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It's how we **treat people.**

# Movement Disorders Specialist approach prior to DBS surgery

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Epilepsy Surgery  
MedStar Georgetown University Hospital



# Agenda

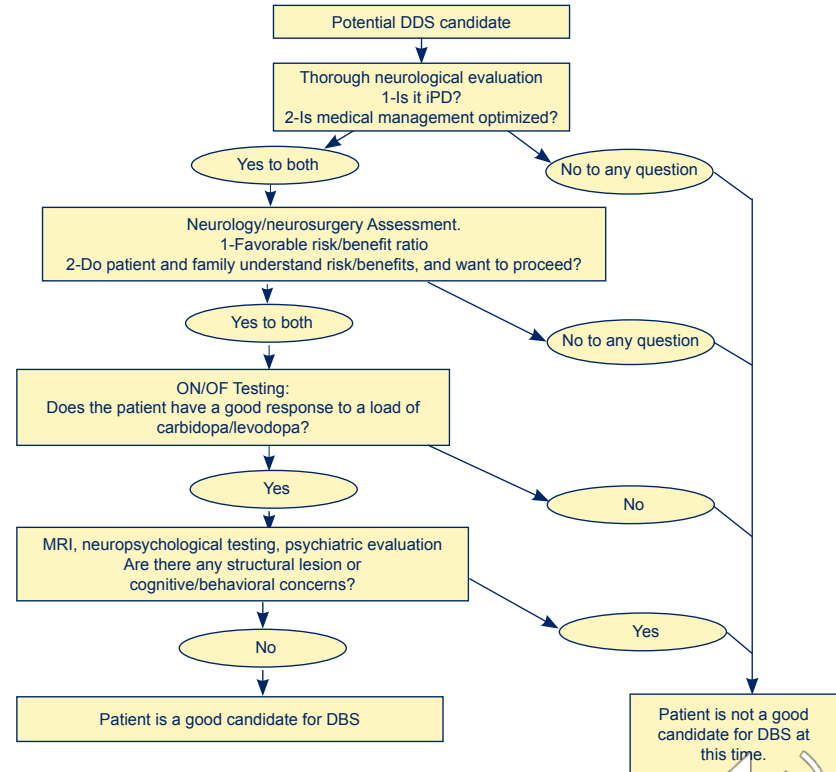
Considering DBS and the screening process

1. Determine candidacy
2. Neurological examination: evaluation of motor and non-motor symptoms.
3. Visualize brain with an MRI and confirm Dopamine Disorder
4. Optimize oral medication therapy
5. On/Off testing
6. Decision of where to locate the DBS within the brain
7. Neuropsychological testing
8. Goals in managing symptoms



# Considering DBS and the screening process

- Consult with a neurosurgeon and a movement disorders specialist
- A movement disorders specialist is a neurologist that subspecializes in caring for patient with PD and usually completed a one- or two-year fellowship
- Find a DBS center with an interdisciplinary team of healthcare professionals
- Planning the initial DBS programming the deep brain stimulator and follow up appointments for regular DBS adjustments will be expected



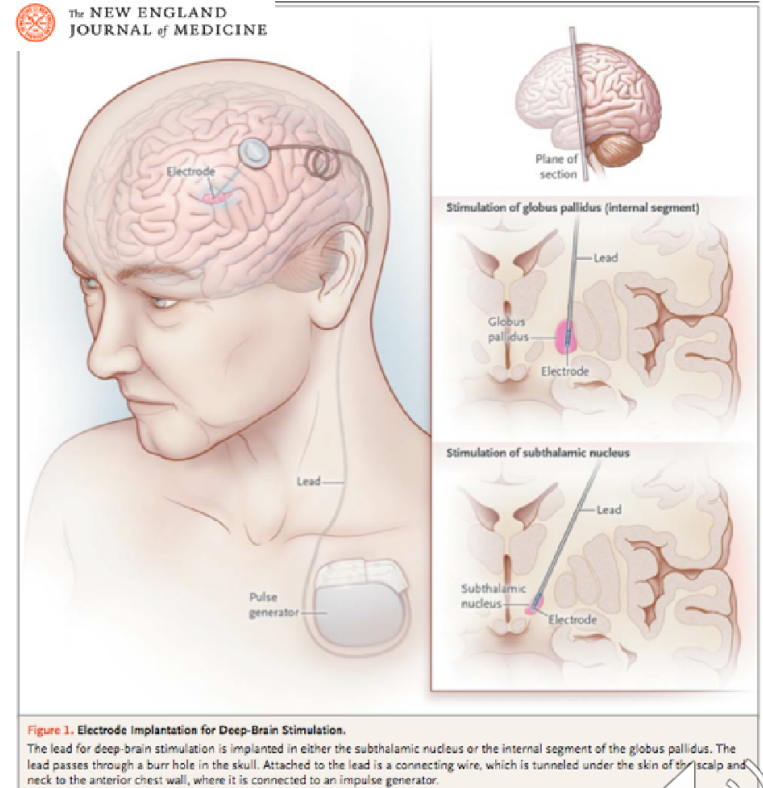
Abbound H, Mehanna R, Machado A, Ahmed A, Gostkowski M, Cooper S, Itin I, Sweeney P, Pandya M, Kubu C, Floden D, Ford PJ, Fernandez HH. Comprehensive, Multidisciplinary Deep Brain Stimulation Screening for Parkinson Patients: No Room for "Short Cuts". *Mov Disord Clin Pract*. 2014 Oct 10;1(4):336-341. doi: 10.1002/mdc3.12090. PMID: 30363983; PMCID: PMC6183455.



# 1. Determine candidacy

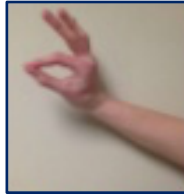
- Idiopathic Parkinson's disease with symptoms of 4 years or more
- No significant cognitive impairment
- Symptoms improve with medication
- Patient complains of motor fluctuations and dyskinesias
- Disabling tremor refractory to medical therapy
- Moderate to advanced symptoms when oral therapies lose effectiveness
- Does not have to be considered as a last resort

<https://practicalneurology.com/articles/2012-nov-dec/identifying-candidates-for-deep-brain-stimulation-for-parkinsons-disease/pdf>



# 2. Neurological examination: evaluation of motor and non-motor symptoms

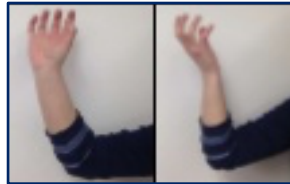
## Neurological and movement disorder examination



**Item 4: Finger Tapping**  
Rhythm, amplitude, interruptions, speed



**Item 5: Hand Movements**  
Rhythm, amplitude, interruptions, speed



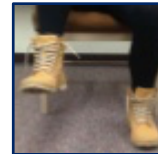
**Item 6: Pronation-supination of hands**  
Rhythm, amplitude, interruptions, speed



**Item 16: Kinetic tremor of hands**  
Presence of tremor and amplitude



**Item 7: Toe-tapping**  
Rhythm, amplitude, interruptions, speed

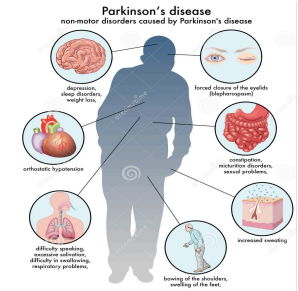


**Item 8: Leg agility**  
Rhythm, amplitude, interruptions, speed

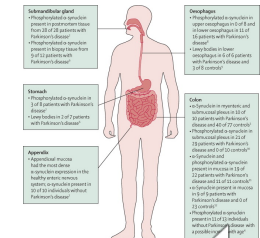


**Item 9: Arising from chair**  
Speed, number of attempts, assistance, posture

## Non-motor symptoms



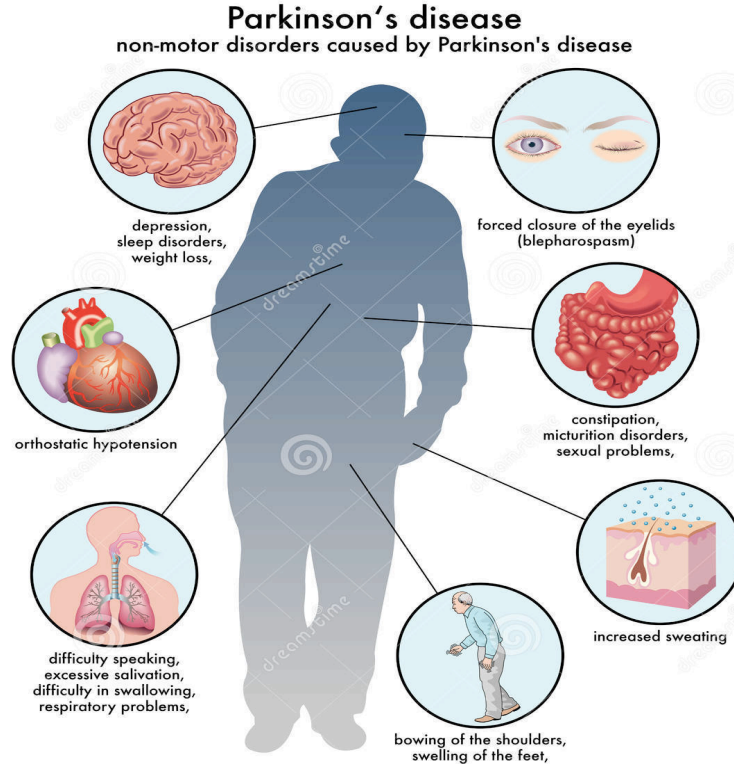
## Addressing GI Tract: constipation management



Understanding the Movement Disorder Society-Unified Parkinson Disease Rating Scale (MDS-UPDRS) Vaughan K. Collins\*, Rachel N. Massart\* OTS, Kristen A. Pickett Ph.D. \*Equal contributors  
References UPDRS - III

# 2. Neurological examination: evaluation of motor and non-motor symptoms

## Non-motor symptoms



## Neurological and movement disorder examination



## Addressing GI Tract: constipation management

**Salivary gland**  
- "Most patients do not present a decrease in salivary gland function from 20 to 25 years with Parkinson's disease"  
- "Medication-induced sialadenitis presents clinically more often in 12 patients with Parkinson's disease"

**Stomach**  
- "Not reported to present in 3 of 12 patients with Parkinson's disease"  
- "One patient in 2 of 7 patients with Parkinson's disease"

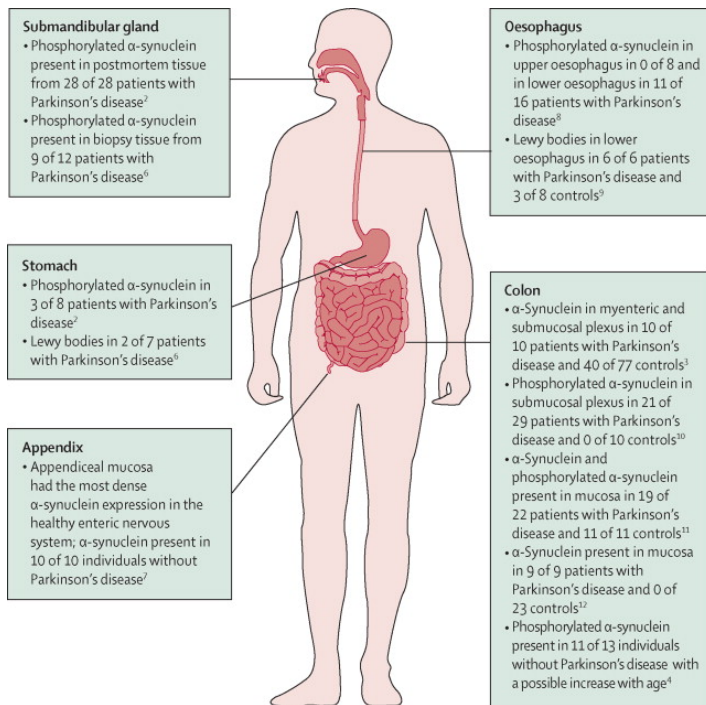
**Appendix**  
- "Medication-induced sialadenitis presents in 15 of 22 patients with Parkinson's disease and in 1 of 2 controls"  
- "Sialadenitis presents in 15 of 22 patients with Parkinson's disease and in 2 of 2 controls"

**Colon**  
- "No decrease in motility and substance (slow) in 12 of 22 patients with Parkinson's disease and in 2 of 2 controls"  
- "Medication-induced sialadenitis presents in 15 of 22 patients with Parkinson's disease and in 1 of 2 controls"

**Rectum**  
- "No decrease in motility and substance (slow) in 15 of 22 patients with Parkinson's disease and in 2 of 2 controls"  
- "Medication-induced sialadenitis presents in 15 of 22 patients with Parkinson's disease and in 1 of 2 controls"

# 2. Neurological examination: evaluation of motor and non-motor symptoms

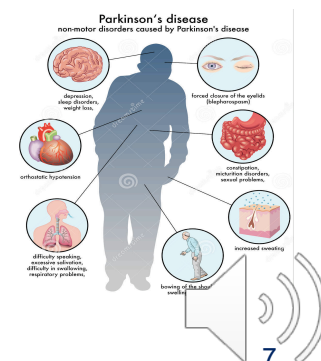
## Addressing GI Tract: constipation management



## Neurological and movement disorder examination



## Non-motor symptoms



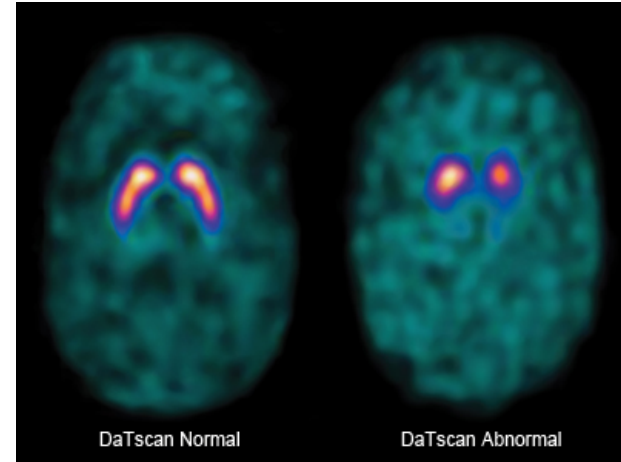
# 3. Visualize brain with an MRI and confirm Dopamine Disorder

MRI Brain



<https://radiopaedia.org/cases/normal-brain-mri-6>

DAT Scan

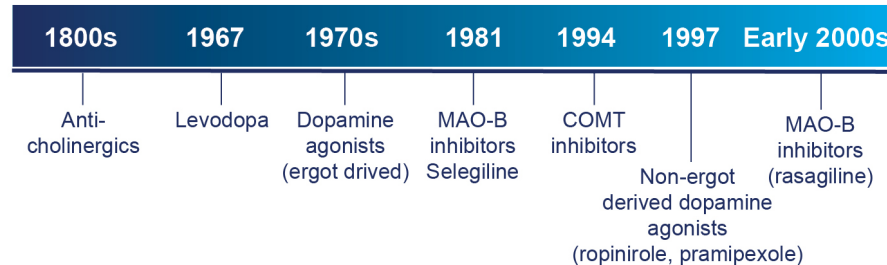
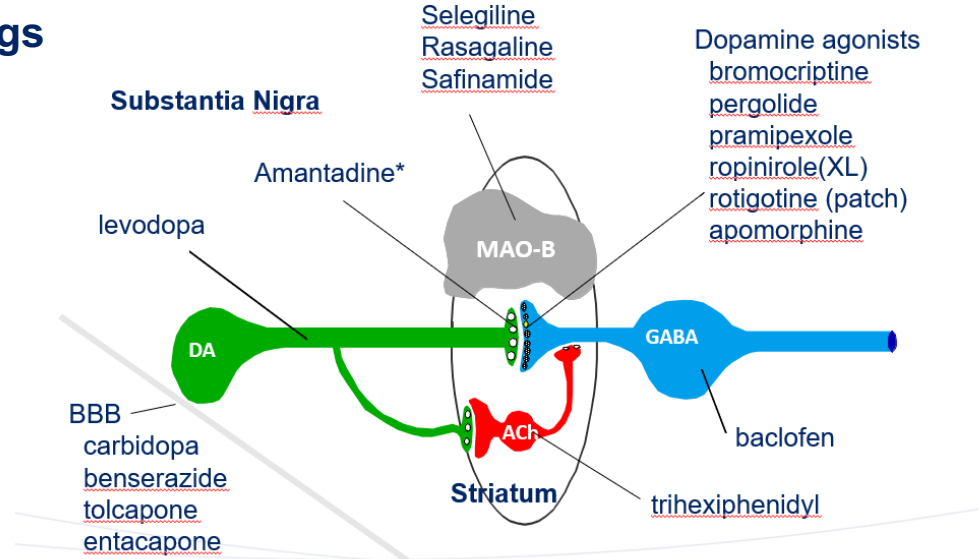


**Parkinson's disease dementia: convergence of  $\alpha$ -synuclein, tau and amyloid- $\beta$  pathologies.** Nat Rev Neurosci. 2013 September; 14(9): 626–636.



# 4. Optimize oral medication therapy

## Sites of Action of PD Drugs



# 5. On/Off testing

- Important part of the screening process to evaluate response to levodopa
- Patient may be asked to come to movement disorders office in an “off” state. Usually performed in the morning to avoid discomfort
- A series of examinations to test for improvement will be performed before and then after administration of Carbidopa-levodopa
- Determining that PD is levodopa-responsive and determine which symptoms are most likely to respond to DBS

<https://www.parkinson.org/sites/default/files/attachments/Deep-Brain-Stimulation-Guide-Parkinsons.pdf>



Hyperdopaminergic behavior

Motor: dyskinesic

Non-motor: relaxed, sensation and pleasure seeking, creative, socializing, talkative, joking, teasing, self-confident, euphoric, self-satisfied, hyperactive, messy, myopic of the future, disinhibited, manic

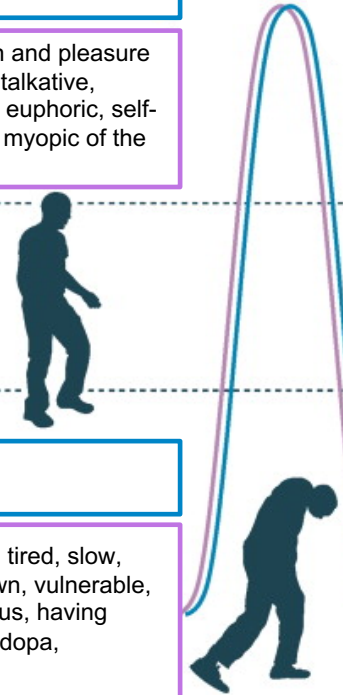
Normodopaminergic behavior

Hypodopaminergic behavior

Motor: akinetic, rigid

Non-motor: feeling dull, weak, tired, slow, apathetic, indifferent, withdrawn, vulnerable, without self-confidence, anxious, having panic attacks, craving for levodopa, dysphoric, sad, suicidal

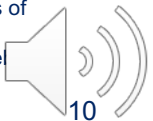
— Motor fluctuations  
— Non-motor fluctuations



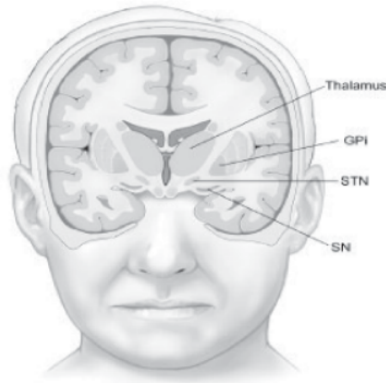
Castrìo A, Lhommée E, Moro E, Krack P. Mood and behavioural effects of subthalamic stimulation in Parkinson's disease. *Lancet Neurol.* 2014 Mar;13(3):287-305. doi: 10.1016/S1474-4422(13)70294-1. Epub 2014 Feb 27. PMID: 24556007.



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# 6. Decision of where to locate the DBS within the brain



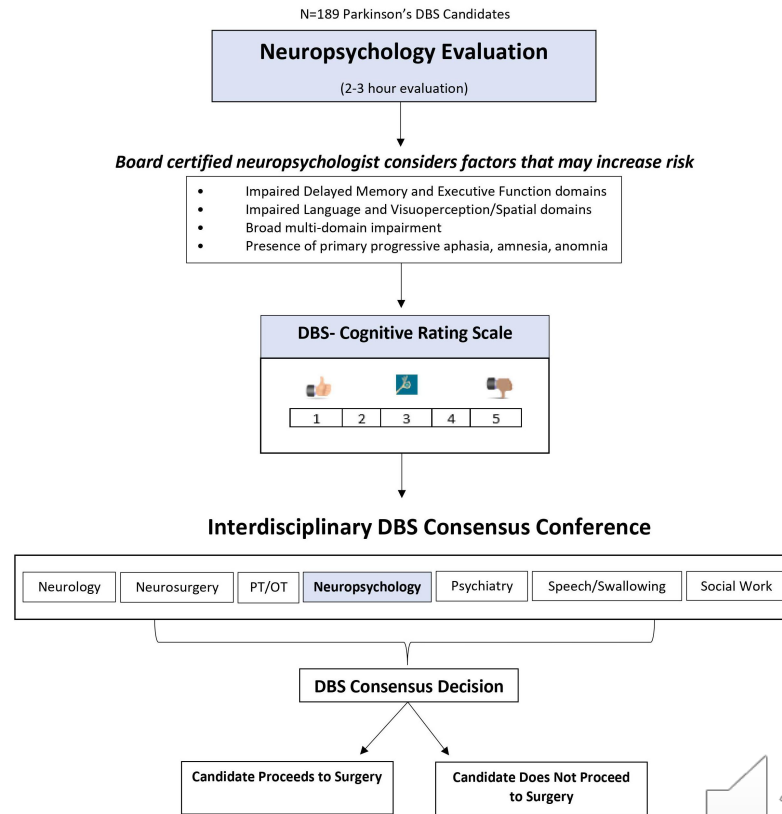
Location of DBS target areas and substantia nigra (SN)

DBS Site	Effects of therapy
Thalamus (Vim)	Reduces tremor but not the other symptoms of PD
Globus pallidus (GPi)	Reduces tremor, rigidity, bradykinesia, gait problems, dyskinesia
Subthalamic nucleus (STN)	Reduces tremor, rigidity, bradykinesia, gait problems, dyskinesia

<https://www.parkinson.org/sites/default/files/attachments/Deep-Brain-Stimulation-Guide-Parkinsons.pdf>

# 7. Neuropsychological testing

- Neuropsychological testing is a series of standardized tests that measure thinking skills, including attention, memory, planning, organization, motivation, and mood
- The tests are administered and reviewed by a neuropsychologist and generally, the testing takes several hours to complete
- A cognitive assessment can help determine a person's ability to participate in the DBS procedure, managing of the neurostimulator after surgery is performed
- This assessment also informs the team of the risk of having worsened confusion or cognitive problems following the procedure



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**MONTREAL COGNITIVE ASSESSMENT (MOCA)**  
Version 7.1 Original Version

NAME: \_\_\_\_\_ Date of birth: \_\_\_\_\_  
Education: \_\_\_\_\_ Sex: \_\_\_\_\_ DATE: \_\_\_\_\_

VISUOSPATIAL / EXECUTIVE		Copy cube					Draw CLOCK (Ten past eleven)			POINTS		
							<input type="checkbox"/> Contour <input type="checkbox"/> Numbers <input type="checkbox"/> Hands				___/5	
NAMING												
									___/3			
MEMORY		Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.					FACE	VELVET	CHURCH	DAISY	RED	No points
1st trial												
2nd trial												
ATTENTION		Read list of digits (1 digit/ sec.). Subject has to repeat them in the forward order [ ] 2 1 8 5 4 Subject has to repeat them in the backward order [ ] 7 4 2					___/2					
Read list of letters. The subject must tap with his hand at each letter A. No points if > 2 errors [ ] F B A C M N A A J K L B A F A K D E A A J A M O F A A B												
Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65 4 or 5 correct subtractions: 3 pts, 3 or 2 correct: 2 pts, 1 correct: 1 pt, 0 correct: 0 pt												
LANGUAGE		Repeat: I only know that John is the one to help today. [ ] The cat always hid under the couch when dogs were in the room. [ ]					___/2					
Fluency / Name maximum number of words in one minute that begin with the letter F [ ] _____ (N ≥ 11 words)												
ABSTRACTION Similarity between e.g. banana - orange = fruit [ ] train - bicycle [ ] watch - ruler												
DELAYED RECALL		Has to recall words WITH NO CUE					FACE	VELVET	CHURCH	DAISY	RED	Points for UNCUED recall only
Optional		Category cue										
		Multiple choice cue										
ORIENTATION		[ ] Date	[ ] Month	[ ] Year	[ ] Day	[ ] Place	[ ] City	___/6				

© Z.Nasreddine MD    www.mocatest.org    Normal 2-26 / 30    TOTAL \_\_\_\_\_ /30  
Administered by: \_\_\_\_\_    Add 1 point if < 12 yr edu



# 8. Goals in managing symptoms

## DBS Therapy Expected Outcomes

### Potential benefits of STN or GPi DBS

#### Either STN or GPi DBS can:

- Improve on times (up to 11 hrs/day)
- Reduce off times
- Markedly reduce dyskinesias
- Often allow reduction in medications
- Improve depression (GPi only)
- Improve prominent dystonic symptoms (GPi only)

<https://practicalneurology.com/articles/2012-nov-dec/identifying-candidates-for-deep-brain-stimulation-for-parkinsons-disease/pdf>



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# 8. Goals in managing symptoms

## DBS Therapy Expected Outcomes

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## Reduce the dyskinesias and wearing off and optimize time within therapeutic window

Hyperdopaminergic behavior

Motor: dyskinetic

Non-motor: relaxed, sensation and pleasure seeking, creative, socializing, talkative, joking, teasing, self-confident, euphoric, self-satisfied, hyperactive, messy, myopic of the future, disinhibited, manic

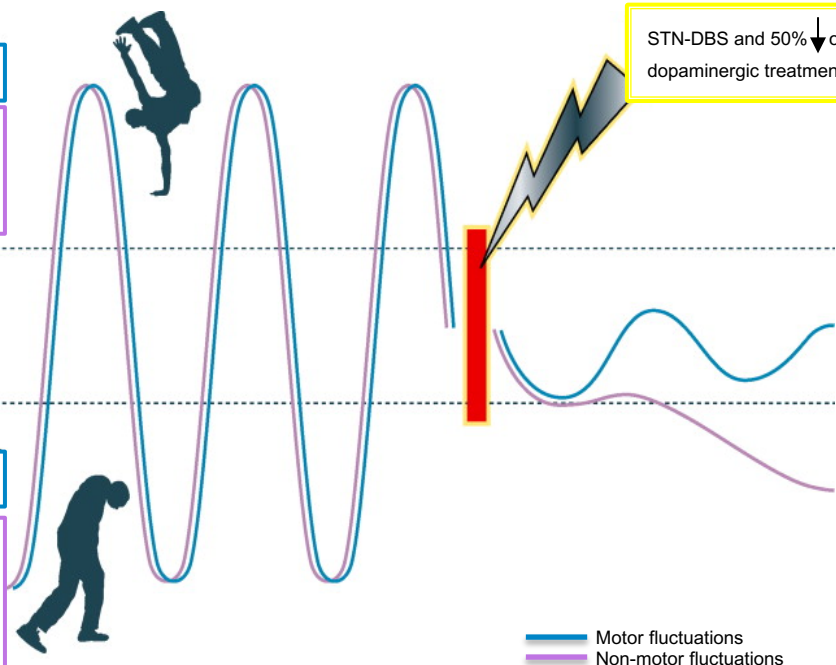
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STN-DBS and 50% ↓ of dopaminergic treatment



— Motor fluctuations  
— Non-motor fluctuations



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Castrioto A, Lhommée E, Moro E, Krack P. Mood and behavioural effects of subthalamic stimulation in Parkinson disease. *Lancet Neurol.* 2014 Mar;13(3):287-305. doi: 10.1016/S1474-4422(13)70294-1. Epub 2014 Feb 17. PMID: 24556007.

# Questions?

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# Thank you

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