

PARKINSON'S DISEASE

SPOTLIGHT ON PARKINSON'S DISEASE: THE ABC'S OF DBS

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WELCOME AND INTRODUCTIONS



Stephanie Paul
Vice President Development and Marketing
American Parkinson Disease Association



PRESENTATION



Jill L. Ostrem, MD

*Carlin & Ellen Wiegner Endowed Professor of Neurology
Division Chief, UCSF Movement Disorder and Neuromodulation Center
Weill Institute of Neurosciences
University of California San Francisco*

FINANCIAL DISCLOSURES

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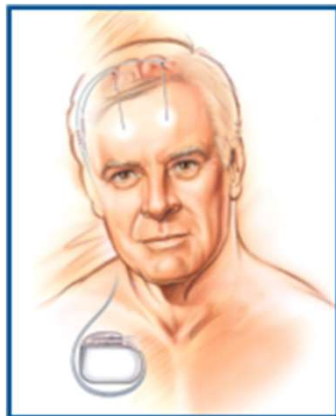


OUTLINE

- What is DBS?
- Who is a candidate?
- What is new in DBS for PD?

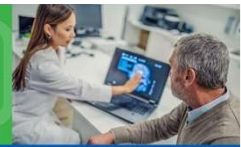
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WHAT IS DEEP BRAIN STIMULATION?

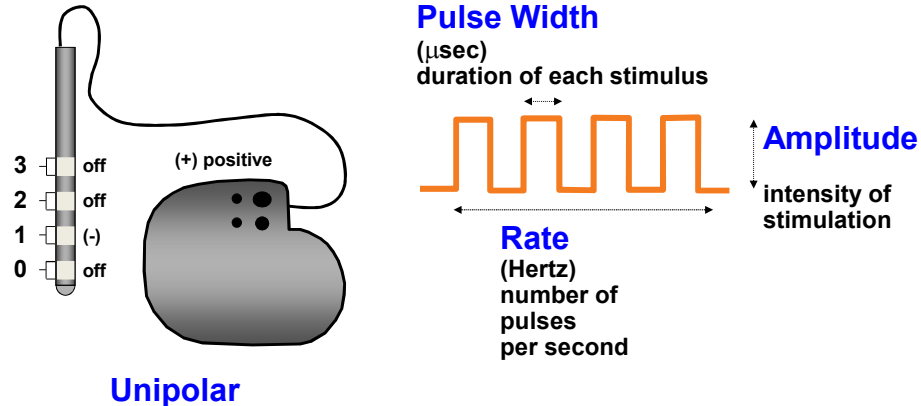


- Surgical procedure used to treat a variety of neurological symptoms
- Does not damage the brain, instead influences electrical signals in brain circuits

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DBS LEAD ELECTRODE SELECTION AND STIMULATION PARAMETERS



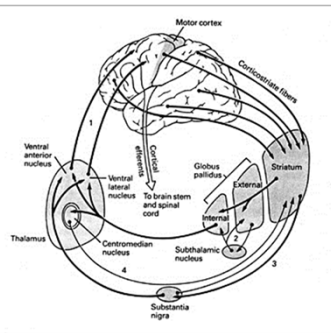
* The negative electrode exerts the therapeutic effect

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HOW DOES DBS WORK?

- The motor system is composed of interconnected loops
- Motor cortex to basal ganglia to thalamus to cortex
- System initiates and maintains desired movements while filtering out undesired movements
- In PD, loss of dopamine disrupts communication through these loops
- DBS thought to break up the pathological signals

40-3 The anatomical connections of the basal ganglia comprise four interconnected loops (see text). Note the major afferent and efferent connections with the neocortex. (Adapted from DeLong, 1974.)



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WHO IS A CANDIDATE FOR DBS?

Most Candidates:

- Moderate/advanced PD disease
- Levodopa-responsive
- Experiencing motor fluctuations
- Experiencing dyskinesia
- “Failed” good control with medical treatments

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WHO IS A CANDIDATE FOR DBS?

Minority:

- Overall milder disease, but:
 - Severe rest tremor resistant to levodopa
 - Painful off-medication state dystonia
 - Severe dyskinesia with low doses levodopa
 - Disability preventing employment

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WHO ARE NOT GOOD DBS CANDIDATES?

- Significant psychiatric illness
 - Psychosis
 - Depression
- Cognitive Impairment
- Significant medical co-morbidities
- Unrealistic goals and expectations

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PARKINSON'S DISEASE CANDIDACY FOR DBS

- Optimization of medications
- Detailed motor testing (on and off medications)
- Neuropsychological testing
- Psychiatric evaluation (in some cases)
- Pre-operative Brain MRI

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PARKINSONIAN SYMPTOMS AND DBS

Predictors of Good Response	Not DBS Responsive
Idiopathic PD	Atypical or Parkinson Plus Syndromes
LD responsive, good ON function	LD unresponsive
Symptoms not adequately controlled <ul style="list-style-type: none"> • Dyskinesia or motor fluctuations • Medication refractory tremor • Frequent or severe OFF periods • Off period disability from: <ul style="list-style-type: none"> • Bradykinesia • Rigidity • Tremor • Dystonia 	Severe disability during best ON time <ul style="list-style-type: none"> • Balance and gait impairment • Freezing of gait • Dementia • Depression or psychosis • Older Age?
	Most non-motor symptoms

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REALISTIC EXPECTATIONS FROM DBS

Identify your patient specific PD symptoms you hope DBS will improve:

- Tremor
- Slow movement
- Stiffness
- Dyskinesia
- Falls/balance
- Painful dystonia
- Depression/Anxiety
- Hallucinations
- Poor Speech
- Poor Sleep
- Freezing
- Unexpected Off time
- Medication side effects
- Poor dexterity
- Motor fluctuations

Are these symptoms DBS responsive?
How levodopa responsive are these symptoms?
Is tremor and/or dyskinesia in the top 3?

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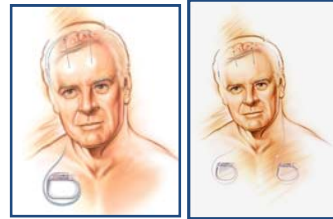


CUSTOMIZED DBS FOR PD

Which device / Which lead?



One or both sides?

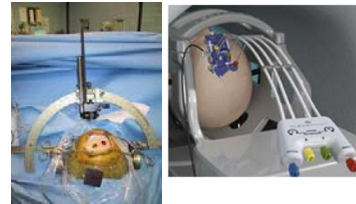


Which DBS target should I select ?

STN	GPI
Facilitates reduction in dopaminergic medications	Possible greater benefit in dyskinesia
Potential increased risk of cognitive and mood decline	Greater flexibility for medication adjustments
Possible increased risk of falls	Simpler programming strategies
Greater programming complexity	Greater battery consumption
Potential economic advantage	Potential for adequate control of symptoms with unilateral implant
Potential mild benefit in non-motor domains	Potential benefit in gait
	Potential benefit in cases with severe/brittle dyskinesia

Equal benefit in bradykinesia, rigidity, tremor and quality of life

Which surgical method?



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STN VS. GPI

ORIGINAL ARTICLE

Pallidal versus Subthalamic Deep-Brain Stimulation for Parkinson's Disease

Kenneth A. Follett, M.D., Ph.D., Frances M. Weaver, Ph.D., Matthew Stern, M.D., Evan Haas, Ph.D., Crystal L. Harris, Ph.D., Ping Luo, Ph.D., William J. Marks, Jr., M.D., Johannes Rohlfing, Ph.D., Owen Sgayer, M.D., Claudia Miao, Ph.D., Baposh Palwa, M.D., Kim Bunshel, M.D., Penelope Hegarty, M.D., Eugene C. Lai, M.D., Ph.D., John E. Dunlop, M.D., Kathryn Hoffrage, M.D., Ali Sami, M.D., Stacy Harris, D.O., Jeff M. Bronte, M.D., Ph.D., Gatzana Stanev, R.N., C.C.R.C., Philip A. Starr, M.D., Ph.D., Richard Simpson, M.D., Ph.D., Gordon Bhatnag, M.D., Ph.D., Antonio De Salles, M.D., Ph.D., Grant D. Hwang, Ph.D., and Domenico J. Reza, Ph.D., for the CDP-448 Study Group*

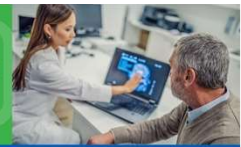
Subthalamic nucleus versus globus pallidus bilateral deep brain stimulation for advanced Parkinson's disease (NSTAPS study): a randomised controlled trial

Vicente J. Adikolen, Teo van Lee, Michiel J. Slaats, Anne-Mieke, Corff E. Heffron, Peter C. Nijssen, Guss N. Bente, Jaap P. Pruyn-Vogt, Mathieu W.P.M. Lenders, M. Favella Cantarino, Marcker S. J.M.H., Lo J. Bouw, Pieter van den Munkhof, Ben A. Schmand, Rob J. de Haan, P. Richard Schuurman, Rob M.A. de Bie

Both targets - similar in improving motor symptoms and quality of life in PD

STN	GPI
More commonly used target	Easier for programming
More medication reduction	Possibly less cognitive impact long term

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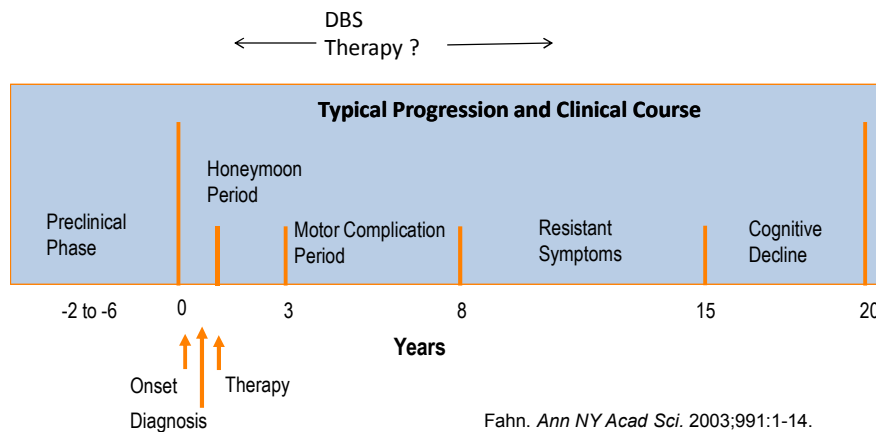
UPDATES IN DBS FOR PARKINSON'S DISEASE

- Updated indication for PD:
 - FDA approves DBS for earlier stage PD 2016 (>4 years disease duration)
- New DBS Manufacturers
 - Medtronic: Activa Series
 - Abbott: Infinity (US FDA approved 2016)
 - Boston Scientific: Vercise (US FDA approved 12/2017)
- New DBS surgical methods
 - Interventional MRI
 - Intra-operative CT

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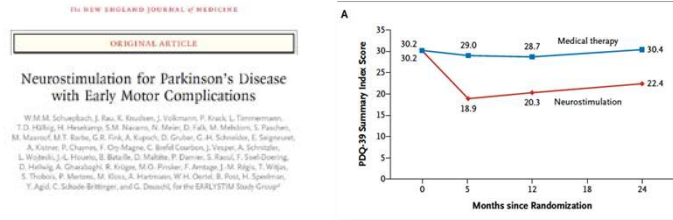
HOW EARLY SHOULD WE OFFER DBS FOR PD



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“DBS PD EARLY STIM TRIAL”



2 year long German trial; N= 251 PD

Early motor complications (mean disease duration 7.5 yr)

Divided patients to DBS plus medication OR medication alone

Primary objective was measurement of quality of life

DBS group improved quality of life scores by ~8 points

Best medical therapy worsened by 0.2 points

DBS superior in motor disability, activities of daily living, Sinemet-related complications and on time.

- DBS improves quality of life

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NEW DBS SYSTEMS

Medtronic Activa System

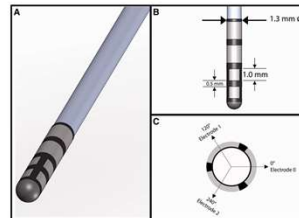


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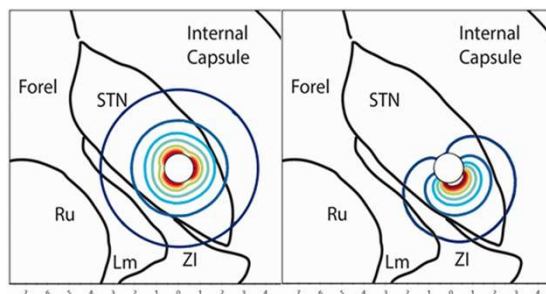
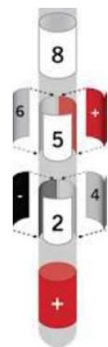
INFINITY™ ABBOTT/ ST JUDE MEDICAL DBS SYSTEM

- FDA approval 2016
- Approved in Australia and Europe
- Constant current device
- “Upgradeable” DBS system- Bluetooth wireless
- Communicates with Apple digital devices
- Directional lead



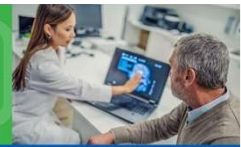
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DIRECTIONAL LEAD



Intraoperative study, Pollo et al. found 43% less current needed for therapeutic benefit in directional lead

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VERCISE™ BOSTON SCIENTIFIC DBS SYSTEM

Charger



- FDA Approval 2017
- Constant current device
- 8 lead electrodes
- Small rechargeable battery
- Fractional current delivery
- MRI is not safe

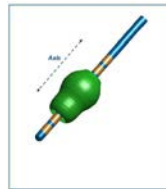


Charging Collar

Remote Control



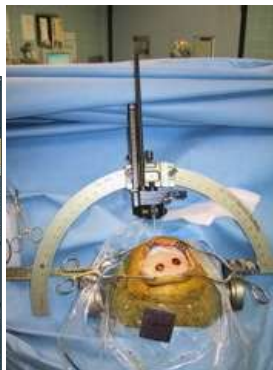
Clinician Programmer



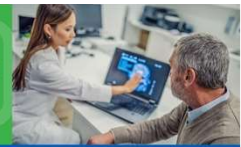
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NEW SURGICAL METHODS

Traditional DBS Surgical Procedure



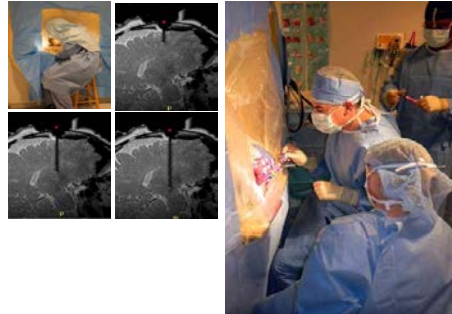
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NEW SURGICAL METHODS

Interventional MRI for DBS lead placement "Asleep DBS"

- Developed at UCSF (ClearPoint system)
- Allows patients to be asleep during the procedure
- Surgical procedure is faster with fewer brain penetrations



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INTERVENTIONAL MRI

Pros

- Comparable efficacy
- Accuracy Excellent
- No MER
 - Reduced brain penetrations
 - No physiology expertise needed
- Patient asleep

Cons

- Technique not readily available
 - No intraoperative MRI
 - MRI suites used 24/7
- Reported outcomes limited to a few centers
- MRI visualization
 - GPI: Usually good
 - STN: not always great
 - VIM: not visible
- Bias of traditionalist: anatomically well placed leads can still be ineffective

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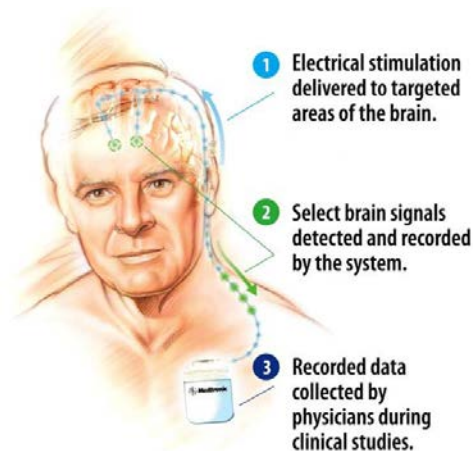
MRI SCANS IN DBS PATIENTS- MEDTRONIC SYSTEMS

- Previously only Head MRI's were approved with SARs <0.1 W/kg (low frequency power limit)- DBS had to be turned "off"
- **FDA approved Medtronic DBS systems for only full-body MRI Conditional Use. (Dec 9, 2015)**, new measurement
- DBS system can be left "on" now if in bipolar mode, can be done with any coil, 1.5T closed bore magnet.
- Fill out eligibility sheet- Medtronic help (1-800-707-0933), give to radiology staff
- Only applies if:
 - Activa portfolio DBS (**Not** Soletra, Kinetra, Active SC model 37602, and model 64001/2 pocket adaptors) – 2 prong connector/adaptor – beginning of 2009 – new systems will be all whole body eligible.
 - No broken conductor (lead extension or pocket adaptor), standard IPG placement

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FUTURE ADAPTIVE DBS FOR PD

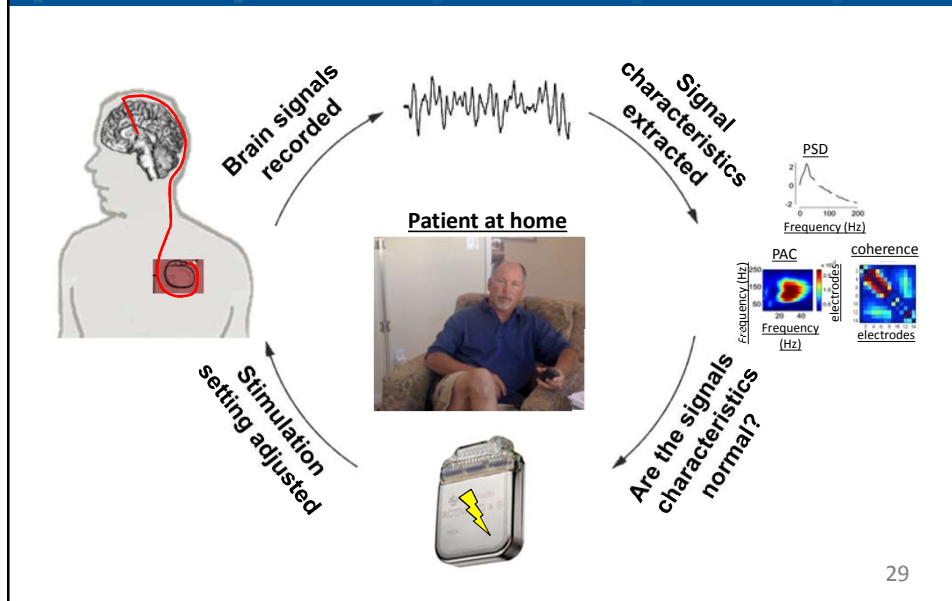
- Determine signals of parkinsonian state
- Signals that correlates with symptoms severity
- Signals that are modulated by medication/DBS
- New Medtronic IPG (Activa PC+S) allows for
 - *Therapeutic stimulation*
 - *Recordings of brain activity*
 - *STN/GPi using DBS lead*
 - *An additional electrode (cortical or other)*



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CLOSED-LOOP "ADAPTIVE" PARADIGM



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EXPANDING DBS INDICATIONS

- Driven by high prevalence of neurological and psychiatric disorders, massive unmet medical needs in treatment options, robust R&D investments and technology developments
- Expanding DBS indications:
 - Epilepsy
 - Tourette's Syndrome
 - Depression
 - Addiction
 - PTSD
 - Chronic Pain
 - Obesity
 - Anorexia
 - Alzheimer's Disease and Dementia
 - Tinnitus
 - Traumatic Brain Injury
 - Minimally Conscious State
 - Stroke Recovery
 - Headache

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UCSF MOVEMENT DISORDERS



Neurology

Jill Ostrem, MD
Nicholas Galifianakis, MD
Caroline Tanner, MD, PhD
Marta San Luciano, MD
Maya Katz, MD
Ian Bledsoe, MD,MS
James Maas, MD, PHD
Chadwick Christine, MD
Michael Aminoff, MD
Robert Edwards, MD
Ken Nakamura, MD, PhD
Alexandra Nelson, MD, PhD
Michael Geschwind, MD
Amy Viehoveer, MD, PhD
Nijee Luthra, MD, PhD
Cameron Dietiker, MD

Research /Support Staff

Sarah Wang, PhD
Kristen Dodenhoff, BA
Farah Kauser
Joncarmen Mergenthaler
Janet Allen
Shatara Blackmon
Yasmeen Gonzalez
Jeverly Calaunan
Kathleen Comyns, MPH
Samantha Bethell, BA
Cheryl Meng, MPH
Danilo Romero
Kanchi Mehta

Psychiatry

Andrea Seritan, MD

Social Work

Monica Eisenhardt, LCSW

Chaplin

Judith Long

Physical Therapy

Nancy Byl, PT, PhD
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Neurosurgery

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Paul S. Larson, MD
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Daniel Lim, MD, PhD
Krzysztof Bankiewicz, MD, PhD
Coralie De Hemptinne, PhD
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Doris Wang, MD, PhD

Neuropsychology

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Nursing

Monica Volz, FNP, MS
Karen Merchant, MSN
Susan Heath, MS, RN
Gina Bringas-Cinco, RN
Annie Li Wong, NP

Fellows

Jessica Weinstein, MD
Kyle Mitchell, MD
Jennifer Choi, MD
Ethan Brown, MD
Mitra Afshari, MD
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Idit Tamir, MD, PhD

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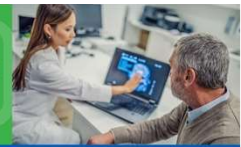
QUESTION & ANSWER



Jill L. Ostrem, MD

*Carlin & Ellen Wiegner Endowed Professor of Neurology
Division Chief, UCSF Movement Disorder and Neuromodulation Center
Weill Institute of Neurosciences
University of California San Francisco*

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CLOSING REMARKS



Stephanie Paul
Vice President Development and Marketing
American Parkinson Disease Association

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apdaparkinson.org

Or call us
1-800-223-2732