American Society for Stereotactic and Functional Neurosurgery

2018 BIENNIAL MEETING

June 2-5, 2018
The Westin Denver Downtown

Jointly provided by the American Society for Stereotactic and Functional Neurosurgery and the Congress of Neurological Surgeons.
The American Society for Stereotactic and Functional Neurosurgery (ASSFN) serves as an affiliate joint section of the CNS and AANS, and remains deeply involved in a variety of educational, organizational, and advocacy activities on behalf of North American functional neurosurgeons.
WELCOME to the 2018 ASSFN BIENNIAL MEETING!

On behalf of the American Society for Stereotactic and Functional Neurosurgery, we are delighted to welcome you to the 2018 ASSFN Biennial Meeting at The Westin Denver Downtown in Denver, Colorado!

The scientific program committee has put together a dynamic education program covering the latest advances, newest research, and innovative technologies that are expanding the reach of our field. We're proud to welcome Honored Guest Dr. Philip A. Starr, the Dolores Cakebread Professor of Neurological Surgery, University of California, San Francisco, as well as keynote speaker Bryan Johnson, Founder and CEO of Kernel, OS Fund, and Braintree. They will be sharing their knowledge along with other illustrious faculty members throughout the meeting.

Three Special Courses kick off the meeting, featuring topics that help you stay on top of the rapidly changing business of health care, while cutting-edge Plenary Sessions showcase the latest clinical research on initiatives funded by the National Institutes of Health (NIH, BRAIN, and SPARC), Defense Advanced Research Projects Agency, the European Human Brain Project, and more. Parallel Sessions personalize your experience, allowing for a deeper dive into specialties. Don't miss our top-ranked Oral Presentations across a variety of sessions on Monday and Tuesday.

Make sure you take the time to explore the newest technology and tools on display from our industry partners in our Exhibit Hall. Take advantage of refreshment breaks as well as sponsored breakfast and luncheons for hands-on experiences with the latest and greatest technology in the field today.

The ASSFN Biennial Meeting is the place to engage in scientific exchange with your peers. From Sunday's Opening Reception to the Poster Session with Wine and Cheese through the ASSFN Awards Ceremony, enjoy the many opportunities we provide to connect with old friends and new colleagues across the field.

Thank you again for joining us at the 2018 AFFSN Biennial Meeting. We hope you enjoy all that the Mile High City has in store, from world-class dining to stunning views of the Rocky Mountains, your meeting experience is bound to be exceptional!

Emad N. Eskander, MD
ASSFN President

Aviva Aboisch, MD, PhD
Meeting Chair

Nader Pouratian, MD, PhD
Scientific Program Chair

R. Mark Richardson, MD, PhD
Scientific Program Committee
University of Pittsburgh
Medical Center
Pittsburgh, PA

Sameer A. Sheth, MD, PhD
Scientific Program Committee
Baylor College of Medicine
Houston, TX

Jennifer A. Sweet, MD
Scientific Program Committee
University Hospitals Case Medical Center
Cleveland, OH

Cristin Welle, PhD
Scientific Program Committee
University of Colorado, Denver
Aurora, CO

Steven Ojemann, MD
Local Arrangements Chair
University of Colorado
School of Medicine
Aurora, CO
HONORED GUEST

Philip A. Starr, MD, PhD
Dolores Cakebread Professor of Neurological Surgery
University of California, San Francisco
San Francisco, CA

Dr. Starr is the Dolores Cakebread Professor of Neurological Surgery at the University of California, San Francisco. He completed his neurosurgery residency at Brigham and Women's Hospital, followed by a fellowship in movement disorders surgery at Emory University with Drs. Roy Bakay and Mahlon Delong. He was recruited to UCSF in 1998 by Dr. Mitchel Berger to launch a clinical and research program in deep brain stimulation. His NIH-funded research addresses the effects of disordered basal ganglia output on cortical function in patients with movement disorders, mechanisms of therapeutic deep brain stimulation, and the use of totally implantable neural interfaces for long-term brain recording and feedback-controlled DBS.

With UCSF colleagues, he developed new surgical approaches to achieve accurate implantation of drugs and devices at deep brain targets using interventional MRI. Dr. Starr, along with UCSF neurologist Dr. Jill Ostrem, directs a multidisciplinary clinic for comprehensive care of patients with movement disorders. Dr. Starr directs a fellowship training program in functional neurosurgery and is Past President of the American Society for Stereotactic and Functional Neurosurgery.

FEATURED SPEAKER

Bryan Johnson
Founder, Kernal,
OS Fund, Braintree

Bryan Johnson is an entrepreneur and the founder of Kernel, OS Fund, and Braintree. Johnson created Kernel in 2016 to build advanced neural interfaces to treat disease and dysfunction, illuminate the mechanisms of intelligence, and extend cognition. Kernel is on a mission to dramatically increase our quality of life as healthy lifespans extend. Johnson believes that the future of humanity will be defined by the combination of human and artificial intelligence (HI + AI).

Johnson started OS Fund in 2014 to invest in inventors and scientists who are working toward breakthrough discoveries. In 2007, he founded online and mobile payment provider Braintree, which was acquired by PayPal in 2013. Johnson is an adventure enthusiast who loves mountains, volcanoes, and arctic dog sledding. He is also a pilot and the author of the children’s book Code 7.

INVITED SPEAKERS

Aviva Abosch
University of Colorado
Aurora, CO

Harith Akram
University College London
London, United Kingdom

Ron L. Alterman
Beth Israel Deaconess Medical Center
Boston, MA

Nicholas M. Boulis
Emory Healthcare
Atlanta, GA

Stephan Chabardes
University Hospital, Grenoble
Grenoble, France

Edward F. Chang
University of California, San Francisco
San Francisco, CA

Patrick Chauvel
Cleveland Clinic Epilepsy Center
Cleveland, OH

Binith Cheeran
University of Oxford
Oxford, United Kingdom

Terence J. Coyne
Briz Brain & Spine
Auchenflower, Qld, New Zealand

Antonio A. De Salles
Hospital do Coração
São Paulo, Brazil

W. Jeffrey Elias
University of Virginia Health Systems
Charlottesville, VA

Alfred Emondi
DARPA
Arlington, VA

Dario J. Englot
Vanderbilt University Medical Center
Nashville, TN

Emad N. Eskandar
Albert Einstein College of Medicine
New York, NY

Kelly D. Foote
University of Florida College of Medicine
Gainesville, FL

Paul J. Ford
Cleveland Clinic
Cleveland, OH

Itzhak Fried
University of California, Los Angeles
Los Angeles, CA

James W. Gnadt
National Institute of Neurological Disorders and Stroke
Bethesda, MD

Wayne Goodman
Baylor College of Medicine
Houston, TX

Alessandra A. Gorgulho
Hospital do Coração
São Paulo, Brazil

Ashok Gowda
Visualase, Inc.
Houston, TX

Robert Greenberg
Alfred Mann Foundation
Sylmar, CA

Warren Grill
Duke University
Durham, NC

Robert E. Gross
Emory University
Atlanta, GA

Suzanne N. Haber
University of Rochester Medical Center
Rochester, NY

Casey H. Halpern
Stanford University
Stanford, CA

Clement Hamani
Sunnybrook Health Sciences Centre
Toronto, ON

Jaimie M. Henderson
Stanford University Hospital
Stanford, CA
INVITED SPEAKERS (cont.)

Zachary Hochstetler  
American Medical Association  
Chicago, IL

Mojgan Hodaie  
Toronto Western Hospital  
Toronto, ON

Judy Illes  
University of British Columbia  
Vancouver, BC

Michael G. Kaplitt  
Weill Cornell Medical College  
New York, NY

Robert Kirsch  
Case Western Reserve University  
Cleveland, OH

Zelma H.T. Kiss  
University of Calgary  
Foothills Hospital  
Calgary, AB

Peter Konrad  
Vanderbilt University  
Nashville, TN

Brian H. Kopell  
Mount Sinai Medical Center  
New York, NY

Paul S. Larson  
University of California, San Francisco  
San Francisco, CA

Andres M. Lozano  
Toronto Western Hospital  
Toronto, ON

J. Luis Lujan  
Mayo Clinic Rochester  
Rochester, MN

Andre Machado  
Cleveland Clinic  
Pepper Pike, OH

Adam N. Mamelak  
Cedars-Sinai Medical Center  
Los Angeles, CA

Dejan Markovic  
University of California, Los Angeles  
Los Angeles, CA

Darlene A. Mayo  
Cleveland Clinic  
Cleveland, OH

Cameron C. McIntyre  
Case Western Reserve University  
Cleveland, OH

Guy M. McKhann  
Columbia University  
New York, NY

David McMullen  
National Institute of Health  
Bethesda, MD

Jonathan Miller  
University Hospitals of Cleveland Case Medical Center  
Cleveland, OH

Alon Y. Mogilner  
New York University  
New York, NY

Martha Morrell  
Stanford University  
Mountain View, CA

Jeffrey G. Ojemann  
University of Washington  
Seattle, WA

Julie G. Pilitsis  
Albany Medical Center  
Albany, NY

Nader Pouratian  
University of California, Los Angeles  
Los Angeles, CA

Ahmed M. Raslan  
Oregon Health & Science University  
Portland, OR

Ali R. Rezai  
West Virginia University  
Morgantown, WV

R. Mark Richardson  
University of Pittsburgh Medical Center  
Pittsburgh, PA

Patricio Riva Posse  
Emory University  
Atlanta, GA

David W. Roberts  
Dartmouth-Hitchcock Medical Center  
Lebanon, NH

Joshua M. Rosenow  
Northwestern University Medical School  
Chicago, IL

Michael Schuler  
Northshore University Hospital  
Manhasset, NY

Ashwini D. Sharan  
Thomas Jefferson University  
Philadelphia, PA

Sameer A. Sheth  
Baylor College of Medicine  
Houston, TX

Kalyanam Shivkumar  
University of California, Los Angeles  
Los Angeles, CA

Philip A. Starr  
University of California, San Francisco  
San Francisco, CA

Jennifer A. Sweet  
Case Western Reserve University  
Cleveland, OH

Nitin Tandon  
University of Texas Medical School  
Houston, TX

William J. Tyler  
Arizona State University  
Tempe, AZ

Ashwin Viswanathan  
Baylor College of Medicine  
Houston, TX

Jonathan Viventi  
Duke University Biomedical Engineering  
Durham, NC

Cristin Welle  
University of Colorado, Denver  
Aurora, CO

Jon T. Willie  
Emory University  
Atlanta, GA

Kareem A. Zaghloul  
NINDS  
Bethesda, MD

Ludvic Zrinzo  
National Hospital for Neurology and Neurosurgery  
London, United Kingdom

THANK YOU

to the following companies for providing an educational grant in support of this meeting:

• Alpha Omega, Inc.
• Boston Scientific
• Elekta
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Exablate Neuro

Incisionless, MR-guided focused ultrasound thalamotomy for essential tremor:

- Immediate improvement in tremor
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- Safe & effective with minimal side effects

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## PROGRAM SCHEDULE

### SATURDAY, JUNE 2, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00 am–6:00 pm</td>
<td>Mezzanine Foyer Registration</td>
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| 8:00 am–12:00 pm | Confluence C <br> **SPECIAL COURSE 1**<br>$250 | Residents $150<br>**Building a Functional Neurosurgery Research Lab**
| Course Directors: Jeffrey G. Ojemann, R. Mark Richardson  <br>Speakers: Harith Akram, Nicholas M. Boulis, Edward F. Chang, Itzhak Fried, Robert E. Gross, Jamie M. Henderson, Michael G. Kaplitt, Peter Konrad, R. Mark Richardson, Philip A. Starr, Kareem A. Zaghloul  <br>Course Description: Neurosurgeon-neuroscientists will share their experiences establishing and maintaining functional neuroscience labs and research collaborations. Targeted presentations and a panel discussion will provide a variety of strategies useful for those at all stages of building a functional neurosurgery research program.  <br>Learning Objectives: Upon completion of this course, participants will be able to:<br>• Identify key elements for successfully integrating clinical science into clinical practice.  <br>• Describe key methods and analytic strategies for imaging and neurophysiological data acquired in functional neurosurgery patients.  <br>• Discuss the opportunities provided by the BRAIN Initiative to excel as a neurosurgeon-scientist. |
| 8:00–8:10 am | Introduction and Welcome<br>Jeffrey G. Ojemann, R. Mark Richardson |
| 8:10–8:25 am | Cognitive Neuroscience<br>Itzhak Fried |
| 8:25–8:40 am | Language Laboratory<br>Edward F. Chang |
| 8:40–8:55 am | Clinical Translation of BCI<br>Jaimie M. Henderson |
| 8:55–9:10 am | Engineering Spinal Technology<br>Peter Konrad |
| 9:10–9:30 am | Discussion: Resiliency and What Goes Wrong<br>Group Discussion |
| 9:30–9:45 am | Break |
| 9:45–10:00 am | Primer on Neurophysiological Recordings<br>R. Mark Richardson |
| 10:00–10:15 am | Signal Acquisition and Processing<br>Kareem A. Zaghloul |
| 10:15–10:30 am | Primer on Advanced Neuroimaging Analyses<br>Harith Akram |
| 10:30–10:45 am | Primer on Gene Therapy<br>Michael G. Kaplitt |
| 10:45–11:00 am | Cell Transplantation<br>Nicholas M. Boulis |
| 11:00–11:30 am | Identifying and Acquiring Necessary Resources<br>Group Discussion |
| 11:30 am–12:00 pm | The BRAIN Initiative and its Impact on Functional Neurosurgery Science<br>Philip A. Starr |
| 1:00–5:00 pm | Confluence A <br>**SPECIAL COURSE 2**<br>$250 | Residents $150<br>**Functional Neurosurgery: Optimizing Finances, Value, and Efficiency**
| Course Director: Joshua M. Rosenow  <br>Speakers: Zachary Hochstetler, Peter Konrad, Darlene A. Mayo, Julie G. Pilitsis, Joshua M. Rosenow  <br>Course Description: This course is intended to review the basics of billing and coding for common functional neurosurgical procedures as well as provide insight into growing a program. Highlights include how CPT codes are created and valued, and strategies for physician socioeconomic advocacy.  <br>Learning Objectives: Upon completion of this course, participants will be able to:<br>• Discuss how physicians and hospitals are reimbursed for functional neurosurgery procedures.  <br>• Review the process of creating CPT codes and their RVU values.  <br>• Describe the integration of allied health providers in optimizing clinical care.  <br>• Identify the role of physician advocacy in neurosurgery. |
12:30 pm  
New Pain Technologies: DRG, High Frequency, and Burst Stimulation  
Jennifer A. Sweet

1:00–1:20 pm  
Emerging Therapies: Stem Cell Trials  
Nicholas M. Boulis

1:20–1:40 pm  
Robots in Functional Neurosurgery  
Stephan Chabardes

1:40–2:00 pm  
sEEG: Interpreting the Network Signal  
Jon T. Willie

2:00–2:20 pm  
Directional Leads  
Brian H. Kopell

2:20–2:40 pm  
Integrating Tractography into Clinical Practice  
Mojgan Hodaie

2:40–3:00 pm  
Stereotactic Laser Ablation  
Jon T. Willie

3:00–3:20 pm  
Emerging Technologies: Gene Therapies  
R. Mark Richardson

3:20–3:40 pm  
Primer on Closed Loop DBS  
Kelly D. Foote

3:40–4:00 pm  
Break

4:00–4:20 pm  
Focused Ultrasound  
W. Jeffrey Elias

4:20–4:40 pm  
Emerging Technologies: Gene Therapies  
R. Mark Richardson

4:40–5:00 pm  
Break

6:30 am–7:00 pm  
Mezzanine Foyer
Registration

6:30–8:00 am  
Mezzanine Foyer
Continental Breakfast

7:00–8:00 am  
Horace Tabor/Molly Brown
BREAKFAST SEMINAR
The Underutilization of Functional Neurosurgery

$55

Moderator: Edward F. Chang
Speakers: Edward F. Chang, Dario J. Englot, Ashwin Viswanathan

Learning Objectives: Upon completion of this seminar, participants will be able to:

• Describe the prevalence of medically-refractory epilepsy, rates of epilepsy surgery, and factors that affect underutilization of epilepsy surgery.
• Review the prevalence of medically-refractory epilepsy, rates of epilepsy surgery, and factors that affect underutilization of epilepsy surgery.

• Identify factors that affect underutilization of pain surgery in light of recent societal focus on the opioid epidemic.

7:00–7:20 am
Epilepsy
Edward F. Chang

7:20–7:40 am
Movement Disorders DBS
Dario J. Englot

7:40–8:00 am
Surgery for Pain
Ashwin Viswanathan

8:00–9:20 am
Confluence A/B/C
PLENARY SESSION 1
World State of Affairs in Functional Neurosurgery

Moderator: Aviva Abosch
Speakers: Aviva Abosch, Terence J. Coyne, Emad N. Eskandar, Mojgan Hodaie, David W. Roberts
Learning Objectives: Upon completion of this session, participants will be able to:

• Describe the activities of major world societies that focus on functional and stereotactic neurosurgery.

• Review differences in priority areas for stereotactic and functional neurosurgery internationally.

• Identify current shortcomings and future needs for functional and stereotactic neurosurgery around the world.

8:00–8:10 am
Meeting Introduction
Aviva Abosch

8:10–8:50 am
World Society Updates

8:10–8:23 am
AASSFN Update
Terence J. Coyne

8:24–8:37 am
WSSFN Update
Mojgan Hodaie

8:38–8:49 am
Update on the ASSFN Journal: Stereotactic and Functional Neurosurgery
David W. Roberts

8:00–8:55 am
Introduction of ASSFN President
Aviva Abosch

8:55–9:20 am
Presidential Address
Emad N. Eskandar

10:00 am–12:00 pm
Confluence A/B/C
PLENARY SESSION 2
BRAIN Initiative

Moderators: Edward F. Chang, Nitin Tandon
Speakers: Edward F. Chang, Alfred Emondi, Kelly D. Foote, James W. Gnadt, Robert E. Gross, Adam N. Mamelak, David McMullen, Nitin Tandon
Learning Objectives: Upon completion of this session, participants will be able to:

• Describe the goals of the BRAIN Initiative as it pertains to advancing mental health.

• Review how the BRAIN Initiative is utilizing neurosurgery to advance our basic science understanding of human brain function.

• Describe the vision of DARPA for advancing military health through the BRAIN Initiative.

10:00–10:20 am
The Goals of the BRAIN Initiative for Mental Health
David McMullen

10:20–10:40 am
BRAIN Initiative and Basic Science of Human Brain Function
James W. Gnadt

10:40–11:00 am
DARPA and BRAIN: The Impact and Future
Alfred Emondi

11:00 am–12:00 pm
BRAIN Investigator Updates: The Scientific Impact of Neurosurgery

11:00–11:12 am
A Unified Cognitive Network Model of Language
Nitin Tandon

11:12 am–11:24 am
Closing the Loop on Tremor: A Responsive Deep Brain Stimulator for the Treatment of Essential Tremor
Kelly D. Foote

11:24–11:36 am
DARPA SUBNETS: Unlearning Systems Neuropsychiatric Disorders
Edward F. Chang

11:36–11:48 am
Neuronal Mechanisms of Human Episodic Memory
Adam N. Mamelak

11:48 am–12:00 pm
Asynchronous Distributed Multielectrode Neuromodulation for Epilepsy
Robert E. Gross

9:20–10:00 am
Mezzanine Foyer
Refreshment Break
### PLENARY SESSION 3
**The Expanding Reach of Functional Neurosurgery**

**Moderators:** Aviva Abosch, Emad N. Eskandar  
**Speakers:** Robert Greenberg, Kalyanam Shivkumar, Cristin Welle  
**Learning Objectives:** Upon completion of this session, participants will be able to:  
- Discuss the role of peripheral neuromodulation in shaping brain activity.  
- Review the role of neurophysiology and neurostimulation in modulating cardiac health.  
- Describe the opportunities and challenges of using high-density arrays to restore vision for the blind.  
- Describe how interfacing with the human brain may shape the future of society.

#### 1:00–1:20 pm  
**SPARC: Peripheral Stimulation Can Do More Than Treat Pain**  
Cristin Welle

#### 1:20–1:40 pm  
**SPARC: Neurocardiology: All Surgery will be Neurosurgery in the Future**  
Kalyanam Shivkumar

#### 1:40–2:00 pm  
**Visual Cortex Stimulation and High-density Brain Stimulation**  
Robert Greenberg

#### 2:00–2:30 pm  
**A Conversation with Bryan Johnson**  
Moderator: Aviva Abosch

#### 2:30–2:40 pm  
**Discussion and Questions**

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**Sponsored by:** Medtronic

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### PLENARY SESSION 4
**Engaging Engineers: Getting Technology to Clinical Practice**

**Moderators:** Jonathan Miller, Ali R. Rezai  
**Speakers:** Robert Kirsch, J. Luis Lujan, Dejan Markovic, William J. Tyler, Jonathan Viventi  
**Learning Objectives:** Upon completion of this session, participants will be able to:  
- Describe emerging sensing technologies for neuromodulation.  
- Review distinct modalities for neuromodulation, including electrical and non-electrical stimulation.  
- Identify key challenges and advances in microchip design towards miniaturization of neuromodulatory devices.

#### 3:20–3:50 pm  
**Emerging Sensing Technologies**

- **3:20–3:35 pm**  
  **Chemical Sensing: Current Status and Barriers**  
  J. Luis Lujan

- **3:35–3:50 pm**  
  **Ultra-thin and Flexible Electrodes**  
  Jonathan Viventi

#### 3:50–4:05 pm  
**Emerging Microchip Design**  
Dejan Markovic

#### 4:05–4:20 pm  
**Functional Electrical Stimulation**  
Robert Kirsch

#### 4:20–4:35 pm  
**Nonelectrical Stimulation**  
William J. Tyler

#### 4:35–5:00 pm  
**Discussion and Questions**

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**Sponsored by:** ClearPoint Precision Guided Therapy
THANK YOU
2018 ASSFN Biennial Meeting Ambassador

MONDAY, JUNE 4, 2018

6:30 am–5:00 pm
Registration
Mezzanine Foyer

6:30–8:00 am
Continental Breakfast
Mezzanine Foyer

7:00–8:00 am
Non-CME Breakfast Symposia
The Directional Lead as Standard of Care
Julie G. Pilitsis

DBS Therapy Beyond the Lead
David VanSickle

7:00–8:00 am
Non-CME Breakfast Symposia
Short-Timescale Neurophysiological Biomarkers of Parkinsonian Motor Symptoms
Speaker: Wael Asaad

STN Activity During Speech Production
Speaker: Mark Richardson

Use of INTRAOP CT and MER for Optimal DBS Lead Placement
Speaker: Alon Mogilner

Asleep Robotic DBS with MER
Speaker: Casey Halpern

HaGuide for DBS Lead Placement
Speaker: Aviva Abosch

7:30 am–6:00 pm
Platte River
Exhibit Hall Open

8:00–9:40 am
Confluence A/B/C
PLENARY SESSION 5
Neuroethics

Moderators: Clement Hamani, Zelma H.T. Kiss
Speakers: Paul J. Ford, Judy Illes, Andres M. Lozano, Nitin Tandon
Learning Objectives: Upon completion of this session, participants will be able to:

• Identify key factors that influence our understanding of the neuroethics of “brain patenting.”
• Review whether DBS and invasive intracranial recordings are safe enough to be used as an exploratory therapeutic tool.
• Discuss considerations related to cosmetic neurosurgery to enhance “normal.”

8:00–8:18 am
Neuroethics of Brain Patenting
Judy Illes

8:18–8:36 am
Novel Ways in Which Ethics Supports Research and Clinical Practice
Paul J. Ford

8:36–8:54 am
How Far are We From Cosmetic Neurosurgery?
Andres M. Lozano
8:54–9:12 am
The Slippery Slope of Intracranial Recordings and Stimulation for Research
Nitin Tandon

9:12–9:43 am
Open Papers

9:12–9:19 am
101 Incidence of Seizures Induced by Intracranial Research Stimulation: A Multicenter Prospective Study in 770 Sessions Across 188 Patients
Hannah E. Goldstein, Elliot Smith, Robert E. Gross, Barbara Jobst, Bradley Lega, Michael Sperling, Gregory A. Worrell, Kareem A. Zaghoul, Paul A. Wanda, Michael J. Kahana, Daniel S. Rizzuto, Catherine Schevon, Guy M. McKhann II, Sameer A. Sheth

9:20–9:27 am
102 Tuning Direct Electrical Amygdala Stimulation Parameters for Declarative Memory Enhancement in Humans
Cory S. Inman, Joseph Manns, Kelly R. Bijanki, David I. Bass, Stephan Hamann, Daniel Drane, Rebecca Fasano, Robert E. Gross, Jon T. Willie

9:28–9:35 am
103 A Cellular Substrate for Theory of Mind in the Human Prefrontal Cortex
Benjamin L. Grannan, Mohsen Jamali, Ziv Williams

9:36–9:43 am
104 High Degree-of-freedom Movement by a Person with Paralysis Using an Implanted Brain-computer Interface
Jaimie M. Henderson, Sergey D. Stavisky, Paul Nuyujukian, Chethan Pandarinath, Beata Jarosiewicz, Nir Even-Chen, Paymon Rezaie, Frank Willett, Sharlene Flesher, Heidi Peterson, Leigh R. Hochberg, Krishna V. Shenoy

10:40–11:00 am
The Cost Effectiveness of DBS for Movement Disorders
Casey H. Halpern

11:00–11:20 am
The Potential for Big Data to Impact Functional Neurosurgery
Ashwini D. Sharan

11:20 am–12:00 pm
Open Papers

11:20–11:27 am
105 INTREPID: A Prospective, Double Blinded, Multi Center Randomized Controlled Trial Evaluating Deep Brain Stimulation with a New Multiple Source, Constant Current Rechargeable System in Parkinson’s Disease
Philip A. Starr, Paul A. House, Roshini Jain, Lilly Chen, INTREPID Clinical Study Group, Jerrold L. Vitek

11:28–11:35 am
106 Dorsal Anterior Cingulum Bundle Stimulation Produces Positive Affect, Anxiolysis Without Sedation, and Analgesia in 20 Patients
Kelly R. Bijanki, Cory S. Inman, John Gale, Daniel Drane, Helen S. Mayberg, Jon T. Willie

11:36–11:43 am
107 Subthalamic Nucleus Deep Brain Stimulation Combined with Duloxetine Changes Pain Behavior in Parkinsonian Rats
Julie G. Pilitsis, Miriam M. Shao

11:44–11:51 am
108 Prominent Temporal Coding of Cognitive Control in Human Prefrontal Cortex
Guillermo Horga, Sameer A. Sheth, Garrett P. Banks, Mark Yates, Yagna Pathak, Guy McKhann, Elliot Smith

11:52–11:59 am
109 Regional Specialization in the Processing of Cognitive Conflict
Matthew Mian, Emad N. Eskandar

12:00–1:00 pm
Augusta
Lunch and Honored Guest Presentation
The Bidirectional Neural Prostheses: A Flexible Platform for Innovation in Neuromodulation
Philip A. Starr
Seating is limited

1:00–2:40 pm
PARALLEL SESSION 1
Movement Disorders

Moderators: Ron L. Alterman, Alon Y. Mogilner
Speakers: Ron L. Alterman, Warren Grill, Philip A. Starr, Ludvic Zrinzo
Learning Objectives: Upon completion of this session, participants will be able to:
• Discuss the advantages of limitations of awake versus asleep deep brain stimulation implantation surgery.
• Review what has been gleaned from invasive human studies about the pathophysiology of movement disorders.
• Discuss mechanisms underlying the therapeutic benefits of deep brain stimulation.

9:44–10:20 am
Platte River
Refreshment Break with Exhibitors

10:20 am–12:00 pm
Confluence A/B/C
PLENARY SESSION 6
Costs, Cost Effectiveness, and Outcomes in Functional Neurosurgery

Moderators: Ahmed M.T. Raslan, Joshua M. Rosenow
Speakers: Casey H. Halpern, Peter Konrad, Ashwini D. Sharan
Learning Objectives: Upon completion of this session, participants will be able to:
• Discuss whether early deep brain stimulation for movement disorders may reduce overall health care expenditures for movement disorders.
• Review the cost effectiveness of DBS for movement disorders.
• Identify key opportunities and obstacles for using big data emerging from functional neurosurgery to impact clinical care.

10:20–10:40 am
Can Early DBS Save the Health Care System Money?
Peter Konrad
PARALLEL SESSION 2
Psychiatric Neurosurgery

Moderators: Emad N. Eskandar, Sameer A. Sheth
Speakers: Wayne Goodman, Suzanne N. Haber, Patricio Riva Posse
Learning Objectives: Upon completion of this session, participants will be able to:

- Identify the array of brain regions that have been targeted for psychiatric neuromodulation and how these relate anatomically.
- Discuss the role of advanced imaging in identifying disease sub-types and how this could be used to stratify patients for therapy or clinical trials.

1:00–1:20 pm
The Structural Connectivity and Convergence of Neuropsychiatric Targets for DBS
Suzanne N. Haber

1:20–1:40 pm
Targeting and Evaluation of SCC DBS Using Connectomics
Patricio Riva Posse

1:40–2:00 pm
Using Automated Facial Affect Recognition to Build Behavioral Classifiers in aDBS
Wayne Goodman

1:00–2:40 pm
General Session 4

1:00–1:20 pm
The Patient Must be Awake for DBS Implantation
Ron L. Alterman

1:15–1:30 pm
Asleep DBS Implantation is the New Standard
Ludvic Zrinzo

1:30–1:45 pm
The Neurosurgical Science of Movement Disorders
Philip A. Starr

1:45–2:00 pm
Therapeutic Mechanisms of Deep Brain Stimulation
Warren Grill

2:00–2:40 pm
Open Papers

2:00–2:07 pm
110 Implantation of Tissue Grafts into the Substantia Nigra to Modify Disease Progression in Parkinson’s Disease: One Year Clinical Update
Craig G. van Horne, George Quintero, Julie Gurwell, John Slevin, Andrew Welleford, Greg A. Gerhardt

2:08–2:15 pm
111 Differential Effects of Low and High Frequency Pallidal Stimulation of Pallidocortical Network in Parkinson Disease
Mahsa Malekmohammadi, Nicholas Au Yong, Nader Pouratian

2:16–2:23 pm
112 Significant Local Increase of GABA in STN and GPI in Response to High Frequency Stimulation (HFS): Contribution of Intraoperative Microanalysis in PD
Maria Gabriela dos Santos Ghilardi, Raquel Martinez, Aline Auada, Ivo Lebrin, Erich T. Fonoff

2:24–2:31 pm
113 Assessment of Rapid Fluctuations in Parkinsonian Symptoms Using a Continuous Motor Assay
James Y. H. Yu, Shane Lee, Erin Schaeffer, Minkyu Ahn, Peter M. Lauro, Daniel E. Amaya, Wael Asaad

2:32–2:39 pm
114 Six-year Outcome of Focused Ultrasound Thalamotomy for Essential Tremor
W. Jeffrey Elias, Diane Huss, Tony R. Wang, Aaron E. Bond, Nader Pouratian, Binit B. Shah

1:00–2:40 pm
PARALLEL SESSION 2
Psychiatric Neurosurgery

Moderators: Emad N. Eskandar, Sameer A. Sheth
Speakers: Wayne Goodman, Suzanne N. Haber, Patricio Riva Posse
Learning Objectives: Upon completion of this session, participants will be able to:

- Identify the array of brain regions that have been targeted for psychiatric neuromodulation and how these relate anatomically.
- Discuss the role of advanced imaging in identifying disease sub-types and how this could be used to stratify patients for therapy or clinical trials.

1:00–1:20 pm
The Structural Connectivity and Convergence of Neuropsychiatric Targets for DBS
Suzanne N. Haber

1:20–1:40 pm
Targeting and Evaluation of SCC DBS Using Connectomics
Patricio Riva Posse

1:40–2:00 pm
Using Automated Facial Affect Recognition to Build Behavioral Classifiers in aDBS
Wayne Goodman

1:00–2:40 pm
TUESDAY, JUNE 5, 2018

6:30 am–3:00 pm Registration
Mezzanine Foyer

6:30–8:00 am Continental Breakfast
Mezzanine Foyer

7:00–8:00 am Non-CME Breakfast Symposia
Horace Tabor/Molly Brown

7:30 am–3:30 pm Exhibit Hall Open
Platte River

8:00–9:40 am Plenary Session 7
Network Modulation and Connectomics for Neurosurgery
Confluence A/B/C

Moderator: Nader Pouratian
Speakers: Suzanne N. Haber, Cameron C. McIntyre, Nader Pouratian, Sameer A. Sheth

Learning Objectives: Upon completion of this session, participants will be able to:

• Describe key imaging and neurophysiological approaches to measuring and detecting structural and functional connectivity.

• Identify approaches for visualizing structural brain networks, with a focus on its relevance to neuromodulation.

• Review the network basis of neuropsychiatric disease and functional neurosurgical therapies.

8:00–8:18 am Primer on Detecting and Quantifying Brain Networks
Nader Pouratian

8:18–8:36 am Visualizing Brain Networks
Cameron C. McIntyre

8:36–8:54 am The Network Basis of Disease
Suzanne N. Haber

8:54–9:12 am The Network Basis of Therapy
Sameer A. Sheth

9:12–9:40 am Open Papers

9:12–9:19 am Magnetoencephalographic and fMRI Examination of the Effects of VC/VS DBS on Post-stroke Pain
Raghavan Gopalakrishnan, Scott F. Lempka, Richard Burgess, Kenneth B. Baker, Stephen E. Jones, Mark Lowe, Andre Machado

9:20–9:27 am Amygdala Structural Connectivity is Associated with Impulsivity and Nicotine Dependence
Ausaf A. Bari, Bayard Wilson, Hiro Sparks, Jean-Philippe Langevin, Nader Pouratian

9:28–9:35 am Human Caudate Nucleus Subdivisions in Tinnitus Modulation
Philip Perez, Sarah Wang, Susan Heath, Jennifer Henderson-Sabes, Danielle Mizuiri, Leighton Hinkley, Srikanth S. Nagarajan, Paul S. Larson, Steven W. Cheung

9:36–9:40 am Discussion and Questions

9:40–10:20 am Refreshment Break with Exhibitors

10:20 am–12:00 pm Parallel Session 3
Pain
Confluence A/B/C

Moderators: Julie G. Pilitsis, Jennifer A. Sweet
Speakers: Binith Cheeran, Jennifer A. Sweet, Ashwin Viswanathan

Learning Objectives: Upon completion of this session, participants will be able to:

• Review the selection of patients for lesioning in the management of chronic pain.

• Discuss the role and outcomes of DBS for chronic pain.

• Identify central and peripheral nervous system targets for modulating and treating chronic pain beyond traditional dorsal column stimulation.

10:20–10:40 am The Re-emergence of Lesional Therapies for Pain
Ashwin Viswanathan

10:40–11:00 am Targets Beyond the Dorsal Columns for Pain
Jennifer A. Sweet

11:00–11:20 am Deep Brain Stimulation of ACC for Pain
Binith Cheeran

11:20–12:00 pm Open Papers

11:20–11:27 am Functional Connectivity Changes in Failed Back Surgery Syndrome Patients After Spinal Cord Stimulation Therapy with Bursting Versus Non-Bursting Stimulation Patterns
Elsa V. Arocho-Quinones, Guangyu Chen, Andrew Nencka, Timothy N. Lynch, Shi-Jiang Li, Peter A. Pahapill

11:28–11:35 am Nationwide Shift from Percutaneous Rhizotomy to Microvascular Decompression for Treatment of Trigeminal and Other Cranial Nerve Neuralgia
Bornali Kundu, John D. Rolston
11:36–11:43 am  
**125 A Pilot Study of Usage Patterns During Simultaneous Administration of Tonic and Sub-threshold Waveforms**  
Michael Gillogly, Julia A. Prusik, Jacquelyn MacDonnell, Julie G. Pilitsis

11:44–11:51 am  
**126 Long-term Outcomes in the Management of Central Neuropathic Pain Syndromes**  
Michael D. Staudt, Alexander J. Clark, Allan S. Gordon, Mary E. Lynch, Patricia K. Morley-Forster, Howard Nathan, Catherine Smyth, Larry W. Stitt, Cory Toth, Mark A. Ware, Dwight E. Moulin

11:52–11:59 am  
**127 Peripheral Nerve Stimulation for Complex Craniofacial Pain: Recent Single-institution Experience**  
Willard S. Kasoff, Robert W. Bina

10:20 am–12:00 pm  
**PARALLEL SESSION 4**  
**Epilepsy**

Moderator: Nitin Tandon  
Speakers: Patrick Chauvel, Itzhak Fried, Guy M. McKhann, Jonathan Miller  
Learning Objectives: Upon completion of this session, participants will be able to:

- Describe and contrast network versus focal approaches to evaluating and treating patients with medically refractory epilepsy.
- Identify the opportunities and limitations of more targeted therapies, such as laser ablation and deep brain stimulation, in the management of medically refractory epilepsy.
- Review what has been learned from sEEG and chronic sensing devices about human cognition.

10:20–10:35 am  
**Epilepsy Surgery is Network Surgery**  
Patrick Chauvel

10:35–10:50 am  
**Who Cares About Networks? All Epilepsy is Focal**  
Jonathan Miller

10:50–11:05 am  
**Less is More: Epilepsy Surgery in the Era of Ablation and Neuromodulation**  
Guy M. McKhann

11:05–11:20 am  
**Probing Neural Function and Circuits with sEEG and Neuropace**  
Itzhak Fried

11:20 am–12:00 pm  
**Open Papers**

11:20–11:27 am  
**128 Radiofrequency Energy and Electrode Proximity Influences SEEG-guided RF Thermocoagulation Lesion Size**  
Michael D. Staudt, Jonathan P. Miller

11:28–11:35 am  
**129 Coherence Between the Anterior Nucleus (AN) of the Thalamus and the Hippocampus Predicts the Effect of AN-DBS in Temporal Lobe Seizures**  
Brigitte Piallat, Ariana Sherdil, Olivier David, Stephan Chabardes

11:36–11:43 am  
**130 The Effects of Epilepsy Surgery on Deep Arousal Structure Functional Connectivity in Temporal Lobe Epilepsy**  
Hernan F. J. Gonzalez, Peter Konrad, Victoria Morgan, Dario J. Englott

11:44–11:51 am  
**131 Modulating Hippocampal Neural States in a Non-human Primate Model of Epilepsy Using Asynchronous Distributed Multi-electrode Stimulation**  
Babak Mahmoudi, Annaelle Devergnas, Mark Connolly, Jocelyn Vuong, Robert E. Gross

11:52–11:59 am  
**132 A Library of Human Electrocorticographic Data and Analyses**  
Kai J. Miller

12:00–1:00 pm  
**Horace Tabor/Molly Brown Non-CME Sponsored Luncheon**  
Deep Brain Stimulation Designed for Accurate Targeting and Precise Control  
Faculty TBD

1:00–2:50 pm  
**PARALLEL SESSION 5**  
**Technology in Functional Neurosurgery**

Moderators: Jonathan Miller, R. Mark Richardson  
Speakers: Kelly D. Foote, Brian H. Kopell, Nitin Tandon  
Learning Objectives: Upon completion of this session, participants will be able to:

- Delineate the potential advantages of directional leads for deep brain stimulation and the data supporting this innovation.
- Discuss the growth of responsive neurostimulation in epilepsy and emerging uses of these closed loop systems.
- Review results that have emerged from chronically implanted sensing devices and how this may impact the future of neuromodulation and functional neurosurgery.

1:00–1:20 pm  
**Directional Leads: A Real or Theoretical Advantage?**  
Brian H. Kopell

1:20–1:40 pm  
**Neuropace: Indications and Opportunities**  
Nitin Tandon

1:40–2:00 pm  
**What We've Learned from Chronic Sensing**  
Kelly D. Foote
2:00–2:50 pm
Open Papers

2:00–2:07 pm
133 Ablation Dynamics of Subsequent Thermal Doses Delivered to Previously Heat-damaged Tissue During Magnetic Resonance-guided Laser Induced Thermal Therapy
Sean Munier, Eric L. Hargreaves, Nitesh V. Patel, Shabbar F. Danish

2:08–2:15 pm
134 The Clinical Utility of Directional Deep Brain Stimulation—A Preliminary Single Center Experience
Marian M. Bercu, Michael Pourfar, Alon Y. Mogilner

2:16–2:23 pm
135 Reversible Complete Circuit Inhibition by Noninvasive Focused Ultrasound is Mediated by a Thermal Mechanism
David P. Darrow, Parker O’Brien, Tom Richner, Theoden Netoff, Emad Ebbini

2:24–2:31 pm
136 Mapping of Primary Somatosensory Cortex of the Hand Area Using a High-density, Small Area Electrocorticography Grid for Closed-loop Brain Computer Interface

2:32–2:39 pm
137 Automated Trajectory Planning for Laser Interstitial Thermal Therapy of Mesial Temporal Lobe Epilepsy
Cristian Donos, Nitin Tandon

2:40–2:47 pm
138 Improving Machine Learning Algorithms for Prediction of Successful Episodic Memory Encoding
Akshay Arora, Bradley Lega, Sarah Segar, Gray Umbach

2:48–2:50 pm
Discussion and Questions

1:00–2:50 pm
PARALLEL SESSION 6
Radiosurgery

Moderator: Michael Schulder
Speakers: Antonio A.F. De Salles, Alessandra A. Gorgulho, Michael Schulder
Learning Objectives: Upon completion of this session, participants will be able to:
• Describe the impact that frameless radiosurgical approaches and hypofractionation have had on clinical practice.
• Identify how the exponential growth in immunotherapies has impacted the use and outcomes of cranial radiosurgery.
• Review the distinct approaches to treating large intracranial arteriovenous malformations and the outcomes for each.

1:00–1:20 pm
The Impact of Fractionated Stereotactic Radiosurgery
Antonio A.F. De Salles

1:20–1:40 pm
The Impact of Immunotherapies on Complications of Radiosurgery
Michael Schulder

1:40–2:00 pm
Dose Staging Versus Volume Staging for Large AVMS
Alessandra A. Gorgulho

2:00–2:50 pm
Open Papers

2:00–2:07 pm
139 RAD 1601: A Phase II Clinical Trial of Frameless, Coneless LINAC Radiosurgical Thalamotomy and Connectomic Thalamic Parcellation in Intractable Essential Tremor and Tremor-dominant Parkinson’s Disease

2:08–2:15 pm
140 Viability of Stereotactic Radiosurgery in the Treatment of Patients with Ten or More Brain Metastases: A Retrospective Chart Review
Elliot Schiff, Luke Swaszek, Jonathan P.S. Knisely, Adi Halthore, Sussan Salas, Nina Kohn, Michael Schulder

2:16–2:23 pm
141 Stereotactic Radiosurgery After Transsphenoidal Resection of Pituitary Pathologies: Frailty as a Predisposing Factor
Anthony O. Asemota, Gary L. Gallia
2:24–2:31 pm
**142 Strategies to Optimize SRS Plans for Brain Metastasis with VMAT (RapidArc)**
David Wang, Harry Hu, Peter D. LeRoux, Albert DeNittis

2:32–2:39 pm
**143 Outcome in Patients Undergoing Stereotactic Radiosurgery: Frailty is Associated with Worse Short-term Outcomes**
Anthony O. Asemota, Gary L. Gallia

2:40–2:47 pm
**144 Adjuvant and Neoadjuvant Radiosurgery of Two Supratentorial Intracranial Metastases in an Individual Patient with Differing Clinical and Radiographic Response: Case Report and Clinical Implications**
Rachel M. Pruitt, Jonathan P.S. Knisely, David Weintraub

2:48–2:50 pm
Discussion and Questions

2:50–3:30 pm Platte River
**Refreshment Break with Exhibitors**

3:30–3:40 pm Confluence A/B/C
**ASSFN Award Ceremony**
Presenters: Aviva Abosch, Nader Pouratian

3:40–5:00 pm Confluence A/B/C
**PLENARY SESSION 8**
Non-CME Session
**Engaging Industry: Getting Technology to Market**

Moderators: Nicholas M. Boulis, Andre Machado
Speakers: Ashok Gowda, Andre Machado, Martha J. Morrell, Imad Younis

3:40–3:55 pm
**What Clinicians Need from Industry**
Andre Machado

3:55–4:40 pm
**Examples of Successful Collaboration**

3:55–4:10 pm
**Visualase**
Ashok Gowda

4:10–4:25 pm
**RNS, Neuropace, and Beyond: Lessons Learned**
Martha J. Morrell

4:25–4:40 pm
**Alpha Omega: Lessons Learned in the US and Global Marketplace**
Imad Younis

4:40–5:00 pm
**Panel Discussion**
Ashok Gowda, Martha J. Morrell, Imad Younis

5:00 pm
Meeting Adjourns
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GENERAL INFORMATION

EXHIBIT HALL
Monday, June 4  7:30 am–6:00 pm
Tuesday, June 5  7:30 am–3:30 pm

REGISTRATION
Saturday, June 2  7:00 am–6:00 pm
Sunday, June 3  6:30 am–7:00 pm
Monday, June 4  6:30 am–5:00 pm
Tuesday, June 5  6:30 am–3:00 pm

No Smoking Policy: Smoking is not permitted at any official ASSFN Biennial Meeting events. The Westin Denver Downtown Hotel is a non-smoking hotel.

Disclaimer: The material presented at the 2018 ASSFN Biennial Meeting has been made available by the ASSFN for educational purposes only. These materials are not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather are intended to present an approach, view, statement, or opinion of the faculty, which may be helpful to others who face similar situations.

All drugs and medical devices used in the United States are administered in accordance with the Food and Drug Administration (FDA) regulations. These regulations vary depending on the risks associated with the drug or medical devices compared to products already on the market, and the scope of the clinical data available.

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Neither the content (written or oral) of any course or presentation in the program, nor the use of a specific product in conjunction therewith, nor the exhibition of any materials by any parties coincident with the program, should be construed as indicating endorsement or approval of the views presented, the products used or the materials exhibited by the ASSFN jointly sponsored by the CNS, or its committees, commission or affiliates.

Opening Reception (Pool Patio), Sunday, June 3 — 6:00–8:00 pm
Enjoy a delicious array of food and refreshments while reconnecting with colleagues and new contacts with exhibiting companies at the Opening Reception. Each medical attendee registered for the meeting will receive one complimentary ticket.

Poster Session with Wine and Cheese (Mezzanine Foyer)
Monday, June 4 — 3:20–5:00 pm
Enjoy a pre-dinner glass of wine during this uninterrupted time dedicated to viewing the scientific posters, and take advantage of this opportunity to interact with the poster authors.

CME INFORMATION

Accreditation: This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the Congress of Neurological Surgeons and the American Society for Stereotactic and Functional Neurosurgery. The Congress of Neurological Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA Credit Designation Statement: The CNS designates this live activity for a maximum of 29.50 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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Additional CME credits can be earned by attending the optional Saturday half day courses (4 credits).

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Posters: Physicians may claim AMA PRA Category 1 Credit™ directly from the AMA for preparing a poster presentation, which is also includes the published abstracts. Physicians may claim them on their AMA PRA certificate application, or apply directly to the AMA for an AMA PRA Category 1 Credit™ certificate.

Physicians may claim AMA PRA Category 2 Credits™ for viewing scientific posters. Physicians should self-claim credit on their AMA PRA certificate application form.

Claiming CME Credit: CME credits can be claimed through the online CME system at www.cns.org. Log in using your last name and the email address with which you registered. You will need to enter the number of hours you are claiming for each session you attended. Physicians should only claim credit for the learning activities at the meeting in which they actively participated. The CME tracking system lets you create and email a CME certificate immediately following the meeting either while you are still in Denver, or from the convenience of your home or office.

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Brief Summary: Prior to using these devices, please review the clinician’s manual for a complete listing of indications, contraindications, warnings, precautions, potential adverse events, and directions for use. The system is intended to be used with leads and associated extensions that are compatible with the system.

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