, MD1; Jeremy T. Hines, MD2; William A. Robinson, MD1; Arjun S. Sebastian, MD, MSc3; Paul M. Huddleston III, MD, MS4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P36. Influence of Lumbar Spine Pathology on Bone Mineral Density Measurement by Quantitative Computed Tomography (QCT)
Stephan Salzmann, MD1; Brandon B. Carlson, MD, MPH2; Toshiyuki Shirahata, MD, PhD3; Courtney Ortiz Miller, BA1; John A. Carrino, MD, MPH1; Jingyan Yang, PhD1; Jennifer Shue, MS1; Andrew A. Sama, MD1; Frank P. Cammisa, MD1; Federico P. Girardi, MD1; Alexander P. Hughes, MD1
1Hospital for Special Surgery, New York, NY, US; 2Hospital for Special Surgery, New York, NY, US; 3Showa University School of Medicine, Department of Orthopedic Surgery, Tokyo, Japan
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P37. QCT L1/L2 Bone Mineral Density Average: A Useful Bone Quantity Measure of the Entire Lumbosacral Spine
Stephan Salzmann, MD1; Toshiyuki Shirahata, MD, PhD2; Courtney Ortiz Miller, BA1; Brandon B. Carlson, MD, MPH3; John A. Carrino, MD, MPH1; Jingyan Yang, PhD1; Jennifer Shue, MS1; Andrew A. Sama, MD1; Frank P. Cammisa, MD1; Federico P. Girardi, MD1; Alexander P. Hughes, MD1
1Hospital for Special Surgery, New York, NY, US; 2Hospital for Special Surgery, New York, NY, US; 3Showa University School of Medicine, Department of Orthopedic Surgery, Tokyo, Japan; 4New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P38. Prevalence of Low Bone Mineral Density Measured by Quantitative Computed Tomography (QCT) in 296 Consecutive Lumbar Fusion Patients
Brandon B. Carlson, MD, MPH1; Stephan Salzmann, MD2; Toshiyuki Shirahata, MD, PhD3; Courtney Ortiz Miller, BA1; John A. Carrino, MD, MPH1; Jingyan Yang, PhD1; Jennifer Shue, MS1; Andrew A. Sama, MD1; Frank P. Cammisa, MD1; Federico P. Girardi, MD1; Alexander P. Hughes, MD2
1New York, NY, US; 2Hospital for Special Surgery, New York, NY, US; 3Showa University School of Medicine, Department of Orthopedic Surgery, Tokyo, Japan
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P39. Modic 2 Changes and Smoking Predict Vascular Adherence during Anterior Lumbar Exposure
Greg M. Malham, MbChB, FRACS
Melbourne, Victoria, Australia
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P40. 18F-Fluoride PET/CT as an Early Predictor of Bony Fusion After Posterior Lumbar Interbody Fusion
Marloes Peters, MSc; Paul Willems, MD
Maastricht University Medical Center, Maastricht, Netherlands
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P41. Agreement of Degenerative Spondylolisthesis Definitions on Standing and Supine Lateral Radiographs in Consecutive Patients
Tyler P. Montgomery, BS1; Austin R. Thompson, BS2; Sawyer Smith3; J. Caillil Gillis, MPH4; Hans L. Carlson, MD2; Nels L. Carlson, MD1; Jung U. Yoo, MD2; Lynn Marshall, ScD5
1Boca Raton, FL, US; 2Oregon Health and Science University, Portland, OR, US; 3Happy Valley, OR, US; 4Harvard T.H. Chan School of Public Health, Boston, MA, US; 5Oregon Health & Science University, Phoenix, AZ, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P42. Preliminary Validation of a Machine-Learning MRI-Based Algorithm to Identify Patients with Functional Impairment Associated with Lumbar Stenosis

Jose G. Tamez-Pena, PhD; Saara M. Totterman, MD, PhD; Maria Frazer, BS; Joshua M. Farber, MD; Patricia C. Gonzalez, BS, MBA; Stephanie Northwood, BA; Edward H. Schreyer, BS; Nicholas Olin, BS; John Markman, MD


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

P43. FDG-PET/CT for Assessment of Pain Perception and Correlation to Clinical Outcome Following Surgery for Lumbar Disc Herniation

Christian C. Stoettrup, MD; Mikkel Andersen, MD; Poul Flemming Hallund-Carlsen, MD

1Lillebaelt Hospital, Middelfart, Denmark; 2Middelfart, Denmark; 3Odense University Hospital - Department of Nuclear Medicine, Odense C, Syddanmark, Denmark

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

P44. Long-Term Follow-Up of Patients with Modic Changes

Peter Udby, MD

Zealand University Hospital, Department of Orthopedic Surgery, Køge, Zealand, Denmark

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

P45. The Prevalence of Incidental and Symptomatic Lumbar Synovial Facet Cysts

Stein Janssen, MD; Paul T. Ogink, MD; Joseph H. Schwab, MD

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

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

P46. Consultation and Surgical Wait Times in Patients with Cervical Spondylotic Myelopathy: A Prospective Canadian Spine Outcomes and Research Network (CSORN) Study

Babak Sharifi; Charles G. Fisher, MD, FRCCSC, MHS; Bradley Jacobs, MD, FRCCSC; Christopher S. Bailey, MD, FRCCSC; Sean D. Christie, MD; Raphaelle Charest-Morin, MD; Kenneth Thomas, MD; Raja Y. Rampersaud, MD, FRCCSC; Greg Mcintosh; Nicolas Dea, MD, MSc, FRCCSC

1Vancouver General Hospital, Vancouver, BC, Canada; 2University of Calgary, Foothills Hospital, Calgary, AB, Canada; 3University of West Ontario/London Health Sciences Centre, London, ON, Canada; 4Que II Health Sciences Centre, Halifax, NS, Canada; 5Quebec, QC, Canada; 6Faculty of Medicine, University of Calgary, Calgary, AB, Canada; 7Toronto Western Hospital, Toronto, ON, Canada; 8Canadian Back Institute, Oakville, ON, Canada; 9Vancouver, BC, Canada

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

P47. Evidence from the Epidemiology, Process and Outcomes of Spine Oncology (EPOSO) Cohort: Surgical versus Radiation Therapy for the Treatment of Cervical Metastases

Michael Bond, MD; Anne Versteeg, MD, MHS; Arjun Sahgal; Peter P. Varga, MD; Daniel M. Sciubba, MD; Michelle J. Clarke, MD; Laurence D. Rhines, MD; Stefano Boriani, MD; Michael G. Fehlings, MD, PhD, FRCCSC; Paul M. Arnold, MD; Charles G. Fisher, MD, FRCCSC, MHS

1Vancouver, BC, Canada; 2Universiteit Utrecht, Netherlands; 3Canada; 4National Center for Spinal Disorders, Budapest, Hungary; 5John Hopkins University/School of Medicine, Baltimore, MD, US; 6Mayo Clinic, Rochester, MN, US; 7Houston, TX, US; 8Istituto Ortopedico Rizzoli, Bologna, Italy; 9Toronto Western Hospital, Toronto, ON, Canada; 10University of Kansas Medical Center/Department of Neurosurgery, Kansas City, KS, US; 11Vancouver General Hospital, Vancouver, BC, Canada

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

P48. What is the Normal Distribution of Kyphosis Across the Thoracic Spine in the Adult Population?

Renaud Lafage, MSc; Sebastien Pesenti, MD; Ayman Assi, PhD; Jonathan Elysee; Tejbir S. Pannu, MD, MS; Brenda A. Sides; Munish C. Gupta, MD; Lawrence G. Lenke, MD; Frank J. Schwab, MD; Han Jo Kim, MD; Virginie Lafage, PhD

1Hospital for Special Surgery, New York, NY, US; 2University of Saint Joseph, Faculty of Medicine, Beirut, Lebanon; 3Washington University School of Medicine, St. Louis, MO, US; 4New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P49. Effects of Lower Extremity Fatigue and Gender on Unanticipated Landing Performance in a Recurrent Low Back Pain Population**
Ram Haddas, PhD, MSc, MEng; Yigal Samocha, MD
1Texas Back Institute, Plano, TX, US; 2Advanced Orthopedics at Westchester Medical Center, Fishkill, NY, US

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

**P50. A Randomized Prospective Comparative Trial of Water-Cooled versus Traditional Radiofrequency Ablation of the Median Branch Nerve in the Treatment of Zygapophyseal Joint Pain: Six-Month Outcomes**
Zachary McCormick, MD; Heejung Choi, MD; Rajiv Reddy, MD; Raafay H. Syed, MD; Mark C. Kendall, MD; Meghan Bhave, MD; Dost Khan, MD; Geeta Nagpal, MD; Masaru Teramoto, PhD, MPH; David R. Walega, MD, MSc
1University of Utah, Salt Lake City, UT, US; 2Little Rock, AR, US; 3UCSD, La Jolla, CA, US; 4Highland Hospital, Oakland, US; 5Providence, RI, US; 6Northwest Suburban Pain Center, Arlington Heights, IL, US; 7Chicago, IL, US; 8Northwestern Pain Medicine Center, Chicago, IL, US

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

**P51. The Efficacy of Spinal Cord Stimulators: A Comparison of Success in the Trial Period versus After Permanent Stimulator Placement**
Ajith Malige, MD; Gbolabo O. Sokunbi, MD

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

**P52. Cervical Epidural Steroid Injections: Incidence and Determinants of Subsequent Surgery**
John Kleimeyer, MD; Jayme Koltsov, PhD; Serena S. Hu, MD
1Redwood City, CA, US; 2Stanford University School of Medicine, Redwood City, CA, US

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

**P53. Management of Pressure Injury with a Novel Negative Pressure Device (NPD) in People with Spinal Cord Injury (SCI)**
Mukesh K. Dwivedi, PhD; Rajeshwar Srivastava, MD
1Department of Orthopaedic Surgery, Lucknow, Uttar Pradesh, India; 2King George’s Medical University, Department of Orthopaedic Surgery, Lucknow, UP, India

**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.
**P58. Identifying Discharge Destination in Patients Undergoing Vertebral ORIF: Analysis of 1055 Cases**

Thomas Kroshus, BA1; Khushdeep S. Vig1; William A. Ranson, MD2; Oscar A. Carrillo, BS2; Samuel J. White, BA1; Deepak Kaji, BA1; Ray Tang, BA1; Ivan B. Ye, BA1; John Di Capua, MHS, BS2; Jun Kim, MD3

1New York, NY, US; 2Icahn School of Medicine at Mount Sinai, New York, NY, US; 3Mount Sinai Medical Center, New York, NY, US

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

**P59. XRay Vision: The Performance of a Technology that Allows Clinicians to See Spinal XRays Superimposed on a Patient’s Back**

Jacob F. Aaskov1; Greg N. Kawchuk, DC, MSc, PhD2; Kenton D. Hamaluik; Pierre Boulander, PhD2

1University of Southern Denmark, Odense, Denmark; 2University of Alberta, Edmonton, AB, Canada

**FDA Device/Drug Status:** Microsoft Hololens (Investigational/Not approved).

**P60. The Effect of Physical Therapy on Gait and Balance in Patients Following Lumbar Artificial Disc Replacement: A Preliminary Study**

Yoheli Perez, PT, DPT; Shelly Ritz, PT, OCS; Nicole G. Musngi, BS; Richard D. Guyer, MD; Scott L. Blumenthal, MD; Ram Haddas, PhD, MSc, MEng

Texas Back Institute, Plano, TX, US

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

**P61. Clinical Outcomes of Microendoscopic Decompression for Lumbar Canal Stenosis: A Comparison Between Patients With and Without Degenerative Lumbar Scoliosis**

Katsumasa Tanimoto, MD, PhD

Sapporo, Hokkaido, Japan

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

**P62. Application of Laparoscopic Lumbar Discectomy and Artificial Disc Replacement: At Least Two-Years of Follow-Up**

Wenjun Wang, MD, PhD; Cheng Wang, MD, PhD

The First Affiliated Hospital of University of South China, Hengyang, China

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

**P63. Pain Related Safety Outcomes Seven-Years Following Lumbar Total Disc Replacement in Mobile Core Devices versus Constrained Core Devices**

Harel Deutsch, MD

Rush University Medical Center Department of Neurosurgery, Chicago, IL, US

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

**P64. Comparing 30-Day Outcomes Between Orthopaedic Surgeons and Neurosurgeons in Lumbar Total Disc Replacement**

Neil V. Shah, MD, MS1; Marine Coste, BA2; Jared M. Newman, MD1; George A. Beyer, MS1; Daniel P. Murray, BA1; Morad Chughtai, MD2; Hiroyuki Yoshihara, MD, PhD1; Vincent Chailier, MD4; Peter G. Passias, MD1; Frank J. Schwab, MD1; Virginie Lafiage, PhD1; Carl B. Paulino, MD1; Bassel G. Diebo, MD2

1SUNY Downstate Medical Center, Brooklyn, NY, US; 2SUNY Downstate Medical Center, New York, NY, US; 3Cleveland, OH, US; 4Spine Unit, Clinique Francheville, Perigueux, France; 5NY Spine Institute, NYU Langone Health, New York, NY, US; 6Hospital for Special Surgery, New York, NY, 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.

**P65. Validity of PROMIS in Minimally Invasive Transformaminal Lumbar Interbody Fusion: A Preliminary Evaluation**

Brittany E. Haws, BS1; Benjamin Khechen, BA2; Kaitlyn L. Cardinal, BS1; Jordan Guntin, BS3; Daniel D. Bohl, MD, MPH1; Kern Singh, MD1

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

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

**P66. Patient Perceptions of Surgeon-Industry Relationships**

Srvavish Iyer, MD1; Benjamin Khechen, BA2; Dil V. Patel, BS1; Brittany E. Haws, BS1; Kaitlyn L. Cardinal, BS1; Jordan Guntin, BS3; Frank M. Phillips, MD2; Kern Singh, MD1

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

**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.
**P67. Efficacy of PROMIS Pain Interference and Likert Pain Scores to Assess Function in Spine Patients**

David N. Bernstein, MBA, MA; Matthew StJohn, MD, MS; Addisu Mesfin, MD  
1University of Rochester Medical Center, Rochester, NY, US; 2Strong Memorial Hospital, Rochester, NY, US; 3University of Rochester, Rochester, NY, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.


Andrew J. Schoenfeld, MD; Justin A. Blucher, MS; James D. Kang, MD  
1Brigham and Women’s Hospital, Boston, MA, US; 2Boston, MA, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.


Bradley Johnson, MD; Dennis Vasquez-Montes, MS, BA; Aaron J. Buckland, MBBS, FRACS; John A. Bendo, MD; Jeffrey A. Goldstein, MD, FACS; Thomas J. Errico, MD; Charla R. Fischer, MD  
1Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 2NYU Langone Orthopedic Hospital, New York, NY, US; 3New York, NY, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P70. Development of a Novel Scoring System to Predict the Length of Stay for the Patients Undergoing ACDF Surgery**

Glenn S. Russo, MD, MS; Taolin Fang, MD, PhD; John J. Mangan III, MD, MHA; Christopher K. Kepler, MD, MBA  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P71. The Effects of Insurance and Employment on the Presence of Waddell Signs**

Stephanie S. Radoslovich, BA; Carter Haag, BS; Hans L. Carlson, MD; Nels L. Carlson, MD; Jung U. Yoo, MD  
Oregon Health and Science University, Portland, OR, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P72. Influence of Racial Disparities on Short- and Long-Term Perception of Health Status and Patient Reported Satisfaction After Elective Lumbar Spine Surgery**

Aladine A. Elsamadicy, BS; Owoicho Adogwa, MD, MPH; C. Rory Goodwin, MD; Isaac O. Karikari, MD; Oren N. Gottfried, MD  
1Duke School of Medicine, Durham, NC, US; 2Rush University Medical Center, Chicago, IL, US; 3Durham, NC, US; 4Duke University Medical Center, Durham, NC, US; 5Duke University, Durham, NC, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.


Francesco Costa, MD; Carla Daniela Anania, MD  
1Istituto Clinico Humanitas, Rozzano, Italy; 2Humanitas Clinical and Research Hospital, Rozzano, Italy  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P74. Clinic Satisfaction Tool Improves Communication and Provides Real-Time Feedback**

Rasheedat Zakare-Fagbamila, BA; Oren N. Gottfried, MD  
1Duke University School of Medicine, Durham, NC, US; 2Duke University, Durham, NC, US  
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P75. Does the Concomitant Presence of Scoliosis or Spondylolisthesis Affect Outcomes Following Stability-Preserving Lumbar Decompression for Spinal Stenosis?

Philip Louie, MD1; Bryce Basques, MD, MHS2; Deven Carroll, MS3; Tarush Khurana, BA4; Michael T. Nolte, MD5; Justin C. Paul, MD, PhD6; Aya G. Varthi, MD2; Edward J. Goldberg, MD7; Howard S. An, MD8

1Rush University Medical Center, Chicago, IL, US; 2Yale University School of Medicine, New Haven, CT, US; 3North Chicago, IL, US; 4Chicago, IL, US; 5Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 6Danbury Orthopedics, Danbury, CT, US; 7Midwest Orthopedics At Rush, Chicago, IL, US; 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.

P76. Growing Rods Instrumentation for Early-Onset Spinal Deformities at Five-Year Follow-Up

Zhihua Ouyang, MD, PhD; Cheng Wang, MD, PhD; Wenjun Wang, MD, PhD

The First Affiliated Hospital of University of South China, Hengyang, China

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

P77. Adult Spinal Deformity Surgery in Patients 75 Years and Older: How Do the Outcomes Compare with Younger Patients?

Zac Lovato, DO1; Andrew S. Chung, DO2; Dennis G. Crandall, MD1; Jan Revella, RN1; Michael S. Chang, MD1

1Sonoran Spine, Tempe, AZ, US; 2Mayo Clinic - Arizona, Phoenix, AZ, US

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

P78. Likelihood of Reaching Minimal Clinically Important Difference in Adult Spinal Deformity Surgery: A Comparison of Patients from North America and Japan

Hideyuki Arima, MD, PhD1; Steven D. Glassman, MD2; Keith H. Bridwell, MD3; Yu Yamato, MD, PhD4; Mitsuru Yagi, MD, PhD5; Kota Watanabe, MD6; Morio Matsumoto, MD6; Satoshi Inami, MD, PhD7; Hiroshi Taneichi, MD8; Yukihito Matsuyama, MD, PhD8; Leah Y. Carreon, MD, MSc9

1Department of Orthopaedic Surgery, Hamamatsu University School of Medicine, Hamamatsu-city, Shizuoka, Japan; 2Norton Leatherman Spine Center, Louisville, KY, US; 3Washington University in St. Louis School of Medicine, St. Louis, MO, US; 4National Hospital Organization Murayama Medical Center, Tokyo, Japan; 5Keio University School of Medicine, Tokyo, Japan; 6Keio University School of Medicine, Tochigi, Japan; 7Dokkyo Medical University, Tochigi, Japan; 8Mibu, Japan

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

P79. Patient Frailty is an Important Contributor to Disability in Adult Spinal Deformity (ASD): Rationale for Routine Frailty and Deformity Assessment

Shay Bess, MD1; Breton Line, BS2; Christopher P. Ames, MD3; Renaud Lafage, MSc4; Virginie Lafage, PhD5; Douglas C. Burton, MD6; Richard A. Hostin Jr., MD6; Gregory M. Mundis Jr., MD7; Robert K. Eastlack, MD8; Robert A. Hart, MD9; Munish C. Gupta, MD10; Michael P. Kelly, MD11; Eric O. Klineberg, MD12; Han Jo Kim, MD4; Frank J. Schwab, MD14; Christopher I. Shaffrey, MD13; Justin S. Smith, MD, PhD14; International Spine Study Group15

1Denver, CO, US; 2Denver International Spine Center, Denver, CO, US; 3University of California, San Francisco, San Francisco, CA, US; 4Hospital for Special Surgery, New York, NY, US; 5University of Kansas Medical Center, Kansas City, KS, US; 6Southwest Scoliosis Institute, Plano, TX, US; 7Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 8Scripps Clinic, San Diego, CA, US; 9Swedish Neuroscience Institute, Seattle, WA, US; 10Washington University School of Medicine, St. Louis, MO, US; 11Washington University, St. Louis, MO, US; 12UC, Davis School of Medicine, Sacramento, CA, US; 13University of Virginia, Charlottesville, VA, US; 14UVA Health System, Charlottesville, VA, US; 15Brighton, CO, US

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

P80. What Factors Predict the Development of Proximal Junctional Kyphosis Requiring Revision Surgery Over Time, Demographic, Surgical or Radiographic? Results from a Time-Dependent ROC Curve

Jingyan Yang, PhD1; Marc Khalifi, MD2; Renaud Lafage, MSc1; Han Jo Kim, MD1; Christopher I. Shaffrey, MD4; Douglas C. Burton, MD4; Christopher P. Ames, MD4; Gregory M. Mundis Jr., MD4; Richard A. Hostin Jr., MD7; Shay Bess, MD8; Eric O. Klineberg, MD8; Robert A. Hart, MD10; Frank J. Schwab, MD11; Virginie Lafage, PhD1; International Spine Study Group11

1Hospital for Special Surgery, New York, NY, US; 2Hopital Européen Georges Pompidou, Paris, France; 3University of Virginia, Charlottesville, VA, US; 4University of Kansas Medical Center, Kansas City, KS, US; 5University of California, San Francisco, CA, US; 6Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; 7Southwest Scoliosis Institute, Plano, TX, US; 8Denver, CO, US; 9UC, Davis School of Medicine, Sacramento, CA, US; 10University of Virginia, Charlottesville, VA, US; 11UVA Health System, Charlottesville, VA, US; 12Brighton, CO, US

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

Ferran Pellise, MD, PhD; Alba Vila-Casademunt, MSc; Sleiman Haddad, MD; Francisco J. Perez-Grueso, MD; Shay Bess, MD; Emre Acaroglu, MD; Justin S. Smith, MD, PhD; Frank Kleinstuck, MD; Virginie Lafage, PhD; Ibrahim Obeid, MD; Frank J. Schwab, MD; Christopher I. Shaffrey, MD; Ahmet Alanay, MD; International Spine Study Group; ESSG European Spine Study Group

1Barcelona, Spain; 2Vall Hebron Institute of Research, Barcelona, Barcelona, Spain; 3H. De La Paz (Madrid), Madrid, Spain; 4Denver, CO, US; 5Ankara, Turkey; 6UVA Health System, Charlottesville, VA, US; 7Switzerland; 8Hospital for Special Surgery, New York, NY, US; 9Bordeaux, France; 10University of Virginia, Charlottesville, VA, US; 11Acibadem University, School of Medicine, Istanbul, Ataşehir, Turkey; 12Brighton, CO, US

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

P82. Surgical Strategy for Congenital Scoliosis Associated with Asymptomatic Tethered Cord

Zhenxing Zhang, PhD
Xi’an, China

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

P83. Development of a Novel Cervical Deformity Surgical Invasiveness Index

Peter G. Passias, MD; Samantha R. Horn, BA; Alexandra Soroceanu, MD, MPH; Cheongun Oh, PhD; Tamir Ailon, MD, MPH; Brian J. Neuman, MD; Renaud Lafage, MSc; Virginie Lafage, PhD; Justin S. Smith, MD, PhD; Breton Line, BS; Robert K. Eastlack, MD; Themistocles S. Protopsaltis, MD; Eric O. Klineberg, MD; Douglas C. Burton, MD; Robert A. Hart, MD; Frank J. Schwab, MD; Shay Bess, MD; Christopher I. Shaffrey, 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.

P84. Transforaminal versus Anterior Lumbar Interbody Fusion at L5-S1 in MIS Treatment of ASD: Effect on Spinopelvic Parameters and Outcomes in Degenerative Scoliosis

Gregory M. Mundis Jr., MD; Eric S. Varley, DO; Juan S. Uribe, MD; Paul Park, MD; Stacie Nguyen, MPH; Pierce D. Nunley, MD; Adam S. Kanter, MD; Neel Anand, MD; Khoi D. Than, MD; David O. Okonkwo, MD; Richard G. Fessler, MD, PhD; Kai Fu; Michael Y. Wang, MD; Dean Chou, MD; Robert K. Eastlack, MD; International Spine Study Group


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

P85. Radiographic Outcome and Complications After Single-Level Lumbar Extended Pedicle Subtraction Osteotomy for Fixed Global Sagittal Malalignment: A Retrospective Analysis of 55 Adult Spinal Deformity Patients with Minimum Two-Year Follow-Up

Thomas Buell, MD; James H. Nguyen, MD; Marcus D. Mazur, MD; Jeffrey P. Mullin, MD; Juanita Garces, MD; Ching-Jen Chen, MD; Davis G. Taylor, MD; Chun-Po Yen, MD; Mark E. Shaffrey, MD; Christopher I. Shaffrey, MD; Justin S. Smith, MD, PhD

1University of Virginia Neurosurgery, Charlottesville, VA, US; 2Charlottesville, VA, US; 3University of Utah, Department of Neurosurgery, Salt Lake City, UT, US; 4Shaker Heights, OH, US; 5Tulane Medical Center, New Orleans, LA, US; 6University of Virginia Health System, Department of Neurosurgery, Charlottesville, VA, US; 7University of Virginia, Charlottesville, VA, US; 8UVA Health System Department of Neurosurgery, Charlottesville, VA, US; 9UVA Health System, Charlottesville, VA, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P86.** ROTEM-Guided Transfusion during Pedicle Subtraction Osteotomy for Adult Spinal Deformity: A Propensity Score-Matched Cohort Analysis

Thomas Buell, MD1; Davis G. Taylor, MD2; Ching-Jen Chen, MD3; Jeffrey P. Mullin, MD4; Marcus D. Mazur, MD5; Chun-Po Yen, MD6; Mark E. Shaffrey, MD6; Christopher I. Shaffrey, MD2; Justin S. Smith, MD, PhD7; Bhiken I. Naik, MbChB2

1University of Virginia Neurosurgery, Charlottesville, VA, US; 2University of Virginia, Charlottesville, VA, US; 3University of Virginia Health System, Department of Neurosurgery, Charlottesville, VA, US; 4Shaker Heights, OH, US; 5University of Utah, Department of Neurosurgery, Salt Lake City, UT, US; 6UVA Health System Department of Neurosurgery, Charlottesville, VA, US; 7UVA Health System, Charlottesville, VA, US

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

**P87.** Determination of Clinically Meaningful PROMIS Severity Ranges for Adult Spinal Deformity

Rafa Rahman1; Alvaro Ibaseta, MS2; Jay S. Reider, MD, MPH3; Richard L. Skolasky, ScD4; David B. Cohen, MD, MPH4; Daniel M. Sciubba, MD1; Khaleel M. Kebaish, MD1; Brian J. Neuman, MD1

1Johns Hopkins University School of Medicine, Baltimore, MD, US; 2Baltimore, MD, US; 3Johns Hopkins Hospital, Baltimore, MD, US; 4Johns Hopkins University, Baltimore, MD, US

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

**P88.** Medical Complications and Risk Factors After Long Level Spinal Fusion for Adult Degeneration Scoliosis

Xinuo Zhang, MD

Beijing Chaoyang Hospital, Beijing, China

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

**P89.** Risk Factors for Proximal Junction Kyphosis (PJK) in Scheuermann’s Kyphosis (SK)

Vishal Sarwahi, MD1; Jesse M. Galina, BS2; Stephen Wendolowski3; Adam Benton, MBBS4; Sean Molloy Orth, MSc, FRCS5; Darren Lui, FRCS6; Terry D. Amaral, MD7


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

**P90.** Touched Vertebra (TV) on Standing XR is a Good Predictor for LIV. TV on Prone XR is Better

Vishal Sarwahi, MD1; Stephen Wendolowski3; Jesse M. Galina, BS2; Beverly Thornhill, MD4; Yungtai Lo, PhD4; Kathleen Maguire, MD5; Terry D. Amaral, MD6


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

**P91.** Lenke 1 Adolescent Idiopathic Scoliosis: Effects of TK Restoration on Regional and Global Alignment

Jonathan Elysee1; Renaud Lafage, MSc1; Brice Henry, MD2; Colleen Wixted, BS3; Manon Bolzinger, MD1; Han Jo Kim, MD1; Matthew E. Cunningham, MD, PhD1; Elie Choufani, MD4; Virginie Lafage, PhD5; John S. Blanco, MD5; Roger F. Widmann, MD1; Jean-Luc Jouve, MD4; Sebastien Pesenti, MD1

1Hospital for Special Surgery, New York, NY, US; 2Hôpital Timone Enfants, Marseille, Provence-Alpes-Côte d’Azur, France; 3Toulouse, US; 4Marseille, France; 5Hospital for Special Surgery, New York, New York, US

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

**P92.** Does UIV Affect Rate of PJK in Adult Deformity Surgery Fused to the Pelvis?

Jay Toor, MD

Mississauga, ON, Canada

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

**P93.** Preoperative Hemoglobin Levels and Risk for Transfusion After Adult Spinal Deformity Surgery: Analysis of Predictive Factors

Tina Raman, MD1; Peter L. Zhou, BA2; Dennis Vasquez-Montes, MS, BA3; Aaron J. Buckland, MBBS, FRACS4; Thomas J. Errico, MD5

1New York, NY, US; 2SUNY Downstate Medical Center, Brooklyn, NY, US; 3Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P94. Changes in Pain and Physical Function Best Predict Patient Satisfaction with ASD Management After Fusion Surgery
Nicholas S. Andrade, BS1; Richard L. Skolasky, ScD2; Khaled M. Kebaish, MD1; Lee H. Riley III, MD1; David B. Cohen, MD, MPH1; Brian J. Neuman, MD1
1Baltimore, MD, US; 2Johns Hopkins University, Baltimore, MD, US; 3Johns Hopkins Outpatient Center/Department Orthopedic Surgery, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P95. Quantitative Age-Adjusted Targets for Ideal Cervicothoracic Sagittal Alignment in Asymptomatic Adults
Peter G. Passias, MD1; Cole Bortz, BA2; Dennis Vasquez-Montes, MS, BA3; Frank A. Segreto, BS4; Samantha R. Horn, BA5; Nicholas J. Frangella, BS5; Nicholas Stekas, BS5; Leah Steinmetz, BA5; Kartik Shenoy, MD1; Peter L. Zhou, BA5; Christopher Variotta, BS5; David H. Ge, BA5; Jordan H. Manning, BA5; Mohamed A. Moawad, MPH5; Chloe Delfiorimonte, BS5; Bassel G. Diebo, MD6; Shaleen N. Vira, MD1; Michael C. Gerling, MD7; Jordan H. Manning, BA5; Mohamed A. Moawad, MPH8; Nicholas J. Frangella, BS5; Nicholas Stekas, BS5
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P96. Adult Spinal Deformity Patients Demonstrate Impaired Postural Stability and Dynamic Balance Compared to Age-Matched Controls
Jakub Godzik, MD1; Christopher W. Frames, BS1; Corey Walker, MD2; Thurmon Lockhart, PhD3; Jay D. Turner, MD, PhD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P97. The Risk of Recurrent Laryngeal Nerve Injury with Laterality of Approach in Anterior Cervical Discectomy and Fusion Procedures: A Randomized, Prospective Study Over 10 Years
William Beutler, MD, FACS1; Shalin Shah, DO2; Manminder S. Bhatia, DO2
1Pennsylvania Spine Institute, Harrisburg, PA, US; 2Pinnacle Health, Harrisburg, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P98. Does Additional Bone Grafting of Atlantoaxial Joint Increase the Bone Fusion Rate of Iliac Crest Autograft in Posterior Occipitocervical Fusion? A Retrospective, Controlled Study with a Two-Year Follow-Up
Jun-Song Yang, MD; Ding-Jun Hao, MD
Department of Spine Surgery, Honghui Hospital, Xi’an Jiaotong University, Xi’an, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P99. Laminoplasty and Laminectomy Hybrid Decompression for the Treatment of Cervical Spondylotic Myelopathy with Hypertrophic Ligamentum Flavum: A Retrospective Study
Yuan Xue, MD, PhD
The Department of Orthopaedic Surgery, Tianjin Medical University General Hospital, Tianjin, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P100. Cervical Laminoplasty: Timing of Postoperative Complications
Kelsey A. Isbester, BS1; Joseph E. Tanenbaum, BA2; Michael P. Steinmetz, MD2; Thomas E. Mroz, MD3
1The Cleveland Clinic, Center for Spine Health Lab, Cleveland, OH, US; 2Cleveland Clinic Center for Spine Health, Cleveland, OH, US; 3Cleveland Clinic, Cleveland, OH, US; 4Cleveland Clinic Departments of Orthopaedic and Neurological Surgery, Cleveland, OH, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P101. Favorable Prognosis for Significant Preoperative Upper Extremity Weakness Following Elective Anterior Cervical Discectomy and Fusion
Arjun S. Sebastian, MD, MSc¹; Scott Wagner, MD²; Joseph S. Butler, PhD, FRCS (Tr & Orth)²; Patrick Morrissey, MD³; Ian D. Kaye, MD⁴; Christopher K. Kelder, MD, MBA⁶
¹Rothman Institute, Rochester, MN, US; ²Walter Reed National Military Medical Center, Bethesda, MD, US; ³National Spinal Injuries Unit, Mater Misericordiae University Hospital, Dublin 7, Ireland; ⁴United States Navy, San Diego, CA, US; ⁵Rothman Institute, Philadelphia, PA, US; ⁶Philadelphia, PA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P102. A Comparison of Three Different Positioning Techniques on Surgical Corrections and Postoperative Alignment in Cervical Deformity (CD) Surgery
Brandon B. Carlson, MD, MPH¹; Renaud Lafage, MSc²; Tejibir S. Pannu, MD, MS³; Peter G. Passias, MD, MS⁴; Christopher P. Ames, MD⁵; Robert A. Hart, MD⁶; Christopher I. Shaffrey, MD⁶; Gregory M. Mundis Jr., MD⁷; Themistocles S. Protopsaltis, MD⁸; Munish C. Gupta, MD⁹; Eric O. Klineberg, MD, MS¹⁰; Douglas C. Burton, MD¹¹; Virginie Lafage, PhD¹²; Han Jo Kim, MD¹²; International Spine Study Group¹²
¹New York, NY, US; ²Hospital for Special Surgery, New York, NY, US; ³NY Spine Institute, NYU Langone Health, New York, NY, US; ⁴University of California, San Francisco, San Francisco, CA, US; ⁵Swedish Neuroscience Institute, Seattle, WA, US; ⁶University of Virginia, Charlottesville, VA, US; ⁷Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; ⁸Department of Orthopaedic Surgery, NYU Langone Orthopaedic Hospital, NYU Langone Health, New York, NY, US; ⁹University of California, San Francisco, CA, US; ¹⁰UC, Davis School of Medicine, Sacramento, CA, US; ¹¹University of Kansas Medical Center, Kansas City, KS, US; ¹²Brighton, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P103. Preoperative PROMIS Score is Not Predictive of Postoperative Pain or Narcotics Consumption After Anterior Cervical Discectomy and Fusion
Benjamin Khechen, BA¹; Brittany E. Haws, BS²; Dil V. Patel, BS²; Ankur S. Narain, BA³; Jordan Guntin, BS²; Kaitlyn L. Cardinal, BS²; Kern Singh, MD²
¹Midwest Orthopaedics at Rush, Chicago, IL, US; ²Rush University Medical Center, Chicago, IL, US; ³Rush University Medical Center-Department of Orthopaedic Surgery, Chicago, IL, US; ⁴Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P104. The Operative Treatment of Shoulder Pain: A Comparison of Shoulder and Cervical Spine Surgical Intervention
Ajith Malige, MD¹; Paul N. Morton, MD²; Gbolabo O. Sokunbi, MD³
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P105. Limited Morbidity and Possible Radiographic Benefit of C2 versus Subaxial Cervical Upper-Most Instrumented Vertebras
Peter G. Passias, MD¹; Cole Bortz, BA²; Renaud Lafage, MSc³; Virginie Lafage, PhD⁴; Justin S. Smith, MD, PhD⁵; Breton Line, BS⁶; Robert K. Eastlack, MD⁷; Samantha R. Horn, BA⁸; Frank A. Segreto, BS⁹; Daniel M. Sciubba, MD⁹; Eric O. Klineberg, MD¹⁰; Alexandra Soroceanu, MD, MPH¹¹; Douglas C. Burton, MD¹²; Frank J. Schwab, MD¹³; Shay Bess, MD¹⁴; Christopher I. Shaffrey, MD¹⁵; Christopher P. Ames, MD¹⁶; International Spine Study Group¹⁶
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P106. Grading of Complications Following Cervical Deformity-Corrective Surgery: Are Existing Classification Systems Applicable?
Cole Bortz, BA¹; Peter G. Passias, MD²; Renaud Lafage, MSc³; Virginie Lafage, PhD⁴; Justin S. Smith, MD, PhD⁵; Breton Line, BS⁶; Gregory M. Mundis Jr., MD⁷; Michael P. Kelly, MD⁸; Paul Park, MD⁹; Daniel M. Sciubba, MD⁹; D. Kojo Hamilton, MD, MS¹⁰; Jeffrey L. Gum, MD¹¹; Douglas C. Burton, MD¹²; Robert A. Hart, MD¹³; Frank J. Schwab, MD¹⁴; Shay Bess, MD¹⁵; Christopher I. Shaffrey, MD¹⁶; Eric O. Klineberg, MD¹⁶; International Spine Study Group¹⁷
¹New York, NY, US; ²NY Spine Institute, NYU Langone Health, New York, NY, US; ³Hospital for Special Surgery, New York, NY, US; ⁴UVA Health System, Charlottesville, VA, US; ⁵Denver International Spine Center, Denver, CO, US; ⁶Scripps Clinic Medical Group, Department of Orthopedics, La Jolla, CA, US; ⁷Washington University, St. Louis, MO, US; ⁸University Of
P107. The Clinical Efficacy of Cervicothoracic Tuberculosis by Anterior Approach Surgery: A Multicenter Retrospective Study

Wen Jie Wu, MD
Southwest Hospital, Chongqing, Chongqing, China

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

P108. A Multicenter Retrospective Research of Anterior Debridement, Decompression, Bone Grafting, and Instrumentation for Cervical Tuberculosis

Wen Jie Wu, MD
Southwest Hospital, Chongqing, Chongqing, China

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


Peter G. Passias, MD; Frank A. Segreto, BS; Renaud Lafage, MSc; Virginie Lafage, PhD; Justin S. Smith, MD, PhD; Breton Line, BS; Cole Bortz, BA; Samantha R. Horn, BA; Eric O. Klineberg, MD; Brian J. Neuman, MD; Han Jo Kim, MD; Michael P. Kelly, MD; Bassel G. Diebo, MD; Shaleen N. Vira, MD; Douglas C. Burton, MD; Robert A. Hart, MD; Frank J. Schwab, MD; Aaron Hockley, MD, FRCS; Christopher I. Shaffrey, 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.

P110. The Impact of Chronic Steroid and DMARD Therapy on Atlanto-Axial Fusion Rates in Patients with Rheumatoid Arthritis: A Multicenter Review

Christopher J. Elia, DO; Sanjay C. Rao, MD
1Riverside University Health System, Moreno Valley, CA, US; 2Kaiser Permanente Medical Center, Fontana, CA, US

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

P111. Significant Differences in Morbidity when Comparing Adverse Events for Cervical and Lumbar Spine Surgery Prospectively Graded with SAVES

Stian I. Solumsmaen, MD; Rachid Bech-Azeddine, MD, PhD
1Rigshospitalet-Glostrup, Glostrup, Denmark; 2Bagsvaerd, Denmark

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

P112. Treatment of Mild Cervical Myelopathy: Which Factors Predict the Decision for Surgical Intervention?

Michael Bond, MD; Christopher S. Bailey, MD, FRCS; Raphaële Charest-Morin, MD; Sean D. Christie, MD; Neil A. Manson, MD, FRCS; Raja Y. Rampersaud, MD, FRCS; Charles G. Fisher, MD, FRCS; Nicolas Dea, MD, MSc, FRCS

1Vancouver, BC, Canada; 2University of West Ontario/London Health Sciences Centre, London, ON, Canada; 3Quebec, QC, Canada; 4QE II Health Sciences Centre, Halifax, NS, Canada; 5Canada East Spine Centre, Saint John, NB, Canada; 6Toronto Western Hospital, Toronto, ON, Canada; 7Vancouver General Hospital, Vancouver, BC, Canada

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P113.** Crossing the Cervicothoracic Junction in Cervical Spine Fusion Surgery Involves Higher Operative Risks, but Superior Long-Term Outcomes

Alvaro Ibaseta, MS1; Rafa Rahman2; Richard L. Skolasky, ScD3; Jay S. Reider, MD, MPH4; Khaled M. Kebaish, MD1; Daniel M. Sciuumba, MD2; David B. Cohen, MD, MPH2; Brian J. Neuman, MD1

1Baltimore, MD, US; 2Johns Hopkins University School of Medicine, Baltimore, MD, US; 3Johns Hopkins University, Baltimore, MD, US; 4Johns Hopkins Hospital, Baltimore, MD, US

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

**P114.** Trend of the Use of Laminoplasty to Treat Cervical Stenosis in the United States

Benjamin M. Weisenthal, MD1; Byron F. Stephens II, MD2; Nicholas S. Golinviaux3

1Nashville, TN, US; 2Vanderbilt University Medical Center, Nashville, TN, US; 3Yale University School of Medicine, New Haven, CT, US

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

**P115.** Clinical Adjacent Segment Pathology Following Treatment with CDA or ACDF at One or Two-Levels Through Seven Years

Pierce D. Nunley, MD1; Eubulus J. Kerr III, MD1; David A. Cavanaugh, MD2; Andrew Utter, MD1; Peter Campbell, MD1; Kelly Frank, MS1; Kyle E. Marshall, MS2; Marcus Stone, PhD3

1Spine Institute of Louisiana, Shreveport, LA, US; 2Fred Hutchinson Cancer Research Center, Seattle, WA, US; 3Spine Institute of Louisiana Foundation, Shreveport, LA, US

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

**P116.** Changes in Radiographic Alignment Do Not Influence the Development of Postoperative C5 Palsy

Ian D. Kaye, MD1; Andrew Sinensky, BS2; Scott Wagner, MD3; Arjun S. Sebastian, MD, MSc4; Joseph S. Butler, PhD, FRCS (Tr & Orth)5; Patrick Morrissey, MD6; Gregory D. Schroeder, MD7; Christopher K. Kepler, MD, MBA2; Mark F. Kurd, MD6; D. Greg Anderson, MD1; Jeffrey A. Rihn, MD8; Barrett I. Woods, MD10; Kris E. Radcliff, MD11; Alexander R. Vaccaro, MD, PhD1; Alan S. Hilibrand, MD12


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

**P117.** Cerebral Vascular Attacks in Cervical Spinal Fusion

Conor Dunn, MD1; Kimona Issa, MD2; Michael J. Faloon, MD3; Kumar G. Sinha, MD1; Ki S. Hwang, MD2; Arash Emami, MD3


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

**P118.** Outcomes of Patients with Parkinson’s Disease Undergoing Cervical Spine Surgery for Radiculopathy and Myelopathy with Minimum Two-Year Follow-Up

John J. Kelly, BA1; Neil V. Shah, MD, MS2; Jared M. Newman, MD2; Cameron R. Moattari, BS3; Joshua D. Lavian, BA2; George A. Beyer, MS2; Qais Naziri, MD, MBA2; Douglas A. Hollern, MD2; Louis M. Day, MD4; Peter G. Passias, MD5; Frank J. Schwab, MD6; Virginie Lafage, PhD6; Carl B. Paulino, MD2; Bassel G. Diebo, MD4

1St. George’s University School of Medicine, New York, NY, US; 2SUNY Downstate Medical Center, Brooklyn, NY, US; 3Brooklyn, NY, US; 4Department of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY, US; 5NY Spine Institute, NYU Langone Health, New York, NY, US; 6Hospital for Special Surgery, New York, NY, US

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

**P119.** Prospective Randomized Clinical Controlled Trial Comparing Clinical Outcomes of Nunec versus Prestige Cervical Disc Replacement with Five-Year Follow-Up

Shoaib Khan, MBBS1; Chandra K. Bhatia, MD2; Mangattil Rajesh3; Tai S. Friesem, MD4

1North Tees and Hartlepool NHS Trust, Stockton on Tees, Durham, United Kingdom; 2University Hospital of North Tees, Stockton on Tees, United Kingdom; 3United Kingdom; 4Spinal Unit, Stockton-On-Teess, United Kingdom

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P120. Short-Term Outcomes Following Cervical Laminoplasty and Laminectomy and Fusion with Instrumentation
Anthony J. Boniello, MD; Samantha R. Horn, BA; Cole Bortz, BA; Frank A. Segreto, BS; Amrit Khalsa, MD; Peter G. Passias, MD
1Drexel University College of Medicine, Philadelphia, PA, US; 2Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 3New York, NY, US; 4NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 5Hahnemann/Drexel Department of Orthopaedic Surgery, Philadelphia, PA, 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.

P121. Predictors of Postoperative Dysphasia in Adult Patients After Occipitocervical Fusion: Occipital and External Acoustic Meatus to Axis Angle
Wataru Ishida, MD; Seba Ramhmdani, MD; Alexander Perdomo-Pantoja, MD; Benjamin D. Elder, MD, PhD; Christina Holmes, PhD; Nicholas Theodore, MD; Ziya L. Gokaslan, MD, FACSp; Jean-Paul Wolinsky, MD; Daniel M. Sciubba, MD; Ali Bydon, MD; Timothy F. Witham, MD, FACSp; Sheng-fu L. Lo, MD, MHS
1Johns Hopkins Hospital, Baltimore, MD, US; 2Baltimore, MD, US; 3Johns Hopkins University School of Medicine, Baltimore, MD, US; 4Rochester, MN, US; 5Columbia University College of Physicians and Surgeons, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P122. Cervical Interbody Spacer with Passive Radiographic Fusion Status Indicator
Paul W. Millhouse, MD, MBA; Md. Arifuzzaman, PhD; Apeksha C. Rajamnthurilag, BS; Nathan T. Carrington, BS; Caleb J. Behrend, MD; John D. DesJardins, PhD; Jeffrey N. Anker
1Clemson, SC, US; 2Clemson University, Clemson, SC, US; 3Carilion Clinic, Department of Orthopaedic Surgery, Roanoke, VA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P123. Selection of Surgical Treatment Approaches for Cervicothoracic Spinal Tuberculosis: A 10-Year Case Review
Biao Wang, MD; Dingjun Hao, MD; Lingbo Kong, MD, PhD
1Xi’an Honghui Hospital, Xi’an, Shaanxi, China; 2Xi’an, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P124. Comparing 30-Day Outcomes After Anterior Cervical Discectomy and Fusion Between Orthopaedic Surgeons and Neurosurgeons: An Eight-Year Analysis
Neil V. Shah, MD, MS; Marine Coste, BA; Daniel P. Murray, BA; George A. Beyer, MS; Jared M. Newman, MD; Morad Chuhtai, MD; Brian Ford, BS; Vincent Challier, MD; Hiroyuki Yoshiihara, MD, PhD; Frank J. Schwab, MD; Virginie Lafage, PhD; Peter G. Passias, MD; Carl B. Paulino, MD; Bassel G. Diebo, MD
1SUNY Downstate Medical Center, Brooklyn, NY, US; 2SUNY Downstate Medical Center, New York, NY, US; 3Cleveland, OH, US; 4Spine Unit, Clinique Francheville, Perigueux, France; 5Hospital for Special Surgery, New York, NY, US; 6NY Spine Institute, NYU Langone Health, New York, NY, 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.

P125. Comparing the Impact of Elderly Age on Outcomes Following Cervical Spinal Fusion: A Statewide Analysis with Two-Year Follow-Up
Neil V. Shah, MD, MS; Ishaan Jain, BS; George A. Beyer, MS; Jared M. Newman, MD; Daniel P. Murray, BA; Jay Rathod, BS; Samuel Aki1, BS; Alexander Chee, BA; Hiroyuki Yoshiihara, MD, PhD; Carl B. Paulino, MD
1SUNY Downstate Medical Center, Brooklyn, NY, US; 2Brooklyn, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Mhamad Faour, MD; Charles C. Yu, MD; Nicholas U. Ahn, MD
1Cleveland, OH, US; 2Henry Ford Health System, Detroit, MI, US; 3University 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.
P127. Redefining the Cervical Disability Threshold of T1 Slope Minus Cervical Lordosis
Peter G. Passias, MD1; Dennis Vasquez-Montes, MS, BA2; Samantha R. Horn, BA2; Cole Bortz, BA3; Frank A. Segreto, BS4; Nicholas J. Frangella, BS5; Christopher Variotta, BS2; Leah Steinmetz, BA3; Nicholas Stekas, BS3; Jordan H. Manning, BA3; Peter L. Zhou, BA4; Mohamed A. Moawad, MPH2; David H. Ge, BA5; Choe DeFlorimonte, BS6; Aaron J. Buckland, MBBS, FRACS2; Themistocles S. Protopsaltis, MD2; Han Jo Kim, MD2; Ronald Moskovich, MD3; Michael C. Gerling, MD3; Renaud Lafage, MS3; Thomas J. Errico, MD2; Frank J. Schwab, MD3; Virginie Lafage, PhD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P128. Surgery for Sacral Perineural Cysts: Cold Facts of the So-Called Tarlov Cysts
Marcelo Galarza, MD, PhD, MSc
University Hospital of Murcia Spain, Murcia, Spain
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P129. True Percutaneous Transforaminal Lumbar Interbody Fusion (pTLIF) with an Expandable Interbody Cage Using the Endoscopic Posterolateral Approach: A Long-Term Follow-Up Report of 50 Cases
Rudolf Morgenstern, MD, PhD; Christian Morgenstern, MD, PhD, MSc
Centro Médico Teknon, Barcelona, Spain
FDA Device/Drug Status: Concorde Lift (Approved for this indication), RISE (Approved for this indication).

P130. Obese Patients May Experience Worse Back Pain and Less Improvement in Back Pain Compared to Non-Obese Patients Following Lumbar Decompression-Only Surgery
Philip Louie, MD1; Bryce Basques, MD, MHS2; Michael T. Noitte, MD3; Kamran Movassagh2; Jeremy D. Mormol, BS4; Jannat M. Khan, BS5; Arya G. Varthi, MD6; Edward J. Goldberg, MD7; Justin C. Paul, MD, PhD8; Howard S. An, MD9
1Rush University Medical Center, Chicago, IL, US; 2Yale School of Medicine, New Haven, CT, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Rush Medical College, Chicago, IL, US; 6Midwest Orthopaedics at Rush, Chicago, IL, US; 7Yale University School of Medicine, New Haven, CT, US; 8Midwest Orthopaedics At Rush, Chicago, IL, US; 9Danbury Orthopedics, Danbury, CT, US; 10Rush 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.

P131. The Duration of Lumbar Radicular Symptoms does not Impact Clinical Outcomes Following Lumbar Decompression Surgery
Bryce Basques, MD, MHS1; Philip Louie, MD2; Michael T. Noitte, MD2; Jonathan Markowitz, BS4; Victor Lei, BS4; Justin C. Paul, MD, PhD5; Arya G. Varthi, MD1; Edward J. Goldberg, MD6; Howard S. An, MD3
1Yale University School of Medicine, New Haven, CT, US; 2Rush University Medical Center, Chicago, IL, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Chicago, IL, US; 5Danbury Orthopedics, Danbury, CT, US; 6Midwest Orthopedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P132. Preexisting Lumbar Spinal Stenosis Does Not Affect Outcomes of Lumbar Microdiscectomy
Philip Louie, MD1; Bryce Basques, MD, MHS2; Michael T. Noitte, MD3; Kamran Movassagh4; Jeremy D. Mormol, BS5; Justin C. Paul, MD, PhD6; Arya G. Varthi, MD2; Edward J. Goldberg, MD7; Howard S. An, MD3
1Rush University Medical Center, Chicago, IL, US; 2Yale University School of Medicine, New Haven, CT, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Rush Medical College, Chicago, IL, US; 6Midwest Orthopaedics at Rush, Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P133. Clinical Outcomes of Decompression Alone versus and Decompression and Fusion for First Episode Recurrent Disc Herniation
Leah Y. Carreon, MD, MSc1; Erica F. Bisson, MD2; Eric A. Potts, MD3; Morgan Brown, MS4; Rebecca Ruegg Cowan, MA5; Stacie Gren, BSN6; Steven D. Glassman, MD1
1Norton Leatherman Spine Center, Louisville, KY, US; 2University of Utah, Department of Neurosurgery, Salt Lake City, UT, US; 3Indianapolis, IN, US; 4Norton Healthcare, Louisville, KY, US; 5Indiana School of Medicine - Goodman Campbell Brain and Spine, Indianapolis, IN, US; 6Goodman Campbell Brain and Spine, Indianapolis, IN, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P134. Application of Laparoscopic Lumbar Discectomy and Anterior Lumbar Interbody Fusion: At Least Six Years of Follow-Up
Cheng Wang, MD, PhD; Wenjun Wang, MD, PhD
The First Affiliated Hospital of University of South China, Hengyang, China

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

P135. Probability of Severe Frailty Development Among Operative and Nonoperative Adult Spinal Deformity Patients: An Actuarial Survivorship Analysis Over a Three Year Period
Peter G. Passias, MD1; Frank A. Segreto, BS2; Cheongeon Oh, PhD3; Virginie Lafage, PhD4; Renaud Lafage, MSc4; Justin S. Smith, MD, PhD5; Alan H. Daniels, MD6; Breton Line, BS7; Han Jo Kim, MD4; Juan S. Uribe, MD8; Robert K. Eastlack, MD9; D. Kojo Hamilton, MD10; Eric O. Klíneberg, MD11; Douglas C. Burton, MD12; Robert A. Hart, MD13; Christopher I. Shaffrey, MD14; Christopher P. Ames, MD15; Shay Bess, MD16; International Spine Study Group17


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

P136. Clinical Presentation, Management and Outcomes of Sacral Metastases: A Multicenter, Prospective Case Series
Raphaëlle Charest-Morin, MD1; Charles G. Fisher, MD, FRCS, MHS2; Anne Versteeg, MD, MHS3; Arjun Sahgal4; Peter P. Varga, MD5; Daniel M. Scibba, MD6; Michelle J. Clarke, MD7; Laurence D. Rhines, MD8; Stefano Boriani, MD9; Chetan Bettegowda, MD, PhD10; Michael G. Fahling, MD, PhD, FRCS11; Paul M. Arnold, MD12; Ziya L. Gokaslan, MD, FACS, FACR13; Nicolas Dea, MD, MSc, FRCS13

1Quebec, QC, Canada; 2Vancouver General Hospital, Vancouver, BC, Canada; 3Heidelberglaan 100, Utrecht, Netherlands; 4Canada; 5National Center for Spinal Disorders, Budapest, Hungary; 6John Hopkins University/School of Medicine, Baltimore, MD, US; 7Mayo Clinic, Rochester, MN, US; 8Houston, TX, US; 9Istituto Ortopedico Rizzoli, Bologna, Italy; 10Johns Hopkins Medicine, Baltimore, MD, US; 11Toronto Western Hospital, Toronto, ON, Canada; 12University of Kansas Medical Center/Department of Neurosurgery, Kansas City, KS, US; 13Vancouver, BC, Canada

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

P137. The Effects of Operating Room Size on Surgical Site Infection Following Lumbar Fusion Surgery
Harold I. Salmons, BS1; Mayan Lendner, BS2; Daniel Tarazona, MD3; Zachary Gala, BS4; Yovel Lendner5; Myles Dworkin, BS6; Barrett I. Woods, MD7; Ian D. Kaye, MD8; Jason W. Savage, MD9; Christopher K. Kepler, MD, MBA10; Mark F. Kurd, MD11; Victor Hsu, MD12; Kris E. Radcliff, MD13; Jeffrey A. Rihn, MD14; D. Greg Anderson, MD15; Alan S. Hillibrand, MD16; Gregory D. Schroeder, MD17; Alexander R. Vaccaro, MD, PhD18


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

P138. Outpatient Lumbar Discectomy Has Significantly Lower Postoperative Surgical Wound Infection and Postoperative Infection Rates in Tobacco Use Disorder and Diabetes Mellitus Patients
Permsak Paholpak, MD1; Blake G. Formanek, BA2; Christopher Wang, BS3; Zorica Buser, PhD4; Jeffrey C. Wang, MD5

1Department of Orthopaedics, Faculty of Medicine, Meung Khon Kaen, Khon Kaen, Thailand; 2Los Angeles, CA, US; 3Norris Research Tower, Keck School of Medicine, USC, Los Angeles, CA, US; 4USC Spine Center, Los Angeles, CA, US

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

P139. The Effect of Preoperative Medications on Length of Stay, Inpatient Pain and Narcotics Consumption Following Minimally Invasive Transforaminal Lumbar Interbody Fusion
Brittany E. Haws, BS1; Benjamin Khechen, BA2; Dil V. Patel, BS3; Jordan Guntin, BS3; Kaitlyn L. Cardinal, BS1; Adam B. Wiggins, BS3; Kern Singh, MD1

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

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P140. Registry Outcomes of Cement Augmentation for Osteoporotic Vertebral Compression Fractures
Neal H. Shonnard, MD1; Sigurd H. Berven, MD2; Paul A. Anderson, MD3; Douglas P. Beall, MD4
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P141. Single Position versus Lateral-Then-Prone Positioning for Lateral Interbody Fusions and Pedicle Screw Fixation
Chason Ziino, MD1; Ivan Cheng, MD2; Justin B. Ledesma, MD3; Remi M. Ajiboye, MD, MPH4; Jayme Koltsov, PhD5
1Stanford Department of Orthopedic Surgery, Stanford, CA, US; 2Stanford University, Redwood City, CA, US; 3Tucson Orthopaedic Institute, Tucson, AZ, US; 4UCLA Medical Center, Department of Orthopaedic Surgery, Los Angeles, CA, US; 5Redwood City, CA, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P142. Are Allografts Safe and Effective in the Treatment of Spinal Infectious Diseases? A Multicenter Retrospective Study
Wen Jie Wu, MD1; Fei Luo, MD2
1Southwest Hospital, Chongqing, Chongqing, China; 2Chongqing, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P143. The Impact of Comorbidity Burden on Complications, Length of Stay and Direct Hospital Costs After Minimally Invasive Transforaminal Lumbar Interbody Fusion
Benjamin Khechen, BA1; Brittany E. Haws, BS2; Dil V. Patel, BS2; Jordan Guntin, BS2; Kaitlyn L. Cardinal, BS2; Kern Singh, MD2
1Midwest Orthopaedics at Rush, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P144. Outcome of Lamina Sparing Decompression in Spinal Tuberculosis
Pankaj Kandwal, MBBS1; Gagan D. Yadav, MS2; Shobha S. Arora, MD3
1All India Institute of Medical Sciences, New Delhi, India; 2Mahendergarh, India; 3Rishikesh, India
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P145. Risk Factors, Additional Length of Stay and Cost Associated with Postoperative Ileus Following Anterior Lumbar Interbody Fusion in the Elderly
Jason A. Horowitz, BA1; Amit Jain, MD2; Varun Puvanesarajah, MD3; Rabia Qureshi, BS4; Joseph P. Gjolaj, MD5; Emmanuel N. Menga, MD6; Hamid Hassanzadeh, MD1
1University of Virginia, Department of Orthopaedic Surgery, Charlottesville, VA, US; 2Baltimore, MD, US; 3Johns Hopkins Medicine, Baltimore, MD, US; 4Charlottesville, VA, US; 5University of Miami & Jackson Memorial Hospital Department of Orthopaedic Surgery, Miami, FL, US; 6University 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.

P146. Postoperative Sick Leave is Correlated to the Length of Preoperative Sick Leave in Patients with Herniated Lumbar Disc Treated with Discectomy
Mikkel Andersen, MD1; Søren Dahl, MD2; Jesper Rasmussen, MD2; Leah Y. Carreon, MD, MSc3
1Middelfart, Denmark; 2Arbejdsmedicinsk Afd. Sydvestjysk Sygehus, Esbjerg, Denmark; 3Sygehus Lillebælt - Rygkirurgi Middelfart, Middelfart, Denmark
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P147. The Effect of Preoperative Symptom Duration on Postoperative Outcomes Following a Tubular Lumbar Microdiscectomy
Bryce Basques, MD, MHS1; Brittany E. Haws, BS2; Dil V. Patel, BS3; Benjamin Khechen, BA4; Philip Louie, MD2; Kamran Movassaghi4; Kaitlyn L. Cardinal, BS2; Jordan Guntin, BS5; Kern Singh, MD2
1Yale School of Medicine, New Haven, CT, US; 2Rush University Medical Center, Chicago, IL, US; 3Chicago, IL, US; 4Midwest Orthopaedics at Rush, Chicago, IL, US; 5Glendale, CA, US; 6Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P148. The "Soft Landing": Proximal Laminar Hooks are Associated with Decreased Rate of Proximal Junctional Kyphosis in Spinal Fusion for Adult Spinal Deformity Compared to Pedicle Screw Fixation**

Bryce Basques, MD, MHS; Philip Louie, MD; Michael T. Nolte, MD; Kamran Movassaghi; Jonathan Markowitz, BS; Joseph F. Michalski, MPh, MSc; Dong Gue Oh, BS; Howard S. An, MD; Christopher J. DeWald, MD

1Yale School of Medicine, New Haven, CT, US; 2Rush University Medical Center, Chicago, IL, US; 3Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, IL, US; 4Glendale, CA, US; 5Chicago, IL, US; 6Rush Medical College, Chicago, IL, US

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

**P149. HIV in the Absence of AIDS and In-Patient Outcomes Following Elective Lumbar Spinal Fusion**

Milad Alam, MD; Chester J. Donnally III, MD; Alexander J. Butler, MD; Karthik Madhavan, MD; Joseph P. Gjolaj, MD

1Jackson Memorial Hospital/University of Miami, Miami, FL, US; 2University of Miami Hospital, Miami, FL, US; 3University of Miami, Miami, FL, US; 4Miami, FL, US; 5University 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.

**P150. The Management of Symptomatic Lumbar Disc Herniation in Pregnancy: A Systematic Review**

Emily R. Whiles; Rozzbeh Shafafy, MBBS, MSc, FRCS; Oliver Stokes, MBBS, FRCS, MSc; Sherief Elsayed, MBChB, FRCS (Tr & Orth)

1Brighton & Sussex University Hospitals NHS Trust, Brighton, Sussex, United Kingdom; 2Exeter Spine Unit, Exeter, United Kingdom; 3South East Spinal Surgery, Brighton, United Kingdom

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

**P151. Modified Frailty Index Predicts Time to Discharge After MIS TLIF or LLIF**

Hesham M. Zakaria, MD; Mohamed Macki, MD; Lara W. Massie, MD; Victor Chang, MD

1Henry Ford Hospital, Detroit, MI, US; 2Detroit, MI, US; 3Henry Ford West Bloomfield Hospital, West Bloomfield, MI, US

FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P156. Decompression Alone versus Decompression Plus Fusion for Claudication Secondary to Lumbar Spinal Stenosis**
Charles G. Fisher, MD, FRCSC, MHS; Neil A. Manson, MD, FRCSC; Raja Y. Rampersaud, MD, FRCSC; Greg McIntosh4
Kenneth Thomas, MD; Hamilton Hall, MD, FRCSC6
1Vancouver General Hospital, Vancouver, BC, Canada; 2Canada East Spine Centre, Saint John, NB, Canada; 3Toronto Western Hospital, Toronto, ON, Canada; 4Canadian Back Institute, Oakville, ON, Canada; 5Foothills Medical Centre, Calgary Canada; 6Markdale ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P157. Retrospective Review of Restoration of Lordosis with MIS TLIF**
Philip Saville, MD1; Avani S. Vaishnav, MBBS1; Steven J. McAnany, MD1; Roger Hartl, MD2; Rodrigo Navarro-Ramirez, MD, MSc3; Eliana E. Kim, BA4; Farah Maryam, BS5; Catherine Himo Gang, MPH6; Sheeraz A. Qureshi, MD, MBA6
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P158. Correlation Between ODI, PROMIS and SF-12 in Minimally Invasive Transforaminal Lumbar Interbody Fusion (MI-TLIF)**
Avani S. Vaishnav, MBBS1; Steven J. McAnany, MD1; Catherine Himo Gang, MPH1; Todd J. Albert, MD1; Sheeraz A. Qureshi, MD, MBA2
1Hospital for Special Surgery, New York, NY, US; 2Weill Cornell Medical College, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P159. First In-Human Prospective Clinical Study Using Augmented Reality Surgical Navigation with Intraoperative 3D Imaging for Pedicle Screw Placement**
Adrian Elmi Terander, MD, PhD1; Rami Nachabe, PhD2; Erik Edström, MD, PhD3; Kyrre Pedersen, MD, PhD1; Hallidor Skulason, MD4; Gustav Burström, MD1; Anastasios Charalampidis, MD5; Fredrik L. Ståhl, MD6; Michael Fagerlund, MD, PhD7; Michael Söderman, MD, PhD1; Drazenko Babic, MD6; Paul Gerdhem, MD, PhD1
1Karolinska University Hospital, Huddinge, Stockholm, Sweden; 2Philips Healthcare, Cincinnati, US; 3Karolinska University Hospital, Department of Neurosurgery, Solna, Sweden; 4Landspitali University Hospital, Reykjavik, Iceland, Reykjavik, Iceland; 5Stockholm, Sweden; 6Solna, Sweden; 7Department of Neuroradiology, Karolinska University Hospital, Stockholm, Sweden; 8Department of Neuroradiology, Stockholm, Sweden; 9Philips Healthcare, Best, Netherlands
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

Vibhu Krishnan Viswanathan, MD1; Amy J. Minnema, MS1; Lohith S. Vatti, BS2; Gerald McGwin, PhD3; H. Francis Farhadi, MD, PhD, FRCSC4
1Columbus, OH, US; 2Northeast Ohio Medical University, Rootstown, OH, US; 3Birmingham, AL, US; 4Ohio State University Medical Center, Columbus, OH, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P161. Inpatient Pain Scores and Narcotic Utilization Based on American Society of Anesthesiologists Score After Minimally Invasive Transforaminal Lumbar Interbody Fusion**
Benjamin Khechen, BA1; Brittany E. Haws, BS2; Dil V. Patel, BS3; Ankur S. Narain, BA3; Fady Y. Hijji, BS3; Jordan Guntin, BS3; Kaitlyn L. Cardinal, BS3; Noah Shoshana4; Kern Singh, MD2
1Midwest Orthopaedics at Rush, Chicago, IL, US; 2Rush University Medical Center, Chicago, IL, US; 3Rush University Medical Center Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

**P162. Safety Profile of Lumbosacropelvic Fixation in Elderly Patients: Comparison between S2-Alar-Iliac Screws and Iliac Screws**
Wataru Ishida, MD1; Benjamin D. Elder, MD, PhD2; Seba Ramhmdani, MD3; Alexander Perdomo-Pantoja, MD4; Christina Holmes, PhD; Nicholas Theodore, MD3; Ziya L. Gokaslan, MD, FACS; Jean-Paul Wolinsky, MD1; Daniel M. Scullica, MD4; Ali Bydon, MD1; Timothy F. Witham, MD, FACS4; Sheng-fu L. Lo, MD, MHS5
1Johns Hopkins Hospital, Baltimore, MD, US; 2Rochester, MN, US; 3Baltimore, MD, US; 4Johns Hopkins University School of Medicine, Baltimore, MD, US; 5Columbia University College of Physicians and Surgeons, New York, NY, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
P163. Efficacy of Biphasic Calcium Phosphate with Submicron-Scale Surface Topography as Autograft Extender in a Rabbit Posterolateral Lumbar Spine Fusion Model
Lukas A. van Dijk, MSc1,2; Davide Barbieri, PhD1; Huipin Yuan, PhD1,3; Joost DeBruijn, PhD1,4
1Kuros Biosciences BV, Netherlands; 2Department of Oral and Maxillofacial Surgery, University Medical Centre Utrecht, Utrecht, Netherlands; 3MERLN Institute, Maastricht University, Maastricht, Netherlands; 4School of Engineering & Materials Science, Queen Mary University of London, United Kingdom
FDA Device/Drug Status: MagnetOs Granules (Approved for this indication)

P164. Promotion Effect of Extracts from Plastrum Testudinis on Alendronate Against Glucocorticoid-Induced Osteoporosis in Rat Spine
Jiang Xiaobing, PhD1; Hui Ren; Gengyang Shen; Xiang Yu, PhD2; Da Z. Zhang, MD3; Qi Shang, MD3
11st Affiliated Hospital of Guangzhou University of Chinese Medicine, Guang Zhou City, China; 2Guangzhou University of Chinese Medicine, Guangzhou, Guang Dong Provence, China; 3Guangzhou, Guangdong, China
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P165. Risk Factors for a Long Hospital Stay Following Minimally Invasive Lumbar Discectomy
Brittany E. Haws, BS1; Benjamin Khechen, BA2; Dil V. Patel, BS1; Ankur S. Narain, BA3; Fady Y. Hijji, BS1; Jordan Guntin, BS4; Kaitlyn L. Cardinal, BS1; Kern Singh, MD1
1Rush University Medical Center, Chicago, IL, US; 2Midwest Orthopaedics at Rush, Chicago, IL, US; 3Rush University Medical Center Department of Orthopaedic Surgery, Chicago, IL, US; 4Chicago, IL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P166. Intraoperative 3D-Radiation-Planning for Spine Metastases in Kypho-IORT
Frederic Bludau, MD
Medical Faculty Mannheim of the University of Heidelberg, Orthopaedic and Trauma, Mannheim, Germany
FDA Device/Drug Status: Intrabeam XRS 4 (Approved for this indication), Radiance Software (Approved for this indication).

Corey Walker, MD1; David S. Xu, MD2; Jakub Godzik, MD2; Jay D. Turner, MD, PhD3; Juan S. Uribe, MD4
1Barrow Neurological Institute, Phoenix, AZ, US; 2Phoenix, AZ, US; 3Barrow Brain and Spine, Phoenix, AZ, US; 4University of South Florida, Tampa, FL, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P168. Professional Baseball Player Performance Outcomes and Return to Play Following Back Injury
Jacob A. Pawloski, BS1; Charles C. Yu, MD2; David J. Clausen, BA3; Andrew R. El-Alam, BS4
1Wayne State University School of Medicine, Detroit, MI, US; 2Henry Ford Health System, Detroit, MI, US; 3Detroi, MI, US; 4Rochester, MI, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P169. National Survey of Lumbar Discectomy Practices
Edward Kachur, MD1; Majid S. Aljoghaiman, MD1; Amanda J. Martyniuk, MSc1; Farroukhyar, Forough, PhD2 Aleksa Cenic, MD1
1McMaster University, Division of Neurosurgery, Hamilton, ON, Canada; 2McMaster University Department of Epidemiology and Biostatistics, Hamilton, ON, Canada
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P170. A Prospective, Randomized Study Evaluating a Novel, Proprietary, Truss-Based, Anterior Lumbar Interbody Fusion (ALIF) Implant Used with Either Crushed Cancellous Allograft Bone or Autologous Bone Marrow Aspirate
Robert Eberle
Frisco, TX, US
FDA Device/Drug Status: ASTS Implant (Approved for this indication).
P171. Improvements in Pain and Physical Function After Lumbar Spine Surgery Predict Betterment in Other Areas of Health and Wellness
Nicholas S. Andrade, BS1; Brian J. Neuman, MD1; Khaled M. Keibaish, MD1; Lee H. Riley III, MD2; David B. Cohen, MD, MPH3; Richard L. Skolasky, ScD3
1Baltimore, MD, US; 2Johns Hopkins Outpatient Center/Department Orthopedic Surgery, Baltimore, MD, US; 3Johns Hopkins University, Baltimore, MD, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P172. In Vivo Demonstration of Bone Formation and Spinal Fusion via Osteogenic Spinal Instrumentation in an Ovine Model
Kirk McGilvray, PhD1; Christian M. Puttlitz, PhD2; Matthew MacEwan, MD3; Jeremiah T. Easley, DVM4; Howard B. Seim III, DVM2
1Colorado State University OBRL, Fort Collins, CO, US; 2Colorado State University, Fort Collins, CO, US; 3St. Louis, MO, US; 4Preclinical Surgical Research Laboratory, Colorado State University, Fort Collins, CO, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P173. Pelvic Incidence Affects Age-Adjusted Alignment Outcomes in a Population of Adult Spinal Deformity
Peter G. Passias, MD1; Cole Bortz, BA2; Frank A. Segreto, BS3; Samantha R. Horn, BA4; Frank A. Segreto, BS4; Dennis Vasquez-Montes, MS, BA2; Leah Steinmetz, BA2; Christopher Varlotta, BS2; Nicholas Stekas, BS2; David H. Ge, BA5; Edward M. DelSole, MD6; Jordan H. Manning, BA6; Dennis Vasquez-Montes, MS, BA6; Mohamed A. Moawad, MPH4; Chloe Deflorimonte, BS2; Bassel G. Diebo, MD7; Shaleen N. Vira, MD4; Frank J. Schwab, MD8; Renaud Lafage, MSc5; Virginie Lafage, PhD5; Michael C. Gerling, MD6; Charla R. Fischer, MD2; Themistocles S. Protopsaltis, MD2; Thomas J. Errico, MD1; Thomas J. Errico, MD6
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P174. Quantitative Increase in Canal Cross Sectional Area and Reduction in Stenosis Following Minimally Invasive Lumbar Interbody Fusion
Peter G. Passias, MD1; Cole Bortz, BA2; Samantha R. Horn, BA2; Frank A. Segreto, BS2; Dennis Vasquez-Montes, MS, BA2; David H. Ge, BA5; Christopher Varlotta, BS2; Nicholas Stekas, BS2; David H. Ge, BA5; Edward M. DelSole, MD6; Renaud Lafage, MSc5; Virginie Lafage, PhD5; Michael C. Gerling, MD6; Themistocles S. Protopsaltis, MD2; Aaron J. Buckland, MBBS, FRACS3; Virginie Lafage, PhD5; Renaud Lafage, MSc7; Michael C. Gerling, MD10; Charla R. Fischer, MD2; Themistocles S. Protopsaltis, MD2; David H. Ge, BA5; Richard L. Skolasky, ScD3
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P175. ODI Can Predict PROMIS Physical Function, Pain Intensity and Pain Interference Domain Scores in Thoracolumbar Patients
Samantha R. Horn, BA1; Frank A. Segreto, BS2; Cole Bortz, BA2; Dennis Vasquez-Montes, MS, BA1; Leah Steinmetz, BA1; Christopher Varlotta, BS1; Nicholas J. Frangella, BS1; Nicholas Stekas, BS2; David H. Ge, BA5; Edward M. DelSole, MD6; Renaud Lafage, MSc5; Virginie Lafage, PhD5; Michael C. Gerling, MD6; Themistocles S. Protopsaltis, MD2; Aaron J. Buckland, MBBS, FRACS3; Charla R. Fischer, MD2; Themistocles S. Protopsaltis, MD2; Aaron J. Buckland, MBBS, FRACS3; Thomas J. Errico, MD1; Peter G. Passias, MD5
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.

P176. Positive Margin Status is Prognostic of Poorer Survival in Primary Bone Tumors of the Spine: An NCDB Study
Brian Dial, MD1; Alexander L. Lazarides, MD2; David Kerr3; Dan Blazer III4; Whitney Lane, MD2; Melissa Erickson, MD2; Sergio Mendoza-Lattes, MD2
1Duke University, Durham, NC, US; 2Duke University Medical Center, Durham, NC, US
FDA Device/Drug Status: This abstract does not discuss or include any applicable devices or drugs.
**P177. Effect of Type of Cage on Restoration of Lordosis in Single-Level MI-TLIF**
Avani S. Vaishnav, MBBS; Catherine Himo Gang, MPH; Steven J. McAnany, MD; Todd J. Albert, MD; Sheeraz A. Qureshi, MD, MBA
1Hospital for Special Surgery, New York, NY, US; 2Weill Cornell Medical College New York, NY, US
**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.

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**P178. Coccydynia, Outcome One-Year After Surgical Treatment of 138 Consecutive Patients**
Ane Simony, MD; Leah Y. Carreon, MD, MSc; Mikkel Andersen, MD
1Charlottenlund, Denmark; 2Sygehus Lillebælt - Rygkirurgi Middelfart, Middelfart, Middelfart, Denmark; 3Middelfart, Denmark
**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.

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Bayard C. Carlson, MD; William A. Robinson, MD; Nathan R. Wanderman, MD; Ahmad N. Nassr, MD; Brett A. Freedman, MD
**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.

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**P180. Epidemiology and Treatment of Central Cord Syndrome in the United States**
Amit Jain, MD; Daniel J. Blizzard, MD; Zachary J. Gabel, MD; John G. Heller, MD; John M. Rhee, MD; Keith W. Michael, MD; S. Tim Yoon, MD, PhD
1Baltimore, MD, US; 2Duke University, Durham, NC, US; 3Atlanta, GA, US; 4Emory Orthopaedics & Spine Center, Atlanta, GA, US; 5Emory University, Atlanta, GA, US; 6The Emory Spine Center, Atlanta, GA, US
**FDA Device/Drug Status:** This abstract does not discuss or include any applicable devices or drugs.

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**P181. The Association Between Frailty Status and Odontoid Fractures Following Traumatic Falls: Investigation of Varying Injury Mechanisms Among 70 Elderly Odontoid Fracture Patients**
Frank A. Segreto, BS; Samantha R. Horn, BA; Christopher Varlotta, BS; Cole Bortz, BA; Peter G. Passias, MD
1NYU Langone Medical Center - Orthopaedic Hospital, Manhattan, NY, US; 2Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, US; 3New York, NY, US; 4NY 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.

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**Innovative Technology Posters**

**Technical Exhibition**

Innovative Technology Posters are submitted and presented by exhibiting companies. Posters are available in the Technical Exhibition during all exhibit hours.

- **Board #1 Philips Healthcare:** Radiation Exposure During Spine Surgery Using Cone-Beam CT Imaging With Augmented Reality Navigation in a Hybrid Operating Room
- **Board #2 Spinal Balance:** Reducing Bacterial Dose During Instrumented Spine Surgery: A Clinical Study on a Novel and Effortless Method
- **Board #3 Amedica:** Inherently Bactericidal Biomaterials for Spinal Fusion Surgery
- **Board #4 MiRus:** Validation of a Wireless, Non-Optical System for Measurement of Intraoperative Spine Alignment
- **Board #5 DePuy-Synthes:** Mechanomyography (MMG) is Superior to EMG in Mapping and Locating Nerves at Risk During Spinal Surgery
- **Board #6 DePuy-Synthes:** Comparative Ethnographic Study of the UNLEASH™ MIS TLIF Procedural Solution in a Cadaveric Lab
- **Board #7 Medtronic:** Use of A Low-Thermal Injury Dissection Device Reduces Tissue Temperature Change in Anterior Lumbar Interbody Fusion Spine Surgery
- **Board #8 RTI Surgical:** Evaluation of Three Design Materials in an Ovine Bone Defect Model
**Board #9 MiRus**: Molybdenum Rhenium (MoRe®) Alloy Provides Superior Biomechanical and Wear Properties for a New Generation of Spine Implants

**Board #10 4Web Medical**: Biologic Alternatives: Significant Cost Savings Through the Use of an Innovative Truss-Based Interbody Fusion Device

**Board #11 Medtronic**: 3D-Printed Rough Titanium Implant for Intervertebral Body Fusion: An In Vitro Evaluation Using Osteoblast Precursor Cells

**Board #12 Medtronic**: Biological Response to Additive Titanium Implants in an Ovine Model

**Board #13 MiRus**: Mechanically Superior Molybdenum-Rhenium (MoRe®) Alloy Allows for New Generation of Spinal Implants Embedded With SMART™ Sensor Technology for Remote Real-Time Monitoring of Bone Growth Across a Fixated Motion Segment

**Board #14 Aziyo**: ViBone® Viable Bone Matrix: Assessment of Cell Health and Early Evidence of Spine Fusion

**Board #15 DiFusion**: Evaluation of the Inflammatory Response of PEEK-Zeolite Implants in an Ovine Fusion Model

**Board #16 Promimic**: Improving the Osseointegration on PEEK with Nanosized Hydroxylapatite

**Board #17 Tyber Medical**: Improved Bone Cell Responses on Titanium Integrated PEEK Surfaces

**Board #18 SpineSource**: L-Varlock Lumbar Cage: An Expandable Lordotic All-Titanium Implant for Lumbar Interbody Fusion

**Board #19 Amedica**: Comparison of Allograft Spacers versus Silicon Nitride Cages in Cervical Fusion

**Board #20 Camber Spine**: Biomechanical Fatigue Evaluation of Anterior Lumbar Interbody Fusion Devices with Respect to Flexion-Extension Loading

**Board #21 CoreLink**: Segmental Lordosis Increment on Single Level Lumbar Fusion Using a 3D Expandable Cage

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**Board #23 Medicrea**: Patient-Specific Rods Show a Reduction in Rod Breakage Incidence

**Board #24 EOS imaging**: Biomechanical Spine Surgery Planning

**Board #25 Simplify Medical**: Clinical Outcomes of the PEEK-on-Ceramic Simplify® Disc: Preliminary Data from One Site Participating in the Single-Level Cervical FDA IDE Trial

**Board #26 Spinendos GmbH**: Bilateral Full-Endoscopic Spinal Decompression for Degenerative Lumbar Stenosis with Ø7.1mm Endoscope via Unilateral Approach: Technique Note and Initial Experience

**Board #27 Anchor Orthopedics**: Intraoperative Assessment to Select the Appropriate Patient for Herniated Disc Repair: Lessons Learned

**Board #28 Empirical Tech**: Comparison of Static Testing per ASTM F2077 Using a Constrained, Semi-Constrained and Unconstrained Test Setups
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Banagan, Kelley E.: Other: K2M (Familial salary).

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Burton, Douglas C.: Royalties: Depuy Synthes (C); Consulting: (None); Board of Directors: University of Kansas Physicians (None), Scoliosis Research Society (None), International Spine Study Group (None); Research Support (Investigator Salary): Depuy Synthes (B), Bioventus (B), Pfizer (B).
Buser, Zorica: Consulting: Xeno Medical (B), AOspine (B).
Cammisa, Frank P.: Royalties: NuVasive (F); Stock Ownership: Paradigm Spine (<1%), Spinal Kinetics (<1%), NuVasive (≤%), 4WEB Medical (<1%); Private Investments: Ivy Healthcare Wind II (F), Woven Orthopedic Technologies (F), Royer BioMedical (E), Liventa Bioscience (E), Bonovo Orthopedics (E), Viscogliosi Brothers (F), HealthPoint Capital Partners (F), Vertical Spine (None); Consulting: 4WEB Medical (A), Vertical Spine (Stock options); Scientific Advisory Board: Alphatec (Amount not disclosed), Woven Orthopedic Technologies (Medical Advisory Board), Spinal Kinetics (Stock Options), Paradigm Spine (Stock Options), HealthPoint Capital Partners (Amount not disclosed); Research Support (Staff and/or Materials): Spinal Kinetics (E, Paid directly to institution/employer), Centinel Spine (B, Paid directly to institution/employer), MiMedx Group (F, Paid directly to institution/employer), Mallinckrodt (F, Paid directly to institution/employer), Depuy (F, Paid directly to institution/employer), Woven Orthopedic Technologies (B, Paid directly to institution/employer).
Campbell, Peter: Consulting: 4WEBb (None), Titan (None).
Cannestra, Andrew F.: Royalties: RTI (A); Consulting: NuVasive (E), Atlas (B), Mazor Robotics (D), Alliance Spine (E), Spinal Elements (A); Speaking and/or Teaching Arrangements: NuVasive (A); Research Support - Staff and/or Materials: Mazor (B).
Caridi, John M.: Consulting: Zimmer Biomet Spine (B); Speaking and/or teaching arrangements: Zimmer Biomet Spine (C).
Carl, Allen L.: Stock Ownership: Intrinsic Therapeutics (<1%); Consulting: K Spine (None); Scientific Advisory Board: Replication Medical (<1% Stock).
Carreone, Leah Y.: Device or Biologic Distributorship (Physician-Owned Distributorship): Orthopedic Research and Education Fund (A, Paid directly to institution/employer), International Spine Study Group (B), Pfizer (D, Paid directly to institution/employer), Intellirod (B, Paid directly to institution/employer); Trips/travel: Center for Spine Surgery and Research, Region of Southern Denmark (B); Scientific Advisory Board: University of Louisville Institutional Review Board (University of Louisville Institutional Review Board), Scoliosis Research Society Research Committee (Scoliosis Research Society Research Committee Chair), The Spine Journal (Editorial Advisory Board), Spine (Editorial Advisory Board), Spine Deformity (Editorial Advisory Board); Other Office: Norton Healthcare (Salary), Center for Spine Surgery and Research, Lillebaelt Hospital, University of Southern Denmark (Salary); Research Support (Staff and/or Materials): Norton Healthcare (B, Paid directly to institution/employer), Orthopedic Research and Educational Fund (B, Paid directly to institution/employer), Scoliosis Research Society (B, Paid directly to institution/employer), Pfizer (C, Paid directly to institution/employer).
Carreone, Leah Y.: Trips/travel: University of Southern Denmark (B); Other Office: Scoliosis Research Society (Research Committee Chair).
Carrino, John A.: Consulting: Pfizer (B), Image Analysis Group (B), Globus Medical (B); Trips/travel: Carestream (B), RAND (B); Scientific Advisory Board: General Electric (Amount not disclosed), Halyard Health (Amount not disclosed), Carestream (Amount not disclosed).
Chang, Michael S.: Consulting: Stryker (B), Spine Wave (B), Orthofix (B); Speaking and/or teaching arrangements: Stryker (B), Depuy (B).
Chang, Victor: Consulting: Globus Medical (D), K2M (C), SpineGuard (C), Depuy Synthes (C); Research Support (Staff and/or Materials): Medtronic (D, Paid directly to institution/employer).
Chapman, Todd M.: Consulting: Medicrea (B); Trips/travel: Amenda (A), NuVasive (A).
Chaput, Christopher D.: Royalties: Globus (C); Consulting: Globus (B), Link Spine (C); Research Support - Investigator Salary: Pfizer (E, Paid directly to institution/employer); Research Support - Staff and/or Materials: Globus (C, Paid directly to institution/employer), Pacira (B, Paid directly to institution/employer).

Chaudhary, Saad B.: Royalties: Innovative Surgical Design (A); Consulting: Clariance Spine (B), Speaking and/or Teaching Arrangements: Medtronic (None), Stryker Spine (None), Depuy Synthes (None); Scientific Advisory Board: U & I Corporation (A); Other: Innovative Surgical Design (Amount not disclosed).

Cheng, Ivan: Royalties: NuVasive (F); Private Investments: Cytonics (<1%)), Spine Innovations (<1%) Consulting: Spine Wave (None), Globus Medical (C); Speaking and/or teaching arrangements: Stryker Spine (B); Scientific Advisory Board: SpineCraft (B).

Cheng, Joseph S.: Board of Directors: NASS (Section Development Chair); Other Office: CSNS (Corresponding Secretary).

Chi, John H.: Consulting: K2M (B), DePuy Spine (B), Medtronic (B).

Cho, Charles H.: Board of Directors: NASS (Evidence Compilation and Analysis Chair).

Cho, Samuel K.: Consulting: Zimmer Biomet (D), Globus (D), Medtronic (B); Research Support (Staff and/or Materials): Zimmer Biomet (B, Paid directly to institution/employer); Grants: OREF (D, Paid directly to institution/employer).

Cholewicki, Jacek: Trips/travel: NASS (B).

Chou, Dean: Royalties: Globus (C), Medtronic (B), Globus (B); Board of Directors: Lumbar Spine Research Society (None).

Chou, Roger: Royalties: UpToDate (B); Consulting: Palladian Health (B).

Christie, Sean D.: Consulting: Medtronic Canada (C); Speaking and/or teaching arrangements: Medtronic (C, Paid directly to institution/employer); Board of Directors: Canadian Spine Society (President); Scientific Advisory Board: Canadian Spine Society (None), NASS (None), Spine Therapy Network (Scientific Advisory Committee Co-Chair), Rick Hansen Institute (Care Committee); Research Support (Staff and/or Materials): Medtronic (D, Paid directly to institution/employer); Grants: Rick Hansen Institute (E, Paid directly to institution/employer); Fellowship Support: Medtronic (E, Paid directly to institution/employer).

Chughtai, Morad: Consulting: Stryker (A), Sage Products (A), DJO (A).

Chutkan, Norman B.: Royalties: Globus Medical (D); Speaking and/or Teaching Arrangements: AOSpine North America (Travel expenses); Board of Directors: NASS (At Large Member).

Claude, John: Stock Ownership: Nocimed (<1%, Paid directly to institution/employer), Other Office: Nocimed (Salary).

Cohen, Jeffrey: Other: SpecialtyCare (Salary).

Colantonio, Donald F.: Stock Ownership: Stryker (<1%), Johnson & Johnson (<1%).

Coste, Marine: Stock Ownership: Schlumberger (<1%).

Cote, Pierre: Consulting: Canadian Chiropractic Protective Association, NCMIC (C); Speaking and/or teaching arrangements: European Spine Society (B); Trips/travel: European Spine Society (B, Paid directly to institution/employer); Research Support (Investigator Salary): Canada Research Chair-Canadian Institutes of Health Research (E, Paid directly to institution/employer); Grants: Ontario Trillium Foundation (G, Paid directly to institution/employer), Canadian Association of College and University Student Services (G, Paid directly to institution/employer), Lear Corporation (G, Paid directly to institution/employer), French Chiropractic Association (G, Paid directly to institution/employer).

Crandall, Dennis G.: Royalties: Medtronic (E); Stock Ownership: Handel (None); Consulting: Spine Wave (B); Board of Directors: Dignity Oasis Hospital (None), Ingenium Spine (None); Research Support (Staff and/or Materials): Sonoran Spine Research Foundation (D, Paid directly to institution/employer).

Crawford, Charles H.: Royalties: Alphatec (C); Consulting: Medtronic (B), NuVasive (B), Alphatec (A); Speaking and/or teaching arrangements: Medtronic (D); Trips/travel: Scoliosis Research Society Committee Work (A); Scientific Advisory Board: Medtronic (B); Other Office: Scoliosis Research Society (Committee Member), NASS (Committee Member); Grants: OREF (A, Paid directly to institution/employer), ISSG (B, Paid directly to institution/employer), Pfizer (D, Paid directly to institution/employer), Intellirad (B, Paid directly to institution/employer).

Crawford, Neil: Stock Ownership: Globus Medical ($5000 shares); Other Office: Globus Medical (Salary).

Cuellar, Jason M.: Stock Ownership: Cytonics (2%), Scientific Advisory Board: Cytonics (Stock Ownership disclosed).

Cunningham, Matthew E.: Consulting: NuVasive (None); Speaking and/or teaching arrangements: DePuy (Amount not disclosed, Paid directly to institution/employer) Johnson & Johnson, (Amount not disclosed, Paid directly to institution/employer) K2M (Amount not disclosed, Paid directly to institution/employer); Research Support (Staff and/or Materials): K2M (Amount not disclosed, Paid directly to institution/employer), RTI (Amount not disclosed, Paid directly to institution/employer).

Currier, Bradford L.: Royalties: DePuy Spine (D, Paid directly to institution/employer), Zimmer Biomet (F, Paid directly to institution/employer), Stryker Spine (Amount not disclosed, Paid directly to institution/employer); Private Investments: Tenex (<1%), Spineology (<1%); Board of Directors: LSRS (Past President), Spine Study Group (None); Fellowship Support: AOSpine North America (E, Paid directly to institution/employer).

Daffner, Scott D.: Stock Ownership: Pfizer (<1%), Amgen (<1%); Consulting: Bioventus (None); Board of Directors: Cervical Spine Research Society (None); Other Office: CSRS (Research Committee), LSRS (Program Committee), NASS (Section on Biologics & Basic Research, Membership Committee), Research Support - Staff and/or Materials: Pfizer (D, Paid directly to institution/employer), Grants: CSRS (F, Paid directly to institution/employer), AO Foundation (F, Paid directly to institution/employer); Fellowship Support: AOSpine (E, Paid directly to institution/employer); Relationships Outside the One-Year Requirement: Medtronic (Fellowship Support, D, Paid directly to institution, Dissolved 08/2011), Medtronic (Fellowship Support, D, Dissolved 08/2011).

Dailey, Andrew T.: Royalties: Biomet/Zimmer/Lanx (D); Consulting: K2M (E, Paid directly to institution/employer); Speaking and/or Teaching Arrangements: Medtronic (B); Research Support - Staff and/or Materials: K2M (E, Paid directly to institution/employer); Relationships Outside the One-Year Requirement: Biomet (Royalties, E, Dissolved 2015).

Daniels, Alan H.: Royalties: Springer (A); Consulting: Stryker (D), Globus (B), DePuy (B), Orthofix (D), SpineArt (B); Research Support (Staff and/or Materials): Orthofix (C, Paid directly to institution/employer); Fellowship Support: Orthofix (D, Paid directly to institution/employer).

Darden, Bruce V.: Stock Ownership: BioMedFlex (<1%), 4WEB (<1%); Consulting: Stryker (B), Synthes (B), SpineGuard (None); Board of Directors: Cervical Spine Research Society (None), Lumbar Spine Research Society (None); Scientific
Advisory Board: Stryker Biologic (None); Fellowship Support: AOSpine (E, Paid directly to institution/employer), Dawson, John M.: Stock Ownership: Zimmer (<1%); Other Office: ARO Medical (None).

Daubs, Michael D.: Royalties: Synthes Spine (F); Speaking and/or Teaching Arrangements: AOSpine North America (B).

Dayer, Romain: Consulting: Medtronic (B, Paid directly to institution/employer); Speaking and/or teaching arrangements: Medtronic (B Paid directly to institution/employer), DePuy Synthes (D, Paid directly to institution/employer); Trips/travel: Medtronic (B, Paid directly to institution/employer); Research Support: (Investigator Salary) DePuy Synthes (D, Paid directly to institution/employer).

Dea, Nicolas: Stock Ownership: Medtronic (MDT) (<1%); Speaking and/or teaching arrangements: Medtronic (B), Baxter (B).

DeBruijn, Joost: Stock Ownership: Kuros Biosciences (None).

DesJardins, John D.: Consulting: DJO Surgical (Amount not disclosed, Paid directly to institution/employer); Research Support (Investigator Salary): DJO Surgical (B, Paid directly to institution/employer); Research Support (Staff and/or Materials): DJO Surgical (E, Paid directly to institution/employer).

Deutch, Harel: Fellowship Support: Globus (D).

Devin, Clinton J.: Consulting: Stryker Spine (F, Paid directly to institution/employer); Speaking and/or teaching arrangements: Stryker Spine (C); Scientific Advisory Board: Wright Medical (Amount not disclosed); Research Support (Staff and/or Materials): Stryker Spine (E, Paid directly to institution/employer).

Deviren, Vedat: Royalties: NuVasive (E); Consulting: NuVasive (D); Board of Directors: SOLAS (None); Research Support (Staff and/or Materials): NuVasive (B, Paid directly to institution/employer); Fellowship Support: AOSpine (E, Paid directly to institution/employer), NuVasive (D, Paid directly to institution/employer), Globus (E, Paid directly to institution/employer); Other: Guidepoint (A), Biomet/Zimmer (B), Pfizer (B), Alphatec (B), Medirec (B).

DeWald, Christopher J.: Stock Ownership: Medtronic (<1%); Alphatec (<1%); Consulting: Kisco (B); Speaking and/or teaching arrangements: K2M (B); Trips/travel: Kisco (B); Research Support (Staff and/or Materials): K2M (C, Paid directly to institution/employer).

Dimar, John R.: Royalties: Medtronic Sofamor Danek (H); Consulting: Medtronic DePuy (D); Board of Directors: SRS (Amount not disclosed), FOSA (Amount not disclosed) Research Support (Staff and/or Materials); Pfizer Strive Study Site (D, Paid directly to institution/employer); Other: Spine (Reviewer), JBJS (Reviewer), Spine Deformity (Reviewer), Global Spine (Reviewer).

DiMauro, Jon-Paul: Research Support (Staff and/or Materials): Ellipse Technologies (D, Paid directly to institution/employer), NuVasive (D, Paid directly to institution/employer); Grants: Scoliosis Research Society (C, Paid directly to institution/employer).

DiPaola, Christian P.: Royalties: K2M (F); Stock Ownership: Nascent Surgical (<1%); Private Investments: Lineage Medical (<1%); Board of Directors: New England Spine Study Group (NESSG) (None), Spinal Injury Research and Education Foundation (None); Scientific Advisory Board: Nascent Surgical (<1%); Other: BrightwRx (None).

Diulos, Carrie A.: Trips/Travel: NASS (Travel expenses).

Djurasevic, Mladen: Device or Biologic Distributorship (Physician-Owned Distributorship): OREF (A, Paid directly to institution/employer), ISSG (B, Paid directly to institution/employer), Pfizer (D, Paid directly to institution/employer), Intellirod (B, Paid directly to institution/employer); Royalties: Medtronic (None), NuVasive (None); Consulting: Medtronic Sofamor Danek (D), NuVasive (B).

Doan, Adam: Private Investments: Veridical RCM (25%).

Dohring, Edward J.: Royalties: Stryker (D, Paid directly to institution/employer); Private Investments: Anzu (<1%); Board of Directors: NASS (Secretary); Research Support - Staff and/or Materials: Medtronic (B, Paid directly to institution/employer).


Dreyfus, Jill: Other: Premier (Salary).

Dufour, Thierry: Royalties: Zimmer Biomet (E); Consulting: Zeiss Microscope (B); Trips/travel: Zimmer Biomet (B); Scientific Advisory Board: Société Française De Chirurgie du Rachis (None).

Eastlack, Robert K.: Royalties: Globus Medical (A), Nutech (None); Stock Ownership: NuVasive (<1%), Spine Innovations (15%), Invuity (<1%), Alphatec (<1%), DiFusion (<1%); Private Investments: Top Doctors Labs (100%), SeaSpine (<1%), Nocimed (<1%); Consulting: K2M (C), Titan (A), SeaSpine (C), NuVasive (D), Aesculap (B), SI-BONE (None), Alphatec (None); Speaking and/or teaching arrangements: AOSpine (A); Board of Directors: San Diego Spine Foundation (None), Inure Free (Stock Options), Nocimed (Stock Options), SOLAS (None), Spine Innovations, (None); Scientific Advisory Board: Alphatec (<1%), Top Doctors Labs (None), Aesculap (B); Research Support (Staff and/or Materials): NuVasive (B, Paid directly to institution/employer); Grants: Scripps Clinic Medical Group (B, Paid directly to institution/employer); Fellowship Support: NuVasive (D, Paid directly to institution/employer).

Eberle, Robert: Other Office: 4WEB Medical (Salary).

Edidin, Av: Stock Ownership: Relievant Medsystems, (<1%); Other Office: Relievant Medsystems (Salary).

Edström, Erik: Other: Philips (None).

Eek, Bjorn: Stock Ownership: Notogen (30%); Board of Directors: Notogen (Stock Options); Scientific Advisory Board: Notogen (Stock Options).

Elbanna, Jamil: Stock Ownership: Trinity Orthopedics (<1%).

Emami, Arash: Research Support (Investigator Salary): NuVasive (C, Paid directly to institution/employer).

Enix, Dennis E.: Trips/Travel: NASS (A); Relationships Outside the One-Year Requirement: U.S. Department of Health and Human Services (H, Dissolved 08/2013).

Errico, Thomas J.: Royalties: Fastenetix (F); Consulting: K2M (C); Speaking and/or teaching arrangements: K2M (C); Trips/travel: K2M (D); Board of Directors: Harms Study Group (None); Research Support (Staff and/or Materials): Pfizer (D, Paid directly to institution/employer), Paradigm Spine (C); Grants: NIH via Wash U (B, Paid directly to institution/employer), Medtronic (B, Paid directly to institution/employer); Fellowship Support: OMEGA (C, Paid directly to institution/employer).

Erwin, William Mark: Stock Ownership: Notogen (33%); Board of Directors: Notogen (Stock Options); Scientific Advisory Board: Notogen (Stock Options); Research Support (Investigator Salary): Canadian Chiropractic Research Foundation (D); Research Support (Staff and/or Materials): Skoll Family Trust (F, Paid directly to institution/employer); Grants: Skoll Family Trust (G, Paid directly to institution/employer).

Essig, David A.: Consulting: Precision Spine (B); Speaking and/or teaching arrangements: Globus (B).

Faloon, Michael J.: Consulting: K2M (C, Paid directly to institution/employer); Speaking and/or teaching arrangements: DePuy Synthes (None); Other: AAOS (Basic Science Committee), SRS (Patient Education Committee).
Fabiano, Andrew J.: Board of Directors: Epilepsy Association of Western New York (Board of Directors); Research Support - Staff and/or Materials: Arbor Pharmaceuticals (A, Paid directly to institution/employer).

Farhadi, H. Francis: Research Support - Staff and/or Materials: DePuy Synthes (C, Paid directly to institution/employer), Implant America (C, Paid directly to institution/employer).

Fehlings, Michael G.: Consulting: Pfizer (B), InVivo Therapeutics (B), Zimmer Biomet (B).

Ferrara, Lisa A.: Consulting: OrthoKinetic Technologies (Amount not disclosed, Paid directly to institution/employer); Scientific Advisory Board: 4Web (<1%).

Fessler, Richard G.: Royalties: DePuy Synthes (None); Stock Ownership: In Queue Innovations (50%); Consulting: DePuy Synthes (Amount not disclosed, Paid directly to institution/employer); Speaking and/or teaching arrangements: Benvenue (Amount not disclosed, Paid directly to institution/employer).

Finkenberg, John G.: Speaking and/or Teaching Arrangements: Zimmer Biomet (C); Trips/Travel: Zimmer Biomet (B); Board of Directors: NASS (Education Council Director).

Fish, David E.: Grants: Medtronic (C, Paid directly to institution/employer), St. Jude (C, Paid directly to institution/employer); Fellowship Support: Boston Scientific (C, Paid directly to institution/employer).

Fischer, Charla R.: Consulting: Stryker (Consultant); Speaking and/or teaching arrangements: Expert Connect (Amount not disclosed).

Fischgrund, Jeffrey: Consulting: Stryker (E, Relievet F).

Fisher, Charles G.: Royalties: Medtronic (G); Consulting: Medtronic (E, Paid directly to institution/employer), NuVasive (B); Speaking and/or teaching arrangements: Medtronic (B), AOSpine B), NuVasive (B); Research Support (Staff and/or Materials): Medtronic (F, Paid directly to institution/employer); Grants: OREF (E, Paid directly to institution/employer); Fellowship Support: Medtronic (E, Paid directly to institution/employer), AOSpine (E, Paid directly to institution/employer), Johnson & Johnson (D, Paid directly to institution/employer).

Florman, Jeffrey E.: Royalties: Stryker Spin (B); Private Investments: ElectroCore (<1%); Consulting: Stryker Spin (C).

Frances, John C.: Board of Directors: CSR5 (Travel expenses); Fellowship Support: AO Foundation (E, Paid directly to institution/employer).


Friesem, Tal S.: Speaking and/or teaching arrangements: RTI Surgical (B), Simplify (A); Trips/travel: Simplify (Travel expenses).

Fritz, Julie: Consulting: FOTO (B); Scientific Advisory Board: FOTO (B).

Gall, Ken: Stock Ownership: NuVasive (20%); Consulting: NuVasive (Stock Options); Board of Directors: NuVasive (Stock Options).


Garfin, Steven R.: Royalties: DePuy Spine (A); Stock Ownership: Cross Tree (<1%), Pioneer Surgical (<1%), Spinal Kinetics (<1%), SurgiFile (<1%), Cytonics Corporation (<1%), SI-BONE (>1%); Consulting: Vertiflex (B), Magnifi Group (B), SI-BONE (Amount not disclosed), Globus Medical (A), Benvenu Medical (D), NuVasive (D, Paid directly to institution/employer), Spinal Kinetics (Amount not disclosed); Board of Directors: International Society for the Advancement of Spine Surgery (Travel expenses); Scientific Advisory Board: NuVasive (Amount not disclosed, Paid directly to institution/employer), Spinal Kinetics (Amount not disclosed), Vertiflex (None), SI-BONE, (None), Benvuen Medical (Amount not disclosed); Research Support (Staff and/or Materials): DePuy (D), EB1 (D), Medtronic (E), NuVasive (E); Fellowship Support: Synthes Spine (E), DePuy (E), Medtronic (E), Biomet (D), AOSpine North America (D), Globus Medical (E).

Garvey, Timothy A.: Royalties: Medtronic (B).

Geisler, Fred: Stock Ownership: Rhuauser (34%), Surgitech (2%); Private Investments: Spinal Integration (<1%); Consulting: Microbeam (None), InVivo (B), Simplify Medical (B), Mesoblast (B), Vertiflex (B).

Gelb, Daniel E.: Royalties: Globus Medical (A) DePuy Synthes Spine (C); Consulting: Synthes Spine (B); Speaking and/or teaching arrangements: AOSpine North America (B); Board of Directors: AOSpine (B); Fellowship Support: Synthes Spine (E).

Gerami, Hoda: Stock Ownership: Notogen (<1%, Paid directly to institution/employer); Research Support (Investigator Salary): Notogen (C, Paid directly to institution/employer).

Gerdel, Paul: Grants: Stockholm County Funds (ALF) (E, Paid directly to institution/employer).

Gerling, Michael C.: Consulting: Stryker (Consultant); Speaking and/or teaching arrangements: Wolf (B).

Ghogawala, Zohar: Stock Ownership: GN2.0-NIDUS (66%); Board of Directors: Cervical Spine Research Society (None); NASS (Research Council Director, 2018 Annual Meeting Co-chair); Other Office: GN2.0-NIDUS (President); Research Support - Staff and/or Materials: Stuart Foundation (F, Paid directly to institution/employer); Grants: NIH (A), PCORI (H, Paid directly to institution/employer).

Gidvani, Sundeep N.: Consulting: Xenco Medical (B).

Gilliland, Jeremy M.: Royalties: OrthoGrid (Amount not disclosed); Stock Ownership: Connexions (<1%); Consulting: Smith and Nephew (A); Speaking and/or teaching arrangements: DJO Global (A); Other Office: Journal of Arthroplasty (Editorial Board Member), AAOS (Orthopedic Video Theatre Committee Member); Research Support (Staff and/or Materials): Zimmer/ Biomet (B).

Girardi, Federico P.: Royalties: DePuy Spine (H, Paid directly to institution/employer), NuVasive (F, Paid directly to institution/employer), Lanix (H, Paid directly to institution/employer), Ortho Development (I, Paid directly to institution/employer); Stock Ownership: Centinel Spine (Amount not disclosed, Paid directly to institution/employer), Spinal Kinetics (<1%); Consulting: NuVasive (A, Paid directly to institution/employer), Capital Royalty (B, Paid directly to institution/employer); Speaking and/or teaching arrangements: DePuy Spine (C, Paid directly to institution/employer); Scientific Advisory Board: Centinel Spine (None), Sctent's USA (None), Spinal Kinetics (A, Paid directly to institution/employer), SpineArt USA (None), Health Point Capital (None), Paradigm Spine (None).

Gjolaj, Joseph P.: Consulting: DePuy Synthes (C); Speaking and/or teaching arrangements: Alphatec (B); Trips/travel: NuVasive (B), Alphatec (B); Research Support (Staff and/or Materials): NuVasive (A, Paid directly to institution/employer).

Glaeser, Julianne: Grants: ORTHOReBIRTH (D, Paid directly to institution/employer), Medtronic (D, Paid directly to institution/employer), Cervical Spine Research Society (C, Paid directly to institution/employer).

Glassman, Steven D.: Device or Biologic Distributorship (Physician-Owned Distributorship): OREF (A, Paid directly to institution/employer), IESS (B, Paid directly to institution/employer), Pfizer (D, Paid directly to institution/employer), Intellirod (B, Paid directly to institution/employer); Royalties: Medtronic (H); Consulting: Medtronic (C); Other Office: American Academy of Orthopaedic Surgeons (Registry Oversight Committee); Research Support (Staff and/or Materials): Norton Healthcare (Amount not disclosed, Paid directly to institution/employer).
<table>
<thead>
<tr>
<th>Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glennie, R. Andrew</td>
<td>Research Support (Staff and/or Materials): Medtronic (E); Grants: Medtronic (B); Fellowship Support: Medtronic (E).</td>
</tr>
<tr>
<td>Goel, Vijay K.</td>
<td>Device or Biologic Distributorship (Physician-Owned Distributorship): Turning Point (B), Butterfly (A), Endosphere, (B); Royalties: Turning Point (B), Globus Spine (B); Stock Ownership: BONE (33%); Consulting: DePuy (Amount not disclosed), Orthokinetics Technologies, (Amount not disclosed); Scientific Advisory Board: Turning Point (None); Grants: DePuy (E).</td>
</tr>
<tr>
<td>Gokaslan, Ziya L.</td>
<td>Stock Ownership: Spinal Kinetics (&lt;1%); Speaking and/or teaching arrangements: AO Foundation (Travel expenses); Trips/travel: AO Foundation (Amount not disclosed, Paid directly to institution/employer); Board of Directors: Neurosurgery Foundation (President); Research Support (Staff and/or Materials): AOSpine International (Amount not disclosed, Paid directly to institution/employer).</td>
</tr>
<tr>
<td>Goldstein, Christina L.</td>
<td>Speaking and/or Teaching Arrangements: AOSpine North America (A); Trips/Travel: AO Spine North America (B, Paid directly to institution/employer), DePuy Synthes Spine (A); Other Office: AOSpine North America (Fellowship Committee), NASS (Coverage Committee, Section on Biologics and Basic Research); Grants: University of Missouri Coulter Translational Partnership (C, Paid directly to institution/employer).</td>
</tr>
<tr>
<td>Goldstein, Jeffrey A.</td>
<td>Royalties: NuVasive (C); Consulting: NuVasive (A), RTI (A); Board of Directors: ISASS (None); Fellowship Support: OREF (None, Paid directly to institution/employer), AOspine (E, Paid directly to institution/employer).</td>
</tr>
<tr>
<td>Gonzalez, Patricia C.</td>
<td>Stock Ownership: Qmetrics Technologies (15%); Board of Directors: Qmetrics Technologies (None).</td>
</tr>
<tr>
<td>Gornet, Matthew F.</td>
<td>Royalties: Medtronic (F), RTI (B); Stock Ownership: Bonovo (4%), Ouroboros (4%), International Spine &amp; Orthopedic Institute (5%), Nocimed (4%), Paradigm Spine (2%); Consulting: Aesculap (Amount not disclosed), Medtronic (F).</td>
</tr>
<tr>
<td>Gottfried, Oren N.</td>
<td>Consulting: RTI (C); Speaking and/or teaching arrangements: RTI (C).</td>
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<tr>
<td>Grauer, Jonathan N.</td>
<td>Other Office: NASS (Program Committee Co-Chair), LSRS (Program Committee Co-Chair), Practical Anatomy and Surgical Education (Course Co-Director); Other: Pfizer (D), Spinal Kinetics (Amount not disclosed), Orthodox (Amount not disclosed); Relationships Outside the One-Year Requirement: Vertex (Consulting, Dissolved 06/2015), ISTO Technologies (Amount not disclosed), Adante Medical Devices (Amount not disclosed).</td>
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<tr>
<td>Green, Bart</td>
<td>Consulting: Brighthall (E); Speaking and/or teaching arrangements: NCNIC (B); Trips/travel: NCNIC (A).</td>
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<tr>
<td>Gregory, Carl A.</td>
<td>Stock Ownership: Theodent Holdings (&lt;1%, Paid directly to institution/employer); Scientific Advisory Board: Theodent Holdings (Share Options).</td>
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<tr>
<td>Groff, Michael W.</td>
<td>Royalties: Johnson &amp; Johnson (A), EBI (D); Consulting: EBI Spine (None), DePuy (B); Fellowship Support: Society of Neurologic Surgeons (E).</td>
</tr>
<tr>
<td>Grossman, Robert G.</td>
<td>Scientific Advisory Board: Vertex Pharmaceuticals (A), INSIGHTEC (B).</td>
</tr>
<tr>
<td>Gum, Jeffrey L.</td>
<td>Device or Biologic Distributorship (Physician-Owned Distributorship): OREF (A, Paid directly to institution/employer), ISSG (B, Paid directly to institution/employer), Pfizer (D, Paid directly to institution/employer), Intellirod (B, Paid directly to institution/employer); Royalties: Acuity (None); Consulting: Medtronic (C), DePuy (None), Alphatec (None), Stryker (B), Acuity (C), PKMed (None), K2M (C), NuVasive (None).</td>
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<tr>
<td>Gupta, Munish C.</td>
<td>Royalties: DePuy (F); Stock Ownership: Johnson &amp; Johnson (&lt;1%), P&amp;G (&lt;1%); Consulting: DePuy (E); Speaking and/or teaching arrangements: DePuy (Amount not disclosed), AOspine (B); Trips/travel: DePuy (B); Scientific Advisory Board: DePuy (Amount not disclosed); Fellowship Support: AOspine North America (E, Paid directly to institution/employer), OMEGA (D).</td>
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<tr>
<td>Guyer, Richard D.</td>
<td>Royalties: Alphatec (B); Stock Ownership: Spinal Motion (None); Private Investments: Spinal Ventures I and II (5%); Consulting: DePuy Synthes (B); Speaking and/or teaching arrangements: Synthes (None); Scientific Advisory Board: K2M (B), Spinal Kinetics (Stock options), Nanovis (A), Crocker Technologies (None), MiMedx (None); Fellowship Support: OREF (Amount not disclosed, Paid directly to institution/employer), Medtronic Neurological Division (C, Paid directly to institution/employer).</td>
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<tr>
<td>Haldeman, Scott</td>
<td>Royalties: Multiple Publishing Companies (A); Stock Ownership: Palladian Health (&lt;1%) Consulting: Palladian Health (E); Trips/travel: (B); Scientific Advisory Board: SpineHealth.com (B); Other Office: World Spine Care (President).</td>
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<tr>
<td>Hall, Hamilton</td>
<td>Consulting: RTI Surgical (C); Speaking and/or Teaching Arrangements: Stryker Spine (None), CBI Health Group (D); Trips/Travel: Stryker Spine (None), CBI Health Group (D); Other Office: CBI Health Group (C).</td>
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<tr>
<td>Harris, Jonathan</td>
<td>Other Office: Employee (Salary).</td>
</tr>
<tr>
<td>Harrop, James S.</td>
<td>Consulting: Ethicon Spine (B, Paid directly to institution/employer); Speaking and/or Teaching Arrangements: Medtronic (None); Scientific Advisory Board: Bioventus (B); Research Support: AONA Spine (B, Paid directly to institution/employer); Research Support - Staff and/or Materials: AOspine (C, Paid directly to institution/employer); Grants: AOspine (E, Paid directly to institution/employer); Fellowship Support: NREF (A); Other: Tejin (Amount not disclosed).</td>
</tr>
<tr>
<td>Hartigan, Carol</td>
<td>Royalties: Up To Date In Medicine On Line Medical Reference (A); Scientific Advisory Board: Member Advisory Editorial Board, The Spine Journal (None); Other Office: no other relationship (None).</td>
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<tr>
<td>Hartl, Roger</td>
<td>Royalties: Lanz (B); Consulting: DePuy Synthes (B); Speaking and/or teaching arrangements: Baxter (A), Brainlab (A); Board of Directors: AOspine (B).</td>
</tr>
<tr>
<td>Hassanzadeh, Hamid</td>
<td>Consulting: Pfizer (B); Speaking and/or teaching arrangements: NuVasive (B); Trips/travel: NuVasive (B); Other Office: MTF (None); Research Support (Investigator Salary): Pfizer (G, Paid directly to institution/employer); Research Support (Staff and/or Materials): InVentric (D, Paid directly to institution/employer); Grants: Orthofix (E, Paid directly to institution/employer), CSRS (C, Paid directly to institution/employer).</td>
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<tr>
<td>Heggeness, Michael H.</td>
<td>Royalties: Relievant Medsystems (C, Paid directly to institution/employer), K2M (C, Paid directly to institution/employer); Stock Ownership: Relievant Medsystems (&lt;1%); Consulting: Intrinsic Orthopaedics (B); Other: NASS (Travel expenses).</td>
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<tr>
<td>Heller, John G.</td>
<td>Royalties: Medtronic (G); Stock Ownership: Medtronic (&lt;1%); Consulting: Medtronic (E); Speaking and/or teaching arrangements: Medtronic (D); Trips/travel: Medtronic (Travel expenses).</td>
</tr>
<tr>
<td>Heller, Joshua E.</td>
<td>Consulting: NuVasive (B), SI-BONE (B); Speaking and/or Teaching Arrangements: NuVasive (B), SI-BONE (B), Convatec (B).</td>
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</table>
Hershman, Stuart H.: Consulting: DePuy Synthes Spine (B); Speaking and/or Teaching Arrangements: DePuy Synthes Spine (B); Trips/Travel: DePuy Synthes Spine (B); Fellowship Support: Nuvasive (E, Paid directly to institution/employer); Relationships Outside the One-Year Requirement: DePuy Synthes Spine (Consulting, B, Dissolved 03/2014), DePuy Synthes Spine (Speaking and/or Teaching Arrangement, B, Dissolved 2014).

Hilibrand, Alan S.: Royalties: Biomet Spine (G), Ameda (D), Aesculap (A); Stock Ownership: Ameda (<1%), Life Spine (<1%), Spinal Ventures (<3%); Private Investments: Benvue (B), Neneq (B), Paradigm Spine (B), Pioneer (<1%), PSD (B), Vertiflex (B); Board of Directors: AAOS (Communications Cabinet Chair), CSRS (President).

Hisey, Michael S.: Royalties: Zimmer Biomet Spine (B); Stock Ownership: Spine Wave (<1%); Private Investments: Medical Venture Fund (<1%); Consulting: Zimmer Biomet Spine (D); Speaking and/or teaching arrangements: Zimmer Biomet (Amount not disclosed); Scientific Advisory Board: Innovasis (A).

Hofstetter, Christoph P.: Consulting: Johnson & Johnson (B, Paid directly to institution/employer); Speaking and/or Teaching Arrangements: Johnson & Johnson (B, Paid directly to institution/employer).

Horn, Scott I.: Speaking and/or Teaching Arrangements: NASS (Amount not disclosed), AAPMR (Amount not disclosed), SIS (Amount not disclosed); Board of Directors: Spine Intervention Society (None); Other Office: CPT Advisor for SIS (None).

Hostin, Richard A.: Consulting: DePuy Spine (B); Research Support (Staff and/or Materials): DePuy Spine (F), Seeger (F), NuVasive (F), DJO (E), K2M (D).

Hsieh, Patrick C.: Consulting: DePuy Synthes Spine (C), Medtronic (C), Zimmer Biomet (B), NuVasive (B); Other: Medtronic (None), NuVasive (None), Zimmer Biomet (None).

Hsu, Erin L.: Royalties: Stryker (E); Other Office: Orthopaedic Research Society (Media Relations and Communications Committee); Relationships Outside the One-Year Requirement: Medtronic Sofamor Danek (F, Dissolved 05/2011).

Hsu, Victor: Royalties: Mediciara (B), Camber Spine (C); Consulting: Mazor (A).

Hsu, Wellington K.: Royalties: Stryker (F); Consulting: Stryker (F), AlloSource (A), AgNovos (A), Mirus (B), JBJS (C), Grafitys (A), Wright Medical (B), Micro Medicine (B), Medtronic (C), Bioventus (A); Speaking and/or teaching arrangements: AONA (A); Trips/travel: Stryker (B), Medtronic (B), Micro Medicine (A); Board of Directors: Lumbar Spine Research Society (None), American Academy of Orthopaedic Surgeons (None), Cervical Spine Research Society (None); Scientific Advisory Board: Bioventus (None); Grants: Medtronic (E, Paid directly to institution/employer).

Hu, Serena S.: Royalties: NuVasive (F); Board of Directors: AO (None).

Huddleston, Paul M.: Board of Directors: Minnesota Orthopaedic Society (Travel expenses); Fellowship Support: AOSpine (E, Paid directly to institution/employer).

Hughes, Alexander P.: Royalties: Altus Spine (B); Research Support (Investigator Salary): MilMedx (F, Paid directly to institution/employer), NuVasive (E, Paid directly to institution/employer), Mallinckrodt Pharmaceuticals (F, Paid directly to institution/employer), Pfizer (D, Paid directly to institution/employer).

Huntman, Kade T.: Device or Biologic Distributionship (Physician-Owned Distributorship): Bacterin (B); Consulting: NuVasive (D); Speaking and/or Teaching Arrangements: NuVasive (B).

Huppert, Jean: Royalties: Biomet Zimmer (F).

Hurwitz, Eric: Consulting: RAND Corporation (B), National Institutes of Health (A), Southern California University of Health Sciences (B), EBSCO Information Services (B); Trips/travel: Global Spine Care Initiative (B), RAND Corporation (B); Other Office: The Spine Journal (Deputy Editor); Other: Palmer Center for Chiropractic Research (Data and Safety Monitoring Committee Chair), World Spine Care (Research Committee Co-Chair), Global Spine Care Initiative (Member).

Hynes, Richard A.: Royalties: Medtronic (D); Consulting: Medtronic (A); Speaking and/or teaching arrangements: Medtronic (Amount not disclosed); Trips/travel: Medtronic (A); Research Support (Staff and/or Materials): Medtronic (D).


Jackson, Robert J.: Royalties: Globus Spine (B, Royalties); Stock Ownership: Medtronic (<1%); Speaking and/or teaching arrangements: Zimmer Biomet (B).

Jaks, Adam E.: Private Investments: Dimension Inx (40%); Other Office: Dimension Inx Chief Technology Officer (Salary).

Jevsevar, David S.: Stock Ownership: Risalto Health (<1%); Research Support (Staff and/or Materials): DePuy (F, Paid directly to institution/employer); Grants: NIH (E, Paid directly to institution/employer).

Johnson, Claire: Consulting: NCMIC (D, Board of Directors), Global Spine Care Initiative (Travel, Hotel Accommodations).

Johnson, J. Patrick: Grants: Medtronic (F).

Johnstone, Brian: Royalties: Osiris Therapeutic (B); Consulting: Acumed (B); Scientific Advisory Board: AO Research Institute, Davos, Switzerland (B); Research Support (Investigator Salary): Orthofix (B, Paid directly to institution/employer); Research Support (Staff and/or Materials): Orthofix (C, Paid directly to institution/employer); Grants: Medtronic (F, Paid directly to institution/employer).

Kanim, Lea: Stock Ownership: MDT (<1%).

Justice, Brian: Stock Ownership: Spine Care Partners (20%); Board of Directors: Spine IQ (None); Other Office: Vice President (None).

Kanter, Adam S.: Royalties: Zimmer Biomet (F, Paid directly to institution/employer), NuVasive (E, Paid directly to institution/employer); Consulting: NuVasive (Amount not disclosed, Paid directly to institution/employer); Research Support (Investigator Salary): Notogen (D, Paid directly to institution/employer); Research Support (Staff and/or Materials): ISSG/NuVasive (B, Paid directly to institution/employer).

Karas, Chris: Consulting: Intelliroid (B), Integra (B); Scientific Advisory Board: Intelliroid (None).

Kariikari, Isaac O.: Consulting: NuVasive (B); Fellowship Support: NuVasive (E, Paid directly to institution/employer).

Karim, Muhammad Zia: Stock Ownership: Notogen (<1%, Paid directly to institution/employer); Scientific Advisory Board: Notogen (Amount not disclosed, Paid directly to institution/employer); Research Support (Investigator Salary): Notogen (D, Paid directly to institution/employer); Grants: Notogen (None).

Kaufman, Christopher P.: Stock Ownership: NOC2 (<1%); Consulting: Hospital Corporation of America (HCA) - (Amount not disclosed), Atlas (B).

Kawchuk, Greg N.: Stock Ownership: VibeDx (51%); Board of Directors: VibeDx (None); Grants: NSERC (C, Paid directly to institution/employer), NHI (E, Paid directly to institution/employer), CIHR (C, Paid directly to institution/employer).

Kebaish, Khaled M.: Royalties: DePuy Synthes (F); Consulting: SpineCraft (B); Speaking and/or teaching arrangements: K2M (C, Paid directly to institution/employer).

Kelly, Michael P.: Research Support (Staff and/or Materials): AOSpine (B, Paid directly to institution/employer); Fellowship Support: AOSpine (E, Paid directly to institution/employer).
Kennedy, D.J.: Speaking and/or teaching arrangements: Spine Intervention Society (Amount not disclosed); Trips/travel: AAPM&R (A), Spine Intervention Society (A); Board of Directors: AAPM&R (Board of Directors), Spine Intervention Society (Board of Directors).

Kepler, Christopher K.: Research Support (Staff and/or Materials): CSRS (D, Paid directly to institution/employer); Grants: NIH (None).

Kerr, Eubulus J.: Royalties: GS Medical (B, Paid directly to institution/employer); Private Investments: Paradigm Spine (-1%); Consulting: GS Medical (A).

Kerrigan, D. Casey: Private Investments: JKM Technologies/OESH Shoes (50%); Research Support - Investigator Salary: National Science Foundation (C); Research Support - Staff and/or Materials: National Science Foundation (D); Grants: National Science Foundation (F).

Khalife, Marc: Stock Ownership: Nova Spine (None).

Khan, Dost: Stock Ownership: Abbvie (<1%), Amgen (<1%), Celgene (<1%), Gilead (<1%), Johnson & Johnson (<1%).

Khanna, Nitin: Royalties: NuVasive (F); Stock Ownership: Spineology, Globus (<1%); Private Investments: Edge (<1%); Consulting: Alphatec (B); Speaking and/or teaching arrangements: Baxter (C); Trips/travel: NuVasive (A), Baxter (A), Alphatec (A).

Kim, Choll W.: Royalties: Globus (F); Stock Ownership: SpineView (None); Consulting: Allen-Hill Rom (Amount not disclosed), Globus (Amount not disclosed), K2M (Amount not disclosed), Joimax (Amount not disclosed); Speaking and/or Teaching Arrangements: Globus (Amount not disclosed); Trips/Travel: Globus (None); Board of Directors: Globus (None); Research Support - Staff and/or Materials: Globus (B).

Kim, Han Jo: Royalties: Zimmer Biomet (F), K2M (A); Board of Directors: AOSPINE (B); Other: ISSGF (Amount not disclosed, Paid directly to institution/employer).

Kim, Jin-Sung L.: Stock Ownership: Innovative (<1%); Consulting: Richard Wolf (Travel expenses); Scientific Advisory Board: Innovative (Amount not disclosed); Grants: AOSPine (None).

Kim, Kee D.: Royalties: LDR (E), Globus (B), Spinal USA (D); Stock Ownership: Molecular Matrix (<1%); Consulting: InVivo Therapeutics (B); Speaking and/or teaching arrangements: Zimmer Biomet (A); Board of Directors: Molecular Matrix (Stock Ownership disclosed); Scientific Advisory Board: InVivo Therapeutics (A); Research Support (Staff and/or Materials): Zimmer Biomet (C, Paid directly to institution/employer), Orthofix (B, Paid directly to institution/employer), Mesoblast (E, Paid directly to institution/employer), InVivo Therapeutics (E, Paid directly to institution/employer), Vertex Pharmaceutical (F, Paid directly to institution/employer), Pacira Pharmaceuticals (D, Paid directly to institution/employer), Medtronic (D, Paid directly to institution/employer).

Kim, Seok Woo: Scientific Advisory Board: The Spine Journal (None).

Kim, Terrence T.: Consulting: Synthes DePuy (Amount not disclosed); Grants: Medtronic (D).

Kim, Yong H.: Royalties: Biomet (D); Consulting: Biomet (B); Speaking and/or teaching arrangements: Biomet (B).

Kleinstuck, Frank: Speaking and/or teaching arrangements: DePuy Synthes (Amount not disclosed, Paid directly to institution/employer); Research Support (Staff and/or Materials): DePuy Synthes (E, Paid directly to institution/employer).

Klineberg, Eric O.: Consulting: DePuy (C, Paid directly to institution/employer), Stryker (C, Paid directly to institution/employer); Speaking and/or teaching arrangements: K2M (C, Paid directly to institution/employer), AOSpine (C), Trevena (C), Springer (C), AlloSource (C); Grants: T32 (C, Paid directly to institution/employer); Fellowship Support: AOSPine (E, Paid directly to institution/employer).

Knight, Reginald Q.: Stock Ownership: VTI (<1%); Consulting: Stryker (C); Speaking and/or teaching arrangements: Stryker Spine (Amount not disclosed); Scientific Advisory Board: Spine Universe (None), Vertera (None), Gerstner Medical (None).

Kopjar, Branko: Consulting: Smith and Nephew (H), Cerapedics (F), BAROnova (F), Hip Innovation Technologies (F), Dignity Health (F), Bio2Technologies (D).

Krag, Martin H.: Grants: Spineology (B, Paid directly to institution/employer); Relationships Outside the One Year Requirement: Spineology (Consulting, B).

Kreiner, Scott: Board of Directors: NASS (Clinical Research Development Chair); Speaking and/or Teaching Arrangements: Spine Intervention Society (Travel expenses); Trips/Travel: MPW AUC on Vertebral Augmentation (B).

Krishnaney, Ajit A.: Speaking and/or Teaching Arrangements: Stryker (C).

Kurd, Mark F.: Speaking and/or teaching arrangements: Philadelphia Spine Society (Director).

Kwon, Brian K.: Fellowship Support: Medtronic (D, Paid directly to institution/employer), AOSPine (D, Paid directly to institution/employer).

Laforge, Virginie: Stock Ownership: Nemaris (20%); Speaking and/or teaching arrangements: DePuy Synthes (B), AOSPine (B); Board of Directors: Nemaris (None); Other Office: International Spine Study Group (Executive Committee).

Lahey, Donna M.: Speaking and/or Teaching Arrangements: NASS (A, Paid directly to institution/employer); Trips/Travel: NASS (B, Paid directly to institution/employer).

Lane, Whitney: Grants: National Institute of Health (B); National Cancer Institute (B); Fellowship Support: National Institute of Health (C); National Cancer Institute (C).

Lau, Edmund: Consulting: Paradigm Spine (Amount not disclosed, Paid directly to institution/employer), Stryker Orthopedics (Amount not disclosed, Paid directly to institution/employer), Boston Scientific (Amount not disclosed, Paid directly to institution/employer), Medtronic (Amount not disclosed, Paid directly to institution/employer), Grants: Medtronic (D, Paid directly to institution/employer), Relevant Medsystem (E, Paid directly to institution/employer), Boston Scientific (E, Paid directly to institution/employer).

Lauffer, Ilya: Consulting: Spine Wave (B), Brainlab (A), Medtronic (C), Globus (B), DePuy Synthes (B).

Lavelle, William F.: Stock Ownership: 4WEB (<1%), Prosidyian (<1%), Cardan Robotics (<1%); Speaking and/or teaching arrangements: Stryker (A); Scientific Advisory Board: SAS (Editorial Board), Innovaisations (Scientific Advisory Board), Prosidyian (<1%); Grants: DePuy Synthes (E, Paid directly to institution/employer), SIGNUS (E, Paid directly to institution/employer), Spinal Kinetics (E, Paid directly to institution/employer), K2M (F, Paid directly to institution/employer), Vertebral Technologies (E, Paid directly to institution/employer).

Lawrence, Brandon D.: Speaking and/or teaching arrangements: AOSPine North America (A), K2M (B); Board of Directors: CSRS (None); Fellowship Support: AOSPine North America (E, Paid directly to institution/employer).

Laxer, Eric B.: Royalties: Stryker (C); Fellowship Support: AOSPine (E, Paid directly to institution/employer).

Leib, Darren R.: Private Investments: Woven (<1%); Consulting: NuVasive (B); Scientific Advisory Board: K2M MIS Advisory Team (B); Research Support (Staff and/or Materials): K2M (B, Paid directly to institution/employer).
Lebwohl, Nathan H.: Royalties: Johnson & Johnson (C); Consulting: Johnson & Johnson (A); Speaking and/or Teaching Arrangements: Johnson & Johnson (None).

Lee, Sang-Hun: Speaking and/or teaching arrangements: Medtronic (B).

Lee, Yu-Po: Consulting: DePuy (D).

Lehman, Ronald A.: Consulting: Medtronic (C); Speaking and/or teaching arrangements: Medtronic (D), Stryker (C); Scientific Advisory Board: Stryker (B); Grants: Department of Defense (DoD) (I, Paid directly to institution/employer).

Lenke, Lawrence G.: Royalties: Medtronic (I), Quality Medical Publishing (None); Consulting: Medtronic (Amount not disclosed); Research Support (Staff and/or Materials): Setting Scoliosis Straight Foundation (None), EOS Imaging (None); Grants: Fox Family Foundation (A); Other: Broadwater (Travel expenses), Seattle Science Foundation (Travel expenses), Scoliosis Research Society (Travel expenses), Stryker Spine (Travel expenses), The Spinal Research Foundation (Travel expenses), Fox Rothschild (Expert witness), AOSpine (Travel expenses).

Levi, Allan D.: Consulting: Medtronic (B); Other: DOD (I, Paid directly to institution/employer).

Lewis, Stephen J.: Private Investments: Augmedics (5%), NeuraNex (4%), COVR Medical (2%); Consulting: L&K (D), Stryker (C); Speaking and/or teaching arrangements: Stryker (D), L&K (B), DePuy Synthes (C); Trips/travel: Stryker (B), AOSpine (C), SRS (A), L&K (D), IMAST (B); Scientific Advisory Board: Augmedics (Member Advisory Board), NeuraNex (Member Advisory Board); Fellowship Support: Medtronic (D), Johnson & Johnson (F, Paid directly to institution/employer).

Lieberman, Isador H.: Stock Ownership: Mazor Robotics (<1%); Private Investments: Bionik Laboratories (<1%); Consulting: Mazor Surgical (D), Safe Orthopaedics (B), Globus Spine (B), Misonix (B), Stryker Spine (B); Scientific Advisory Board: Stryker (B).

Lindley, James G.: Royalties: Globus Medical (C); Private Investments: Mirus (<1%); Consulting: Globus Medical (Scientific Advisory Board).

Line, Breton: Consulting: International Spine Study Group Foundation (C).

Lipson, Adam C.: Stock Ownership: Acadia Pharmaceuticals (20000000 Shares), MATR Incorporated (10%), Diffusion Pharmaceuticals (37500 Shares), Acera Surgical (<1%); Private Investments: Bionik Laboratories (2.5%), Epibone (<1%); Cell Source (2.5%), Sapience Therapeutics (<1%), X4 Pharmaceuticals (1.5%); Consulting: Stryker (C), Paradigm Spine (Amount not disclosed), Nuvecra (B); Speaking and/or Teaching Arrangements: Bioventus (Amount not disclosed), Centinel Spine (C); Other: Gerson Lehrman Group (C), MATR Incorporated (Amount not disclosed), FundRx (Scientific Advisor).

Little, Kenneth M.: Private Investments: AI Health (55%); Consulting: HealthTrust (A); Speaking and/or teaching arrangements: HealthTrust (A); Trips/travel: HealthTrust (A); Board of Directors: AI Health (CEO); Scientific Advisory Board: HealthTrust (Travel expenses).

Liu, Raymond W.: Royalties: Orthopediatrics Corporation (B, Paid directly to institution/employer); Board of Directors: Journal of Pediatric Orthopaedics (None), Limb Lengthening and Reconstruction Society (None).

Loidolt, Travis: Trips/travel: 4WEB (A).

Lonne, Baron S.: Royalties: DePuy Synthes (G), Zimmer Biomet (None); Stock Ownership: Spine Search (<1%), Paradigm Spine (<1%); Private Investments: Paradigm Spine (E); Consulting: DePuy Synthes (D), UNYQ Align (B), ApiFix (B), Zimmer Biomet (B), Ethicon (None); Speaking and/or teaching arrangements: DePuy Synthes (C), K2M (B); Board of Directors: Spine Search (None); Scientific Advisory Board: DePuy Synthes (None); Other Office: SRS Spine Deformity Journal (Editorial Board); Grants: DePuy Synthes (D), John and Marcella Fox Fund (B), OREF (C).

Lotz, Jeffrey C.: Royalties: University of California (B); Stock Ownership: ISTO Technologies (<1%), Relievant Medsystems (<1%), Nocimed (9%), Aleeva Medical (<1%), SMC Biotech (<1%), Bioniks (20%); Private Investments: Nocimed (<1%); Consulting: Applied Biomechanics (Amount not disclosed); Scientific Advisory Board: Relievant Medsystems (Stock Ownership disclosed), SMC Biotech (Stock Ownership disclosed); Research Support (Investigator Salary): Orthofix (B, Paid directly to institution/employer); Research Support (Staff and/or Materials): Orthofix (E, Paid directly to institution/employer); Grants: Orthofix (E, Paid directly to institution/employer).

Loughenbury, Peter R.: Speaking and/or teaching arrangements: Stryker (Amount not disclosed).

Ludwig, Steven C.: Royalties: DePuy Synthes (B), Globus Medical (B); Stock Ownership: ISD (4%); Private Investments: Advanced Spinal Intellectual Properties (29%); Consulting: DePuy Spine (D); Speaking and/or teaching arrangements: AOSpine (B); Trips/travel: K2M (B); Board of Directors: Advanced Spinal Intellectual Properties, (D); Scientific Advisory Board: Globus Medical (B); Grants: Foundation for Orthopedic Trauma (C, Paid directly to institution/employer); Fellowship Support: OREF Grant (B, Paid directly to institution/employer); Other: K2M (B).

Lurie, Jon D.: Stock Ownership: NewVert (<1%); Consulting: Foundation for Informed Medical Decision Making (None), FzioMed (B), NewVert (Stock Ownership disclosed).

MacEwan, Matthew: Royalties: OsteoVantage (None); Stock Ownership: OsteoVantage (10%).

Majd, Mohammad E.: Royalties: Gold Standard Orthopaedic (E, Paid directly to institution/employer); Consulting: Alphapec (B, Paid directly to institution/employer); Trips/travel: SpineArt (A).

Malham, Greg M.: Consulting: Globus (B, Paid directly to institution/employer), Stryker (B, Paid directly to institution/employer), NuVasive (B, Paid directly to institution/employer), NuVasive (B, Paid directly to institution/employer); Trips/travel: Globus (B, Paid directly to institution/employer), Stryker (B, Paid directly to institution/employer), NuVasive (B, Paid directly to institution/employer), NuVasive (B, Paid directly to institution/employer); Board of Directors: SOLAS (None).

Malone, Kyle: Stock Ownership: NuVasive (<1%); Other Office: NuVasive (Amount not disclosed).

Mannen, Erin M.: Consulting: MatOrtho (C), Southern Spine (B); Research Support (Staff and/or Materials): Ergobaby (C, Paid directly to institution/employer), Boba (B, Paid directly to institution/employer).

Manson, Neil A.: Consulting: Medtronic Canada (B), Medtronic Europe (B); Speaking and/or teaching arrangements: Medtronic (B); Scientific Advisory Board: Medtronic Europe (B); Research Support (Staff and/or Materials): Medtronic Canada (F, Paid directly to institution/employer).

Marino, James F.: Stock Ownership: Trinity Orthopedics (80%); Private Investments: Trinity Orthopedics (80%); Consulting: Trinity Orthopedics (Amount not disclosed); Trips/travel: Trinity Orthopedics (Travel expenses); Board of Directors: Trinity Orthopedics (Stock Ownership disclosed); Scientific Advisory Board: Trinity Orthopedics (Stock Ownership disclosed); Other Office: Trinity Orthopedics (CEO); Research Support (Staff and/or Materials): Trinity Orthopedics (E).
Markman, John: Consulting: Pfizer (C); Scientific Advisory Board: Biogen (B), Immune Pharma (B), Nektar (B), Teva (B), Grunenthal (B), College of Physicians and Surgeons, University of California, San Francisco (B), Divacchi Sankyo (B), Novartis (B), Egalet (C); Grants: Pfizer (C, Paid directly to institution/employer).

Marshall, Kyle E.: Consulting: Zimmer Biomet (E); Relationships Outside the One Year Requirement: Zimmer Biomet (E, dissolved 05/2017).

Martin, Brook L.: Consulting: Washington State Department of Health (D); Other Office: Statix, (Amount not disclosed); Research Support (Investigator Salary): University of Utah (F, Paid directly to institution/employer); Grants: University of Utah (F, Paid directly to institution/employer).

Matsumoto, Morio: Consulting: NuVasive (A); Scientific Advisory Board: Kyocera (A); Research Support (Staff and/or Materials): Medtronic Japan (D, Paid directly to institution/employer).

Matta, Ajay: Stock Ownership: Notogen (<1%, Paid directly to institution/employer); Scientific Advisory Board: Notogen (Stock Options, already disclosed); Research Support (Investigator Salary): Notogen (D, Paid directly to institution/employer); Research Support (Staff and/or Materials): Notogen (None); Grants: Notogen (None).

Maus, Timothy P.: Trips/travel: Spine Intervention Society (B), Spanish Pain Society (C), University Hospitals (A), Mayo Clinic (A); Board of Directors: Spine Intervention Society (Trip/Travel); Research Support (Investigator Salary): Mayo Clinic Research Committee (E).

Mayer, John M.: Consulting: Palladian Muscular Skeletal Health (B); Speaking and/or Teaching Arrangements: Rehab Essentials (B); Scientific Advisory Board: Palladian Muscular Skeletal Health (B); Research Support - Investigator Salary: FEMA (D, Paid directly to institution/employer); Research Support - Staff and/or Materials: FEMA (F, Paid directly to institution/employer); Grants: FEMA (F, Paid directly to institution/employer).

McCarty, Richard E.: Royalties: Medtronic (D); Speaking and/or teaching arrangements: Medtronic (None).

McCormick, Zachary: Board of Directors: Spine Intervention Society (Travel expenses).

McGirt, Matthew J.: Consulting: Stryker Spine (D), Mirus Medical (B); Stock Ownership: PeerWell (<1%); Consulting: Abbott (B, Paid directly to institution/employer), CyMedica (B), DJO (D, Paid directly to institution/employer), Johnson & Johnson (B, Paid directly to institution/employer), Mallinckrodt (D, Paid directly to institution/employer), Ongoing Care Solutions (B, Paid directly to institution/employer), OrthoSensor (B, Paid directly to institution/employer), Pacira (B, Paid directly to institution/employer), Performance Dynamics (B, Paid directly to institution/employer), Sage (B, Paid directly to institution/employer), Stryker (B, Paid directly to institution/employer), TissueGene (B, Paid directly to institution/employer).

Mont, Michael A.: Royalties: Stryker (E, Paid directly to institution/employer), Microport (B, Paid directly to institution/employer); Stock Ownership: PeerWell (<1%); Consulting: Abbott (B, Paid directly to institution/employer), CyMedica (B), DJO (D, Paid directly to institution/employer), Johnson & Johnson (B, Paid directly to institution/employer), Mallinckrodt (D, Paid directly to institution/employer), Ongoing Care Solutions (B, Paid directly to institution/employer), OrthoSensor (B, Paid directly to institution/employer), Pacira (B, Paid directly to institution/employer), Performance Dynamics (B, Paid directly to institution/employer), Sage (B, Paid directly to institution/employer), Stryker (B, Paid directly to institution/employer), TissueGene (B, Paid directly to institution/employer).

Morgenstern, Rudolf: Royalties: Joimax GmbH (C); Consulting: DePuy Synthes (Amount not disclosed).

Moskovich, Ronald: Royalties: Exactech (B).

Mroz, Thomas E.: Royalties: Stryker (F); Stock Ownership: Pearl Diver (<1%); Consulting: Stryker Spine (D); Board of Directors: NASS (CMC Chair); Fellowship Support: AOSpine (B).

Muehlbauer, Eric J.: Board of Directors: NASS (Executive Director).

Mueller, Benjamin: Consulting: Globus (C), Next Spine (C).

Mundis, Gregory M.: Royalties: NuVasive (D), K2M (B); Consulting: NuVasive (D), K2M (B), AlloSource (B); Speaking and/or teaching arrangements: NuVasive (C); Board of Directors: Global Spine Outreach (None), Society of Lateral Access Surgery (None), San Diego Spine Foundation (None); Fellowship Support: NuVasive (E, Paid directly to institution/employer); Other: ISSGF (Paid directly to institution/employer).

Murphy, Donald R.: Stock Ownership: Primary Spine Provider Network (20%), Spine Care Partners (20%); Consulting: Allstate (B), CRISP Education and Research (B), Speaking and/or Teaching Arrangements: CRISP Education and Research (B); Trips/Travel: New York Chiropractic College (A); Scientific Advisory Board: MedRisk (B).

Nachabo, Rami: Other: Philips Healthcare (Salary).

Nassr, Ahmad N.: Consulting: Vikon Surgical (None); Speaking and/or teaching arrangements: Magnifi Group (Travel expenses); Research Support (Staff and/or Materials): Pfizer (E, Paid directly to institution/employer); Fellowship Support: AOSpine (E, Paid directly to institution/employer).
Neuman, Brian J.: Grants: DePuy Synthes (C, Paid directly to institution/employer); Other: ISSGF (Research Support).

Ney, John P.: Consulting: SpecialtyCare (B), CeriBell (B).

Nottmeier, Eric W.: Royalties: Globus (E, Paid directly to institution/employer); Stock Ownership: Excelsius Spine (<1%); Private Investments: Mirus (<1%), OR Hub (<1%); Consulting: Medtronic Navigation (B), Mirus (A), Amendia (A); Relationships Outside the One-Year Requirement: BrainLAB (Consulting, B, Dissolved 01/2009), Medtronic Navigation (Consulting, B, Dissolved 05/2011).

Nouri, Aria: Other: NASS (Research Project Management Committee).

Nunley, Pierce D.: Royalties: Zimmer Biomet (E), K2M (E); Stock Ownership: Amedica (<1%), Paradigm Spine (<1%), Spineology (<1%); Consulting: VertiFlex (B), K2M (C), Zimmer Biomet (B); Speaking and/or teaching arrangements: K2M (C), Zimmer Biomet (B).

Obeid, Ibrahim: Royalties: Alphatec spine (B), CLARIANCE (B), SpineArt (C); Consulting: Medtronic (B), DePuy Synthes (B, Paid directly to institution/employer); Research Support (Investigator Salary): DePuy Synthes (D, Paid directly to institution/employer).

O’Brien, David R.: Stock Ownership: OrthoCarolina (<1%), Transformant Health (<1%), Arrowlytics (<1%); Board of Directors: NASS (Health Policy Council Director); Speaking and/or Teaching Arrangements: SIS (Travel expenses); Trips/Travel: SIS (Travel expenses).

Odom, Susan: Consulting: Universal Research Solutions (B); Other Office: American Association Hip and Knee Surgeons (None); Research Support (Staff and/or Materials): Facet Solutions (D, Paid directly to institution/employer) Bioventus (D, Paid directly to institution/employer) Spinal Kinetics (D, Paid directly to institution/employer) Pacira (D, Paid directly to institution/employer).

Ohmneiss, Donna D.: Board of Directors: NASS (Education Publishing Chair); Other: Texas Back Institute Research Foundation (Salary).

Okonkwo, David O.: Royalties: Biomet (F, Paid directly to institution/employer), NuVasive (E).

O’Brien, Margaret: Speaking and/or teaching arrangements: Pfizer (B).

Ong, Kevin L.: Consulting: Stryker (Amount not disclosed, Paid directly to institution/employer), Ferring Pharmaceuticals (Amount not disclosed, Paid directly to institution/employer), Sanofi (Amount not disclosed, Paid directly to institution/employer), Paradigm Spine (Amount not disclosed, Paid directly to institution/employer), St. Jude Medical (Amount not disclosed, Paid directly to institution/employer), Medtronic (Amount not disclosed, Paid directly to institution/employer), Pacira Pharmaceuticals (Amount not disclosed, Paid directly to institution/employer), Stryker Mako Surgical (Amount not disclosed, Paid directly to institution/employer), DJO (Amount not disclosed, Paid directly to institution/employer), Ossur (Amount not disclosed, Paid directly to institution/employer), Stryker (Amount not disclosed, Paid directly to institution/employer), Zimmer Biomet (Amount not disclosed, Paid directly to institution/employer), SpineFrontier (Amount not disclosed, Paid directly to institution/employer), Ethicon (Amount not disclosed, Paid directly to institution/employer); Other: Exponent (Salary).

Ormoff, Douglas G.: Royalties: SeaSpine (B); Consulting: SeaSpine (D, Paid directly to institution/employer), NuVasive (B), Stryker (A, Paid directly to institution/employer); Trips/travel: NuVasive (B), Stryker (A), SeaSpine (C); Research Support (Investigator Salary): NuVasive (C), Globus (B), VertiFlex (B), SeaSpine (B).

Owens, R. Kirk: Consulting: Medtronic (C), NuVasive (B), K2M (A); Speaking and/or teaching arrangements: NuVasive (None); Trips/travel: DePuy Spine (A); Grants: Pfizer (D, Paid directly to institution/employer), OREF (A, Paid directly to institution/employer), Intellijob (B, Paid directly to institution/employer).

Palumbo, Mark A.: Consulting: Stryker (C), SpineArt (None).

Park, Don Y.: Consulting: NuVasive, (B); Speaking and/or teaching arrangements: DePuy Synthes (A).

Park, Paul: Royalties: Globus Medical (C); Consulting: Globus Medical (B), Medtronic (B), Biomet Zimmer (B), NuVasive (B); Speaking and/or Teaching Arrangements: Globus Medical (C); Research Support - Investigator Salary: Pfizer (B, Paid directly to institution/employer); Grants: Pfizer (C, Paid directly to institution/employer).

Passias, Peter G.: Consulting: Medicrea (None), Spine Wave (None); Speaking and/or teaching arrangements: Zimmer Biomet (None); Scientific Advisory Board: AlloSource (None); Grants: CSRS (D, Paid directly to institution/employer).

Patel, Pavan D.: Other Office: Research Engineering Intern (C); Research Support (Staff and/or Materials): Globus Medical (C).


Paulino, Carl B.: Consulting: Ethicon (B); Speaking and/or teaching arrangements: DePuy/Johnson & Johnson (B); Trips/travel: Ethicon (B).

Peacock, James C.: Stock Ownership: Nocimed (8%), Relivant Medsystems (<1%); Private Investments: Nocimed (<1%); Board of Directors: Nocimed (F); Other Office: Nocimed (F).

Pelisse, Ferran: Consulting: DePuy Spine (C), Johnson & Johnson (C), Zimmer Biomet (B); Grants: DePuy Spine Synthes (C, Paid directly to institution/employer), Medtronic (C, Paid directly to institution/employer).

Pennings, Jaquelyn S.: Consulting: Elite Research, (B).

Perez-Gruoso, Francisco J.: Consulting: K2M (A); Research Support (Investigator Salary): DePuy Synthes (D, Paid directly to institution/employer).

Perra, Joseph H.: Royalties: Medtronic (D).

Petrizzo, Anthony: Consulting: Stryker Spine (D).

Phillips, Frank M.: Royalties: NuVasive (G), Stryker (E), DePuy Spine (B); Stock Ownership: NuVasive (<1%), TheraCell (5%), Spinal Kinetics (<1%), SI-BONE (<1%), Bonova (2%); Consulting: NuVasive (B); Board of Directors: Vital 5 (Stock ownership), TheraCell (Stock ownership).

Pinto, Manuel R.: Device or Biologic Distributorship (Physician-Owned Distributorship): Medtronic (D), Globus (D); Royalties: Globus (B); Consulting: Medtronic (D).

Pittman, Jason: Consulting: DePuy Synthes (B); Trips/travel: DePuy Synthes (A).

Place, Howard M.: Consulting: DePuy Synthes Spine (B); Grants: Sciosis Research Society (None).

Plastaras, Christopher T.: Consulting: TLG Associates (A); Speaking and/or teaching arrangements: Elite Rehabilitation Solutions (A), NASS (A), Oakstone Publishing (A); Trips/travel: TLG (A); Other Office: TLG Associates (A); Other: RICPLAS (None).

Poelstra, Kornelis A.: Royalties: K2M (B); Stock Ownership: Mazor (<1%), Flow Pharma (<1%); Private Investments: SpinalCyte (<1%), Mirus (5%); Consulting: Medtronic (C), K2M (B), Atlas Spine (Travel expenses), Inion Spine (Travel expenses), Integrity Spine (Travel expenses), Acuity Surgical (Travel expenses), ISD (Travel expenses), Misonix (Travel expenses); Speaking and/or Teaching Arrangements: K2M (D), Mazor Robotics (Travel expenses); Trips/Travel: Mazor (Travel expenses); Scientific
Advisory Board: Medtronic (Travel expenses), Mirus (Travel expenses); Other: Ascension Health (B).

Pollina, John: Consulting: Stryker Spine (B); Speaking and/or teaching arrangements: NuVasive (E, Paid directly to institution/employer); Research Support (Investigator Salary): Medtronic (None); Fellowship Support: Western NY Spine (D, Paid directly to institution/employer).

Popovich, John M.: Grants: NASS (D, Paid directly to institution/employer).

Prasad, Ravi: Consulting: Mission Lisa Foundation (B); Scientific Advisory Board: Bicycle Health (Stock Options).

Prasad, Srinivas K.: Royalties: Stryker Spine (D); Consulting: Stryker Spine (D), Globus Medical (C), Spine Wave (B), DePuy Synthes (C); Speaking and/or Teaching Arrangements: Stryker Spine (D), DePuy Synthes (B); Board of Directors: AKOS Health Systems (None); Fellowship Support: AOSpine (E, Paid directly to institution/employer), NREF (E, Paid directly to institution/employer).

Prasher, Anuj: Consulting: NuVasive (B, Paid directly to institution/employer).

Prince, Jose M.: Consulting: Merck (None).

Protopsaltis, Themistocles S.: Consulting: Medcirea (B), NuVasive (B), Innovaxis (B); Grants: Zimmer Biomet (B, Paid directly to institution/employer), CSRS (C, Paid directly to institution/employer); Other: ISSGF (Amount not disclosed, Paid directly to institution/employer).

Przybylski, Gregory J.: Stock Ownership: Cigna (<1%); Private Investments: South Jersey CK Leasing (<1%); Speaking and/or Teaching Arrangements: NASS (B), Decision Health (None), Eli Research (B); Trips/Travel: AMA Relative-Value Update Committee (B); Other Office: Eli Research Advisory Editor (B), Board of Education, WHRHS (Vice President), Cigna Healthcare (Salary).

Puttlitz, Christian M.: Consulting: Medtronic (Amount not disclosed); Grants: Medtronic (D, Paid directly to institution/employer).

Queshi, Sheeraz A.: Royalties: Zimmer Biomet Spine (None); Private Investments: Avaz Surgical (2%); Consulting: Stryker Spine (B), Medtronic Spine (None), Globus (B); Speaking and/or teaching arrangements: Globus (B), Stryker (B), Medtronic (None); Board of Directors: MTF (None), Scientific Advisory Board: Orthofix (None), Zimmer (None); Other: CSRS (Program Committee), NASS (Value Committee), CSRS (Survey Committee), AAOS (Committee of Fellows), Grants: CSRS (C, Paid directly to institution/employer); Fellowship Support: Globus Medical (E, Paid directly to institution/employer).

Radcliff, Kris E.: Royalties: Globus Medical (B), Orthopedic Sciences, (Intellectual property, Implant Design); Stock Ownership: 4WEB Medical (<1%, Scientific advisory board. Paid directly to institution/employer), Rothman Institute (2%); Consulting: Advance Medical (C), Medtronic Advanced Energy (A), Zimmer Biomet (None), LDR Spine (None); Trips/travel: Zimmer Biomet (B), LDR Spine (B); Board of Directors: Association for Collaborative Spinal Research (None); Scientific Advisory Board: 4WEB Medical (None); Research Support (Staff and/or Materials): Simplify Medical (None).

Rahm, Mark D.: Royalties: SpineSmith (B); Research Support (Staff and/or Materials): K2M (B, Paid directly to institution/employer).

Rampersaud, Raja Y.: Royalties: Medtronic (E); Consulting: Medtronic Spine (C).

Rao, Sanjay C.: Relationships Outside the One Year Requirement: General Electric (Dissolved 09/2006).

Rappard, George: Stock Ownership: Miracle Mile Outpatient Surgery Center (2%); Speaking and/or Teaching Arrangements: Southern California Health Sciences University (Adjunct Professor).

Razi, Afshin E.: Consulting: DePuy (B), Johnson & Johnson (B).

Redmond, Andy: Consulting: RTI Surgical (B).

Redmond, Kristin: Speaking and/or Teaching Arrangements: AstraZeneca (A).


Reitman, Charles A.: Trips/Travel: NASS (Travel expenses); Board of Directors: NASS (Administration & Development Council Director); Scientific Advisory Board: Clinical Orthopedics and Related Research (Deputy Editor, B, Paid directly to institution/employer).

Resnick, Daniel K.: Royalties: Elsevier (B); Stock Ownership: Nidus (<1%); Board of Directors: American Board of Neurological Surgeons (None), NASS (President).

Rhee, John M.: Royalties: Biomet Spine (D), Stryker Spine (E); Stock Ownership: Phygen/Alphatec (<1%); Consulting: DePuy Synthes Spine (B); Speaking and/or teaching arrangements: Zimmer Spine (C), Board of Directors: CSRS (Research Committee Chairman, Traveling Fellowship Committee Chairman); Other: Lippincott (B).

Rhines, Laurence D.: Speaking and/or teaching arrangements: Stryker (Honoraria), Medtronic (Honoraria).

Riew, K. Daniel: Royalties: Biomet (F, Paid directly to institution/employer); Stock Ownership: Osprey (<1%), Expanding Orthopedics (<1%), Spineology (<1%), Spinal Kinetics (<1%), NexGen Spine (10 shares); Consulting: Biomet (B), Medtronic (B); Speaking and/or teaching arrangements: Medtronic (B); Trips/travel: DePuy Synthes (B); Board of Directors: AOSpine (E); Scientific Advisory Board: The Spine Journal (None); Research Support (Staff and/or Materials): AOSpine (B, Paid directly to institution/employer).

Riew, K. Daniel: Royalties: Biomet (F), Zeiss (B), Medtronic (G); Stock Ownership: Osprey (<1%), PSD (<1%); Paradigm Spine (<1%), Benvenue (<1%), Vertiflex (<1%), Amdecia (<1%), NexGen Spine (<1%), Spinal Kinetics (<1%), Spineology (<1%); Consulting: Biomet (B), Medtronic (B); Speaking and/or teaching arrangements: Medtronic (B); Trips/travel: DePuy Synthes (Travel expenses); Board of Directors: AOSpine (E); The Spine Journal (None); Research Support (Staff and/or Materials): AOSpine (B, Paid directly to institution/employer).

Rihn, Jeffrey A.: Stock Ownership: Xant Medical (<1%); Consulting: Globus Medical (B); Board of Directors: Cervical Spine Research Society (None), The Spine Journal (Deputy Editor), Juvenile Diabetes Research Foundation (None).

Riley, Lee H.: Royalties: Avitus (D, Paid directly to institution/employer); Stock Ownership: Spinal Kinetics (<1%); Trips/travel: AOSpine (Amount not disclosed); Board of Directors: Lifenet Health (C); Grants: DePuy Spine (E, Paid directly to institution/employer).

Roberto, Rolando F.: Speaking and/or teaching arrangements: MedCom Tech (B); Fellowship Support: DePuy Spine (E, Paid directly to institution/employer); Other: K2M (E, Paid directly to institution/employer).

Roh, Jeffrey S.: Royalties: Stryker Spine (A); Stock Ownership: PearlDiver (<1%); Consulting: Stryker Spine (A); Speaking and/or Teaching Arrangements: Stryker Spine (A), Medtronic (B); Trips/Travel: Stryker Spine (Amount not disclosed); Board of Directors: Orthopedics International (None); Other Office: Evergreen Hospital Medical Center (A).
Rosendale, Richard: Consulting: McKenzie Institute International (A); Speaking and/or Teaching Arrangements: McKenzie Institute Canada (A); Scientific Advisory Board: McKenzie Institute International Conference Committee (Travel expenses); Other Office: McKenzie Institute International Education Committee (B).


Ryaby, James T.: Stock Ownership: Orthofix (<1%); Consulting: Chrysalis BioTherapeutics (Stock Options); Speaking and/or teaching arrangements: Orthofix (B); Trips/travel: Orthofix (Travel expenses); Scientific Advisory Board: Chrysalis BioTherapeutics (Consulting disclosed).

Sahgal, Arjun: Speaking and/or teaching arrangements: Elekta AB (A), Accuray (A), Varian Medical Systems (A).

Salfi, Comron: Stock Ownership: Vertera/NuVasive (<1%); Consulting: Vertera (Stock Ownership disclosed).

Saiz, Paul: Royalties: Zimmer (A); Stock Ownership: Mindset (<1%); Private Investments: Mindset (<1%); Consulting: K2M (A); Speaking and/or Teaching Arrangements: K2M (A); Trips/Travel: K2M (A); Board of Directors: Las Cruces Surgical Center (None), Western Heritage Bank (None); Research Support - Investigator Salary: K2M (A); Research Support - Staff and/or Materials: K2M (A).

Sama, Andrew A.: Royalties: Ortho Development Corporation (D), DePuy (B); Stock Ownership: Paradigm Spine (<1%), Sentio, (<1%); Consulting: Ortho Development (None), 4WEB (A), Clariance, (B), DePuy (C); Speaking and/or teaching arrangements: DePuy Spine (D); Scientific Advisory Board: Clariance, (None); Research Support (Staff and/or Materials): Spinal Kinetics (D, Paid directly to institution/employer), MIIMedx (C, Paid directly to institution/employer), Aesculap (B, Paid directly to institution/employer); Fellowship Support: AOSpine (E, Paid directly to institution/employer).

Sandhu, Harvinder S.: Stock Ownership: Spine Wave (<1%), Allergan (<1%), Paradigm Spine (<1%), Providence Medical Technology (<1%); Scientific Advisory Board: Prosidyam Medical (<1%), Kunovus (<1%); Grants: Hospital for Special Surgery (D, Paid directly to institution/employer).

Safi, Arshae, Vishal: Royalties: Precision Spine (D); Consulting: DePuy Spine (None), Medtronic (None); Research Support (Staff and/or Materials): Precision Spine (C, Paid directly to institution/employer).

Sasso, Rick C.: Royalties: Medtronic (I); Board of Directors: Cervical Spine Research Society (None); Research Support (Staff and/or Materials): Medtronic (B, Paid directly to institution/employer), Cerapedics (E, Paid directly to institution/employer), Smith and Nephew (D, Paid directly to institution/employer).

Savage, Jason W.: Consulting: Stryker Spine (D); Fellowship Support: AOSpine (E, Paid directly to institution/employer).

Schneider, Byron J.: Consulting: AIM Specialty (B), PDA (B); Speaking and/or Teaching Arrangements: NASS (A), SIS (A); Trips/Travel: AAPM&R (A); Scientific Advisory Board: Tennessee State Technical Advisory Committee Spine Episodes of Care (None).

Schneider, Michael J.: Consulting: NCMIC (B), State Farm Insurance (C); Research Support - Investigator Salary: NIH (D, Paid directly to institution/employer), PCORI (B, Paid directly to institution/employer); Research Support - Staff and/or Materials: PCORI (B, Paid directly to institution/employer); Grants: NIH (F, Paid directly to institution/employer), PCORI (B, Paid directly to institution/employer).

Schneider, Philip L.: Royalties: Biomet (D); Consulting: Collagen Matrix (B); Board of Directors: NASS (Advocacy Council Chair).

Schoenfeld, Andrew J.: Royalties: Wolters Kluwer (B), Springer (B); Consulting: ArborMetrix (C); Trips/Travel: JBJS (A); Other Office: Journal of Bone and Joint Surgery (C); Research Support - Staff and/or Materials: CMS (D, Paid directly to institution/employer); Grants: Department of Defense (D, Paid directly to institution/employer), OREF (D, Paid directly to institution/employer), NIH (F, Paid directly to institution/employer).

Schrack, Francine W.: Stock Ownership: Nocimed (<1%).

Schreyer, Edward H.: Private Investments: 4Qimaging Qmetrics (30%), Board of Directors: 4Qimaging Qmetrics (Director); Other Office: 4Qimaging Qmetrics (F), Research Support: (Staff and/or Materials): 4Qimaging Qmetrics (F, Paid directly to institution/employer).

Schroeder, Gregory D.: Trips/Travel: Medtronic (Travel expenses, Paid directly to institution/employer); Grants: Medtronic (C, Paid directly to institution/employer).

Schoerlucke, Samuel R.: Research Support (Staff and/or Materials): Mazor (B, Paid directly to institution/employer); Other: NuVasive (B, Paid directly to institution/employer).

Schwab, Frank J.: Royalties: MSD (D); Stock Ownership: Nemaris, (30%); Consulting: MSD (B), Zimmer Biomet (E), NuVasive (C); Speaking and/or teaching arrangements: Zimmer Biomet (B); Board of Directors: Nemaris (shares); Grants: DePuy Spine (H, Paid directly to institution/employer), Stryker (D, Paid directly to institution/employer), NuVasive (E, Paid directly to institution/employer), K2M (E, Paid directly to institution/employer).

Schwab, Joseph H.: Speaking and/or teaching arrangements: Stryker Spine (Amount not disclosed).

Schwender, James D.: Royalties: Medtronic (D) Stryker (D).

Sciubba, Daniel M.: Consulting: Medtronic (D, Paid directly to institution/employer), Stryker (C), NuVasive (B), DePuy Synthes (B).

Segebarth, P. Bradley: Consulting: NuVasive (B); Speaking and/or teaching arrangements: DePuy Synthes Spine (B Research Support (Staff and/or Materials): NuVasive (C, Paid directly to institution/employer); Grants: Medtronic Sofamor Danek (C, Paid directly to institution/employer); Fellowship Support: NuVasive (D, Paid directly to institution/employer).

Sembrano, Jonathan N.: Board of Directors: Philippine-Minnesotan Medical Association (None); Research Support (Staff and/or Materials): NuVasive (B, Paid directly to institution/employer), SI-BONE (None), Zyga (A, Paid directly to institution/employer), AOSpine (A, Paid directly to institution/employer); Grants: SOLAS (B, Paid directly to institution/employer), SRS (B).

Semler, Eric: Other Office: MTF Biologics (Amount not disclosed).

Sengupta, Dilip K.: Royalties: Globus Medical (D); Stock Ownership: Globus Medical (<1%); Private Investments: International Spine and Orthopaedic Institute (<1%); Consulting: Globus Medical (None); Scientific Advisory Board: Globus Medical (None); Research Support - Staff and/or Materials: Globus Medical (A, Paid directly to institution/employer); Fellowship Support: Globus Medical (A, Paid directly to institution/employer).

Septokas, Anthony K.: Stock Ownership: KSPC Holdings (<1%); Other Office: SpecialCare (Salary).

Sethi, Rajiv K.: Speaking and/or Teaching Arrangements: NuVasive (B, Paid directly to institution/employer); Trips/Travel: Orthofix (B); Scientific Advisory Board: Spine Craft (None); Fellowship Support: K2M (E, Paid directly to institution/employer).

Shaffrey, Christopher L.: Royalties: Medtronic (F), NuVasive (F), Zimmer Biomet (F); Stock Ownership: NuVasive (15000 shares); Consulting: K2M (C); Speaking and/or teaching arrangements: Stryker Spine (C); Board of Directors: AANS (Travel expenses), CSRS (Travel expenses), ABNS (Travel expenses); Other Office: ABNS (Travel expenses); Grants: NIH...
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(C), Department of Defense/ NACTN (F), ISSG (C); Fellowship Support: AO (E), NREF (E); Relationships Outside the One Year Requirement: DePuy Synthes (Consulting, Dissolved 07/2012).


Shamie, A. Nick: Royalties: SeaSpine (B); Stock Ownership: SI-BONE (<1%), VertiFlex (<1%); Consulting: Stryker (None), SeaSpine (None), SI-BONE (None), VertiFlex (None); Speaking and/or teaching arrangements: Medtronic (None); Trips/travel: Medtronic (None); Board of Directors: VertiFlex (Medical Director); Scientific Advisory Board: SI-BONE (Medical Advisory Board).

Sharan, Alok D.: Royalties: Jaypee Publishers (A); Stock Ownership: Medetel (<1%), ReVivo (<1%); Consulting: Cartiva (B), McKinsey (B); Speaking and/or teaching arrangements: Globus (None); Trips/travel: Globus (B); Board of Directors: Indo-American Spine Alliance (None); Scientific Advisory Board: ReVivo (None); Other: Jaypee Brothers (A).

Shaw, Jeremy D.: Consulting: Ceterix Orthopaedics (E)

Shea, Kevin G.: Board of Directors: POSNA (None), ROCK (None), PRISM (None); Grants: Vericel (E) AlloSource (E).

Shen, Francis H.: Royalties: Elsevier (B), Globus (D); Consulting: DePuy Synthes (B), Axsome Therapeutics (B), Medtronic (D); Board of Directors: MTF (B); Research Support (Staff and/or Materials): Medtronic (None).

Shimer, Adam L.: Royalties: Stryker (C); Consulting: Medtronic (B), NuVasive (B); Speaking and/or teaching arrangements: Biomet (B).


Shonnard, Neal H.: Royalties: Globus Medical (B).

Shufflebarger, Harry L.: Royalties: DePuy Spine (Amount not disclosed), K2M (Amount not disclosed); Consulting: DePuy Spine (Amount not disclosed), K2M (Amount not disclosed); Speaking and/or teaching arrangements: DePuy Spine (Travel expenses), K2M (Travel expenses).

Siddiqui, Farzan: Speaking and/or teaching arrangements: Varian Medical Systems (B); Trips/travel: Varian Medical Systems (A); Research Support (Staff and/or Materials): Varian Medical Systems (F, Paid directly to institution/employer); Other: American College of Radiology (B).

Silber, Jeff S.: Speaking and/or teaching arrangements: Medtronic (C); Trips/travel: Stryker (B).

Singh, Kern: Royalties: Stryker (C), Jaypee Publishing (B), Thieme (C), Lippincott (C), Pioneer (B), Zimmer (B); Consulting: Stryker Spine (B), DePuy (B), Zimmer (C); Board of Directors: CSRS (None), ISASS (None), AAOS (None), SRS (None), Vertebral Column-ISASS (None); Other Office: J Contemporary Spine Surgery (Editor-in-Chief), Spine Surgery Today (Editorial Board), Journal of Orthopedics (Editorial Board); Grants: CSRS Resident Grant (C).

Skolasky, Richard L.: Board of Directors: NASS (Governance Committee Chair); Other Office: International Society for Quality of Life (Chair, Health Preferences Research Associate Editor); Research Support - Staff and/or Materials: NASS (D, Paid directly to institution/employer); Grants: AT&T Foundation (C, Paid directly to institution/employer).

Slosar, Paul J.: Royalties: Titan Spine (D); Stock Ownership: Titan Spine (<1%), Relevant (<1%); Consulting: Relevant (A); Other Office: CMO Titan Spine (E); Research Support - Staff and/or Materials: Titan Spine (B, Paid directly to institution/employer).

Smith, Justin S.: Royalties: Zimmer Biomet (E); Consulting: Zimmer Biomet (D), K2M (B), NuVasive (B), AlloSource (B); Grants: DePuy Synthes (C, Paid directly to institution/employer); Fellowship Support: AO (E, Paid directly to institution/employer), NREF (E, Paid directly to institution/employer).

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Stoner, Kirsten E.: Consulting: Exponent (Amount not disclosed, Paid directly to institution/employer); Fellowship Support: University of Iowa (C).

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Welser, Sherr: Speaking and/or Teaching Arrangements: NASS (A).


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Whitcomb, Gregory L.: Speaking and/or Teaching Arrangements: NASS (A); Trips/Travel: NASS (Travel expenses).

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Williams, Seth K.: Private Investments: Titan Spine (<1%); Consulting: DePuy Synthes Spine (C), Stryker (C), Medtronic (B), Titan Spine (B), Globus Medical (A); Trips/Travel: Stryker (A).

Wilham, Timothy F.: Speaking and/or teaching arrangements: AOSpine North America (B); Research Support (Staff and/or Materials): Eli Lilly and Company (C, Paid directly to institution/employer); Grants: The Gordon and Marilyn Macklin Foundation (G, Paid directly to institution/employer).

Woods, Barrett I.: Royalties: Altus (B); Consulting: Altus (Amount not disclosed), Titan (Amount not disclosed), Precision (Amount not disclosed); Speaking and/or teaching arrangements: Stryker (Amount not disclosed).

Woods, Kamal R.: Consulting: Medtronic (E, Paid directly to institution/employer); Speaking and/or teaching arrangements: Medtronic (C, Paid directly to institution/employer); Research Support (Investigator Salary): Medtronic (C, Paid directly to institution/employer).

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James J. Lynch, MD
Mohammad E. Majd, MD
Steven M. Mardjetko, MD
Lionel N. Metz, MD
John D. Miles, MD
Gregory R. Misenhimer, MD
George S. Miz, MD
Michael Moghimi, MD
Timothy A. Moore, MD
Isaac Moss, MD
Fred Farid Naraghi, MD
Senthil T. Nathan, MD, MBA
Konrad H. Ng, MD
Donna D. Ohnmeiss, PhD
Gbolahan O. Okubadejo, MD
Michele M. Page
Mark A. Palumbo, MD
Sanjog Pangarkar, MD
Kamran Parsa, DO
Peter Gust Passias, MD
Duane DH Pitt, MD
James B. Reynolds, MD
Dean S. Ricketts, MD
Jeffrey J. Roberts, MD
Pratik Rohatgi, MD
Brett D. Rosenthal, MD
Allan Rowley, MD
David Rubin, MD
Glenn S. Russo, MD, MS
Kulpreet Sahota, MD
Perry L. Savage, MD
Nicholas R. Scarcella, MD
Scott M. Schlesinger, MD
Randall E. Seago, MD
Michael Eric Seiff, MD
Lali Sekhon, MD, PhD, FRACS
Paramjit Singh, MD, MA
Richard L. Skolasky, ScD
Hesham Soliman, MD, MSc
Alessandro C. Speciale, MD
Scott K. Stanley, MD
John C. Steinmann, DO
Mauricio Valdes, MD
Gus G. Varnavas, MD
Joseph K. Weistroffer, MD
Ned A. Wilson, MD
Christina Wolf
Michael S. Zeide, MD
## TECHNICAL EXHIBITION

**3D Systems**

www.3dsystems.com/healthcare

3D Systems provides a range of healthcare solutions for the spine and orthopaedic specialties. We are committed to providing medical device companies with a comprehensive set of manufacturing and product development solutions to bring ideas to reality using 3D technologies. With world-class FDA registered and ISO 13485 certified facilities located in the US and Europe and >600,000 devices manufactured, 3D Systems is the partner of choice for your next project.

**4WEB Medical**

www.4webmedical.com

4WEB Medical is an orthopedic implant company based in Frisco, Texas. Thirty years of research in topological dimension theory led to the discovery of a novel geometry, the “4WEB”, which could be used as a building block to create high-strength, lightweight web structures. The company leveraged this breakthrough, along with cutting-edge 3D printing technology, to develop its proprietary truss implant platform. Over 30,000 of 4WEB’s truss implants have been utilized in surgery since 2012.

**7D Surgical**

www.7dsurgical.com

7D Surgical is a Toronto based company that develops advanced optical technologies and machine-vision based registration algorithms to improve surgical workflow and patient care. 7D Surgical’s Machine-vision Image Guidance System (MvIGS) delivers profound improvement to workflows in spine surgery, providing the promise of future advancements in other surgical specialties.

**Abbott Neuromodulation**

**Accurate Neuromonitoring**

www.accurateiom.com

Our mission is to deliver a superior Intraoperative Neuromonitoring (IONM) service that can be incorporated into any surgical procedure with ease and efficiency. We will accomplish our mission through our commitment to extraordinary customer service and our dedication to quality management and clinical excellence. It is our vision that the use of Intraoperative Neuromonitoring will become the standard of care for all surgeries that entail a risk of neurological compromise.

**Acero Precision**

aceroprecision.com

Acero Precision's World Class Team of CNC Machinists has been hand-selected and trained on state-of-the-art equipment to engineer the complex spine and trauma implant assemblies you need to keep your business going. Other manufacturers try to stay ahead of the curve. We continue to define it.

**Acuity Surgical**

www.acuitiesurgical.com

Acuity Surgical is your trusted partner for physician-designed implant technologies. Our novel porous titanium A Link Z System, with new footprints and lordotic options, and minimally processed AcuPac Allograft Tissue demonstrate our unwavering commitment to evidence-based lumbar, cervical, and biologic solutions. Experienced sales execs with strong ties to the spine surgeon community interested in best in class benefits, call John 817-718-0538 or Bryan 214-405-2870. All calls are confidential.

**Advantage Manufacturing Technologies, Inc.**

www.teamamt.com

Advantage Manufacturing Technologies (AMT) is your single source contract manufacturer for medical implants and surgical instruments. AMT offers the technical resources and manufacturing expertise that will give your medical device company the competitive advantage and speed to market that it needs on every project. We are proud to be manufacturing in the U.S. in our 65,000 square foot facility in Monroe, WA. AMT is proud of our 100% customer retention rate, which is rare in our industry.
Aegis Spine Inc. 2423
www.aegisspine.com
Aegis Spine, Inc. was founded to bring about change and innovation to the medical industry. We endeavor to be the leading manufacturer in the medical devices market. Our first priority is to provide excellent service and support to our clients, who are regarded as family. The integral strategy of our company is to keep up with changes in the industry. Our staff is open to change, innovative ideas, and new technology.

Aesculap Implant Systems 1101, 2807
www.aesculapimplantsystems.com/spine
Aesculap Implant Systems, LLC, a B. Braun Company, is part of a 175-year-old global organization focused on meeting the needs of the changing healthcare environment. Through close collaboration with its customers, Aesculap develops advanced spine implant technologies to treat a variety of complex disorders. Combining years of R&D with modern technology, Aesculap is committed to excellence and the delivery of innovative, cost-effective operative solutions.

AlloSource 2031
www.allosource.org
AlloSource develops and processes cellular and tissue therapies to get patients back to life. Our biologics portfolio includes advanced technologies, like AlloStem® Cellular Bone Allograft, AlloFuse® Select Cellular Allograft Matrix and AlloFuse DBF™ Fibers. We also produce a wide range of biologic therapies, like AlloFuse DBM Putty, AlloWrap® Amniotic Membrane and AlloFlex®. Visit booth 2031 to discover how our allografts can help achieve life-saving and life-enhancing possibilities.

Alphatec Spine 1423
www.alphatecspine.com
Alphatec Spine, Inc. is a medical device company that designs, develops and markets spinal fusion technology products and solutions for the treatment of spinal disorders associated with disease and degeneration, congenital deformities and trauma. The Company’s mission is to improve lives by providing spine surgery solutions through our relentless pursuit of superior outcomes. The Company markets products in the U.S. via independent sales agents and a direct sales force.

Amedica 1611
www.amedica.com
Amedica is the only manufacturer of medical grade silicon nitride, an innovative biomaterial ideal for use in spinal fusion. Our silicon nitride features a unique nanosurface texture that promotes bone growth and addresses clinical needs by providing excellent imaging capabilities and demonstrating anti-bacterial characteristics. Our interbody fusion devices and modular pedicle screw systems are designed to benefit both the patient and the surgeon. For more information visit us at amedica.com.

Amniox Medical 2523
www.amnioxmedical.com
AMNIOX® Medical is the leader in umbilical cord restorative tissue technology and was the first to provide an umbilical cord matrix for transplantation. Our proprietary CRYOTEK™ process is the result of 30 years of National Institute of Health-sponsored research into this unique regenerative biology. Our leadership in the ocular, wound, and surgical sectors, supports our current work in spine with additional clinically impactful published study outcomes. Restore naturally with Respina™.

Anchor Orthopedics 1363
www.anchor-ortho.com
Anchor Orthopedics is dedicated to providing innovative clinical solutions to support minimally invasive surgical techniques for herniated disc repair procedures. We envision products that optimize current procedures in an effort to preserve the natural biomechanics of the patient. For more information, contact us at www.anchorortho.com or email us at info@anchorortho.com.

AOSpine International 926
www.aospine.org
AOSpine is an international community of spine surgeons generating, dis–trib–uting, and exchanging knowledge to advance science and the spine care profession through research, education, and community development. With this collaborative approach AOSpine continues to advance spine care worldwide.

Applied Medical Technology, Inc. AMT 2539
www.appliedmedical.net
AMO, the Orthopedic division of AMT, has developed Auxano™ surface morphology for addressing bone ingrowth and implant/tissue interface. All AMT products are proudly made in the USA!
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Booth Number</th>
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<tbody>
<tr>
<td>APS Materials Inc.</td>
<td>2340</td>
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<td><a href="http://www.apsbiomedical.com">www.apsbiomedical.com</a></td>
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<tr>
<td>Artery Studios, Inc.</td>
<td>1659</td>
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<td><a href="http://www.arteryhealthcarevisuals.com">www.arteryhealthcarevisuals.com</a></td>
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<td>Artery Studios specializes in the creation of medical animations and illustrations for purposes of advancing medicine. Our eye-catching visuals are used to educate patients and health care professionals; promote existing and developing products; attract investment capital; and generally boost marketing messages. We bring your message to life.</td>
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<tr>
<td>ArabSpine</td>
<td>930</td>
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<td><a href="http://www.arabspine.org">www.arabspine.org</a></td>
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<td>ArabSpine (AS) is an international, educational, and scientific association, a key one focused on the field of spine in the Arab world. It’s an independent body of regional spine societies, spine chapters of other scientific (academic) societies, individual spine surgeons from orthopedics, neurosurgeons, and physicians from other spine related medical disciplines.</td>
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<tr>
<td>Arcamed, LLC</td>
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<td><a href="http://www.arcamed.com">www.arcamed.com</a></td>
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<td>Arcamed &amp; Veracity Medical Solutions are committed to being a fast, responsive, and reliable provider of case and tray systems and precision machined products to orthopedic OEMs. We understand that without the products we provide, our customers are unable to get their products to market right and on time. Everyone at Arcamed takes great pride in ensuring that our customers across the globe are completely satisfied from design to delivery. <a href="mailto:sales@arcamed.com">sales@arcamed.com</a> <a href="http://www.arcamed.com">www.arcamed.com</a> Booth #2034.</td>
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<tr>
<td>Archway Health</td>
<td>2058</td>
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<td><a href="http://www.archwayhealth.com">www.archwayhealth.com</a></td>
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<tr>
<td>Astura Medical</td>
<td>1149</td>
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<tr>
<td>asturamedical.com</td>
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<tr>
<td>Argon Medical Devices OEM</td>
<td>1256</td>
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<td><a href="http://www.argonmedical.com">www.argonmedical.com</a></td>
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<tr>
<td>Argon Medical Devices Inc. is a global OEM manufacturer of specialty medical products, custom components, and drainage catheters. Capabilities include injection and insert molding, tubing extrusion, metal forming, grinding, welding, and slip coat hydrophilic coating. Custom components include needles, stopcocks, guidewires, and sheath introducers. It offers private label packaging, sterilization, and custom kit assembly. ISO 13485 certified.</td>
<td></td>
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</table>
Augmedics’ mission is to revolutionize surgeries by developing cutting-edge technologies that enhance surgical performance and improve surgeon’s experience. xvision™ is a head-mounted display that allows surgeons to see and navigate inside a patient’s body through skin and tissue, as if they had "X-Ray Vision", which can lead to easier, faster and safer surgeries. At NASS 2018, Augmedics will unveil the latest version of the xvision™ system. To experience the xvision™, come visit our booth #2328.

Aurora Spine, Inc. offers a rich and diverse product portfolio for both the “Screwless Procedure” and the more traditional spinal procedures. These products include ISP devices, titanium coated interbody cages, biologics, plates, pedicle screw systems, cervical stand-alone implant, and surgical instruments.

Autocam Medical is a contract manufacturer of precision-machined implants and instruments for surgical applications. We offer a value-added approach to high-precision manufacturing with specialties in CNC milling, turning and cutter grinding. Our product specialties include bone screws & plates, fixation devices, surgical drivers, drill bits, and other cutting instruments. As a uniquely collaborative partner, our OEM customers rely on us as a valuable part of their supply chain.

Avalign Technologies designs, manufactures, and delivers the highest quality, precision-machined instruments, implants, and delivery systems for a wide variety of surgical and medical specialties around the world. From proprietary implant coatings to German-made instruments, Avalign is a leading full-service manufacturer known for consistent and sophisticated production and supply chain management.

Leveraging the Less Exposure Surgery (LES) philosophy, AxioMed & SpineFrontier set a new standard of outpatient care providing better results for surgeons & patients. SpineFrontier’s LES technologies are created in collaboration with surgeons resulting in faster operating times, less blood loss & psoas-sparing techniques, optimizing patient recovery. AxioMed’s Freedom® Disc is a one-piece next generation viscoelastic total disc replacement that facilitate pain relief & restoration of motion.

Aziyo Biologics, Inc. is a leading regenerative medicine company with the mission of restoring health and mobility to the greatest number of patients possible. Our vision is to provide impactful solutions for spine and other therapeutic areas through the innovation of new regenerative medicine based products. Aziyo has developed a number of proprietary products for use in spine and orthopedics including ViBone, OsteGro, OsteSpine and TranZgraft.

Back2Basics revives the tradition of innovation in Spinal Surgery in NE Ohio, Back2Basics is dedicated to the advancement of “Surgeon-Driven Solutions”. Back2Basics' first offering is the Dymaxeon Spinal System, sterile packed implants with associated instrumentation and still in development unique carbon composite implants that will provide the surgeon with superior choices over current plastic and metal devices. Welcome to Back2Basics.

Bar-Ray is the world's largest manufacturer of radiation protective garments and accessories. With complete control over the quality of our products, Bar-Ray is the leader in the radiation protection industry for 3 generations. All wearables are made exclusively in our U.S. factory. Choose from over 20 different styles of lead and non-lead aprons, skirts, and vests with six protection options and more than 425 colors and patterns. Custom sizing is also available at our booth.
Barrier Technologies
www.barriertechnologies.com
Barrier Technologies is a USA manufacturer of Radiation Protection products. Our products protect healthcare professionals who work in fluoroscopic environments from the harmful effects of scatter radiation & include our Leaded Eyewear, X-Ray Protective Aprons, (Lead & Lead-Free) SecureTouch Sterile Radiation Protective Gloves, Scatter Reducing Pads & Drapes, Mobile Barriers, & X-ray Accessories. For more information please visit us in booth #1145 or at our web site www.barriertechnologies.com

BAUI Spine
www.baui.com.tw
BAUI Biotech Co. Ltd., starts to supply the implants in the brand since September 2009. We are the No.1 spinal implants manufacture and best seller in Taiwan. The full range of products including NOVA MIS, Z-brace dynamic intervertebral fusion device, Awesome dynamic rod, posterior cervical fixation system, anterior plate system, lumbar fixation system, cervical cage, PLIF, and TLIF. Our major services are selling BAUI spinal implants and instruments and OEM/ODM for other company as well.

Baxter Healthcare
www.baxter.com
From emergency surgeries to elective surgeries, Baxter’s advanced surgery products are trusted across a variety of specialties including spinal & orthopedic. When you need us most, the our clinically differentiated surgical care products support hemostasis, tissue sealing, reconstruction, tissue repair, and intraoperative patient care. Our robust portfolio has been demonstrated to reduce intra- and post-operative complications that require costly blood transfusions and extend operating time.

Berkeley Advanced Biomaterials
www.ostetic.com
Berkeley Advanced Biomaterials, Inc. manufactures high-quality and cost-effective skeletal repair resorbable biomaterials. The company offers the entire range of biologics from synthetics HAP/TCP Granules, Strip, Putty to allograft DBM 100% DBM Putty, Sponge, and Chip. Berkeley Advanced Biomaterials, Inc. is an AATB accredited licensed Tissue Bank.

BFW, Inc.
www.bfwinc.com
BFW™ is a global technological leader in surgical headlights and headlight imaging systems. Please check out our innovative Lighthouse™ LED Series that includes the Hatteras™ LED, a light source cleared for use with fiber optic headlights and endoscopes and our range of high intensity LED portables. The Pharos Headlight/Video Camera System provides a coaxial surgeons eye view of the procedure; excellent for teaching. Our products are engineered and proudly assembled in the USA.

Biedermann Motech
www.biedermann.com
Since 1916, Biedermann has been working with world-class surgeons to solve clinical challenges through the development of next-generation technology. As the inventors of the first ever polyaxial pedicle screw, Biedermann Motech has changed the way spinal surgery has been treated for the last 30 years. Today, the company has over 100 employees in the US and in Europe focused on innovation, research and development, manufacturing, and sales in the spine industry.

Biogennix
www.biogennix.com
Biogennix is a leading developer of osteobiologic products specifically designed for posterolateral spine and long bone fusion. Founded in 2009, we are led by a team of scientists and industry veterans committed to delivering unique products for bone regeneration. Biogennix designs, manufactures and distributes all of its products from its Irvine facilities located in the heart of Southern California’s “Technology Coast.”

Biologica Technologies
www.biologicatechnologies.com
Biologica Technologies is a company established to provide innovative biologic products. We are fully dedicated to improving patients’ lives and the health care providers’ experience through groundbreaking tissue processing methods. Our focus is the aesthetic and orthopaedic markets, with ProteiOS being our latest introduction into the spine/ortho market.

Bioventus Surgical
www.BioventusSurgical.com
At Bioventus Surgical, we are driven to advance the science and surgical performance of orthobiologics with a comprehensive portfolio of clinically efficacious and cost-effective solutions. Our comprehensive portfolio of surgical orthobiologics offers a wide variety of bone graft solutions to meet the needs of any surgeon across a broad range of patient needs, procedures, and hardware selection.
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Booth</th>
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<tbody>
<tr>
<td>Bon Secours Orthopedics</td>
<td>2639</td>
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<tr>
<td>Bon Secours Orthopedics is seeking qualified fellowship-trained spine surgeons to join a newly-formed orthopedic practice in the heart of Richmond at the health’s system’s largest, busiest hospital. Surgeons will have access to the latest in spine surgery technology, thrive with the support of orthopedic PA/NPs, and work collaboratively with an extensive network of over 200 primary care providers across Central Virginia.</td>
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<tr>
<td>BOSS Instruments Ltd.</td>
<td>1301</td>
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<tr>
<td>BOSS Instruments concentrates on the global development and distribution of specialty surgical instruments in disciplines such as: Neuro, Spine, Cardiovascular/Thoracic, Orthopedic, ENT, Ophthalmic and Ob/Gyn. Stop by and see the recently acquired LightMat, which can be adhered to any existing retractor, and the VersaLight, which is a multifunctional Light, Suction and Irrigation handpiece. You will also see the robust portfolio of cervical and lumbar retractor systems and kerrison rongeurs.</td>
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<tr>
<td>BPB Medica</td>
<td>2141</td>
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<td>BPB MEDICA is an Italian manufacturing Company with over 45-years-experience. Our production is 100% carried-out in house, from the product design to the final packaging. Our SPINE line includes: - KYPHOPLASTY KIT A) 11G Kyphoplasty kit, for FAST procedure B) 8G Kyphoplasty kit, for CLASSIC procedure - PERCUTANEOUS DISCECTOMY DEVICE - COMPLETE VERTEBROPLASTY KIT - SCREW AUGMENTATION CANNULA - BONE ACCESS NEEDLES - K-WIRES BPB MEDICA’s products already got FDA and EC clearance.</td>
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<tr>
<td>Bradshaw Medical, Inc.</td>
<td>1435</td>
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<tr>
<td>Bradshaw Medical is a designer, developer and manufacturer of highly specialized OEM orthopedic and spinal instrumentation. We manufacture world class instruments to meet the most demanding requirements. Instruments are designed, machined, molded, and assembled in Bradshaw’s facility, enabling total control over the production process, and the ability to be nimble from concept through production, with customization in colors and branding. Quality. Innovation. Service.</td>
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<tr>
<td>Brainlab</td>
<td>2401</td>
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<td>Brainlab develops, manufactures and markets software-driven medical technology with the aim of optimizing patient treatments. Core products revolve around less-invasive image guided surgery technology, more accurate and effective radiation therapy, and integration through planning and collaboration systems that brings patient data and physicians together.</td>
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<tr>
<td>BRAMISS - Brazilian Minimally Invasive Spine Surgery Society</td>
<td>1030</td>
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<tr>
<td>BRAMISS is an independent Society that has 350 members, manages a Fellowship Program with NASS and works with other medical entities in order to facilitate and standardize the MIS procedures along the private and public health care systems and also divulges MIS possibilities of treatment for patients trough regular media. BRAMISS organizes two main events: COMINCO and SIMINCO. We are also focused on continuing education, graduate education, specialization courses and hands on courses.</td>
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<tr>
<td>Brazilian Spine Society</td>
<td>923</td>
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<tr>
<td><a href="http://www.coluna.com.br">www.coluna.com.br</a></td>
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<tr>
<td>Bremer Group Company, (The)</td>
<td>1422</td>
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<td><a href="http://www.bremergroup.com">www.bremergroup.com</a></td>
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<td>For 20+ years, you have trusted our clinically proven VertAlign® &amp; ComfAlign® Spinal Supports for effective TLSO &amp; LSO external spinal stabilization, from “immobilization through support” on your patients. Whether for post-surgical or trauma stabilization, pain relief, or conservative care, the VertAlign &amp; ComfAlign systems provide unique, patented, “select and apply,” molded, rigid, gender-specific orthoses available at the point of patient care, which results in timely, effective spinal care.</td>
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<tr>
<td>Brussels International Spine Symposium</td>
<td>924</td>
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<td><a href="http://www.spinesymposium.com">www.spinesymposium.com</a></td>
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<td>The next edition of our Brussels International Spine Symposium will be the 25th and will take place on 16 &amp; 17 November 2018 at the BluePoint Brussels. The topic is “Disc Herniation: Back to Basics, co-chaired by Drs. Marek Szpalski and Robert Gunzburg.</td>
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</table>
Business Dynamics RCM
businessdynamicsrcm.com
Since 1998, Business Dynamics has emerged as the top full service spine coding and reimbursement firm in the country. Business Dynamics was developed specifically to serve spine practices, orthopedic and neurosurgical medical groups, facility spine programs, spine product manufacturers and numerous secondary organizations within the medical community. Business Dynamics’ corporate headquarters is located in New York and services clients nationwide.

Buxton BioMedical, Inc.
www.buxtonbio.com
On turbulent seas of hi-tech companies
Their ominous messages Of latest “truths”, or dire consequences
For the wary and weary, prepare your defenses!
Come find us to be an isle of tranquility
Devices to prod, products to probe
A clamp to do this, a hook to do that
Exciting angulations, exotic articulations.
Find civilized refinements to traditional instrument designs along with simple solutions to the plethora of problems still plaguing product performance in everyday surgeries of the spine.

C&A Tool Engineering, Inc
www.catool.com
Contract Manufacturer of Spinal Implants and Instruments.
Be sure to ask about our Laser Sintering capabilities for Rapid Prototyping.

Camber Spine
www.cambermedtech.com
Camber Spine Technologies is dedicated to creating surgeon designed minimally invasive access solutions for the treatment of complex spinal pathology. Incorporating innovative design elements, state of the art manufacturing techniques and an acute sensitivity to patient anatomy, Camber Spine is making quantum leaps in the spinal fusion market. Combining the above with a focus on mechanical fusion properties of implants and bone biology, we are exploring the next level of implant design.

Captiva Spine
www.captivaspine.com
Captiva Spine supports spine surgeons, tenured distributors, and healthcare facilities in providing patients progressive care with an obsessive focus on quality. We strive to create and maintain sincere, honest, collaborative relationships. Valuing relationships, above all else, fosters the mutual trust and openness needed for Captiva Spine to be a conduit of high quality, smart, elegant, and intuitive patient solutions. Captiva Spine — Strength Through Connections.

CarboFix Orthopedics, Ltd.
www.carbo-fix.com
CarboFix Orthopedics Ltd. specializes in orthopedic implants made of, non-metal, continuous carbon fibers reinforced polymer (CFR-PEEK). In addition to trauma nails & plates, the company has developed the CarboClear™ Pedicle Screws & Rods made out of Carbon Fibers. The system advantages include minimal artifacts in CT & MRI, advantageous in radiation therapy (including proton therapy), superior fatigue strength & optimal modulus of elasticity.

CellRight Technologies, Inc.
www.tissueregenixus.com
CellRight Technologies is the leader in the development and manufacture of verified osteoinductive regenerative orthopedic matrices. The matrices provide a delivery vehicle for current and future cellular therapies such as PDGF, BMA, PRP, antimicrobial agents and other growth factors. CellRight Technologies is the manufacturer of MatrixCellect 100 DBM Putty, FlexIT, Matrix OI sponge-like collagen scaffold, ConCelltrate 100 and Matrix IQ decellularized human dermis intended for homologous use.

Centinel Spine
www.centinelspine.com
Centinel Spine, LLC is the largest privately-held spine company, focused on anterior column reconstruction. The company recently acquired the prodisc® Total Disc Replacement portfolio, an extensive cervical and lumbar disc replacement platform with the longest history of global clinical use.

Cerapedics Inc.
www.cerapedics.com
Cerapedics is an orthobiologics company focused on developing and commercializing novel bone grafts that enhance and accelerate bone growth in a variety of orthopedic procedures. The company has developed a technology platform based on a synthetic small peptide, P-15, which has a novel mechanism of action designed to support safer and more predictable bone formation compared to commercially available growth factors. i-FACTOR™ Bone Graft is the company’s lead product.

CHANGZHOU XIETONG INDUSTRIES CO., LTD.
www.exportxt.com
XieTong Industries Group deals the business and serves of orthopedic surgical implants and instruments. YONGHUA factory main products are kinds of orthopedic surgical instruments parts and sets, and also produce all kinds of metal and plastic boxes. We can produce according to requirements of OEM productions, and also can make design and produce for customers.
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Booth Number</th>
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<tr>
<td>ChoiceSpine</td>
<td>1739</td>
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<td><a href="http://www.choicespine.com">www.choicespine.com</a></td>
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<td>ChoiceSpine is a privately held spine company located in Knoxville, TN, that offers a breadth of innovative and surgeon focused systems that are designed to be safe, efficient, and easy-to-use. By working closely with physicians and maintaining service-focused distribution, we will continue to bring technically-superior spinal products to the market.</td>
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<tr>
<td>Clariance</td>
<td>1341</td>
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<td><a href="http://www.clariance-spine.com">www.clariance-spine.com</a></td>
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<tr>
<td>Founded in 2007 by Alain Tornier, Clariance is a spinal device company focused on designing, manufacturing and marketing innovative solutions for the treatment of spinal disorders, based in France with US headquarters in Chicago. Driven by surgeon’s expertise, Clariance provides advanced surgical applications with a fundamental priority in advancing patient outcomes.</td>
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<tr>
<td>Collagen Matrix, Inc.</td>
<td>1829</td>
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<td><a href="http://www.CollagenMatrix.com">www.CollagenMatrix.com</a></td>
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<tr>
<td>At Collagen Matrix we are passionate about advancing the science of tissue repair and regeneration. That's why we're the driving force in the design, development and manufacturing of advanced collagen and mineral based medical devices. At NASS 2018 we will feature our line of mineral and collagen composite bone graft matrices and our collagen dural repair and regeneration portfolio of products. We are seeking global distributors and partnerships with established medical device companies.</td>
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<tr>
<td>CoreLink</td>
<td>2038, 2939, 2943</td>
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<td><a href="http://www.corelinksurgical.com">www.corelinksurgical.com</a></td>
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<tr>
<td>There's truth in the saying, &quot;If you want it done right, do it yourself.&quot; That’s why CoreLink internally designs and manufactures more than 99% of its instruments and implants. This unique level of vertical integration is dedicated to empowering surgeons and their teams with the highest quality and most effective spinal instruments and implant systems. It's also how we came to be recognized as The Source. Be a part of something. Come to The Source. Collaboration - Quality - Value</td>
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<tr>
<td>Cretex Medical</td>
<td>1654</td>
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<td><a href="http://www.cretexmedical.com">www.cretexmedical.com</a></td>
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<tr>
<td>Since 1917, Cretex has earned a reputation for core principles of honesty and integrity. Our employees take great pride in their work and customer service. Our portfolio of companies includes rms, rms Surgical, JunoPacific, Quality Tech Services (QTS), Spectralytics and Meier. We provide a full suite of capabilities, including metal and plastic machining, plastic injection molding, metal stamping and fabrication, laser processing and cleanroom assembly, packaging and sterilization management.</td>
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<td>CTE Solutions</td>
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<td><a href="http://www.culvertool.com">www.culvertool.com</a></td>
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<td>CTE Solutions (Culver Tool &amp; Engineering) has supplied spinal orthopedic OEM's for over 30 years by building enduring partnerships with our customers. Our goal is to have a culture of excellence, based upon integrity. We specialize in spinal rods but also offer single-source solutions for other spinal implants and instruments ranging from prototypes to production quantities. CTE Solutions is ISO 13485 certified, FDA registered and accredited with Japan as a foreign medical device manufacturer.</td>
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<td>CTL Medical Corporation</td>
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<td><a href="http://www.ctlmed.com">www.ctlmed.com</a></td>
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<td>CTL Medical Corporation is a forward thinking medical device design, development and manufacturing company aiming to become a leader in the medical device industry. Combining in-house manufacturing and a robust R&amp;D Center of Excellence further advances us from the competition. Our team works closely with end users to imagine and construct multifaceted implants and instruments that ultimately become works of art. Learn how Science, Mathematics and Technology blend to create the CTL experience.</td>
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<tr>
<td>curasan Inc.</td>
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<td><a href="http://www.curasaninc.com">www.curasaninc.com</a></td>
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<td>curasan develops, manufactures and markets biomaterials and medical devices in the field of bone and tissue regeneration, wound healing and osteoarthritis therapy. As a pioneer and global technology leader in the growing field of regenerative medicine, curasan is specialized primarily on biomimetic bone grafting materials for dental, oral/ maxillofacial, orthopedic and spinal applications.</td>
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</tr>
</tbody>
</table>
Cutting Edge Spine, llc  
www.cuttingedgespine.com

Cutting Edge Spine is the first to market in the United States with an HA enhanced peek lumbar interbody system; EVOS-ha. The innovative polymer, Invibio’s Peek-Optima HA Enhanced, has been compounded with hydroxyapatite (HA), an osteoconductive material, to enhance bone apposition. EVOS-ha is yet another step in fulfilling it’s mission of providing patients, payers and healthcare providers with optimal value relative to the company(s) and implant system(s) they select.

Daewoong Pharmaceutical  
www.cgbio.com

Daewoong Group is a global healthcare group established in 1945 under the vision to ‘manufacture high-quality pharmaceuticals and medical devices to enhance people's health and create a healthy society’.

Danco Anodizing  
www.danco.net

Danco provides anodizing of titanium implants and aluminum medical instruments and devices. Finishing capabilities include mechanical deburring, hand polishing, grinding, blasting and electro polishing. Low Friction Chrome Coating (LFCC) provides cosmetic and functional improvement to surgical instruments. Marking methods incorporate laser, silk-screen and Full Color Deep Image (R) anodizing techniques. Danco maintains production facilities in Arcadia, CA and Warsaw, IN with R&D support in CA.

DePuy Synthes  
www.depuy spine.com

DePuy Synthes Companies, part of the Johnson & Johnson Medical Devices Companies, provides one of the most comprehensive orthopaedics portfolios in the world. DePuy Synthes Companies solutions, in specialties including joint reconstruction, trauma, cranio-maxillofacial, spinal surgery and sports medicine, are designed to advance patient care while delivering clinical and economic value to health care systems worldwide. For more information, visit www.depuy syntheses.com.

Designs for Vision, Inc.  
www.designsforvision.com

Just See It™ with Designs for Vision’s lightweight custom-made surgical Telescopes- available with Nike® frames. See It Even Better™ with the L.E.D. Daylite® or Twin Beam®, L.E.D. Daylite® providing the brightest and safest un-tethered illumination. Introducing the L.E.D. Daylite® Nano Cam HD document procedure and HD video from your prospective.

DiFUSION Technologies, Inc.  
www.difusiontech.com

DiFUSION Technologies, Inc. is an advanced biomaterials manufacturer located in Houston Texas. DiFUSION has developed multiple patent pending MITA Technologies (Metallic Ion Therapeutic Agents) for antimicrobial, cellular repair, tissue regeneration, bone growth, scaffold construction and increased angiogenesis. We have 2 current platform polymers for antimicrobial - CleanFuze and osteoconductive - ZFUZE fully developed and ready for market.

Dino-Lite Scopes  
www.dinolite.us

Dino-Lite portable digital microscopes and eyepiece cameras provide high-quality microscopy video interfacing to PC and MAC. Most models provide 10x-220x magnification with features such as measurement and adjustable polarizer. The included software makes it easy to take snapshots, record videos, manipulate images, save and email discoveries.

DJO Global  
www.djoglobal.com

DJO Global is a leading global medical device company providing solutions for musculoskeletal and vascular health, and pain management. The Company’s products help patients prevent injuries or rehabilitate after surgery, injury or degenerative disease. DJO’s brands include Aircast®, DonJoy®, ProCare®, CMF™, Saunders®, Chattanooga Group™, DJO Surgical, Cefar®-Compex® and Ormed®, Dr. Comfort, Bell Horn www.DJOglobal.com

DNV GL Healthcare USA, Inc.  
dnvglcert.com/healthcare

DOT America  
www.dot-coatingusa.com

DOT offers a wide range of surface treatments for orthopaedic and dental implants and instruments such as PVD coatings(Tin, TiNbN, ZrN, CrN, and TiAlN); TPS coatings on metal, PEEK and ceramics; Sprayed HA coatings, Anodic oxidation types II(DOTIZE) and III (color), microblasting(RBM & Alumina Oxide), passivation, electro-polish and laser marking. This facility, located in Columbia City, IN, is an extension to DOT GmbH located Rostock, Germany.
DSM Biomedical
www.dsm.com/medical

DSM is the world’s leading biomedical partner with over 30 years of experience, offering the broadest portfolio of advanced healing solutions and expertise. From concept to commercialization, DSM is a full service partner, turning ideas into high-quality solutions from biomedical materials to finished devices. In 50 countries and 6 continents, benefitting 3.5M+ patients annually, the breadth of DSM’s global network is unmatched.

ECA Medical Instruments
ecamedical.com

ECA Medical Instruments is the industry leading designer & manufacturer of precision single-use surgical torque-limiting, fixed driver and related procedural instruments and kits for the ortho/spine industry. ECA collaborates with implant OEMs to develop customized single-use instruments as well as turnkey disposable and sterile packed prep, tightening and fixation trays and kits for complete range of spine implant procedures. ECA helps OEMs, hospitals & ASCs save over $1k per procedure.

EIT Emerging Implant Technologies Inc.
www.eit-spine.de

Emerging Implant Technologies is the Smart Spinal Fusion company. In developing EIT Smart Spinal Implants™ we combined the latest research of ‘osteo influentials’ with additive manufacturing technologies to create 3D printed EIT Cellular Titanium®. Fully focusing on improving fusion results, supporting minimal invasive techniques, taking spinal balance into account and addressing the cost aspect at the same time. Drive for ‘first-time right’ EIT Smart Spinal Fusion™.

Electrolizing Corporation of Ohio
www.electrohio.com

We have a great team of; product specialists, engineers, quality assurance, and more all committed to your success and complete satisfaction. A little bragging, Electrolizing Corporation of Ohio is one of the Top 50 Finishing Shops in the country for the 2nd year in a row, with 98% on time delivery, 0.25% rejection rate in addition to our Validated process we assure you that your parts will be done right the first time and shipped on time. ECO is registered to ISO 9001:2008

elliquence
www.elliquence.com

elliquence, LLC manufactures patented Radiowave technology with innovative devices for orthopedic, neurosurgery, and pain management applications. Surgi-Max® permits precision tissue preservation, non-adoherent bipolar effects and surgical versatility. Disc-FX® Discectomy System, Trigger-Flex® bipolar handpiece and a full line of endoscopic spine instruments are examples of the surgical accessories offered. elliquence focuses on sparing healthy tissue while precisely treating pathology.

Elsevier, Inc.
www.elsevierhealth.com

Elsevier is a world-leading provider of information solutions that enhance the performance of science, health, and technology professionals, empowering them to make better decisions, and deliver better care. Elsevier presents The Spine Journal, the official journal of the North American Spine Society.

Empirical
www.empiricaltech.com

The Empirical family of companies can reduce your time to market by 20-30 percent and help you achieve regulatory clearance or approval in the U.S. and abroad. We provide a comprehensive solution for consulting, testing, manufacturing and validation services. Empirical collaborates with you to deliver exceptional service, a regulatory plan, an efficient test plan and industry expertise. We hold the largest scope of accreditation for medical device testing methods in the United States.

Enova Illumination
www.goenova.com

Enova Illumination is the leading manufacturer of premium headlight products for all types of procedures with illumination from 30,000 to 225,000lux. Enova also offers a new premium line of custom through-the-lens loupes. Our products are designed to offer light weight, comfortable, durable magnification and lighting options. At Enova we strive for the best customer service and are dedicated to enhancing and enlightening the world with life-changing vision and illumination technologies.

EOS imaging
www.eos-imaging.com

Born from technology awarded the Nobel Prize for Physics, the EOS® system is the first imaging solution designed to capture simultaneous front and lateral images of patients in a weight bearing position at very low dose exposures. EOS enables global assessment of balance and posture and automatically provides over 100 clinical parameters to the orthopedic surgeon for pre and post operative surgical planning.
ERS Rapid Sensory 1463
www.cleanwheel.com

Esaote North America 1541
www.esaote.com
Esaote North America, located in Indianapolis, is part of the Esaote Group, a global leader in the research, production and marketing of medical diagnostic equipment. Esaote is among the largest manufacturers of imaging systems worldwide and prides itself in achieving superior price and performance over competitors. With determination, Esaote North America focuses on quality medical imaging within office-based MRI and ultrasound medical equipment. Visit us at www.esaote.com

Evolution Spine, LLC 2753
www.evolutionspine.com
Evolution Spine based in Dallas, Texas, the Company was founded with the desire to supply premier products to spine surgeons and hospitals by providing best in class products, flawless service, and the desire to innovate. The Company has positioned itself to be very responsive to individual surgeon needs for implant design or instrumentation that improves operating theater workflow.

Evonik Corporation 2322
medical.vestakeep.com/product/medical/en
Evonik, a global leader in specialty polymers, develops biomaterials for permanent implant and temporary contact devices for the orthopedic and spine markets. Evonik’s VESTAKEEP® PEEK (polyetheretherketone) products demonstrate exceptional biocompatibility and biostability and are used in a wide range of spinal implants and instrumentation. VESTAKEEP® PEEK is referenced in numerous spine 510(k) clearances and is on file at the FDA with a comprehensive Master File.

Fehling Surgical Instruments, Inc. 1323
www.fehlingsurgical.com
Fehling Surgical Instruments provides innovative surgical instrument designs using state-of-the-art materials combined with enhanced technology manufacturing techniques. See the Fehling CERAMO® Surgical Instrument Line and feel the Quality. Featuring: Greatly Improved Ejector Kerrisons, Leksells and Micro Instruments. Also experience the new MI TLIF Multi Function Retractor.

FH ORTHO GROUP 1955
www.fhorthopedics.com
FH Orthopedics has dedicated a specialized business unit to market its latest generation of disc replacement (lumbar and cervical). These disc replacements are monobloc and restore natural disc functions by allowing all natural movement.

Flagship Surgical, LLC 1750
www.flagshipsurgical.com
FLAGSHIP SURGICAL prides itself on providing comfortable, safe and economical products engineered to ensure a more focused and comfortable surgical experience for surgeons, nurses and OR technicians. The Surgical Mat™, The Mini Mat™ & The Suctioner™ are the only patented, anti-microbial disposable Surgical Mats addressing 3 important operating room issues: surgical comfort, fluid management and OR ergonomics.

Fountainhead Investment Partners 2159
www.fountainheadinvestors.com
Accelerating Advanced Medical Technologies Fountainhead Investment Partners is a venture capital firm that invests in companies that are applying advanced technologies to progressing patient care. Fountainhead will showcase two of its companies that are providing innovative products for spine surgeons – Watershed Idea Foundry, a biomedical incubator and accelerator that offers additive manufacturing and R&D, and Nvision Biomedical Technologies, a medical device and biologics manufacturer.

FUJIFILM Medical Systems U.S.A., Inc. 1962
www.fujifilmusa.com/products/medical/private-practice
DR solutions are available for all practices that make high speed and low radiation dose a top priority. Digital x-ray also provides reduced operating costs and improved workflow efficiencies.

Fundamental Surgery 2649
www.fundamentalsurgery.com
Fundamental Surgery is driving change in the world of medical training, with virtual reality surgical simulations - featuring haptic feedback, plus real-time assessment, on compact, low-cost hardware.

FzioMed, Inc. 1410
www.fziomed.com
FzioMed develops and commercializes absorbable surgical biomaterials based on its patented polymer science, for use in many surgical applications including spine, orthopedics, tendon, peripheral nerve, gynecology and general surgery.
G21
www.g-21.it
G21 is a leading developer and manufacturer of bone cements and acrylic resins with years experience in orthopedics, oncology orthopedics and minimal invasive spine surgery. We are proud to affirm our unique and complete range of products for spine minimally invasive procedure, in particular our high viscosity acrylic resin V-Steady developed for vertebroplasty and kyphoplasty, our minimal invasive kyphoplasty kit 11 Gauge and our new line Flex Drill and Flex Filler.

Gauthier Biomedical Inc.
www.gauthierbiomedical.com
U.S. manufacturer of high-quality orthopedic instruments, offering contract manufacturing as well as our very own proprietary line of instruments -- including customized branded instrument sets. With our patented multi-color silicone over-molding process we can help brand your instrumentation so it stands out in the marketplace. We specialize in helping our OEM partners build their brand through instrumentation excellence. Come see us today!

GE Healthcare
www.gehealthcare.com
GE Healthcare provides transformational medical technologies and services to meet the demand for increased access, enhanced quality and more affordable healthcare. From medical imaging, software & IT, patient monitoring & diagnostics to drug discovery, biopharmaceutical manufacturing technologies and performance improvement, GE Healthcare helps medical professionals focus on delivering better outcomes.

GENOSS Co. Ltd.
www.genoss.com
Since its establishment in 2004, GENOSS made an endeavor to become the world’s leading medical device company. The primary mission set forth by GENOSS is focusing on delivering treatment solutions and promoting the well-being of its consumers and patients. GENOSS is trying to prepare for a bigger leap forward into the endless competition of the world biotechnology market through our technical innovation.

Globus Medical
www.globusmedical.com
Globus Medical, Inc. is a leading musculoskeletal solutions company based in Audubon, PA. The company was founded in 2003 by an experienced team of professionals with a shared vision to create products that enable surgeons to promote healing in patients with musculoskeletal disorders. For more information on Globus Medical’s innovation visit us at GlobusMedical.com.

GoHealthcare Consulting and Business Development, Inc.
www.gohealthcareconsulting.com
Leader in Revenue Cycle Management and Business Development. We are a Team of Experienced Medical Practice Consultants. We Focus on: Revenue Cycle Management Solutions, Credentialing and Fee Negotiations, Coding Guidance and Consulting, Compliance Program. Office Workflow Optimization. So you can Maximize Reimbursement, Stay Compliant and Focus More on Patient Quality Care.

GPC Medical USA
www.gpccmedicalusa.com
The GPC SpineHEAL System is a posterior non-cervical pedicle screw system intended to provide precise & segmental stabilization of the spine in skeletally mature patients.

GPI Prototype & Manufacturing Services
www.gpiprotype.com
GPI Prototype and Manufacturing Services has been providing metal 3D printing services since 2008. We offer a variety of metals including aluminum, stainless steels, titanium, inconel and cobalt chrome. Six metal additive manufacturing machines are currently on site including: 2x EOS M270, 2x EOS M280, and 2x EOS M290. GPI is pleased to be ISO 9001:2015, ISO 13485:2003, and AS9100D certified as well as ITAR & FDA registered.

GS Medical
www.gsmedicalusa.com
A leader in the surgical spine industry, GS Medical is a supplier of spinal implants and instrumentation, and provider of high-quality surgical solutions. Our mission is simple: improve the treatment and quality of life for patients with debilitating back and neck pain by creating state-of-the-art, intuitive spine products. Through effective development, refined engineering and process, GS Medical has successfully launched many new platforms that focus on reproducible results and cost reduction.

gSource LLC
www.gsourcellc.com
gSource—the Orthopedic and Spinal Source for Surgical Instruments—produces instruments used throughout the world by many leaders and innovators in spine and orthopedics. From custom designs to off-the-shelf products, gSource is committed to putting the finest instruments into the hands of surgeons and their teams.
Solution Showcase Presentation:
Clinical Use of Demineralized Cancellous Bone Block (D-Sure block)
Friday, September 28, 12:00 p.m., Red Theater

HansBiomed is a leading bio-engineering company that manufactures different types of orthobiologics such as DBM, allograft and synthetic. HansBiomed has the biggest bio-engineering research institute in Asia, and received 510K approval of the DBM products. As the first tissue bank established in Korea, Hans has been developing variety biologic products and currently selling to more than 30 different countries.

HD LifeSciences
Next generation spinal fusion devices engineered for better surgical outcomes. The Hive™ family includes multiple footprint and lordosis options for each surgical approach.

Hensler Surgical Products
Hensler Surgical Products was founded in February 2010. Hensler Surgical Products is a Wilmington, N.C. based medical device company. Sean Hensler, a Neurosurgical Physician Assistant, and Dr. Thomas Melin, Neurosurgeon, formed Hensler Surgical as a way to conceive, develop and introduce leading surgical innovations into the orthopedic and neurosurgical field. Since 2010, Hensler Surgical has brought to market the Hensler Bone Press, Premier disposable bipolars, and the Hensler Bone Collector.

Hill-Rom Surgical Solutions
The Allen Medical Spine portfolio offers innovative solutions to help with all of your patient positioning challenges in spine surgery. The Allen® Advance Table is our premium solution for complex spine surgery designed to be backward compatible. It is capable of 180° and 90° rotation allowing for Anterior/Posterior surgery as well as Lateral-to-Prone patient movement. Pinned and pinless patient platform attachment options allow for both user preferences and protect against future changes.

HT Medical
HT Medical, LLC is dedicated to designing, patenting, and marketing best of class spinal fusion devices utilizing cutting edge material technologies, including products featuring proprietary 3D titanium technology. HT Medical received its first 510(K) clearance in 2016 with NeoFuse™ HA Enhanced PLIF/TLIF, featuring PEEK-OPTIMA® HA Enhanced polymer from Invibio®, and has received two more 510(k) clearances in 2017, including Neofuse™ Ti3D Cervical and Neofuse™ Ti3D PLIF/TLIF.

H-Wave
H-Wave is a unique form of electrical stimulation designed to improve the quality of life with drug free pain relief and functional restoration. For patients suffering from chronic pain, H-Wave devices offer powerful & long-lasting pain relief to control even the most difficult symptoms & decrease the need for medication. H-Wave also addresses chronic inflammatory problems by dramatically improving blood flow & lymphatic action, causing angiogenesis and improved vascularization to tissue beds.

icotec ag
icotec, a Swiss company, designs and manufactures nonmetallic spinal implants made from carbon-fiber-reinforced PEEK (Carbon/PEEK). Carbon/PEEK breaks barriers in radiotherapy: it enables artifact-free CT/MRI images for accurate delineation of critical structures and accelerated dose planning. During radiotherapy, Carbon/PEEK is radiolucent, enables homogenous doses, and avoids shielding and scattering. Radiation therapy during tumor treatment is no longer limited by metallic implants.

iData Research
iData Research is an international consulting and market research firm dedicated to the medical device industry. Our global analysis of the spine market has been the industry-leading resource for over a decade. Our clients know they can make confident decisions because the data is built with our meticulous methodology of primary research, procedure data and SKU-level data. Ask about our new MedTrack consulting to monitor competitor sales by brand and SKU on a quarterly basis.
IHI Ionbond Inc. 1442
www.ionbond.com

Ionbond provides the highest performance PVD, CVD, and PACVD medical implant and surgical instrument coatings for the reduction of wear, ion release, galling, friction, and operating room light reflectivity. Ionbond ensures that the ISO 10993 certified coatings meet the specifications. In the demanding medical market, it is imperative to have the highest level of quality management and control throughout the coating process following ISO 13485 in 8 coating centers worldwide.

Implant 2024
www.implanet.com

Solutions to complex spinal pathologies through the use of Band Technology. The JAZZ Band hybrid approach has been shown to reduce implant volume in patients, decrease surgical cost, and reduce blood loss and OR time while demonstrating significant improvement in Sagittal Balance with a band-screw hybrid approach over all-screw constructs.

Indonesian Spine Society 1026

Infinity Massage Chairs 2048
www.infinitymassagechairs.com

Our mission is to improve the health and wellness of our customers to live more comfortably and make the most of every day. Experience relaxation at booth 2048

Inion, Inc. 1639
www.inion.com

Inion is a medical device company focused on the development and commercialization of innovative biodegradable and bioactive implants for Spinal, Specialty Orthopedic and Craniofacial applications. Inion’s proprietary blending technology enables application specific implants which have ‘custom fit’ capabilities for patients that do not interfere with imaging.

Innovasis 1909
www.innovasis.com

Innovasis is committed to the constant innovation of Spinal Implants and other related products. We Innovate. We Involve. We Invent.

Innovative Sterilization Technologies, LLC 1362
www.iststerilization.com

Surgical facilities across the country are being asked to do MORE with LESS. ONE TRAY® is the solution that allows facilities to meet these demands head on without compromising patient safety. Our innovative ONE TRAY® Sealed Sterilization Containers, provide for the safe storage, transport and assured delivery of enclosed devices in a sealed container while offering tremendous value and efficiency over traditional rigid containers. One standard of care in less time than theirs, ONE TRAY®

Intai Technology Corp. 2258

INTAI was founded in 1988. Today, headquartered in Taichung, Taiwan, we offer a wide range of products serving industries such as automotive, aerospace, precision hardware, medical device and electronic communication. Our broad-based expertise, vertical-integrated supplier based and project management capabilities are rooted in a culture of continuous improvement. We are located close to our customers to enhance communications and timely delivery.

In'Tech Medical 1435
www.intech-medical.com

Founded in France in 2000, In'Tech Medical is a global leading contract-manufacturer of surgical instruments, implants, delivery systems & silicone overmold. Powered by 800 employees across the USA, Europe & Asia-Pacific, In'Tech is a premiere engineering powerhouse, capable of delivering manufacturing solutions anywhere, at any time, to the benefit of medical device companies worldwide. With its innovative portfolio of turn-key designs, In'Tech is in the business of accelerating time-to-market.

Integra LifeSciences 2156
www.integralife.com

Integra LifeSciences is a global leader in regenerative technologies, neurosurgical and extremity orthopedic solutions dedicated to limiting uncertainty for clinicians, so they can focus on providing the best patient care. Integra offers a comprehensive portfolio of high quality, leadership brands.

Integrity Implants 1129, 2709
www.integrityimplants.com

Founded in 2016, Integrity Implants focuses on unique expandable interbody technology. The FlareHawk family of expandable interbody are the world’s first to expand in height, width and lordosis. FlareHawk, the answer to expandable interbody -- expansion without compromise.
Intelligent Implant Systems, LLC
www.intelligentimplantsystems.com
Intelligent Implant Systems exhibits the Revolution Spinal System® for posterior lumbar fusion and the MEDIANT™ anterior cervical plating system. Both of these systems utilize pre-sterilized implants and one tray of single-use instruments. No more expensive, bulky instrument trays. These elegant implants are quick to implant, saving surgery time, and the all-sterile instruments allow the OR to be turned quickly and reduce the risk of infection.

International Instruments
www.myjjonline.com
JJ International Instruments is a leader in designing & manufacturing high quality Surgical Instruments in India since 1999. JJ has successfully launched their products in USA market at AAOS 2013 in Chicago. JJ takes great pride in their extensive range of instruments offered for General Orthopaedic, Spine, Hand, Micro surgeries along with Neuro, Uro, Cardio Thoracic and General Surgeries. Visit booth # 2255 and experience their innovative instruments with INTERNATIONAL QUALITY @ INDIAN PRICE!

Invibio Biomaterial Solutions
www.invibio.com
Invibio Biomaterial Solutions continues to revolutionize spinal device design by offering the implantable polymer, PEEK-OPTIMA™ HA Enhanced, integrated, not-coated, with hydroxyapatite (HA), an innovative choice for medical applications where early bone ongrowth is required. With over 15 years of clinical history and ~9M PEEK-OPTIMA™ devices implanted worldwide, Invibio is driven by clinical need and our customers’ desire to continually improve patient outcomes.

Isto Biologics
www.istobiologics.com
Isto Biologics is focused on offering evidence-based solutions for bone regeneration and cell therapy to help improve patient outcomes. The company’s best-in-class product offerings include the market-leading MAGELLAN® Autologous Concentration System, InQu®, a Bone Graft Extender & Substitute; Influx®, a natural bone graft material and CellPoint®, a concentrated bone marrow aspirate system.

IZI Medical
izimed.com
IZI Medical Products, LLC develops minimally invasive diagnostic and therapeutic spine solutions to restore patients’ quality of life. Our spine product offerings include vertebroplasty, vertebral compression fracture solutions and vertebral augmentation systems. We embrace the legacy of the Osteo-site portfolio acquired from Cook Medical, as well as the recently added Kiva® and Blazer® systems acquired from Benvenue Medical. We look forward to working together to improve patient care.

Jade Precision Medical Components
www.jademed.com
At JPMC, we do more than provide the medical device industry with the highest quality implants, instruments and components on time; we provide manufacturing solutions. JPMC develops strategic partnerships to meet our clients’ needs, such as prototyping for labs and testing, new product launches into the market and contracted capacity for full production requirements. JPMC is the manufacturing partner you need to launch your next big project.

JALEX Medical
www.jalexmedical.com
JALEX Medical offers a one-stop-shop when it comes to Class I & Class II product development & regulatory services. Our team of biomedical engineers and regulatory & quality management specialists all work under one roof to provide your organization with a streamlined & client centered approach to commercialization. We are dedicated to organizations with big ideas, but who are short on resources to bring their innovation to market. Contact us at 216-307-6299 or LBARTOS@JALEXMEDICAL.COM

Janco, Inc.
www.janco-inc.com
Janco, Inc. is a premier contract supplier of custom plastic foam, disposable thermoformed trays and medical packaging designed and manufactured to meet exacting specifications and standards for the Spinal and Biologic’s markets. Janco’s custom thermoformed medical tray manufacturing offers the flexibility to meet exacting medical specifications and quality standards for the most demanding medical tray applications.
The 48th Annual Meeting of the Japanese Society for Spine Surgery and Related Research (JSSR) will be held in Yokohama, Japan, April 18-20, 2019. This meeting specialized for spine is largest in Japan and approximately 3,000 people including overseas doctors participate in this meeting. We are trying to increase the sessions in English to welcome more participants from overseas.

Jewel Precision began manufacturing innovative custom sterilization case systems in 1984. Jewel Precision's experience in sterilization case manufacturing gives us an edge in developing distinctive systems with a combination of material choices, finishes, and product housing features.

joimax® is the leading developer and marketer of complete systems for endoscopic minimally invasive spinal surgery. With TESSYS® (transforaminal), iLESSYS® (interlaminar) and CESSYS® (cervical) for decompression procedures, MultiZYTE® for Pain Therapy or with EndoLIF® and Percusys® for minimally invasive endoscopic assisted stabilizations, proven endoscopic systems are provided. Together, they cover a variety of indications.

Knight Mechanical Testing (KMT) is an ISO/IEC 17025 accredited laboratory specializing in static and dynamic mechanical testing for orthopedic implants and instruments. KMT provides world class testing facilities and superior guidance on the appropriate test methods for your device. With expertise in spine, extremities, sports medicine, trauma, large joint, dental, and cranial/maxillofacial repair, KMT has you covered from head to toe.

K2M Group Holdings, Inc. is a global leader of complex spine and minimally invasive solutions focused on achieving three-dimensional Total Body Balance™. K2M has designed, developed, and commercialized innovative complex spine and minimally invasive spine technologies. K2M introduces Balance ACS™, a platform of products, services, and research to help surgeons achieve three-dimensional spinal balance for their patients.

Kasios proposes a full range of cages, pre-filled with a bone substitute and pre-assembled on a disposable cage inserter, supplied sterile in a double blister pack.

KCI, an Acelity Company, and its subsidiaries are a global advanced wound care company that leverages the strengths of Kinetic Concepts, Inc. and Systagenix Wound Management, Limited. Available in more than 80 countries, the innovative and complementary ACELITY™ product portfolio delivers value through solutions that speed healing and lead the industry in quality, safety and customer experience.

Kirwan Surgical Products is an industry leader in the development of electrosurgical and nonstick bipolar specialty products for microsurgical indications including neurosurgery, spine surgery, ophthalmology, otolaryngology, plastic and reconstructive surgery, and orthopaedic surgery. Visit www.ksp.com.

KitoTech has recently launched our novel wound closure product, microMend, onto the market. It is applied like a bandage, which makes it much faster and easier to use than sutures and removed by the patient eliminating return clinic visits. With pricing similar to sutures, this translates into reduced procedure costs, and increased convenience for patients. Superior healing & cosmetic results to sutures have also been shown in clinical studies.
Kleiner Device Labs
www.kleinerlabs.com
Kleiner Device Labs develops unique spinal surgical tools that make procedures faster and easier for surgeons -- and improve outcomes for patients, hospitals and insurers. Kleiner recently announced a new spinal bone graft delivery tool, the KG® 1, that is much easier for the surgeon in MIS approaches, can save 20 minutes per level, and proved in clinical testing to improve spinal fusion success rates to 92%, without the use of chemical adjuvants.

Knobbe Medical
www.kobbemedical.com
KnobbeMedical.com is a cooperative portal for inventors, entrepreneurs, executives, clinicians, researchers, investors, and corporate board members who are exploring a start-up, joint venture or spin-off in the med device industry. KnobbeMedical.com is presented by the IP attorneys of Knobbe Martens. Our goal is to introduce the most current thought leadership and industry developments that may inform your strategy as well as the practical considerations that can help move your venture forward.

Koros USA, Inc.
www.korosusa.com
Koros USA designs and distributes state of the art surgical instruments. Our most popular best sellers include the Cervical Black Belt, Lumbar Super Slide and Lateral Retractors, along with our rotating Osteopunch & Ejector Punch Plus rongeurs and a variety of many more fine instruments. Koros specializes in cervical, spine, micro discectomy, lumbar and anterior fusion.

Kyocera SGS Precision Tool - Medical Division
www.kyocera-sgstool.com
Kyocera SGS Precision Tools (KSPT) Medical Division is a 20+-year engineering and contract manufacturer of orthopedic cutting devices and dental tools with various coatings and finishing requirements. Our engineers are experienced with domestic and international OEM and tier suppliers. KSPT Medical Division is FDA Registered and ISO 13485 Certified.

Lee Medical/Bone Shark
www.leemedicalnj.com
Lee Medical markets the only disposable bone mill. Our patented, sterilized Bone Shark® reduces risk of potential infection and is used in orthopedic procedures when autologous bone is required. No additional costly equipment is needed. Our Lee-Lok® disposable bone marrow needles aid in spinal procedures. Lee Medical has a reputation for delivering high quality products to hospitals and distributors. Our certified woman-owned, small business guarantees quality and customer satisfaction.

Leica Microsystems
www.leica-microsystems.com
Leica Microsystems surgical microscopes are designed with input from surgeons to meet evolving needs, create unique value, and help improve patient outcomes. Our latest surgical microscope, the Leica M530 OHX, provides clear visualization into deep cavities, market-leading 600 mm working distance, and an ergonomic design to support a comfortable working position and reduce musculoskeletal strain.

LH Medical Corporation
www.lhindustries.com
LH Medical, an LH Industries Company, is a worldwide leader of Medical Device Outsourcing Services specializing on Orthopedic, spine, extremity and total joints. LH provides Expertise to our Partners Manufacturing High Quality Implants and Instrumentation. From General Instruments to Complex Mechanical Assemblies. LH Machines all types of Metals, Plastics and Peek. LH Medical, a Competent Qualified forward thinking Contract Manufacture providing Answers and Solutions to our Client’s Needs.

Life Instrument Corporation
www.lifeinstruments.com
Life Instrument Corporation is dedicated to serving neurosurgeons and orthopedic surgeons with the highest quality surgical instruments. Over the years spine surgery has advanced with new procedures and approaches to the spine. Life Instrument Corporation is committed to meet the needs of spine surgeons for these new surgical techniques. Please stop by Booth 1700 to see our wide array of cervical, lumbar and micro instruments.

Life Spine
www.lifespine.com
Life Spine is a full line spine company which develops and markets an innovative family of spinal implants and instruments to serve the orthopedic and neurosurgery communities. A comprehensive product portfolio, focused on fusion devices and minimally invasive spine surgery, has been created by Life Spine via strong strategic partnerships with surgeons.

LifeLink Tissue Bank
www.lifelinktb.org
LifeLink Tissue Bank, the largest not-for-profit tissue bank in the Southeast, is an industry leader in providing allografts recovered and processed with the most stringent safety standards. LifeLink offers a complete range of traditional grafts, sports medicine grafts and milled LifeGraft spinal allografts.
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LifeNet Health helps to save lives, restore health and give hope to thousands of patients each year. We are the world’s most trusted provider of transplant solutions, from organ procurement to new innovations in bio-implant technologies and cellular therapies—a leader in the field of regenerative medicine, while always honoring the donors and healthcare professionals that allow the healing process.

Lowell is the premier partner for the development and production of technologically advanced, implantable medical devices and instruments. We capture design intent and convert it to manufacturability through communication, anticipation and the drive to meet and exceed your requirements.

Lowery Enterprises, LLC is a family owned and operated business that strives toward unparalleled service, speed, and delivery of high quality product. We are a full service design and prototyping company, specializing in both standard and customized spine models for marketing, training, and doctor and patient education purposes. With our clear anatomical models, you can showcase your implant technology in a way that is professional, demonstrative, and visually appealing.

Lumenis, the world’s largest surgical laser company, provides minimally invasive solutions for Spine, Gynecology, ENT, Urology and General Surgery. A rich assortment of CO2 and Holmium laser products is available for a variety of spinal pathologies, including microdiscectomy (MED) and endodiscectomy (PELD). Brands: Lumenis® MOSES™ pulse 120H, UltraPulse® duo, Holmium and CO2 range of end and side-firing fibers.

Founded in 1993, Macom Surgical Instruments is a genuine Brazilian company. Its mission is to offer the best and most precise surgical instruments, fulfilling market needs.

Marksman’s goal is to maximize operating room efficiencies by creating reproducible surgical protocols through novel devices that decrease radiation exposure, surgical times, and costs. The goal is to turn existing C-arms into advanced image-guidance systems. Investigational Device not ready for commercial sale.

As a leading manufacturer of medical implants and instruments, Marox utilizes the most advanced machining technology. Process capabilities include simultaneous 5-axis CNC milling, CNC 6-8 axis multi-process machining, CNC Swiss turning, additive manufacturing (Ti powder), CNC wire EDM, and assemblies. We process titanium, implantable grade PEEK, cobalt chrome, stainless steel and many other materials. ISO 13485, AS9100D and FDA registered.

Mazor Robotics believes in healing through innovation by developing and introducing revolutionary technologies and products aimed at redefining the gold standard of quality care. Over 24,000 patients have experienced the benefits of Mazor Robotics surgical guidance technology. At NASS 2017, Mazor will be showcasing its latest spinal deformity correction planning software, Mazor X™ Align, along with other advanced solutions for your spine practice.

Medacta International is a Swiss company specialized in joint replacement, spine surgery and sports medicine. Medacta’s revolutionary approach and innovation have advanced the standard of care with several Spine solutions where MySpine® patient matched technology and MUST Universal Screw platform can be combined with the innovative MectaLIF fusion devices. Medacta has grown dramatically by placing value on all aspects of care experience through excellence in design, training and sustainability.
### MEDDDBASE GmbH
**1754**
www.medddbase.com

What we can do for you? Building a business with the vision of providing back office services for medical device manufacturers. Set up and grow sales activity, covering daily sales activities like customer services, order fulfillment, logistics, loaner set management, administrative services and accounting.

### Medfix
**2300**
www.medfix.com

Medfix® International, LLC is focusing on delivering total solutions to the global spine market which enable our customers to deliver a more cost-effective procedure while maintaining the highest level of quality in their instrumentation and implants. Our design team has removed the uncertainty of what equipment is necessary for spinal procedures. Medfix® International, LLC can provide a comprehensive package of spine instruments, retractor sets procedure-specific instrumentation and implants.

### Medicrea
**1823, 3037**
www.medicrea.com

Through the lens of predictive medicine, Medicrea leverages its proprietary software analysis tools with big data and machine learning technologies supported by an expansive collection of clinical and scientific data. The Company is well-placed to streamline the efficiency of spinal care, reduce procedural complications and limit time spent in the operating room. With 185 employees worldwide, the Company has an ultra-modern manufacturing facility in Lyon, France.

### Mediflex Surgical Products
**2463**
www.mediflex.com

Since 1969, Mediflex has been the worldwide leader in table mounted holding and positioning systems for all surgical specialties. FlexArm™ and StrongArm™ systems provide unparalleled versatility, flexibility and surgical efficiency as they offer stabilization of spine endoscopes, retractors, instruments and/or devices - which eliminates an assistant. A variety of holding and positioning devices will be on exhibit.

www.mediflex.com – sales@mediflex.com – 631.582.4520

### Medikrebs
**1160**
www.medikrebsusa.com

### Medin Technologies
**2251**
www.medin.com

Medin Technologies, Inc. is the largest, focused supplier of sterilization cases, trays, and accessory products. Our strategy is to provide exceptional engineering support services, vertically integrated manufacturing processes, reduced lead-times, and a company wide commitment to stringent quality requirements. We are FDA and ISO13485 registered working with aluminum and stainless steel as well as thermoformed and machined plastics.

### Meditech Spine, LLC
**1757**
www.meditechspine.com

Meditech Spine is an innovative organization that partners with industry leaders to design, develop, and distribute medical devices that make a positive difference in the marketplace. Since the introduction of the Talos® line of lumbar and cervical interbody implants, Meditech has continued to enhance its line of products with the introduction of PEEK-OPTIMA® HA Enhanced for its interbody family along with the CURE Anterior Cervical and Anterior Lumbar Plating systems.

### MEDMIX SYSTEMS AG
**1329**
www.medmix.ch

We are a leading supplier of mixing and application systems for the global medical device industry. We make it look easy to respond to clinical challenges by developing unique, efficient and user-friendly delivery systems for biomaterials. We offer a broad range of OEM products that allow you to reduce time to market and to keep investment low. We enjoy partnering with medical device teams around the world to develop innovative customer specific solutions.

### Medtronic
**1201, 2601, 2701, 2703**
www.medtronic.com

We believe in applying the full power of technology for better patient outcomes. In addition to alleviating pain, restoring health, and extending lives, we work in partnership with others to create seamless, more efficient care. Learn how we’re taking healthcare Further, Together at Medtronic.com. Visit booth #1201 to learn more about our innovative solutions.

### Medyssey USA
**1726**
www.medyssey.com

Medyssey designs, develops, manufactures and markets products for the surgical treatment of spine disorders through novel instrumentation and advanced orthobiologic solutions designed to improve spinal fusion rates, preservation of mobility and clinical outcomes.
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**Met One Technologies**
Met One Technologies is a manufacturer of cutting edge technologies for the spine implant market. We focus on innovative, artful, implant design solutions with the help of our spine surgeon customers. The Xultan Pedicle Screw System is designed and manufactured in the USA, incorporates the latest in pedicle screw technology combining double lead threads, cortical-cancellous threads, reverse angle set screws, and superior easy to use instrumentation, all in one system.

**Metal Craft**
Metal Craft and Riverside Machine & Engineering provide in-house medical device and implant manufacturing from start to finish. Specializing in close tolerance contract manufacturing, their services include DFM assistance, prototyping, and short through long run production capabilities. Primary and secondary manufacturing capabilities in-house ensure all aspects of your project are finished with upmost quality. FDA registered and a Women Owned Small Business. Check them out at www.MCandRS.com.

**Micro Machine co**
For over 50 years, Micro Machine has been a supplier to Spine and Orthopedic industry OEMs. Our goal is to provide quality surgical instruments and implants that are made with pride in the United States to the Spine, Knee, Hip, Extremity, Trauma and additional markets. We are ISO 13485:2003 & ISO 9001:2008 Certified, FDA Registered and have two locations in Kalamazoo, MI and Warsaw, IN. We are charged up for the next 50 years to serve our customers.

**Mighty Oak Medical**
Our Mission: By combining the talents of experienced spine surgeons and biomedical engineers, spine surgeries can be made safer and more efficient. Our mission is to improve surgical outcomes in a manner that is both cost-effective and patient-centered. As an independent incubator focused on spinal technologies, we have the freedom to focus on innovative solutions. Our pipeline features many exciting and disruptive products that meet these objectives.

**Millstone Medical Outsourcing**
Millstone Medical, leading provider of customized solutions to the med device industry, has over 15 years of experience in organizing the chaos of outsourced supply chains. Operating three environmentally controlled & strategically located facilities in the US, MMO offers clean room packaging, warehousing & distribution, loaner kit management, advanced inspection and after-market services. With an unparalleled focus on quality, MMO is the partner you can trust with your post-manufacturing needs.

**MiMedx Group Inc.**
MiMedx® is a biopharmaceutical company developing and marketing regenerative and therapeutic biologics utilizing human placent-al allografts and patent-protected processes for multiple sectors of healthcare. "Innovations in Regenerative Medicine" is the framework behind our mission to provide physicians with products and tissues to help the body heal itself.

**MiRus**
MiRus was launched in 2016, bringing novel material and software solutions to spine and orthopaedic surgery. MiRus has created a comprehensive platform centered around our proprietary MoRe® alloy to create the world’s smallest, strongest and biologically superior implants. We also address the demands of today’s healthcare environment with an integrated platform of pre-operative planning and risk assessment tools, a breakthrough navigation system and post-operative monitoring and risk mitigation.

**Misonix, Inc.**
Misonix is a world leader in developing ultrasonic surgical devices for hard and soft tissue removal. The Misonix BoneScalpel is a unique ultrasonic osteotome for tissue-selective bone dissection that encourages en-bloc bone removal and refined osteotomies while sparing elastic soft tissue structures. Many leading surgeons have praised the BoneScalpel to be one of the most important advancements to enter spine surgery this decade.
Mizuho OSI
www.mizuhosi.com
Mizuho OSI significantly improves the surgical experience through advanced patient positioning. With products like the ProAxis® Table and Levö™, surgeons can better anatomically align the patient’s spine intraoperatively with the touch of a button. Since introducing the first dedicated Spinal Surgery Table in 1992, the company has revolutionized the industry to provide surgeons with improved surgical access, unobstructed imaging and enhanced safety. Come by booth #2023 to learn more.

Mobius Imaging
www.mobiusimaging.com
Mobius Imaging seamlessly integrates advanced imaging technologies into medical workflow—enhancing the clinician’s ability to collect the highest quality images whenever and wherever they are needed.

MTF Biologics
www.mtfbiologics.org
Headquartered in Edison, New Jersey, MTF Biologics has spent more than 30 years honoring donated gifts by developing innovative, effective allograft solutions to help people heal. From orthopedics to wound care to plastic and reconstructive surgery, we have become a force in scientific progress and patient advocacy. For more information, visit www.mtfbiologics.org.

Musculoskeletal Clinical Regulatory Advisers, LLC (MCRA)
www.mcra.com
Musculoskeletal Clinical Regulatory Advisers, LLC (MCRA) is a highly specialized, medical device consulting firm and CRO serving the worldwide orthopedic and spine industries. MCRA’s team of experts is committed to executing successful regulatory, clinical, quality assurance, healthcare compliance and reimbursement strategies. MCRA works with companies at all stages of development, whether they are single-product companies or companies with multiple technologies.

N2 Biomedical
www.n2bio.com
N2 Biomedical is a leading provider of surface modification services to orthopedic, spinal, and cardiovascular device manufacturers. Our specialty is in providing solutions to improve surface characteristics such as enhanced bone ingrowth and anti-microbial property, improved biocompatibility, thromboresistance, increased wear and scratch resistance, reduced friction, corrosion resistance, improved radiopacity, product differentiation, as well as enhanced electrical and optical properties.

Nadia International, Inc.
www.ronadro.com
Nadia International will display educational/surgical bronze sculptures specifically for the spine surgeon. These museum quality limited editions are created by the late Ronadro’. Ronadro’ has over 7700 surgeons in 78 countries collecting his fine works of art. They are displayed at the Smithsonian and various medical universities all over the world. The Ronadro Collection will be introducing a new bronze sculpture “Spine In Motion II” and “The Greatest Gift”.

Nano Bridging Molecules
www.nbmolecules.com
NBMolecules® offers SurfLink®, a unique surface for bone anchored implants. Through its bio-mimicking characteristics, SurfLink® promotes true osseointegration. With over 8 years in dental clinical use, SurfLink® is clinically proven and available for dentists in over 30 countries. NBMolecules®, a privately held Swiss company founded in 2002, is dedicated to developing and licensing out SurfLink®. Licensing opportunities for spinal applications are available.

Nanovis, LLC
nanovisinc.com
Nanovis’ mission is to develop science-enhanced, life-improving technologies targeted at tissue fixation and infection. Focused on aggressive, sustainable growth in the Spine market, Nanovis is commercializing science-driven platforms: the deeply porous scaffold currently available with the FortiCore® line of interbody fusion devices; an advanced nanotube-surface technology currently available; and surface technologies with anti-colonization and bactericidal capabilities in development.

Neo
www.neo-medical.com
Neo is a Swiss medical device company focused on developing next generation spinal fusion technology for value-based healthcare. We are dedicated to enabling all peri-operative stakeholders to improve efficiency, procedural simplicity and construct integrity while pursing outcome excellence in thoracolumbar fusion procedures.

NeuroEnterprises
www.neuroenterprises.com
NeuroEnterprises, LLC manufactures and sells innovative surgical instruments and disposable devices. Our flagship product is the ChicagoTip, a self cleaning disposable suction. We design new instruments and make functional improvements on exiting instruments to improve surgical techniques and enhance overall surgical outcomes. Our engineering and product design teams work directly with surgeons to improve on the design and functionality of instruments currently used daily in the operating rooms.
NeuroPoint Alliance 1858
www.neuropoint.org
The NPA is designed to meet the quality improvement and research needs of physicians and allied health care professionals, health care plans, the biomedical industry and government agencies. To accomplish this, NPA spearheads and manages various clinical data registries and studies. Clinical data registries are valuable tools to support evidence development, performance assessment, comparative effectiveness studies and adoption of new treatments into routine clinical practice.

NeuroStructures, Inc. 1655
www.neurostructures.com
NeuroStructures is dedicated to advancing orthopedics and neurosurgery through the discovery and development of quality innovative implantable surgical solutions that restore patient quality of life. Our expertise in designing medical devices and ability to effectively collaborate with surgeons, allow us to develop products that are less invasive and provide optimal clinical results. Please visit us on our website at www.neurostructures.com or download the NeuroStructures App to discover more.

Next Orthosurgical 1229
www.nextorthosurgical.com
Next Orthosurgical is an international medical device company focused on the rapid development and distribution of innovative quality products. We’re experienced professionals using proven, advanced design and manufacturing methods. We’re guided by our surgeon customers and their patients to deliver safe, repeatable, and life changing solutions. We have a robust operational infrastructure that supports product manufacture, delivery, and expert service to our surgeons and distribution team.

Nexxt Spine 1134
www.nexxtspine.com
Nexxt Spine is a privately held medical device company dedicated to the treatment of painful and debilitating spinal pathologies. Through innovative product development, technologically advanced manufacturing platforms, and irreplaceable quality standards, Nexxt Spine works toward increasing procedural efficiency and improving patient outcomes. All implant and instrument development, design, manufacturing, and distribution takes place within the company’s headquarters in Noblesville, Indiana.

NN Life Sciences/Paragon Medical 2551
www.nninc.com
NN Life Sciences combines advanced engineering and production capabilities with in-depth materials science expertise to design and manufacture a diverse range of reusable and single-use surgical instruments, implantable components, and cases and trays to leaders in the world-wide medical device marketplace. We create a partnership with our clients to bring innovation and world-class quality from the inception of a project to its completion.

Norman Noble, Inc. 1755
www.nnoble.com
Norman Noble Inc. manufactures orthopedic devices and implants to customer specifications in compliance with FDA regulations and ISO 13485:2012. Full capabilities include seven-axis contour milling, Swiss machining, laser machining and welding, wire EDM, sinker EDM, turnkey Nitinol manufacturing, metal finishing and packaging. Prototype services are also available. Visit the company’s Web site for more information.

NovaBone Products 2215
www.novabone.com
NovaBone Products provides a best-in-class synthetic bone graft substitute. The unique bioactive grafting technology delivers an osteoconductive matrix while signaling and stimulating osteoblastic activity to the site. For ease of use and surgical convenience, NovaBone is available in a variety of forms and sizes along with multiple delivery options.

Novarad 2630
www.novarad.net
Founded by a radiologist over 20 years ago, Novarad has demonstrated Best in KLAS expertise in enterprise imaging, including viewing, workflow, and storage. Providing both easily deployed modular products and fully customizable enterprise imaging solutions, the company has installed over 1000 systems globally with KLAS-confirmed, market-leading retention rates.
Novid Surgical, LLC 1426
www.novidsurgical.com

Novid Surgical, LLC is pleased to present the Swiss-Made FISSO line of Quick Fixation positioning arm systems. Available in numerous weight capacities and lengths, we can provide a stable mounting platform for a myriad of applications. These include endoscopes, instruments, and retractors among others. Due to modular design, numerous configurations are possible to meet your exact needs. OEM inquires are welcome.

NSpine 1024
www.nspine.com

NSpine is a multidisciplinary educational platform for spinesurgeons and allied health care professionals. The Main Event is held every two years with up to 10 parallel sessions covering all aspects of Spinal Health Care. The main event is supplemented with Masterclass Case Discussion events and regional targeted meetings. NSpine furthermore promotes spine related charities and patient education with a significant proportion of profit being directed towards this.

NuTech Spine and Biologics 1148
www.nutechspine.com


NuVasive 2301, 2603, 2605, 3027
www.nuvasive.com

NuVasive, Inc. is a world leader in minimally invasive, procedurally-integrated spine solutions. From complex spinal deformity to degenerative spinal conditions, NuVasive is transforming spine surgery with innovative technologies designed to deliver reproducible & clinically proven surgical outcomes. Highly differentiated solutions include access instruments, implantable hardware & software for surgical planning & reconciliation technology that centers on achieving global alignment of the spine.

Nuvectra 1760
www.nuvectramed.com

Nuvectra™ is a neurostimulation company committed to helping physicians improve the lives of people with chronic conditions. Nuvectra’s Algovita® SCS system is approved in the United States and Europe for the treatment of chronic intractable pain of the trunk and/or limbs. To learn more about Nuvectra and our technologies, visit www.nuvectramed.com.

Oerlikon AM US Inc. 2558
www.oerlikon.com/am

Oerlikon AM Business Line dedicated to medical (former DTI) is a contract manufacturer of implants servicing the global orthopedic markets. We are your trusted supplier for products made from titanium, cobalt chrome and medical grade plastics. • FDA-registered medical manufacturing facility in Shelton, CT • Orthopedic center of excellence • End-to-end series production offering, including post-processing • Deep expertise in additive and subtractive manufacturing • ISO13485 and ISO9001 certifications

Oerlikon Balzers Coating US 2556

Oerlikon Balzers is one of the world’s leading suppliers of surface technologies that significantly improve the performance and durability of precision components as well as tools for the metal and plastics processing industries. Extremely thin and exceptionally hard coatings.

Worldwide, more than 1,100 coating systems are in operation at Oerlikon Balzers facilities and its customers. Oerlikon Balzers operates a dynamically growing network of more than 100 coating centres in 35 countries.

Oquendo Center 1558
www.oquendocenter.org

THE TURNKEY SOLUTION FOR YOUR NEXT MEDICAL EVENT. The clinical capabilities and astounding amenities of the Oquendo Center make it an incomparable event solution. Even with 66,000 square feet to work with, our attention to detail is staggering. It starts with our capacity for up to 30 fully-equipped clinical lab stations, allowing for more simultaneous, hands-on learning. This means more opportunity to practice and perfect each new skill.

Orchid Orthopedic Solutions 1635
www.orchid-ortho.com

As a leader of medical device outsourcing services, Orchid has experience with both fusion and motion preserving technologies as well as standard open procedure instruments and complex, high precision, minimally invasive instrumentation. In addition to our design and manufacturing services, our proprietary coating technologies, including Titanium on PEEK and UHMWPe, set us apart.
Organogenesis Surgical & Sports Medicine 1660
www.organogenesis.com

Organogenesis Inc. offers a portfolio of bioactive and acellular biomaterials products in advanced wound care and surgical biologics, including orthopedics and spine. Organogenesis’s versatile portfolio is designed to treat a variety of patients with repair and regenerative needs.

Ortho Sales Partners 1135
www.orthosalespartners.com

Ortho Sales Partners is a consulting firm focused on assisting companies commercialize their products using unique strategies and years of personal relationships. Our mission is to help our clients reduce the time to revenue and increase market adoption by introducing them to top surgeons and distributors around the country as well as the national contracting firms.

Orthofix 1723, 2917, 3017, 3039
www.orthofix.com

Orthofix is a global medical device company focused on musculoskeletal healing products and value-added services aimed at improving patients’ lives by providing superior reconstruction and regenerative musculoskeletal solutions to physicians worldwide. Headquartered in Lewisville, Texas, the Company has two strategic business units: Extremities and Spine and regularly collaborates on research and development activities with leading clinical organizations. Visit www.orthofix.com to learn more.

Orthomed Inc. 1142
www.orthomedinc.com

The Surgical Instrument Specialists offering one of the largest selections of orthopedic and spinal instruments. We provide innovative instruments to aid surgeons in new and evolving surgical techniques. We work with surgeons to design, engineer and produce custom and specialty instruments for the industry.

Orthopaedic Solutions Center 1854
www.my-osc.eu

OSC is a consortium of companies offering manufacturing solutions for the medical device industry. We are a one-stop shop for OEMs with needs ranging from raw material to finished and packaged products. Four members: EZM - K-wires, round bars, profiles, flats and sheets Forecreu - Cannulated bars in stainless steels and titanium alloy for instruments and implants HTI - Ti & HA coating, technical ceramics, cleaning & packaging Sayan - Design and manufacture of orthospine instruments and implants

Orthopedic Design & Technology 2533
www.odtmag.com

ODT is recognized as the industry-leading publication, widely recognized for its in-depth, high-quality coverage of the specialized field of orthopedic product development and manufacturing. With each issue, ODT offers readers comprehensive feature articles, industry news, trends and up-to-date market data on the ever-evolving orthopedic sector. With 7,500 subscribers ODT reaches key decision makers who look to ODT as their No. 1 source for information. Visit www.odtmag.com for more information.

Orthopedic Renovation Technologies 1162
www.pediclescrewremoval.com

Orthopedic Renovation Technologies is excited about releasing our Tornado Pedicle Screw Removal System. This is an instrument that can be used to remove tulip style pedicle screws from any company. The Tornado has proven to make the often difficult process of removing pedicle screws easier and faster while remaining highly effective. Several surgeons have endorsed this product and use the Tornado on a regular basis. Please come by and see the future standard of pedicle screw removal.

OrthoReBirth USA 2129
www.orthorebirthusa.com

ORTHOREBIRTH USA is proud to present ReBOSSIS: a biosynthetic, fibrous scaffold ideal for cell infiltration, retention, and colonization. Created by a novel and proprietary electrospinning process, ReBOSSIS is a highly absorbent, cohesive, and perfectly moldable osteogenic material, with the ideal consistency to fit and fill bony voids or gaps.

ORTHOWORLD Inc. 2559
www.orthoworld.com

Founded in 1992, ORTHOWORLD® is the only provider of strategic intelligence in the world solely focused on the global orthopaedic market. Its singular mission is helping orthopaedic companies and individuals improve their performance. Highly specialized product offerings such as ORTHOWORLD Membership, ORTHOFLASH®, BONEZONE® and OMTEC® empower industry participants to respond to challenges, maximize opportunities and more aggressively expand their orthopaedic businesses.
**TECHNICAL EXHIBITION**

**OSSimTech Inc.**
www.ossimtech.com

OSSimTech are creators of open surgery training simulators. Come and try the “Sim-Ortho”, a virtual reality training simulator for orthopedics featuring procedures in spinal surgery (fusions and decompressions for trauma and deformities). The Sim-Ortho simulator is the best way to teach and train orthopedic surgery in a safe environment. Our simulators offer haptic feedback (applied force and resistance) and allow handling and manipulation of multiple tools.

**OsteoNovus**
www.osteanovus.com

OsteoNovus Inc. is a start-up orthopedic medical device company focused on the development of biologic materials to support and regenerate bone. Our innovative calcium phosphate based technology will be available as moldable putty and an injectable cement for spine, trauma and orthopedic surgery for treatment of bone voids, various fractures and spinal disorders.

**Oxford Performance Materials**
www.oxfordpm.com

OsteoFab Technology accelerates the speed at which implants are designed, manufactured, and cleared for sale. The OsteoFab platform combines design, material, 3D printing, quality, and regulatory clearance into one streamlined process. The result is a faster and more predictable path to market. OPM has FDA clearances for the following products: OsteoFab Patient Specific Cranial Device OsteoFab Patient Specific Facial Device SpineFab VBR System

**PanMed US (Pan Medical)**
www.panmed.us

Headquartered in Largo, Florida, with State of the Art manufacturing facilities, PanMed US has been since 2008 a recognized leader in Vertebral Compression Fracture (VCF) with cutting edge technology in the spine arena, such as the CurvePlus and the 13g balloon catheter, is strengthening the minimally invasive approach in the cervical and thoracic area. During NASS 2018 PanMed will be introducing their newest product the VertX Plus an RF cooled unipedicular ablation device for the Spine Cavity.

**Paragon Medical/NN Life Sciences**
www.nninc.com

NN Life Sciences combines advanced engineering and production capabilities with in-depth materials science expertise to design and manufacture a diverse range of reusable and single-use surgical instruments, implantable components, and cases and trays to leaders in the world-wide medical device marketplace. We create a partnership with our clients to bring innovation and world-class quality from the inception of a project to its completion.

**Paragon Medical/NN Life Sciences**
www.nninc.com

NN Life Sciences combines advanced engineering and production capabilities with in-depth materials science expertise to design and manufacture a diverse range of reusable and single-use surgical instruments, implantable components, and cases and trays to leaders in the world-wide medical device marketplace. We create a partnership with our clients to bring innovation and world-class quality from the inception of a project to its completion.

**Paradigm BioDevices, Inc.**
www.paradigmbiodevices.com

Paradigm BioDevices, Inc. specializes in novel spinal technologies including Interplate™ a system based solution to simple and complex spinal care; and the QuickDraw Bone Harvester® for harvesting and collecting autogenous bone graft.

**Paradigm Spine**
www.paradigmspine.com

Paradigm Spine is an innovative leader in the field of non-fusion spinal implant technology in the global spine market. The Company believes there is a significant opportunity to improve treatment options for patients suffering from lumbar spinal stenosis and age related spinal deformities. Paradigm Spine is committed to improving the quality of life of patients with spinal diseases.

**Pfizer**
pfizer.com

At Pfizer, we apply science and our global resources to bring therapies to people that extend and significantly improve their lives. Every day, Pfizer colleagues work across developed and emerging markets to advance wellness, prevention, treatments and cures that challenge the most feared diseases of our time.
PHACON GmbH
www.phacon.de

PHACON from Germany develops and sells training systems and models as marketing tools for instrument and implant manufacturers as well as for hands on trainings in hospitals and training centres. Realistic Anatomical models of bone like material, combined with various soft tissues, all structures and landmarks, based on real CT-data of patients. Use your common devices, instruments and implants, with realistic haptic and feel. Navigate within the included CT-data set of the related model.

Phamedica Inc.
www.phamedica.com

We are manufacturer of Spinal Implants and Orthopedic Implants our success key is Honesty, Mutual understanding and collaboration with all our customers, bringing advanced design and efficient product yet keeping operation with our system simple and quick. We have a vast production capacity due to our techniques and production personnel experience. For making the spinal implants we are the one!

Philips Healthcare
www.healthcare.philips.com

About Royal Philips Royal Philips (NYSE: PHG, AEX: PHIA) is a diversified health and well-being company, focused on improving people’s lives through meaningful innovation in the areas of Healthcare, Consumer Lifestyle and Lighting. The company is a leader in cardiac care, acute care and home healthcare, energy efficient lighting solutions and new lighting applications, as well as male shaving and grooming and oral healthcare. News from Philips is located at www.philips.com/newscenter.

Phillips Precision Medicraft
www.phillipsmedicraft.com

Supporting An Adaptive, Flexible, Advanced Manufacturing Operation: With a history of innovation and a critical understanding of how to bridge the gap between engineering and manufacturing, we’re able to meet the rigorous demands of a global orthopedic marketplace. By maintaining a culture of continuous improvement, LEAN manufacturing disciplines and integrating continuous improvement efforts with value stream partnerships, we can adapt our business to fit our customer’s needs, precisely.

Precision ADM
www.precisionadm.com

Precision ADM is a global engineering and manufacturing solutions provider that uses Additive Manufacturing, also known as 3D-Printing, as a core technology, complimented by multi-axis machining to manufacture high value medical components and devices. Precision ADM has created a comprehensive Advanced Digital Manufacturing™ process which includes Design Support, Engineering, Manufacturing and Finishing. Precision ADM is ISO 13485:2016 certified and headquartered in Winnipeg, Manitoba, Canada.

Precision Medical Technologies
www.premedtec.com

Precision Medical Technologies, Inc. is a contract manufacturer of orthopedic implants and instruments with a focus on spine, extremities, trauma and sports medicine. We are ISO 13485:2003 Certified. Our Implant and Instrument divisions have their own separate Quality Engineering, Production Engineering, and Operating Management. The Instrument Division operates out of the Warsaw and Rome City facilities, while the Implant Division is only located at the Warsaw facility.

Precision Spine Inc.
www.premedtec.com

Precision Spine, makers of the Reform® Pedicle Screw System, will showcase our Made in the USA portfolio of innovative spine solutions. Discover the patented MD-Vue™ Lateral System, comprised of MD-Vue™ Retractor, AccuFit® Lateral Plate and ShurFit® Interbody Cage, Reli™ SP Plus Spinous Plating System, ShurFit® ACIF 2C Ti and HA Coated Cervical Cage, SureLOK™ MIS 3L Pedicle Screw System and the Reform® POCT System for Occipital Cervical Thoracic Fixation. Visit Precision Spine at Booth 1835.

Promimic
www.promimic.com

Promimic sells HAnano Surface; a 0.02um thin coating that accelerates and improves osseointegration of implants. The coating can be used on all types of implant materials and applications, including complex geometries and porous structures. Presence of HAnano Surface renders a super-hydrophilic implant surface and improves the anchoring strength of implants. The coating process is cost efficient and can easily be implemented at the implant production line.
Protech Leaded Eyewear
DBA Protech Medical
www.protechmed.com
Products MADE IN THE USA. Protech Medical is a high quality radiation safety apparel manufacturer. Our focus on custom tailored solutions combined with personalized professional service is a hallmark of our family owned business. Protech’s innovation and elevated service separates us from the competition. To learn more, visit the leading manufacturer of Radiation Safety Products at booth 1428 or contact us: 561.627.9769 | sales@protechmed.com

Providence Medical Technology
1535, 2739
www.providencemt.com
Providence Medical Technology, Inc. is a privately-held medical device company focused on innovative solutions for cervical spinal conditions. The company has pioneered a proprietary approach to cervical fusion and has developed surgical instrumentation and implants that offer unique benefits to the $2 billion worldwide cervical spine market. The Providence family of shipped-sterile, single-use products includes DTRAX® Spinal Instrumentation System, CAVUX® cages, and ALLY® bone and facet screws.

puracon GmbH
1754
www.puracon.com
For more than 10 years, puracon has been a Full Service Supplier for cleaning, packaging, sterilization and logistics of implants and instruments. Our solutions include standardized and customized packaging concepts. Customers appreciate our up to 7-year shelf life, just-in-time service and uncompromising quality. With our Consulting Services in medical device certification & validation as well as our Logistic Services, including Loaner Set Management, we create additional value. www.puracon.com

Qatar Spine Society
1028

Quinn Medical/Thuasne USA
2641
www.thuasneusa.com
Quinn Medical offers a full line of spinal bracing products featuring their flagship, the SLEEQ Spinal Compression Brace. SLEEQ’s elegant, easy-to-use, & patient friendly design offers best-in-class comfort for improved patient compliance & outcomes. While universal size braces are now industry standard, the patented SLEEQ technology offers unmatched ease of adjustment & adaptability for optimum fit, function & comfort. The Eclipse Cervical Collar advances cervical care & comfort to a new level.

Radius Pharm
2359
radiuspharm.com
Solution Showcase Presentation:
Fragility Fracture Alert: Treating Postmenopausal Patients with Osteoporosis at High Risk for Fracture with an Anabolic Agent
Thursday, September 27, 12:30 p.m., Red Theater

Ranfac Corp.
1554
www.marrowcellution.com
Ranfac Corp. manufactures the patent pending Marrow Cellution Bone Marrow Aspiration Systems, which overcome the limitations of traditional bone marrow needles by allowing the user to aspirate in a measured and controlled manner over a large geography inside the marrow space, while restricting peripheral blood infiltration. Our bone grafting kits include a tool to extract intact bone dowels, providing autograft in a minimally invasive manner without sacrificing cellular quality.

Raylytic GmbH
1461
www.raylytic.com
We are passionate about facilitating medical and scientific data of the utmost quality by providing customized software solutions for data collection and image analysis. Powered by artificial intelligence, our software can handle routine tasks and allows to build unique tools that enhance the experience of surgeons. A webbased application programming interface makes interfacing to other systems and importing legacy data simple. Web-based QDICOM platform gives you complete control over processes.

REINVENT BIOLOGICS LLC
1159
www.reinventbiologics.com
‘Sometimes you need to take a step back in order to leap forward’ - Our flagship Genius Concentration System uses a truly revolutionary vertical centrifuge design that achieves maximum efficiency and cell viability in isolating and concentrating the healing factors in blood and bone marrow aspirate. Our centrifuge sets new benchmarks in every category. We are introducing, at NASS, our creative allograft and synthetic bone options.

Relievant Medsystems, Inc.
2355, 2749
www.relievant.com
Relievant Medsystems is a medical device company focused on solutions for treating chronic low back pain (CLBP). Relievant developed the Intricate Procedure – a minimally invasive procedure targeting the basivertebral nerve for the relief of CLBP. Relievant sponsored the SMART Trial - a Level 1, prospective, randomized, double-blinded, sham-controlled clinical trial evaluating pain reduction in subjects with CLBP. The Intricate System is FDA 510(k) cleared and commercially available in the US.
Renovis Surgical 1749
www.renovis-surgical.com

Renovis has been a leader in 3D-printed, porous implants since 2014. We’ve developed a full line of interbody implants for cervical & lumbar applications using our proprietary Tesera® porous structure, engineered for bone on-growth and in-growth, with a low modulus interface & large graft windows. We offer multiple solutions for Cervical and Lumbar fusions in Anterior, Lateral, Transforaminal, Oblique and Posterior approaches, all with multiple geometries. Visit booth 1749 to learn more.

Richard Wolf Medical Instruments Corporation – see RIWOspine

RIWOspine, A Richard Wolf Company 1223
www.richardwolfusa.com

Solution Showcase Presentation: “Full-endoscopic spine surgery – the concept and rationale for use in lumbar decompression”
Wednesday, September 26, 12:30 p.m., Red Theater

Richard Wolf Spine Endoscopy is now RIWOspine to better address the unique needs of the spine endoscopy community, with a global emphasis on innovation and education. We retain the resources of Richard Wolf, as well as a rich history of innovation in spine endoscopy, including the first instrument sets and techniques for transforaminal, interlaminar, cervical, stenosis, and rhizotomy. Visit us at booth #1223 for the latest in spine endoscopy and lectures from Dr. Martin Komp and other experts.

Ronin Surgical Corp. 2651
www.roninsurgical.com

Wireless surgical headlights.

Rose Micro Solutions 1748
www.rosemicrosolutions.com

Rose Micro Solutions sells High Quality Optical Loupes & LED Lights for Less! Our Loupes start @ $279.00. We are a "Family" Business consisting of 4 Brothers. We named the company after our Mother "ROSE". Stop by Booth #1748 to see our "NEW" Line of "TTL" Loupes, you’ll love the Optics! Visit us online @ www.rosemicrosolutions.com or call 716-608-0009 Make sure you stop by and say Hi to the "ROSE" Brothers!

rose plastic USA, LLLP 1557
www.rose-medipack.com

rose plastic medical packaging develops, produces and sells worldwide intelligent plastic packaging products for medical engineering, dental, healthcare, laboratory and diagnostics. Choose the best solution from our diverse standard tubes, boxes, cassettes and cases or let us work with you to develop your own special packaging requirement.

RTI Surgical 1523, 3023
www.rtx.com

RTI Surgical is a leading global surgical implant company providing surgeons with safe biologic, metal and synthetic implants. Committed to delivering a higher standard, RTI's implants are used in sports medicine, general surgery, spine, orthopedic and trauma procedures and are distributed in nearly 50 countries. RTI has four manufacturing facilities throughout the U.S. and Europe. RTI is accredited in the U.S. by the American Association of Tissue Banks and is a member of AdvaMed. For more information, visit www.rtx.com.

Ruthless Spine 2356
www.ruthlesspine.com

VDM: Provisionally-patented technology and process to automate key aspects of spinal deformity surgeries intra-operatively. This will decrease operating time, reduce x-ray exposure, reduce screw failures, and increase the pool of surgeons able to perform these surgeries. RJB: Provisionally-patented technology to more accurately align pedicle screws for spinal fusion surgeries. This will provide a relatively low-cost means of reducing screw failures and decreasing operating times. We intend to demonstrate working models of both products in our booth.

SAGICO USA 1357
sagico.com

Founded in 2017, SAGICO focuses on providing logical surgical solutions for spine surgeons throughout the world. Arion 5° Lordosis Cervical Expandable Implant with Tri-Fix™ and Aria Hybrid Lumbar Expandable with Sure-Fit™ are new implants available in the US and are the beginning to a larger portfolio of spinal surgical solutions. These implants, along with our FDA cleared OSI pedicle screw system, are on display at our booth.
The Saudi Spine Society is a non-profit organization, which was established in 2015, to promote excellence in spine care by running an efficient, transparent multidisciplinary society that nurtures a collaborative community of practice of spine practitioners who disseminate high-quality research, and conduct innovative educational activities for the public and the professionals.

For over three decades, Sawbones, the originators of “hands on” workshop models continues to be the leader in anatomical models for medical education, new product demonstration, sales training, and patient awareness. In addition to over 2000 products, Sawbones offers complete product development to meet company and teaching institution custom specifications.

SBH is a medical device company focused on a streamlined supply chain and operational efficiency, offering a comprehensive line of premium surgical hand-held instruments for use in Neuro, Spine, Vascular and many other Surgeries. SBH offers also a wide range of surgical retractor systems such as abdominal, bariatric. At SBH, we pledge an uncompromising commitment to the excellence. For more information visit us online at www.sbhsurgical.com.

Seabrook International is a leading contract manufacturer of highly-engineered precision instruments, implants, and other devices primarily for the orthopaedic implant industry. We have a strong technical staff to provide value-added engineering and design support services to complement our rapid manufacturing of prototypes, customs & specials, instrument modification, and production-volume manufacturing services.

SeaSpine is a global medical technology company focused on the design, development and commercialization of surgical solutions for the treatment patients suffering from spinal disorders. SeaSpine has a comprehensive portfolio of orthobiologics and spinal instrumentation solutions to meet the varying combinations of products that neurosurgeons and orthopedic spine surgeons need to perform fusion procedures on the lumbar, thoracic and cervical spine.

Sectra offers a complete set of highly efficient preoperative planning tools both for 2D and 3D images. The latter are especially valuable for planning complex trauma cases. Sectra’s solution enables orthopedic surgeons to increase precision in planning and advance preparation for various scenarios, thereby avoiding stress, saving time and minimizing risk during surgery.

Seed Biotech, Inc. is a biological material derived product manufacturer, created for the purpose of pioneering advanced research, development, production, distribution, and effective use of intelligently designed biological material based products. Seed Biotech® products are processed to provide safe, consistent and effective solutions for clinicians.

SI-BONE, Inc. is the leading sacroiliac (SI) joint medical device company dedicated to the development of tools for diagnosing and treating patients with low back issues related to certain SI joint disorders. The company has developed, and is manufacturing and marketing, minimally invasive products for patients with these disorders. The iFuse Implant System was developed as a minimally invasive surgical option for patients who have failed non-surgical options.

Siemens Healthineers is committed to becoming the trusted partner of healthcare providers worldwide, enabling them to improve patient outcomes while reducing costs. Driven by our long legacy of engineering excellence and our pioneering approach to developing the latest advancements, we are a global leader in medical imaging, laboratory diagnostics, clinical IT, and services. usa.siemens.com/Healthineers
SIGNUS Medizintechnik GmbH  
www.signus.com

Innovative high-end implants made in Germany: For more than 20 years, SIGNUS has been the experienced specialist in the surgical spine care sector. Family-owned SIGNUS offers the comprehensive product range of cervical spine to SIG sacroiliac joints, which are manufactured at the nearby production site. In addition to Europe (CE) and the USA (FDA), we sell our certified implants throughout the world on every continent. ST-Line® by SIGNUS offers highest technology structural titanium implants.

Silony Medical  
us.silony-medical.com

Clinically driven concepts – Welcome to Silony Medical! We are proud of our - Made in Germany – which symbolises high quality in manufacturing and engineering. We are a young company – not burdened by the past. Thus, Silony is not constrained by obsolete corporate structure; we are open to build new and enduring partnerships to achieve mutual goals. This enables us to include fresh thinking and the ultimate flexibility to meet the ideas and needs of our users.

Simplify Medical, Inc.  
www.simplifymedical.com

Simplify Medical is focused on developing next generation cervical artificial disc for 1 & 2-levels, using MRI compatible materials- PEEK endplates with ceramic core, disc heights as low as 4mm and mobile-bearing design. Simplify Medical is located in Sunnyvale, California. To learn more, visit www.simplifymedical.com.

Sintea Plustek  
www.sinteaplustek.com

Established in 1987 near Milano, Italy, Sintea Plustek develops several innovative spine systems for the treatment of a broad range of spinal disorders. Sintea Plustek’s engineering capabilities allow for advanced research and projects to meet the needs of patients and spine surgeons. Our products line include Posterior/Lateral Cervical/Dorso/Lumbar System, Interbody Spacers, and Cement Dispenser. We are currently in USA, Europe, and Latin America. We are looking forward to hear more from you.

Sites Medical  
www.sitesmedical.com

SITES Medical is an orthopedic technology development company focused on meaningful innovations for the evolving marketplace. Our first technology to reach the marketplace through our OEM partners is OsteoSync, a highly porous titanium ingrowth material that is clinically proven and cost-effective. This platform technology can be used as a standalone material, allowing bone to grow through the entire implant or attached to various substrates as desired. Other technologies are under development.

SMTP Technology Co ltd  
www.smtpmed.com

The SMTP XD880A Ultrasonic Osteotome is the leading brand in the target field. SMTP is the only company participated in the establishment of the Industry Standard on Ultrasonic Bone Tissues Surgical Equipment.

Solco Biomedical Co., Ltd.  
www.solco.co.kr

Solco Biomedical is a manufacturer and global supplier of spinal implants and instrumentation focused on developing innovative surgical solutions. We are dedicated to exploring cost-contained approaches and less-invasive surgical options that provide optimal outcomes for the surgeon and patient.

Southern Spine, LLC  
www.southernspine.net

Southern Spine features the StabiLink® MIS Interlaminar Spinal Fixation System along with the innovative, patented PG® Precision Guided Inserter/Compressor that redefines ease of use. The StabiLink® System is the new standard in minimally invasive spinal fusion providing the missing link between conservative therapy and more traditional invasive spinal fusion procedures. The StabiLink® Interlaminar System has the most anatomical selections and should be a part of every surgeon’s armamentarium.

Spinal Balance  
www.spinalbalance.us

Solution Showcase Presentation: Better Practices in Implant Handling and Delivery Thursday, September 27, 12:00 p.m., Red Theater

Spinal Balance presents Libra®, a technically advanced pre-sterilized pedicle screw system with the ability to prevent cross contamination intra-operatively. Our package guards the implant during handling and delivery, is easy to open and extremely intuitive to use. A major benefit of our package is its ability to act as a guide for loading the screwdriver, making that key step effortless. Using Libra saves time, money, eliminates direct handling of the implant and reduces the workload at SPD.
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<th>Company</th>
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<tr>
<td>Spinal Elements, Inc.</td>
<td>2411, 2837</td>
<td><a href="http://www.spinalelements.com">www.spinalelements.com</a></td>
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<td>Spinal Simplicity, LLC</td>
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**Spinal Elements, Inc.**
Spinal Elements is an outcomes-driven spinal surgical solutions company headquartered in Carlsbad, California. A leading designer, developer, manufacturer, and marketer of innovative medical devices used in spinal surgical procedures, our mission is to develop novel medical device technologies, biologics, and instrumentation to create positive surgical outcomes that exceed surgeon and patient expectations.

**Spinal Simplicity, LLC**
Spinal Simplicity is dedicated to the creation of innovative simple solutions to treat complex spinal and orthopedic conditions through three distinct product platforms: Minimally Invasive Lumbar Fusion, Cervical Fusion and Extremities. The Minuteman®G3 MIS Fusion Plate System, can be implanted through a MIS Lateral or MIS Posterior approach, reducing the trauma to healthy tissue without compromising fixation. The Minuteman®G3 has FDA clearance and is now for sale in the United States.

**Spine Innovation**
Spine Innovation Expandable TLIF provides stability without compromising safety or efficacy. In-situ rotation and expansion provides restoration of disc height and lordosis.

**Spine Wave**
Spine Wave is an innovation leader in expandable fusion and minimally invasive fixation technology with a broad product and intellectual property portfolio. Our comprehensive solutions address posterior, anterior, lateral, thoracolumbar fixation, and cervical spine procedures. Our portfolio includes the Velocity®, Leva® and StaXx® expandable devices; the True Position® Pivoting Spacer; the Sniper®, CapSure® PS3 and Annex® fixation systems; and the Proficient® and Paramount® cervical systems.

**Spineart**
Spineart is one of the fastest growing privately held spine companies, with a leading position in the European market and representation in more than 55 countries worldwide. Spineart established its US presence in 2009, providing to distributors, hospitals and surgeons a unique offer: Sterile-packed, barcoded implants and a compact set philosophy. Spineart introduced clinically validated technologies in Minimally Invasive Surgery, Motion Preservation, Fusion, Biologics, and Fractures Treatment.

**SpineEX, Inc.**
Founded in 2017, SpineEX, Inc, is a global technology company committed to improving patient outcomes through innovation. SpineEX, Inc has developed Sagitta®, the first fully adjustable, expandable lateral lumbar interbody cage with independent control of height and lordosis; giving surgeons the freedom to adjust the implant in-situ to the patient’s specific anatomy. (Pending 510(k). Not available for sale within the United States.) (As of Print)

**SpineGuard, Inc.**
SpineGuard provides tools equipped with DSG™ (Dynamic Surgical Guidance) Technology to enhance spinal surgery. Devices built with DSG Technology give real-time audio and visual feedback to improve the accuracy of pedicle screw placement, without the need for ancillary equipment. These devices have assisted spine surgeons in accurately placing pedicle screws in approximately 50,000 spinal procedures around the world. Visit www.spineguard.com for more information.

**SPINENDOS GmbH**
SPINENDOS as a German manufacture and innovator, we produce and supply professional endoscopic instruments for minimally invasive spine surgery. We are committed and focused on innovative technologies, systems and methods for endoscopic minimally invasive spinal and arthrosis surgery. Spinendos is one of the most professional suppliers for global spinal endoscopy products.

**Spineology**
Spineology, an innovator in anatomy-conserving™ spine surgery, develops spinal implants and instruments. Spineology surgical techniques conserve spinal bone, ligament and muscle tissue. Spineology is committed to increasing procedural efficiency, reducing surgical morbidity and accelerating patient recovery. Learn more at spineology.com.
SpineSource, Inc.
www.spinesource.com

SpineSource® L-Varlock® Expandable Lumbar Cage. L-Varlock® provides in situ Hyper-lordotic Sagittal Expansion up to 7 mm and 24°. The open framework of L-Varlock® provides a large space for packing bone graft. L-Varlock® Expandable Lumbar Cage provides superior tactile feedback during expansion and can help surgeons—with the adjunct of supplemental internal fixation such as pedicle screws—achieve lordotic angles necessary for segmental alignment and sagittal balance.

SpineVision
www.spinevision.net

SpineVision® is a privately-owned integrated spinal technology company focused on the development and marketing of implants and instrumentation for spinal treatment. Since its foundation in 1999, the company has designed innovative products which offer key advantages to surgeons and benefits to patients. SpineVision’s current products offer solutions for approximately 90% of spinal pathologies i.e. lumbar degenerative disc diseases, deformities, cervical disorders, trauma and tumors.

SpineWeek
www.spineweek.org

We are pleased to announce SpineWeek from 27 April to 1 May, 2020 in Melbourne. The idea to have a joint meeting bringing together several spine societies at the same time and at the same place originated around the turn of the century. The increase of participants coming from Asia was remarkable over the past Meetings. This incited the SpineWeek committee to move east for the 2020 SpineWeek meeting, and we are pleased to announce the meeting in Melbourne on 27 April – 1 May 2020.

SS White Technologies Inc./Shukla Medical
www.shuklamedical.com

Shukla Medical® is a universal implant removal company. Our objective is to simplify revision surgery by offering uniquely designed tools and techniques that target the removal of Cervical, Thoracic and Lumbar hardware, pedicle screws, and broken and stripped screws. For more information on the Xtract-All®, call 888-4-SHUKLA (888-474-8552) or visit www.ShuklaMedical.com

Stability Biologics
www.stabilitybio.com

Stability Biologics, based in Nashville, Tennessee is a rapidly growing organization focused on providing innovative products for spinal surgery, orthopedics, sports medicine and advanced wound care. Stability provides a full range of allograft and synthetic tissue including cellular repair products, structural and flowable bone products and sports medicine grafts.

Stimwave
www.stimwave.com

Stimwave’s Freedom SCS & PNS System, the world’s only fully programmable wireless stimulator platform for Dorsal Root Ganglion, Peripheral Nerve and Spinal Cord Stimulation, features the world’s smallest, microsize neurostimulator, 95% smaller than other systems. Revolutionizing the industry with sleek, easily wearable technology for patients needing pain management. Visit www.stimwave.com

Structure Medical
structuremedical.com

Since 2004, Structure Medical has been a leading manufacturer of spine, trauma and arthroscopic medical implant products used to treat problems with the musculoskeletal system. These medical devices make a profound difference in the lives of patients suffering from trauma, tumors, sports injuries, degenerative diseases and congenital orthopedic conditions.

Stryker
wwwstryker.com

Solution Showcase Presentation:
A Clinical Update on Tritanium – A Novel, Highly Porous Material Designed for Bone In-growth and Biological Fixation
Wednesday, September 26, 12:00 p.m., Red Theater

Stryker is one of the world’s leading medical technology companies, and together with our customers, we are driven to make healthcare better. We offer innovative products and services in Orthopaedics, Medical and Surgical, and Neurotechnology and Spine that help improve patient and hospital outcomes.

Superior Polymers
www.superior-polymers.com

Magnolia Peek is a high performance implantable grade plastic known for its high purity and light color and is used as a metal replacement in the medical industry. Magnolia Peek is manufactured in a cGMP clean room production facility ISO 13485 certified.
## TECHNICAL EXHIBITION

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<td><a href="http://www.supraalloys.com">www.supraalloys.com</a></td>
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<td>Supra Alloys/Edge International is an ISO 9001 &amp; ISO13485:2016 certified stocking distributor of raw materials, specializing in medical grade Cobalt-alloy and Stainless Steel Bar and Titanium Bar, Plate and Sheet with value-added services for the manufacture of implants and instruments for the orthopaedic, spine and trauma markets. We work with customers to provide cost-effective solutions to their raw material needs to ensure the highest level of compliance, quality and service.</td>
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<td><a href="http://www.sdbioc">www.sdbioc</a> coatings.com</td>
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<td>Surface Dynamics and Eurocoating are medical device coating companies with State-of-the-Art manufacturing facilities in US (Cincinnati &amp; Memphis), Italy (Trento) and China (Wuxi) offering cutting edge technologies in Plasma Spray Coating and Additive Manufacturing. They provide Porous Titanium and Hydroxypatite coatings for any substrates including PEEK and DMLS &amp; E-Beam Sintering services. SD &amp; EC are ISO 13485 Approved/21 CFR 820 Compliant.</td>
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<td><a href="http://www.surgentec.com">www.surgentec.com</a></td>
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<tr>
<td>SurGenTec is a privately owned medical device company based out of Boca Raton, FL that strives to bring the next level of technology to the spine and orthopedic industry. Our patented technologies deliver safe, cost effective and unique solutions which benefit healthcare providers as well as their patients. Our Products: -Graftgun™ Universal Graft Delivery System -ALARA™ Access Needle -AccuDepth™ Precision Guidewire</td>
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<tr>
<th>Company</th>
<th>Booth No.</th>
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<tr>
<td>Surgeons Capital Management</td>
<td>2503</td>
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<tr>
<td>ces-home.com/PLIP</td>
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<tr>
<td>SCM is a wealth management firm with over 50 years of experience in healthcare. SCM focuses on the creation, management, protection, and distribution of wealth for surgeons around the country. We specialize in creditor and asset protection, tax-advantaged distribution, and wealth and estate strategies for high net worth individuals. We oversee all financial aspects of private practices including buy/sell for partners, disability buyouts, pension creation, practice management, and group benefits.</td>
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<th>Company</th>
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<tr>
<td>SurgiTel</td>
<td>1710</td>
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<tr>
<td><a href="http://www.surgitel.com">www.surgitel.com</a></td>
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<tr>
<td>SurgiTel’s mission is to offer customers the best in vision, comfort and ergonomics. Our patented lightweight optics and LEDs, coupled with Oakley frames, means all-day-comfort for the clinician. SurgiTel’s unmatched loupe declination angle means your body is in the correct ergonomic position, reducing pain and the risk of injury. Our loupe mounted SurgiCam Pro digital video camera and our PrismPro loupe line (5.5x-8.0x) can only be seen at SurgiTel.</td>
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<th>Company</th>
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<tr>
<td>SURGIVISIO</td>
<td>2338</td>
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<tr>
<td><a href="http://www.surgivisio.com">www.surgivisio.com</a></td>
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<tr>
<td>Surgivisio redefines minimally invasive spine surgery procedures with its all-in-one 2D/3D imaging AND real-time navigation platform. ✓ Reliable and accurate: a patented technology that significantly reduces uncertainties and errors ✓ Fast, intuitive, and automatic: 5 minutes to start navigating, including the complete patient registration procedure, 3D image acquisition and reconstruction ✓ Low x-ray radiation: Up to 4 times fewer images than needed by existing systems to complete a 3D reconstruction</td>
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<tr>
<th>Company</th>
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<tr>
<td>SygenX, Inc.</td>
<td>2162</td>
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<tr>
<td><a href="http://www.sygenx.com">www.sygenx.com</a></td>
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<tr>
<td>SygenX, Inc. is an emerging leader in the growing field of regenerative therapies and healthcare solutions. Our patented APIC A2M isolation therapy, is coupled with the only biomarker diagnostic available in the industry. It’s a powerful 1-2 punch in the orthopedic, spine and veterinary market! A2M is a broad-spectrum protease inhibitor that baits and traps all known factors causing cartilage catabolism found in arthritic joints and painful discs.</td>
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<th>Company</th>
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<tr>
<td>Synaptive Medical</td>
<td>1138</td>
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<tr>
<td><a href="http://www.synaptivemedical.com">www.synaptivemedical.com</a></td>
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<tr>
<td>Synaptive Medical Inc., a Toronto-based Medtech company, collaborates with clinicians and healthcare systems to deliver products and services that cross traditional barriers and information silos. Our BrightMatter™ solutions — surgical planning and navigation, robotic digital microscopy and informatics — create Connected ORs to help clinicians ensure the best possible outcomes for patients.</td>
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<th>Company</th>
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<tr>
<td>Synergy Biomedical</td>
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<tr>
<td><a href="http://www.synergybiomedical.com">www.synergybiomedical.com</a></td>
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<tr>
<td>Synergy Biomedical is a privately-held medical device company focused on bringing biomaterial based products to the orthopedic and spinal surgery markets. Synergy has developed next-generation bone graft technology based on an innovative, spherical form of bioactive glass. Synergy’s BioSphere particles have been engineered to maximize the bone healing potential of bioactive glass.</td>
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<tr>
<td>Techmetals, Inc.</td>
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<tr>
<td><a href="http://www.techmetals.com">www.techmetals.com</a></td>
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<tr>
<td>Our 170,000 sq. ft. campus provides a ONE STOP SHOP for: Medical Coatings, Medical Surface Treatment, Titanium Anodize, HardCoat, Aluminum Anodize, Electro polish, Passivation, Chrome Plating, Precious metal Plating, PVD coatings: (Titanium Nitride, Diamond Like Coating), Hard Chrome replacement technology and tray color anodize imaging. Medical Coating Applications: implants/devices. R&amp;D department can: develop/create coatings per customer needs. ISO-13485 &amp; Nadcap. OEM and CM approvals.</td>
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<tr>
<th>Tegra Medical</th>
<th>2348</th>
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<tr>
<td><a href="http://www.tegramedical.com">www.tegramedical.com</a></td>
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<tr>
<td>Tegra Medical offers end-to-end contract manufacturing solutions from prototyping to production of components and finished medical devices, with full assembly, packaging and sterilization. We make whole devices, from the “business end” to the handle and everything in between. Orthopaedic expertise includes devices for spine, arthroscopy, joint and extremities reconstruction, sports medicine, interventional spine and trauma. Expertise in minimally-invasive and interventional markets as well.</td>
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<tr>
<th>Tecomet, Inc.</th>
<th>2028</th>
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<tr>
<td><a href="http://www.tecomet.com">www.tecomet.com</a></td>
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<tr>
<td>The global capacity to deliver the most difficult challenges with unparalleled industry expertise and superior capabilities. Tecomet produces forged, cast and machined orthopedic implants, precision surgical instruments, sterilization cases/trays and photochemical etched products. Additional specialization exists through innovative product development, Tecomet Standard Products, LaunchQuick™ Development Center and our Total Solutions® approach where we manage the entire product launch cycle.</td>
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<tr>
<th>Tecres SPA</th>
<th>2049</th>
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<tr>
<td><a href="http://www.tecres.it">www.tecres.it</a></td>
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<tr>
<td>Tecres has got over thirty years of experience in orthopaedics and is also active in minimal invasive surgery. Mendec Spine HV System: the unique all in one closed mixing device for preparation of high density resin for vertebroplasty. Mendec Spine: our acrylic resin for filling vertebral cavities, it goes with a kit for vertebroplasty procedure in Mendec Spine Kit. Mendec Aqva: hydraulic delivery device that allows the surgeon to extrude high viscosity cement remaining distant from the x-ray beam.</td>
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<tr>
<th>TeDan Surgical Innovations</th>
<th>1115</th>
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<tbody>
<tr>
<td><a href="http://www.tedansurgical.com">www.tedansurgical.com</a></td>
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<tr>
<td>TeDan Surgical Innovations (TSI) designs and manufactures specialty surgical products for use in orthopedic, neuro, thoracic and spine surgeries. All of our retractor systems have patented ergonomically designed blade locking mechanisms simplifying their use in surgery.</td>
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<tr>
<th>Terumo BCT</th>
<th>1123</th>
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<tbody>
<tr>
<td><a href="http://www.terumobct.com/harvest">www.terumobct.com/harvest</a></td>
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<tr>
<td>Terumo BCT is a global leader in blood component, therapeutic apheresis and cellular technologies, offering more than 30 years of cell processing expertise and a comprehensive range of solutions that cover the continuum of cell therapy—from autologous biologics to cell therapy manufacturing. As a leader in innovation with established global reach, we are shaping the future of cell therapy.</td>
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<tr>
<th>TheraCell, Inc.</th>
<th>2160, 2763</th>
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<tr>
<td><a href="http://www.theracellinc.com">http://www.theracellinc.com</a></td>
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<tr>
<td>TheraCell is a regenerative medicine company that has a range of demineralized bone allograft fiber products and oxygenated grafts based on its patented technology. Our demineralized bone fiber products (DBF) provide a 100% cortical bone graft that is osteoinductive, osteoconductive, and provides a unique nano-topography fiber surface. The TheraFuze DBF™ platform includes: TheraFuze DBF™ Fiber Mat; TheraFuze DBF™ Fiber Syringe; TheraFuze DBF™ Fiber Plus; TheraFuze DBF™ Fiber Boat; and TheraFuze DBF™ Fiber Sheet. Additionally licensed products have been commercialized and are offered by AlloSource, NuVasive and Australian Biotechnologies.</td>
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<tr>
<th>Thompson Surgical Instruments, Inc.</th>
<th>1414</th>
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<tr>
<td>thompsonsurgical.com</td>
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<tr>
<td>Thompson is a leader in spine exposure and the original manufacturer of the table-mounted retractor. We understand the value of exposure in surgery and are dedicated to providing innovative, high quality systems that deliver safe, versatile, and low-profile retraction. From MIS to open, we offer unlimited customization and safe, independent, retraction. Our table mounted retractors are ideal for Cervical, Anterior Lumbar, Posterior Lumbar, and MIS Posterior Lumbar exposures.</td>
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Titan Spine
www.titanspine.com

Titan Spine, Inc. began the surface technology revolution for interbody fusion devices several years ago with the introduction of its full line of Endoskeleton® interbody devices featuring its proprietary textured surface. The company’s award-winning surface, nanoLOCK®, is the only titanium FDA-cleared nanotechnology for the spine, and it has sole access to the CMS new technology code for fusions utilizing nanotextured interbody devices. Visit booth #1441 to learn more. titanspine.com

Tobra Medical
www.tobramedical.com

Tobra Medical is launching the new Tobra Bone Basket. The first autograft bone collection device that maximizes collection and is easy to use. This patented product utilizes a mesh basket system to collect drilled autologous bone during high speed drilling for use as a bone graft. Great for patient with autograft bone and great for facility in helping to reduce expensive bone substitutes. Please visit Booth #1163 for "Bone Collection Made Easy”

Tria Spine Medikal
www.triaspine.com

Tria Spine® is a privately owned Turkish company supplying spinal implants and instruments. Almost one decade of experience was combined to design, manufacture and supply spinal and orthopedic implants, and thus the company was founded in 2009. "Customer satisfaction is at first priority for Tria Spine®, while we always intend to use advanced technologies and focus on supplying best products to our customers based on simplicity, creativity and quality."

Triangle
www.trianglemfg.com

For 60 years Triangle has partnered with global OEMs to engineer and manufacture a wide range of medical devices and surgical implants for all facets of the orthopedic industry. From early-stage design, development and prototyping to pre-production and volume production, Triangle takes you from concept to launch with speed and economy while achieving precision machining to the tightest tolerances and meticulous finishing and assembly.

Trifecta Medical, LLC
www.trifectamed.com

Trifecta Medical is a dedicated Case & Tray supplier. The Trifecta Medical team has a long history of leadership and innovation; particularly regarding design, quality and delivering fast and on time. Trifecta Medical’s customized case, tray and caddy systems ensure validation, support and protect your implants and instruments. We also assist your product team to make sure your delivery systems stand apart from your competition.

Trinity Orthopedics, LLC
www.trinity-ortho.com

We are dedicated to innovating procedures and devices that enable spine surgeons to meaningfully impact patient satisfaction and healthcare economics. Our initial focus is on improving lumbar and cervical fusion outcomes.

Tyber Medical, LLC
www.tybermedical.com

Tyber Medical, a private label original equipment manufacturer (OEM), is creating new pathways to regulatory approved implants and instruments for orthopaedic companies, distributors, and hospital organizations. Tyber Medical designs and develops class II orthopedic systems; verifies and validates those systems using a QSR and ISO 13485 certified quality system; and pursues and maintains both US (FDA 510(k)) and OUS (CE Mark) regulatory approvals. For more information, visit www.tybermedical.com

U&I Corporation
www.youic.com

Drive innovation, Drive success

Ukrainian Spine Society
www.smiss.kh.ua

UKRAINIAN SPINE SOCIETY (Society for Minimal and Instrumented Spinal Surgery) is a public organization that promotes the development of domestic medical science and solving urgent practical problems of care in the direction of minimally invasive and instrumental surgery spine. On May 25, 2018 we invite you to attend the Sytenko Institute of Spine and Joint pathology INTERNATIONAL 17th SYMPOSIUM on MINIMAL INVASIVE AND INSTRUMENTED SURGERY OF THE SPINE. Join us in Kharkiv, Ukraine.
UKSSB-BASS/BRITSPINE

www.ukssb.com

Striving to improve Spine Care in the UK The United Kingdom Spine Societies Board (UKSSB) is an organisation composed of 4 UK societies that are members of the UKSSB: British Association of Spine Surgeons (BASS) Society for Back Pain Research (SBPR) British Scoliosis Society (BSS) British Association of Spinal Cord Injury Specialists (BASCIS) The UKSSB is an association with the stated objective to facilitate collaborative working between the above spinal societies for the benefit of the UK population.

University Neuro, LLC

www.UniversityNeuro.com

We are dedicated to administering a nationwide network of professional services associated with neuromonitoring. We establish, organize, and advise for one of several service models that comply to high ethical standards, as well as national rules and regulations designed with the surgeons and physicians as the focus of providing patient care. We bring extensive experience and professionalism to every operating room and customize our design and support to your individual needs and concerns.

Value and Trust Co., Ltd.

www.vntc.me

Vertex Pharmaceuticals

www.vrtx.com

Vertex is a global biotechnology company that aims to discover, develop and commercialize innovative medicines so people with serious diseases can lead better lives. Founded in 1989 in Cambridge, Mass., Vertex today has research and development sites and commercial offices in the United States, Europe, Canada and Australia. Vertex initiated a Phase 2b/3 study with VX-210 in patients with acute traumatic cervical spinal cord injury (SCI) in 2016. This study is known as the SPRING Trial.

Vertical Spine, LLC

www.verticalspine.com

Founded in late 2010, Vertical Spine LLC is a revenue generating spinoff from Cascade Medical Enterprises (CME) commercializing the FIBRINET® System technology which is a regenerative medical solution for spinal fusion surgery. Two PRFM grafts and the Surgeon Defined Graft have been used successfully in almost 2,000 cases and a variety of spine applications. FIBRINET has demonstrated excellent fusion at 12 months in six separate studies. Please visit us at booth #2633 to learn about the company and the technology.

Vertiflex

www.vertiflexspine.com

Vertiflex is committed to delivering clinically proven treatments for lumbar stenosis that are minimally invasive in order to help people take back their lives. We believe there is a gap in the continuum of care between long-term pain management and traditional surgery. Our mission is to improve the standard of care with new solutions that put patient safety and comfort first. We are relentlessly focused on providing the most advanced, least invasive treatments for lumbar stenosis.

Vertos Medical, Inc.

www.vertosmed.com

Vertos Medical Inc. was founded to advance the treatment of patients suffering from lumbar spinal stenosis (LSS), primarily a degenerative, age-related narrowing of the lower spinal canal. Vertos Medical’s proprietary technologies include mild®, which is an outpatient, minimally invasive, fluoroscopically guided LSS treatment. For more information, visit www.Vertosmed.com.

VGI Medical

www.vgimedical.com

VGI Medical pioneered the first and only integrated bilateral-fixation interbody implant, VertelP®, and continues to innovate spinal fusion products for niche applications. Dual-geometric allografts SiJoin® (sacroiliac fusion), as well as VerteLoc® and CerLoc® (facet fusion), are engineered for advanced yet straightforward techniques.

Wayvio

www.wayvio.com

Powered by InTech Medical, Wayvio is an advanced technology that turns virtually any medical device (instrument or cases & trays) in to a self-monitoring smart tool. From the board room to the operating room, Wayvio’s innovative RFID platform helps you keep your supply chain optimized, drive down cost and ultimately improve patient outcome by providing your engineering team with dependable field data (ie. sterilization or torque click counts) for informed decision-making throughout a medical device’s lifecycle.

WCMISST 2019

www.wcmisst.org

Don’t miss this chance to interact with international doctors and broaden your knowledge on not only Endoscopic Spine Surgery but Minimally Invasive Spinal Techniques.
Weigao Orthopaedic Device Co., Ltd. 2505
wegortho.en.alibaba.com
WEIGAO ORTHOPAEDIC DEVICE CO., LTD is China’s best spine products/services supplier. As a leading medical company in China, we work with research institutions developing innovative technology, assist top hospitals offering effective treatment solutions, relieve suffering patients from their pains and restore their health. Dedicated to global medical and health course, engaged with top surgeons and companies worldwide, we’re now seeking for opportunities to work with partners all over the world.

Wenzel Spine 1438
wenzelspine.com
Wenzel Spine, Inc. is a medical technology company focused on providing minimally invasive solutions for the treatment of spinal disorders. Headquartered in Austin, TX, Wenzel is focused on delivering solutions that improve the overall quality of spine care by simplifying procedures and reducing recovery time. Wenzel seeks to improve patient quality of life by designing and producing devices of the highest quality to support our surgeon clients in the care and treatment of their patients.

WIGGINS MEDICAL 2241
www.wigginsmedical.com
Wiggins Medical introduced The Original Black Kerrison to the U.S. market in 1995. Now, there are many copies. Compare and see the difference. In our diverse inventory, we offer ultra-thin footplates, endoscopic shafts, bayonets, delicate IVDs, rotating shafts, and other unique designs. We have a large assortment of "detachable" kerrisons conforming to the latest, strict requirements for cleaning. Our kerrisons are easy on the hands, and extremely smooth. Call us at 800-497-0851.

Wiltrom Co., Ltd. 2158
www.wiltrom.com.tw
Wiltrom is established in Dec. of 2009, and it’s a spin-off of Industrial Technology Research Institute. Wiltrom is dedicated in the research and production of a wide range of various high-end, implantable, Class II, III medical devices. The development of products is focused on innovation and create a highly competitive private brand on the market internationally. We provide mainly the orthopedic surgery products, Bone Graft Substitute, Spinal Fixation system and Interbody Fusion system.

Zavation 2261
www.zavation.com

Wolters Kluwer 1607
www.lww.com
Wolters Kluwer Health is a global provider of information, business intelligence and point-of-care solutions for healthcare. Brands include Lippincott Williams & Wilkins, ProVation® Medical and Lippincott Solutions, a series of comprehensive, integrated software applications that includes workflow technology, current evidence-based clinical information, and professional development tools. Visit booth 1607 to review Spine, the most cited journal in the field of spinal deformity.

Xenco Medical 2039
www.xenomedical.com
Xenco Medical is an American medical technology company committed to disruptive innovation for the purposes of creating safer, more efficient surgical environments. Through its line of sterile packaged, disposable spinal systems, Xenco Medical seeks to transform the standard of surgical care by eliminating the challenges of current surgical instrumentation processing. Xenco Medical has recently launched The ASC CerviKit, a compact ASC delivery platform for its disposable ACDF system.

ZEISS 1714
www.zeiss.com/meditec
The medical technology business of ZEISS offers a comprehensive line of surgical microscopes and loupes that uncompromisingly enhance visualization during spine surgery. ZEISS supports spine surgeons in seeing more by ensuring optical precision, flexibility, fast OR setup and ease of use for surgeon, assistant, and OR staff.
Ziehm Imaging specializes in the development, manufacture and worldwide marketing of mobile C-arm X-ray imaging solutions for interventional operating room procedures. Through continuous dialogue and close cooperation with renowned universities, research centers and hospitals, Ziehm Imaging has developed groundbreaking technologies known for their outstanding versatility, easy handling, and seamless digital network integration for a wide variety of medical applications.

Zimmer Biomet Spine is a global leader in spine innovation, dedicated to enhancing the quality of life for spine patients worldwide by delivering comprehensive thoracolumbar, cervical, biologics, and implantable solutions, along with training and clinical support that support surgeons.

Z-Medical GmbH + Co. KG is a privately held and financed medical device company that designs, develops, manufactures and markets innovative implants and surgical instruments in the section of spine, hand & foot and arthroscopy. The company’s U.S. subsidiary is based in Atlanta, Georgia. Z-Medical implants are made in-house and stand for precision, innovative simplicity and ready for surgery.
Mechanical Testing
Accel LAB Inc. 2249
Empirical Testing 1643
JALEX Medical 1939
NN Life Sciences 2551

Sterile Packaging
Aurora Spine 1625
DSM Biomedical 2349
Innovasis, Inc. 1909
Innovative Sterilization Technologies, LLC 1362
Janco, Inc. 1615
Jewel Precision 2316
Medacta International 2323
Millstone Medical Outsourcing 1954
NN Life Sciences 2551
Orthopaedic Solutions Center - OSC 1854
puracon GmbH 1754
Structure Medical 2056
Tyber Medical, LLC 1106

Surgery Center Management/Development
Innovative Sterilization Technologies, LLC 1362
JALEX Medical 1939

DIAGNOSTICS/IMAGING
3D Touch Workstations
Sectra NA Inc. 1358

Auxiliary Imaging
Raylytic GmbH 1461
Sectra NA Inc. 1358

C-Arm Fluoroscopy
Accel LAB Inc. 2249
Barrier Technologies, LLC 2304
Markman Targeting 1257
Surgivisio 2338
Ziehm Imaging 1009
Ziehm Imaging 1549

Computational Biomodeling (CoBi)
Medtronic 1201
Medtronic 2601
Mighty Oak Medical 2239
Raylytic GmbH 1461

Diagnostics/Imaging
Barrier Technologies, LLC 2304
EOS Imaging 2314
Esaote North America, Inc. 1541
FUJIFILM Medical Systems USA, Inc. 1962
iData Research Inc. 1963
Mazor Robotics Inc. 2819
Medtronic 1201
Medtronic 2601
Mighty Oak Medical 2239
Raylytic GmbH 1461
Sectra NA Inc. 1358
Stryker 1401
Ziehm Imaging 1009
Ziehm Imaging 1549

HD Radiography
Accel LAB Inc. 2249
EOS Imaging 2314
iData Research Inc. 1963

Micro CT
Accel LAB Inc. 2249
iData Research Inc. 1963
PHACON GmbH 2625
Raylytic GmbH 1461

MRI
Accel LAB Inc. 2249
Barrier Technologies, LLC 2304
Esaote North America, Inc. 1541
iData Research Inc. 1963
Raylytic GmbH 1461

Tomography/Scanners
iData Research Inc. 1963

Ultrasound
Accel LAB Inc. 2249
Esaote North America, Inc. 1541
iData Research Inc. 1963
SMTP Technology Co Ltd. 2329

Whole Body CT
Accel LAB Inc. 2249
iData Research Inc. 1963

X-ray
Accel LAB Inc. 2249
Barrier Technologies, LLC 2304
EOS Imaging 2314
FUJIFILM Medical Systems USA, Inc. 1962
iData Research Inc. 1963
Protech Medical, inc. 1428
Raylytic GmbH 1461

Computer Hardware/Software
FundamentalVR 2649
OSSimTech 1661
Sectra NA Inc. 1358

Contract Research Organization
Accel LAB Inc. 2249
CPI Global CRO 1263
Musculoskeletal Clinical Regulatory Advisers, LLC 2308
N2 Biomedical 1929
Seed Biotech, Inc. 2441

Marketing Services
Ortho Sales Partners 1135
ORTHOWORLD Inc. 2559
OSSimTech 1661

CLINICAL SERVICES
Intraoperative Neurophysiologic Monitoring
Accurate Neuromonitoring 1152
NuVasive 2301
NuVasive 2603
NuVasive 2605
University Neuro, LLC 1359

CONSULTING SERVICES
Computer Hardware/Software
FundamentalVR 2649
OSSimTech 1661
Sectra NA Inc. 1358

EXHIBITORS BY PRODUCT CATEGORY

EXHIBITORS BY PRODUCT CATEGORY

EDUCATION
Allied Health Education
Artery Studios, Inc. 1659
Brazilian Spine Society 923
NeuroPoint Alliance 1858
NSpine 1024
OSSimTech 1661

Education—Patient and Physician
Artery Studios, Inc. 1659
BRAMISS - Brazilian Minimally Invasive Spine Surgery Society 1030
Bremer Group Company, (The) 1422
Innovasis, Inc. 1909
K2M 2001
Lowery Enterprises, LLC 2622
Medacta International 2323
Nadia International, Inc. 1617
NeuroPoint Alliance 1858
NuVasive 2301
NuVasive 2603
NuVasive 2605
OSSimTech 1661
PHACON GmbH 2625
Sawbones/Pacific Research Labs 2501
Seed Biotech, Inc. 2441
Stryker 1401

Patient Education
Artery Studios, Inc. 1659
Lowery Enterprises, LLC 2622
Nadia International, Inc. 1617
NuVasive 2301
NuVasive 2603
NuVasive 2605
Nuvestra 1760
Sawbones/Pacific Research Labs 2501
Stryker 1401

Physician Education
Artery Studios, Inc. 1659
AxioMed 2429
BRAMISS - Brazilian Minimally Invasive Spine Surgery Society 1030
Brazilian Spine Society 923
Choice Spine 1739
FundamentalVR 2649
Globus Medical 1411
GS Medical 2002
joimax, Inc. 1529
Lowery Enterprises, LLC 2622
Markman Targeting 1257
Medacta International 2323
NeuroPoint Alliance 1858
NSpine 1024
NuVasive 2301
NuVasive 2603
NuVasive 2605
Nuvestra 1760
Orthofox, Inc. 1723
ORTHOWORLD Inc. 2559
OSSimTech 1661
Oxford Performance Materials, Inc. 1354
PHACON GmbH 2625
Sawbones/Pacific Research Labs 2501
SPINENDOS GmbH 1960
Stryker 1401
Zimmer Biomet 1713
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<thead>
<tr>
<th>Product Category</th>
<th>Exhibitors</th>
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<tbody>
<tr>
<td><strong>Procedural Education</strong></td>
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<tr>
<td>Alphatec Spine, Inc</td>
<td>1423</td>
</tr>
<tr>
<td>Artery Studios, Inc</td>
<td>1659</td>
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<tr>
<td>AxioMed</td>
<td>2429</td>
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<tr>
<td>Choice Spine</td>
<td>1739</td>
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<td>FundamentalVR</td>
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### EXHIBITORS BY PRODUCT CATEGORY

#### Cervical Plates
- **3DSYSTEMS**: 2509
- **Advantage Manufacturing Technologies, Inc.**: 2549
- **Aegis Spine, Inc.**: 2423
- **Alphatec Spine, Inc.**: 1423
- **Astura Medical**: 1149
- **AutoMed**: 2012
- **Avalign Technologies**: 1740
- **AxioMed**: 2269
- **Back 2 Basics Direct**: 2527
- **BAUI Biotech Co., Ltd.**: 1959
- **C & A Tool Engineering, Inc.**: 1949
- **Captive Spine**: 1649
- **Centinel Spine**: 2123
- **Choice Spine**: 1739
- **Clariance**: 1341
- **CoreLink**: 2038
- **Cretex Medical**: 1654
- **CTL Medical Corporation**: 2159
- **Daewoong**: 2259
- **DePuy Synthes**: 1701
- **DSM Biomedical**: 2349
- **Fountainhead Investment Partners**: 2341
- **Globus Medical**: 1411
- **GS Medical**: 2002
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- **iData Research Inc.**: 1963
- **Inion, Inc.**: 1639
- **InTech Medical**: 1435
- **Intelligent Implant Systems**: 1905
- **JALEX Medical**: 1939
- **K2M**: 2001
- **LifeWave**: 2111
- **Life Spine**: 1213
- **Medacta International**: 2323
- **Medfix International**: 2300
- **Meditec Spine, LLC**: 1757
- **Medyssey USA**: 1726
- **Micro Machine Company**: 2154
- **MiRus**: 2449
- **N2 Biomedical**: 1929
- **Nanobridging Molecules**: 1259
- **Neurostructures, Inc.**: 1655
- **Nexus Spine**: 1235
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- **Orchid Orthopedic Solutions Center**: 1365
- **Orthofix, Inc.**: 1723
- **Orthopaedic Solutions Center**: 1354
- **OrthoMax Surgical**: 2026
- **Orthromed**: 1911
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- **PARADIGM BioDevices, Inc.**: 1931
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## EXHIBITORS BY PRODUCT CATEGORY

| JALEX Medical               | 1939 |
| LH Medical                  | 2211 |
| N2 Biomedical               | 1929 |
| NN Life Sciences            | 2551 |
| Orthofix, Inc.              | 1723 |
| Seabrook Medical            | 2026 |
| SIGNUS.                     | 1623 |
| Spine Wave                  | 1627 |
| Structure Medical           | 2056 |
| Tegra Medical               | 2348 |
| Triangle                    | 2515 |
| Zimmer Biomet               | 1713 |
| Staples                     |      |
| iData Research Inc.         | 1963 |
| K2M                         | 2001 |
| MEDICREA USA Corp.          | 1823 |
| N2 Biomedical               | 1929 |
| Nano Bridging Molecules     | 1259 |
| Norman Noble, Inc.          | 1755 |
| Orthopaedic Solutions Center|      |
| Orthopaedic Solutions Center|      |
| Seabrook Medical            | 2026 |
| Stryker                     | 1401 |
| Tegra Medical               | 2348 |
| Tyber Medical, LLC          | 1106 |
| Weigao Orthopaedic Device Co., Ltd. | 2505 |
| Stents                      |      |
| Crexet Medical              | 1654 |
| iData Research Inc.         | 1963 |
| IZI Medical                 | 1759 |
| N2 Biomedical               | 1929 |
| Nano Bridging Molecules     | 1259 |
| Norman Noble, Inc.          | 1755 |
| Seabrook Medical            | 2026 |
| Vertebral Body Replacement Systems |    |
| Aesculap Implant Systems    | 1101 |
| Alphatec Spine, Inc.        | 1423 |
| Back 2 Basics Direct        | 2527 |
| Camber Spine Technologies   | 1241 |
| Choice Spine                | 1739 |
| DePuy Synthes                | 1701 |
| Globus Medical              | 1411 |
| icotec ag.                  | 1126 |
| iData Research Inc.         | 1963 |
| Innovasis, Inc.             | 1909 |
| InTech Medical              | 1435 |
| JALEX Medical               | 1939 |
| Medfix International, LLC   | 2300 |
| MEDICREA USA Corp.          | 1823 |
| N2 Biomedical               | 1929 |
| NuVasive.                   | 2301 |
| NuVasive.                   | 2603 |
| NuVasive.                   | 2605 |
| Orthofix, Inc.              | 1723 |
| Orthopaedic Solutions Center|      |
| Orthopaedic Solutions Center|      |
| Orthopaedic Solutions Center|      |
| Oxford Performance Materials| 1854 |
| Advanced Coatings & Components |    |
| Autocam Medical             | 2012 |
| Biedermann Motech           | 2435 |
| Danco Anodizing             | 1935 |
| DOT America, Inc.           | 1560 |
| DSM Biomedical              | 2349 |

## MANUFACTURING

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## Biomedical Textiles

| DSIM Biomedical               | 2349 |
| iData Research Inc.           | 1963 |

## Casting

| Avalign Technologies          | 1740 |
| BPA Biotech                   | 1959 |
| BPB MEDICA                    | 2141 |
| C & A Tool Engineering, Inc.  | 1949 |
| Crexet Medical                | 1654 |
| CTE Solutions                 | 1736 |
| DSM Biomedical                | 2349 |
| ECA Medical Instruments       | 2315 |
| G & A Technology & Manufacturing Service | 1762 |
| InTech Medical                | 1435 |
| Jade Precision Medical        |      |
| JALEX Medical                 | 1939 |
| Lowell, Inc.                  | 1927 |
| Marox Corporation             | 1563 |
| Nexst Spine                   | 1134 |
| NN Life Sciences              | 2551 |
| Seabrook Medical              | 2026 |
| SS White Technologies, Inc/ Shukla Medical | 1327 |
| Structure Medical             | 2056 |
| Tegra Medical                 | 2348 |
| Weigao Orthopaedic Device Co., Ltd. | 2505 |

## Component Parts

| Acer Precision                | 2648 |
| Autocam Medical               | 2012 |
| Avalign Technologies          | 1740 |
| BPB MEDICA                    | 2141 |
| C & A Tool Engineering, Inc.  | 1949 |
| Crexet Medical                | 1654 |
| CTE Solutions                 | 1736 |
| DSM Biomedical                | 2349 |
| ECA Medical Instruments       | 2315 |
| G & A Technology & Manufacturing Service | 1762 |
| InTech Medical                | 1435 |
| Jade Precision Medical        |      |
| JALEX Medical                 | 1939 |
| Lowell, Inc.                  | 1927 |
| Marox Corporation             | 1563 |
| Nexst Spine                   | 1134 |
| NN Life Sciences              | 2551 |
| Seabrook Medical              | 2026 |
| SSI White Technologies, Inc/ Shukla Medical | 1327 |
| Structure Medical             | 2056 |
| Tegra Medical                 | 2348 |
| Weigao Orthopaedic Device Co., Ltd. | 2505 |

## Contract Manufacturers

| 3DSYSTEMS                     | 2509 |
| Acer Precision                | 2648 |

## Custom Machined Parts

<p>| Acer Precision                | 2648 |
| Advantage Manufacturing       | 2549 |
| APS Materials                 | 2340 |
| Autocam Medical               | 2012 |
| Avalign Technologies          | 1740 |
| BPB MEDICA                    | 2141 |
| Bremer Group Company, (The)   | 1422 |
| C &amp; A Tool Engineering, Inc.  | 1949 |
| CTE Solutions                 | 1736 |
| Danco Anodizing               | 1935 |
| DSM Biomedical                | 2349 |
| Empirical Testing             | 1643 |
| Fountainhead Investment Partners | 2341 |
| G21                           | 2334 |
| Gauthier Biomedical, Inc.     | 2109 |
| GENOSS                        | 2312 |
| G &amp; A Technology &amp; Manufacturing Service | 1762 |
| InTech Medical                | 1435 |
| JALEX Medical                 | 1939 |
| Janco, Inc.                   | 1615 |
| Kyocera SGS Precision Tool    | 2551 |
| Machine &amp; Engineering         | 1712 |
| Micro Machine Company         | 2154 |
| N &amp; N Life Sciences           | 2551 |
| Norman Noble, Inc.            | 1755 |
| Novid Surgical, LLC           | 1426 |
| Oerlikon AM US Inc.           | 2558 |
| Orchard Orthopaedic Solutions | 1635 |
| Orthopaedic Solutions Center  |      |
| Orthopaedic Solutions Center  |      |
| Pacific Instruments, Inc.     | 2227 |
| Phillips Precision Medical, Inc. | 1412 |
| Precision ADM                 | 1861 |
| Ranfac Corp.                  | 1554 |
| Seabrook Medical              | 2026 |
| Seed Biotech, Inc.            | 2441 |
| SIGNUS.                       | 1623 |
| Structure Medical             | 2056 |
| Tecommet                      | 2028 |
| TECRES SPA                    | 2049 |
| Tegra Medical                 | 2348 |
| Triangle                      | 2515 |
| Weigao Orthopaedic Device Co., Ltd. | 2505 |</p>
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- iData Research Inc. ................................. 1740
- Nano Bridging Molecules .......................... 2012
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STABILIZERS/ STABILIZATION
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CTL Medical Corporation 2159
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ECA Medical Instruments 2315
Fountainhead Investment
Partners ................. 2341
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Systems ............... 1905
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Spineart ................. 1731
SpineVision ............... 1311
Stryker ....................... 1401
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Co., Ltd. .................. 2505
Xenco Medical, LLC ..... 2039
Zavation .................. 2261
Zimmer Biomet ...... 1713
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<th>EXHIBITORS BY PRODUCT CATEGORY</th>
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<td>DiFusion Technologies, Inc.</td>
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## EXHIBITORS BY PRODUCT CATEGORY

| Wenzel Spine | 1438 |
| Zavation | 2261 |
| Zimmer Biomet | 1713 |
| Z-Medical Gmbh + Co.KG1756 |  |

### Spinal Clip System

- **Alphatec Spine, Inc.** 1423
- **Globus Medical.** 1411
- **Implanet.** 2024
- **Nano Bridging Molecules** 1259
- **NN Life Sciences** 2551
- **Orthopaedic Solutions Center**
  - **-OSC.** 1854
- **Tegra Medical.** 2348
- **Alphatec Spine, Inc.** 1423
- **BPB MEDICA.** 2141
- **Bremer Group Company, (The).** 1422
- **DJO Global.** 2008
- **Globus Medical.** 1411
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- **Inion, Inc.** 1639
- **Medfix International, LLC** 2300
- **Nano Bridging Molecules** 1259
- **NN Life Sciences** 2551
- **NuTech Spine and Biologics.** 1148
- **NuVasive.** 2301
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- **NuVasive.** 2605
- **Precision Spine Inc.** 1835
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- **Wenzel Spine.** 1438
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- **Alphatec Spine, Inc.** 1423
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- **Medacta International.** 2323
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- **Innovative Sterilization Technologies, LLC** 1362
- **Xencos Medical, LLC** 2039

### Facility Planning

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- **Accel LAB Inc.** 2249
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- **Alphatec Spine, Inc.** 1423
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- **CHANGZHOU XIETONG INDUSTRIES CO., LTD.** 1860
- **Cretex Medical.** 1654
- **DePuy Synthes.** 1701
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- **Feuling Surgical Instruments Inc.** 1323
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- **Life Instrument Corporation.** 1700
- **Medfix International, LLC** 2300
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- **Orthomed, Inc.** 1142
- **Orthopaedic Solutions Center -OSC.** 1854
- **Pacific Instruments, Inc.** 2227
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- **SPINENDOS GmbH.** 1960
- **Stryker.** 1401

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- **Hensler Surgical Products, LLC.** 1454
- **Joimax, Inc.** 1529
- **Koros USA, Inc.** 1941
- **Kyocera SGS Precision Tool - Medical Division.** 2254
- **Lee Medical** 1255
- **LH Medical.** 2211
- **MedActus.** 2000
- **NuVasive.** 2301
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- **Orthopaedic Solutions Center -OSC.** 1854
- **Orthopedic Renovation Technologies.** 1162
- **PacMed, Inc.** 2227
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- **Seabrook Medical.** 2026
- **SIGNUS.** 1623
- **SS White Technologies Inc/Shukla Medical.** 1327
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- **Tegra Medical.** 2348
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- **Autocam Medical.** 2012
- **Avalign Technologies.** 1740
- **CHANGZHOU XIETONG INDUSTRIES CO., LTD.** 1860
- **DePuy Synthes.** 1701
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- **Medacta International.** 2323
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- **NuVasive.** 2603
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- **Pacific Instruments, Inc.** 2227
- **Pan Medical.** 1841
- **SIGNUS.** 1623
- **SPINENDOS GmbH.** 1960
- **Stryker.** 1401

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- **7D Surgical.** 1249
- **Alphatec Spine, Inc.** 1423
- **Anchor Orthopedics.** 1363
- **Arcamed, LLC.** 2034
- **Avalign Technologies.** 1740
- **BAU Biotech Co., Ltd.** 1959
- **BOSS Instruments Ltd.** 1301
- **BPB MEDICA.** 2141
- **Brainlab.** 2401
- **Buxton BioMedical Inc.** 2022
- **Captive Spine.** 1649
- **CHANGZHOU XIETONG INDUSTRIES CO., LTD.** 1860
- **Cretex Medical.** 1654
- **ECA Medical Instruments 2135
- **Hensler Surgical Products, LLC.** 1454
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- **K2M.** 2001
- **Kirwan Surgical Products Inc.** 2000
- **Koros USA, Inc.** 1941
- **Kyocera SGS Precision Tool - Medical Division.** 2254
- **Lee Medical** 1255
- **LH Medical.** 2211
- **Life Instrument Corporation.** 1700
- **Mediflex International, LLC** 2300
- **Mediflex Surgical Products.** 2463
- **Meditech Spine, LLC.** 1757
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- **NN Life Sciences** 2551
- **NuVasive.** 2301
- **NuVasive.** 2603
- **NuVasive.** 2605
- **Orthomed, Inc.** 1142
- **Orthopaedic Solutions Center -OSC.** 1854
- **Orthopedic Renovation Technologies.** 1162
- **Pacific Instruments, Inc.** 2227
- **RIWoSpine, A Richard Wolf Company.** 1223
- **SBH.** 1951
- **Seabrook Medical.** 2026
- **SIGNUS.** 1623
- **SpineGuard.** 1335
- **SPINENDOS GmbH.** 1960
- **SS White Technologies Inc/Shukla Medical.** 1327
- **Structure Medical.** 2056
- **SurGenTec.** 1110
- **TeDan Surgical Innovations, LLC.** 1115
- **Tegra Medical.** 2348
- **Thompson Surgical Instruments Inc.** 1414
<table>
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<th>EXHIBITORS BY PRODUCT CATEGORY</th>
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</table>

**Triumph.**

| Weigao Orthopaedic Device Co., Ltd. | 2505 |
| Gammex Medical | 2241 |

**Headlights/Loupes/Magnification Glasses**

| Barrier Technologies, LLC | 2304 |
| BFV, Inc. | 1355 |
| Designs for Vision, Inc. | 1404 |
| Eclipse Loupes and Products | 2456 |
| Enova Illumination | 1605 |
| Rose Micro Solutions LLC | 1748 |
| TeDan Surgical Innovations, LLC | 1115 |
| ZEISS | 1714 |

**Minimally Invasive Surgery Instruments**

| Alphatec Spine, Inc. | 1423 |
| Anchor Orthopedics | 1363 |
| AXIOMED | 2429 |
| BAUI Biotech Co., Ltd. | 1959 |
| Biedermann Motech | 2435 |
| BOSS Instruments Ltd | 1301 |
| BPB MEDICA | 2141 |
| CHANGZHOU XIETONG INDUSTRIES CO., LTD. | 1860 |
| DePuy Synthes | 1701 |
| icotec ag | 1126 |
| iData Research Inc. | 1963 |
| Joimax, Inc. | 1529 |
| Lumenis LTD | 1154 |
| Marksman Targeting | 1257 |
| Medacta International | 2323 |
| Mediflex Surgical Products | 2463 |
| Nextx Spine | 1134 |
| NN Life Sciences | 2551 |
| NuVasive | 2301 |
| NuVasive | 2063 |
| NuVasive | 2605 |
| Pan Medical | 1841 |
| Precision Spine Inc | 1835 |
| Relevant Medsystems, Inc. | 2355 |
| SIGNUS | 1623 |
| Spineart | 1731 |
| SPINENDOS GmbH | 1960 |
| Spineology | 1901 |
| Structure Medical | 2056 |
| Synaptive Medical | 1138 |
| Tecomet | 2028 |
| Tegra Medical | 2348 |
| Vertos Medical, Inc. | 1561 |

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| Aesculap Implant Systems | 1101 |
| Alphatec Spine, Inc. | 1423 |
| Applied Medical Technology, Inc. AMT | 2539 |

**Aurora Spine.**

| Avalign Technologies | 1740 |
| BOSS Instruments Ltd. | 1301 |
| CHANGZHOU XIETONG INDUSTRIES CO., LTD. | 1860 |
| DePuy Synthes | 1701 |
| K2M | 2001 |
| Kirwan Surgical Products Inc. | 2000 |
| Medacta International | 2323 |
| Mediflex Surgical Products | 2463 |
| NN Life Sciences | 2551 |
| NuVasive | 2301 |
| NuVasive | 2603 |
| NuVasive | 2605 |
| Precision Spine Inc. | 1835 |
| SIGNUS | 1623 |
| Structure Medical | 2056 |
| Stryker | 1401 |
| Tecomet | 2028 |
| Thompson Surgical Instruments Inc. | 1414 |

**Suction**

| Applied Medical Technology, Inc. AMT | 2539 |
| BOSS Instruments Ltd. | 1301 |
| Flagship Surgical, LLC | 1750 |
| NeuroEnterprises.com | 2054 |
| Structure Medical | 2056 |
| Synaptive Medical | 1138 |

**Surgical Illumination**

| 7D Surgical | 1249 |
| Barrier Technologies, LLC | 2304 |
| BFV, Inc. | 1355 |
| BOSS Instruments Ltd | 1301 |
| CHANGZHOU XIETONG INDUSTRIES CO., LTD. | 1860 |
| Eclipse Loupes and Products | 2456 |
| Enova Illumination | 1605 |
| LumitexMD | 2014 |
| Medacta International | 2323 |
| NuVasive | 2301 |
| NuVasive | 2603 |
| NuVasive | 2605 |
| Rose Micro Solutions LLC | 1748 |
| SBH | 1951 |
| Synaptive Medical | 1138 |
| Thompson Surgical Instruments Inc | 1414 |

**Surgical Microscopes**

| Barrier Technologies, LLC. | 2304 |
| Eclipse Loupes and Products | 2456 |
| iData Research Inc. | 1963 |
| Leica Microsystems | 1400 |
| Rose Micro Solutions LLC | 1748 |
| Synaptive Medical | 1138 |
| ZEISS | 1714 |

**Wound Management**

| Aziyo Biologics, Inc. | 1158 |
| DePuy Synthes | 1701 |
| iData Research Inc. | 1963 |
| KCI | 2643 |

**Analytical Chemical Testing**

| Techmetals | 1555 |

**Bio Medical Testing Equipment**

| Biedermann Motech | 2435 |
| JTL America | 2042 |

**Equipment Testing**

| Dino-Lite Scopes | 1763 |
| JTL America | 2042 |

**Lab Testing Services**

| Accel LAB Inc. | 2249 |
| JTL America | 2042 |
| puracon GmbH | 1754 |
| Seed Biotech, Inc. | 2441 |

**Mechanical Testing**

| Accel LAB Inc. | 2249 |
| Empirical Testing | 1643 |
| JTL America | 2042 |
| Seabrook Medical | 2026 |

**Microbiological Testing**

| Dino-Lite Scopes | 1763 |
| SygenX, Inc. | 2162 |

**Testing Solutions**

| Alphatec Spine, Inc. | 1423 |
| Barrier Technologies, LLC | 2304 |
| BPB MEDICA | 2141 |
| DePuy Synthes | 1701 |
| G21 | 2334 |
| Globus Medical | 1411 |
| iData Research Inc. | 1963 |
| IZI Medical | 1759 |
| Macom Instrumental Cirurgico Industria Ltda | 1459 |
| Pan Medical | 1841 |
| SIGNUS | 1623 |
| Solco Biomedical Co., Ltd. | 2624 |
| Structure Medical | 2056 |
| Stryker | 1401 |
| TECRES SPA | 2049 |
| Tegra Medical | 2348 |
| Zavation | 2261 |

**Wound Management**

| Amniox Medical | 2523 |
| Aziyo Biologics, Inc. | 1158 |
| DePuy Synthes | 1701 |
| Fountainhead Investment Partners | 2341 |
| iData Research Inc. | 1963 |
| KCI | 2643 |
| Organogenesis Surgical & Sports Medicine | 1660 |

**Dresses**

| iData Research Inc. | 1963 |
| Seed Biotech, Inc. | 2441 |

**Wound Closure**

| Aziyo Biologics, Inc. | 1158 |
| DePuy Synthes | 1701 |
| Fountainhead Investment Partners | 2341 |
| iData Research Inc. | 1963 |
| KCI | 2643 |
| Organogenesis Surgical & Sports Medicine | 1660 |
Administration and Development Council

The Administration and Development Council ensures that NASS’ internal governance processes follow best practice standards for associations, including processes which preserve NASS leadership’s role as stewards of the public trust and the trust of NASS membership, ensuring legal and ethical integrity, safekeeping ongoing revenue generation and financial viability, board continuity, an effective governance process, and compliance with the corporate charter and bylaws. Committees overseen by this council include but are not limited to: Governance Relations, Leadership Development, Nominating, Professional Conduct & Ethics Committee (PCEC), the Professional Compliance Panel (PCP), the Conflict of Interest Review Committee (COIRP), the Committee on Ethics and Professionalism, Membership, Finance, Audit, Investment, Spine Foundation, Section Development and Website and Digital Platform.

Advocacy Council

The Advocacy Council acts as the principal conduit between NASS members, Congress and Administration officials for the purposes of influencing policymaking in Washington, DC. The Advocacy Council oversees operations in three main areas including: fostering relationships on Capitol Hill, educating and mobilizing grassroots advocates, and forging political alliances in support of NASS’ legislative agenda. The Advocacy Council also oversees NASS’ political action committee, SpinePAC, and approves political contributions to congressional candidates who champion issues that are important to spine specialists.

Education Council

The Education Council oversees all educational programming. The Annual Meeting attracts an international audience by offering symposia featuring world-renowned experts speaking on surgical, medical and interventional care; paper presentations announcing results of research on new techniques, treatments, devices and more; special interest group discussions; a technical exhibition; instructional courses and technique workshops; specialty tracks for allied health providers and other learning opportunities. Hands-on courses devoted to members’ needs focus on interventional injection techniques, surgical techniques and our allied health constituents. We continue to expand our online offerings each year. In addition to the Annual Meeting, NASS’ Education programs offer top-quality, relevant continuing medical education throughout the year.

Health Policy Council

The Health Policy Council promotes sound health care policies that ensure patient access to quality spine care. NASS works collaboratively with medical specialty societies, federal agencies and insurers to develop coding, coverage and reimbursement policy for spine care. NASS also monitors the practice environment to be a source of information to members and others about the state of spine care practice.

Research Council

The Research Council promotes high quality spine care and offers numerous clinical and research resources to spine care providers and their patients, including clinical guidelines, appropriate use criteria, performance measurement information, patient safety information and tools, and more. The Research Grant and Fellowship Program supports the best of spine research applications every year and has provided more than $3.8 million in research funding to date.
Specialty Education and Research Center
NASS opened the state-of-the-art Specialty Education and Research Center (SERC) outside Chicago in the spring of 2007. SERC houses the NASS headquarters, a 12 station bio-skills lab, classroom and center with videoconferencing and webcasting capabilities. Members receive special discounted registration fees for all NASS-sponsored educational programs.

National Association of Spine Specialists
To pursue its advocacy agenda, NASS established the National Association of Spine Specialists, a trade that unites spine care providers and patients in the fight for sound health policy. Through awareness campaigns, legislative updates, action alerts, events and partnerships with other medical specialties, NASS Advocacy helps members understand the issues shaping health care policy and provides opportunities for members to advocate for change at the state and federal levels.

Education Publishing
The Education Publishing program is responsible for several periodicals, publications, online resources, social media content, and public affairs and media relations activities. NASS members enjoy free or discounted access to everything produced under the NASS imprint, including:

- *The Spine Journal*, the official scientific journal of NASS, is an international, multidisciplinary journal that publishes original, peer-reviewed articles on research and treatment related to the spine and spine care, including basic science and clinical investigations. Published online and printed monthly by Elsevier, Inc., *The Spine Journal* holds the highest Impact Factor among spine publications in the world. NASS adheres to a policy of editorial independence for the journal’s editorial board, which follows guidelines of the International Committee of Medical Journal Editors, Committee on Publication Ethics and other best editorial practices.

- *SpineLine*, the clinical and news magazine of NASS, features relevant cutting-edge invited reviews along with pertinent discussions of controversial cases, interesting images and other clinical content. *SpineLine* examines current concepts in spine care, medical socioeconomics, ethics, advocacy, regulatory and reimbursement issues, and provides information about NASS’ programs and activities.

- NASS publishes guidelines, reference materials and other resources developed by leading spine experts. These include *Evidence-Based Clinical Guidelines*, *Common Coding Scenarios for Comprehensive Spine Care*, *Compendium of Outcome Instruments for Assessment and Research of Spinal Disorders* and other titles. NASS also collaborates with AAOS to produce spine-specific resources such as *Orthopaedic Knowledge Update: Spine*, *Instructional Course Lectures Spine* and *Advanced Reconstruction: Spine*.

- In addition to providing resources to members and spine providers, NASS offers comprehensive patient education information developed by physician experts. Credible, unbiased information on spine conditions, treatments, procedures, exercise and wellness is available online at www.KnowYourBack.org and in print.

- Public affairs efforts support NASS’ mission through web site content, promotional campaigns, and other print, electronic or broadcast opportunities. NASS also serves as a resource to the media on spine care topics, advocacy initiatives and related issues in the news.
In the late 1970s, spine care pioneers determined that a scientific society including all members of the spine community regardless of specialty or locale was essential to the advancement of care, and in 1984 this vision was realized through the creation of the North American Spine Society (NASS).

More than 30 years later, these same ideas inspire a new generation of members as NASS becomes the premier multidisciplinary medical organization representing the field of spine care. With more than 9,000 members worldwide, NASS provides our members with many professional opportunities, events and initiatives designed to advance their careers, support the field, and define the future of spine care.

NASS members receive access to critical resources for their careers in the areas of education, research, health policy, reimbursement, practice management, networking, career development and philanthropy. Visit the membership booth in the main lobby for more information about membership, to renew your membership for 2019, or to apply to become a member. You can also learn more or apply online at www.spine.org.

**CATEGORIES OF MEMBERSHIP**

**Active** members are Board-certified MDs and DOs, PhDs, or international equivalents (as determined by the Board of Directors) who devote at least 50% of their professional activities to spine in the areas of clinical care of patients, academic research, teaching or patient advocacy.

**ANNUAL DUES:** $655
Includes print and online subscriptions to *The Spine Journal (TSJ)* and *SpineLine*

**Associate** members are Board-eligible MDs and DOs or individuals who have completed a substantially equivalent program (as determined by the Board of Directors) who devote at least 50% of their professional activities to spine in the areas of clinical care of patients, academic research, teaching or patient advocacy.

**ANNUAL DUES:** $655
Includes print and online subscriptions to *TSJ* and *SpineLine*

**Affiliate** members are physicians or PhDs who devote less than 50% of their professional activities to spine, nurse practitioners, registered nurses, physician assistants, chiropractors, physical therapists, researchers, practice managers, coders, technical professionals or other health care professionals with an interest in spine in the areas of clinical care of patients, academic research, teaching or patient advocacy.

**ANNUAL DUES:** $340
Includes print and online subscriptions to *TSJ* and *SpineLine*

**International** members are health care professionals not residing in the United States with an interest in spine in the areas of clinical care of patients, academic research, teaching or patient advocacy.

**ANNUAL DUES:** $285
Includes print and online subscription to *TSJ* and online subscription to *SpineLine*

**In-training** members are physicians, medical students, graduate students or other individuals of the medical profession, basic sciences or allied services who are enrolled in a full-time, accredited program related to spine care.

**ANNUAL DUES:** Complimentary
Includes online subscriptions to *TSJ* and *SpineLine*

**Honorary** membership is bestowed by the Board of Directors to recognized leaders in the field of spine care.

**ANNUAL DUES:** Complimentary
Includes online subscriptions to *TSJ* and *SpineLine*

**Emeritus** members are individuals who have been Active members for at least fifteen years and have retired from the practice of medicine.

**ANNUAL DUES:** Complimentary
Includes online and discounted print subscriptions to *TSJ* and *SpineLine*
MEMBERSHIP MILESTONES

Congratulations to the following members who, according to our records, reached their 10-year, 20-year or 30-year anniversary with NASS in 2018! Members attending the meeting who are included on these lists are encouraged to stop by the Membership Services booth in the lobby to receive a special anniversary lapel pin and ribbon for your badge.

30-Year Anniversaries

Gunnar Andersson, MD, PhD—Scottsdale, AZ
Gail Benson, MD—Sioux Falls, SD
William Boulten, MD—Waukee, IA
Douglas Bradley, MD—Union, NJ
Courtney Brown, MD—Golden, CO
Douglas Brown, MD—Monroe, LA
Laurence Cohen, MD—Richmond, MA
Howard Cotler, MD—Houston, TX
A. Edward Dean, MD—Shreveport, LA
Ronald Donelson, MD, MS—Hanover, NH
Steven Dorsky, MD—Chatham, NJ
Robert Fielden, MD, FRCS—Toronto, ON
Kevin Gill, MD—Dallas, TX
James Gmeiner, MD—Steamboat Springs, CO
John Greco, MD—Salisbury, MD
H. Austin Grimes, MD
Stephen Grubb, MD—Christiansburg, VA
Brad Hall, MD—San Antonio, TX
James Harms, MD—Urbana, IL
William Harris, MD—Norman, OK
Jonathan Horne, MD—Salt Lake City, UT
Roger Jackson, MD—North Kansas City, MO
Reginald Knight, MD, MS—Cooperstown, NY
David Kraus, MD—Pittsburgh, PA
John Larkin, MD—White Bear Lake, MN
David Lehrman, MD—Miami Beach, FL
Vito Loguidice, MD—Bethlehem, PA
Mark Lorenz, MD—Hinsdale, IL
Robert Lowe, MD—Huntington, WV
James Maddox, MD—Dothan, AL
James Mayoza, MD—Tulsa, OK
Thomas Mclndoe, MD—Apple Valley, CA
Gilbert Meadows, MD—San Antonio, TX
David Mino, MD, MBA—King of Prussia, PA
Morris Mitsunaga, MD—Honolulu, HI
Wade Rademacher, MD—Carmel, IN
Joseph Ray, MD—Saraland, AL
Bruce Razza, MD—Metairie, LA
Glenn Rechtine, MD—Pittsford, NY
Seyed Rezaian, MD, PhD, FRCS
Walter Sassard, MD—Houston, TX
Gary Speck, MB, BS, FRACS—Albert Park, Australia
Jeffery Stambough, MD, MBA—Cincinnati, OH
Thomas Stonecipher, MD
Aubrey Swartz, MD—Oakland, CA
Rudolph Taddeonio, MD—White Plains, NY
William Watters, MD, MS—Houston, TX
Franklin Wong, MD—Portland, OR

20-Year Anniversaries

Gregory Alvine, MD—Sioux Falls, SD
Ali Araghi, DO—Phoenix, AZ
Paul Arnold, MD—Kansas City, KS
C. William Bacon, MD—Provo, UT
Stewart Bailey, MD—London, ON
Tarcisio Barros Filho, MD, PhD—Sao Paulo, Brazil
John Bendo, MD—New York, NY
Jeffrey Bert, MD—Coos Bay, OR
Benjamin Blair, MD—Pocatello, ID
Kevin Booth, MD—Pleasanton, CA
Ross Bremer, CPO/LPO—Jacksonville, FL
Jason Brodkey, MD—Ann Arbor, MI
Rocco Calderone, MD—Camarillo, CA
Andrew Cappuccino, MD—Lockport, NY
John Carbone, MD—Baltimore, MD
Gregory Chapis, MD—Pottstown, PA
Robert Cheney, MD—Albany, NY
Kazuhiro Chiba, MD, PhD—Saitama, Japan
Wen-Hsiang Chou, MD—Taipei, Taiwan
Keolanui Chun, MD—Riverside, CA
David Cicercchia, MD—East Greenwich, RI
Douglas Clark, MD—Tempe, AZ
John Clifford, MD—Baton Rouge, LA
William Cohen, MD—Yankton, SD
Brian Cole, MD—Englewood, NJ
Ernest Cope, MD—Sellersville, PA
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Mark Gardon, MD—Green Bay, WI
Douglas Geiger, MD—Ypsiilanti, MI
Federico Girardi, MD—New York, NY
Paul Glazer, MD—Chesnut Hill, MA
M. Michael Glover, MD—Flagstaff, AZ
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Greg Gurwitz, MD—San Antonio, TX
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Perry Haney, MD—Lone Tree, CO
Kenneth Heiferman, MD—River Forest, IL
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Lee Hieb, MD—Logan, IA
Michael Hoffman, MD, JD—Encino, CA
Brian Holmes, MD—Hagerstown, MD
James Hoski, MD—Asheville, NC
Deborah Hrstuch, MD—Rensselaer, NY
David Hubbell, MD—Cartersville, GA
Herman Hugenholz, MD, FRCS
Robert Jackson, MD—Kansas City, KS
Saied Jamshidi, MD—Oxon Hill, MD
Ken Jarolem, MD—Plantation, FL
G. Edward Jeffries, MD—Knoxville, TN
Louis Jenis, MD—Hopkinton, MA
Stephen Johnson, MD, FACS—South Weymouth, MA
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Sanjay Rao, MD—Fontana, CA
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John Ried, MD—New York, NY
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Michael Russell, MD—Tyler, TX
Patrick Ryan, MD—Montgomery, AL
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Juan Santiago-Palma, MD—Bradford, IL
Scott Schlesinger, MD—Little Rock, AR
Daniel Schmelka, MD—Grand Forks, ND
Jeffrey Segal, MD—Greensboro, NC
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Kourosh Shamliou, MD—Downey, CA
Ashish Shanbhag, MD—Spartanburg, SC
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Joseph Zuhosky, MD—Cornelius, NC
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Don Assmussen, MD—Long Lake, MN
Carlos Bagley, MD—Dallas, TX
Wahid Bagge, MD—Gulpever, PA
Stephan Becker, MD—Vienna, Austria
S. Samuel Bederman, MD, PhD, FRSCC—Orange, CA
Michael Bertram, MD—Cincinnati, OH
Jesse Bibe, MD—Hershey, PA
Rick Burg, MD—Allen, TX
Josip Buric, MD—Bologna, Italy
Douglas Burns, MD—Redmond, WA
Emmie Butterworth, RN, RNFA—Richmond, VA
J. Calhoun, MD—North Little Rock, AR
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Ira Goldstein, MD—Newark, NJ
Christopher Good, MD—Reston, VA
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Robert Gunzburg, MD, PhD—Berchem, Belgium
Artem Gushchka, MD, PhD—Moscow, Russia
John Hall, MD—Flagstaff, AZ
James Hanna, NP, MSN—Lockport, NY
Kenneth Hansraj, MD—Ploughkeepse, NY
Colin Harris, MD—Newark, NJ
Raymond Hines, PA-C—Frankfort, IL
Scott Horn, DO—Virginia Beach, VA
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At-Large Member

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Executive Director

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NASS thanks the following members for their valued time, effort and dedication in planning the educational content for this year’s annual meeting:

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President

Zoher Ghogawala, MD, FACS
Donna D. Ohnmeiss, PhD
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NASS thanks the following volunteers who spent numerous hours reviewing abstracts:

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1986-1987: J. Elmer Nix, MD

1987-1988: Vert Mooney, MD

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1997-1998: Steven R. Garfin, MD

1998-1999: Tom G. Mayer, MD

1999-2000: Neil Kahanovitz, MD

2000-2001: Volker K.H. Sonntag, MD

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2003-2004: Thomas J. Errico, MD

2004-2005: Jean-Jacques Abitbol, MD

2005-2006: Joel M. Press, MD

2006-2007: Richard D. Guyer, MD

2007-2008: Thomas Faciszewski, MD

2008-2009: Charles L. Branch Jr., MD

2009-2010: Ray M. Baker, MD

2010-2011: Gregory J. Przybilski, MD

2011-2012: Michael H. Heggeness, MD, PhD

2012-2013: Charles A. Mick, MD

2013-2014: William C. Watters III, MD

2014-2015: Heidi Prather, DO

2015-2016: Christopher M. Bono, MD

2016-2017: F. Todd Wetzel, MD

2017-2018: Daniel K. Resnick, MD, MS

2018-2019: Jeffrey C. Wang, MD

2019-2020: William J. Sullivan, MD

FUTURE MEETING LOCATIONS

15th Annual Evidence + Technology Spine Summit
February 13-16, 2019
Park City, UT

Summer Spine Meeting
July 31-August 3, 2019
Honolulu, Hawaii

34th Annual Meeting
September 25-28, 2019
Chicago, Illinois

35th Annual Meeting
October 7-10, 2020
San Diego, California

36th Annual Meeting
September 29-October 2, 2021
Boston, Massachusetts

37th Annual Meeting
October 12-15, 2022
Chicago, Illinois

38th Annual Meeting
October 18-21, 2023
Los Angeles, California

39th Annual Meeting
October 9-12, 2024
Boston, Massachusetts
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