2026 Parkinson's Disease Conference

Division of Movement Disorders

Department of Neurological Sciences

UNMC COLLEGE OF ALLIED HEALTH PROFESSIONS

UNMC

Parkinson’s Disease in 2026

A conference for people with Parkinson’s disease
and their families and care partners

September 30, 2026 | Embassy Suites La Vista

Matthew Rizzo, MD

Parkinson’s affects more than movement

Movement and balance

Sleep, mood and thinking

Work, relationships and daily routines

Each person’s priorities are different.

Good care draws on many kinds of expertise

Movement disorders care

Rehabilitation and mental health

Deep brain stimulation and focused ultrasound

Support for patients and families

Parkinson’s happens between clinic visits

At home, in the community and throughout an ordinary day



A research example: cognitive change

EVERYDAY LIFE

Sleep, movement, driving and shared routines

CLINICAL ASSESSMENT

Cognitive tests, blood markers and imaging

Which measures predict meaningful change?

Proposed research. These measures are not clinical prediction tools.

Your questions matter

Ask about the challenges you face

Share what has helped and what has not

Tell us what research would matter to you

Thank you for being here.

The Diagnosis of Parkinson's Disease

Erin L. Cameron-Smith, MD
Assistant Professor, Neurological Sciences
Movement Disorders Division



University of Nebraska Medical Center℠

Today's Objectives

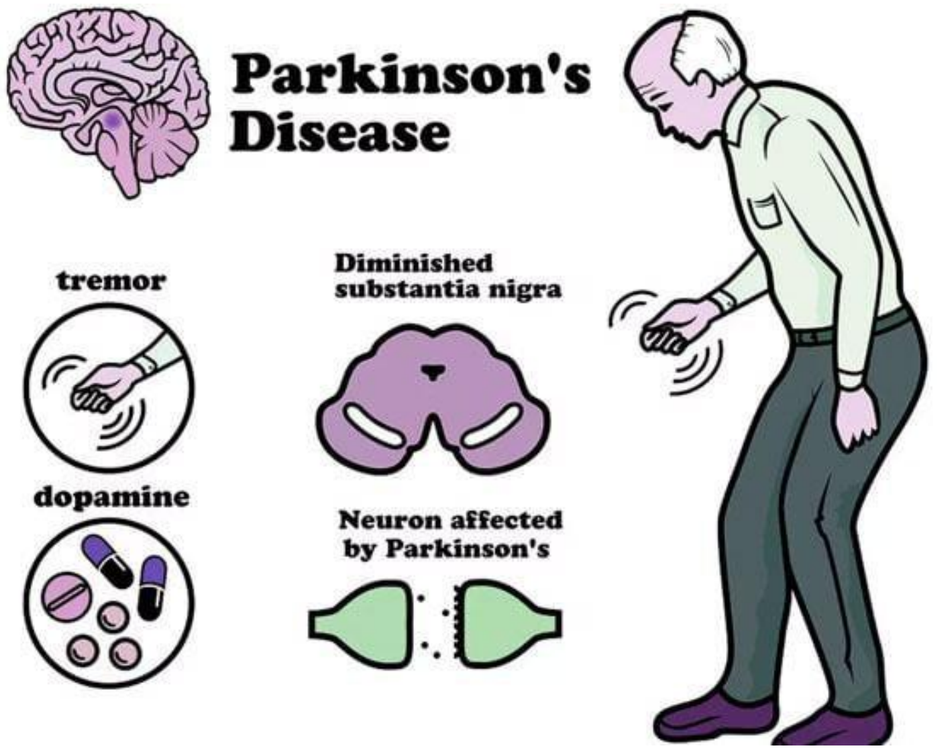
1. Define Parkinson's Disease (PD)
2. Understand how your neurologist makes the diagnosis
3. Show examples of key exam features
4. Discuss why it's challenging to diagnose
5. List the Movement Disorder Society (MDS) criteria
6. Look into the future of diagnosing PD
   - Imaging
   - Biomarkers
   - Artificial Intelligence

What is Parkinson’s Disease (PD)?

What's Parkinson’s Disease (PD)?

Progressive neurological disease characterized by:

- Resting tremor
- Slowness (“bradykinesia”)
- Rigidity / muscle stiffness
- Shuffling feet
- Stooped forward posture



Starts on one side of the body

Who gets Parkinson's Disease?

Slowing down…

Quieter voice…

Stooped posture…

Feeling stiff…

Sound familiar?



Some symptoms are also seen normal aging!

- PD affects older persons (6-7th decade of life)
- Can present under 40 in 5-10% of cases

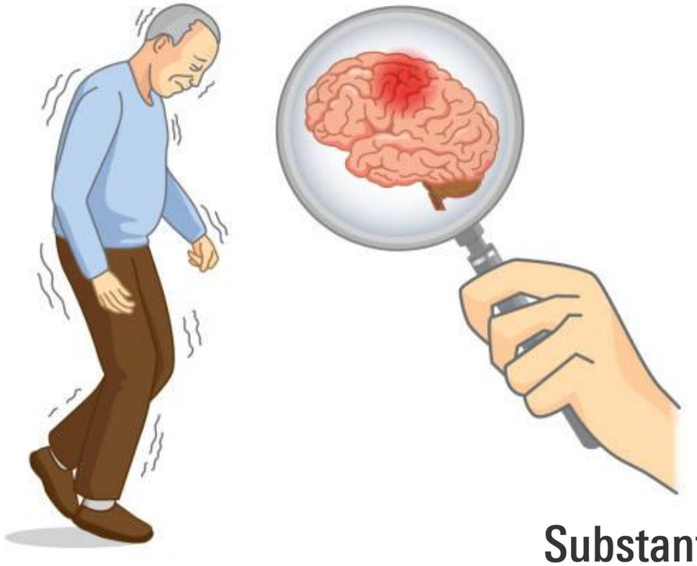
→ Risk increases with **age**

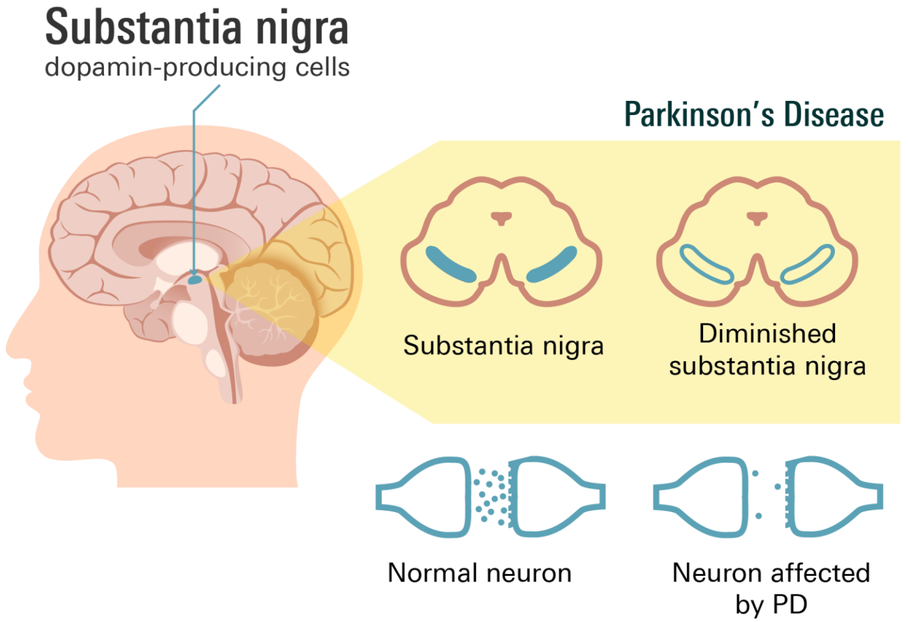
What Causes Parkinson's Disease?

All of these combine in different amounts in every person…

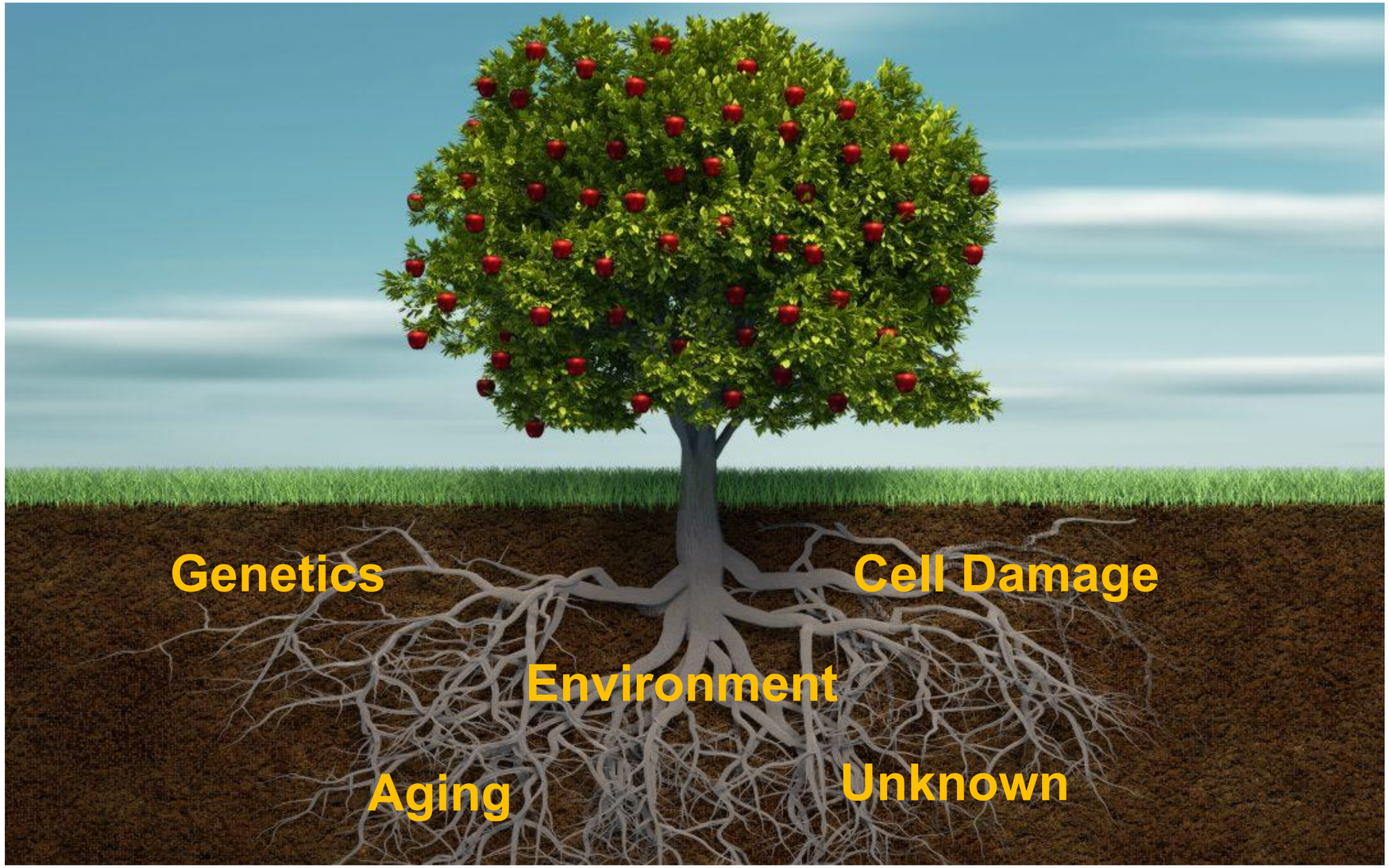
Protein called **alpha synuclein** builds up into clumps

Clumps kill off dopamine brain cells





What Causes Parkinson's Disease Today?



Making the Diagnosis of Parkinson's Disease

How do we diagnose PD?

Clinical Diagnosis!

- Symptoms you describe
- Your neurological exam
- How things progress over time
- Response to treatment (Carbidopa/Levodopa)



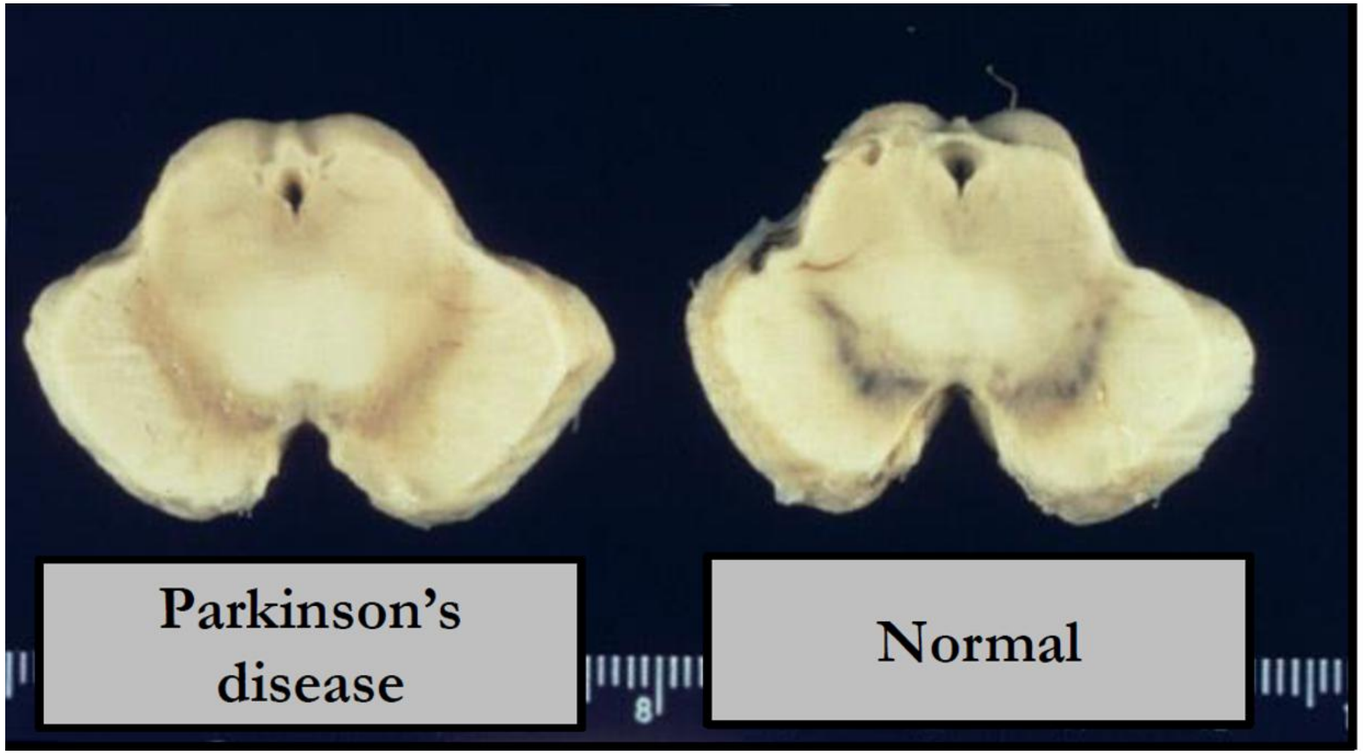
How do we diagnose PD today?

- No lab or imaging test can prove the diagnosis
- Some tests help support our suspicion

  → not required

Gold standard:

Brain Autopsy



How do we diagnose Parkinsons?

Diagnosis is best made by a Movement Disorders Neurologist

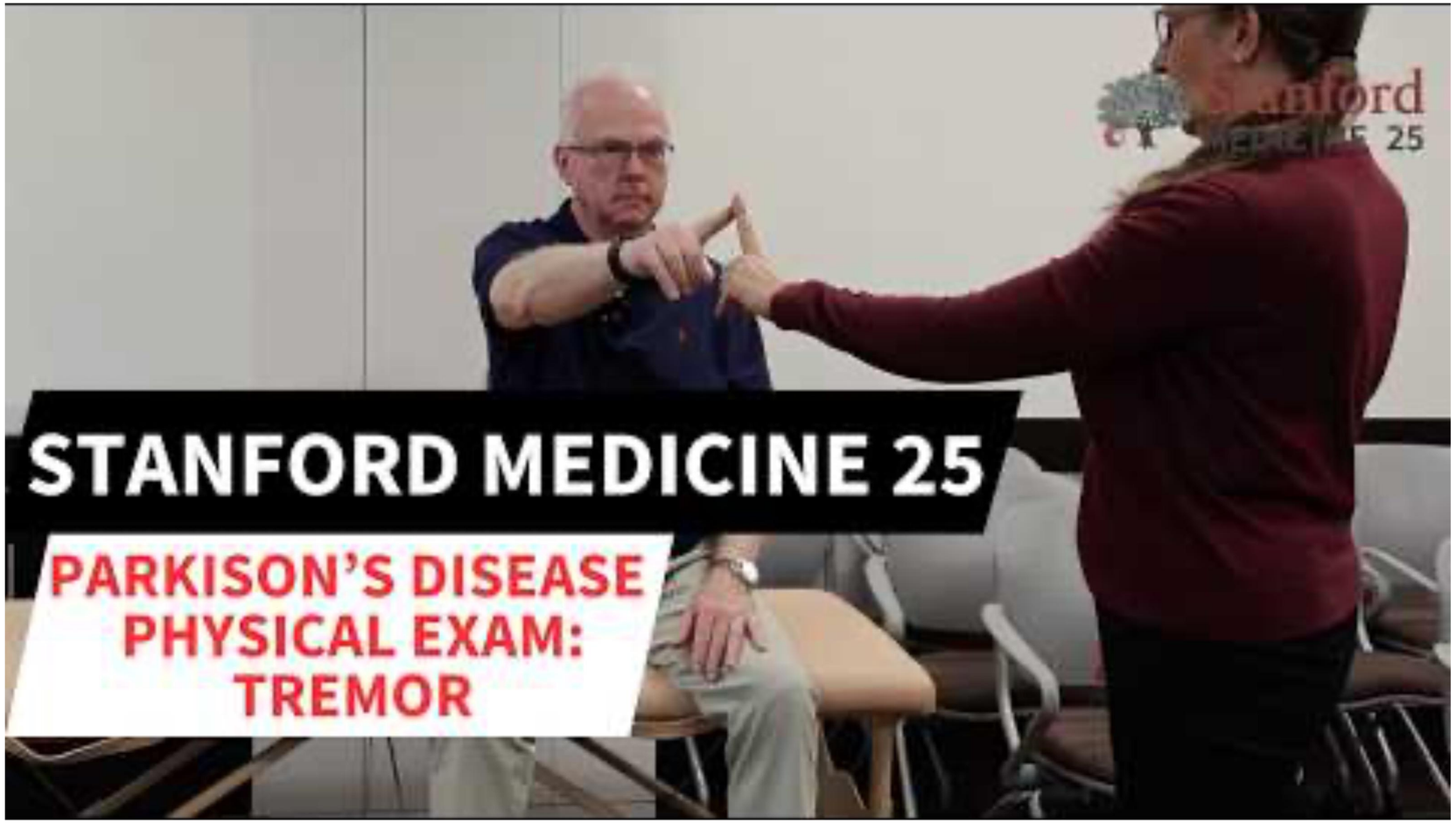
- ***84% accurate (when compared to brain autopsies)***
- Less accurate with a General Neurologist
- Primary care is on the front lines!



The “Clinical Diagnosis”: What We are Looking for On Exam

Resting Tremor

- Present when relaxed, distracted, or while walking
  - ➢ Goes away when using hands
- “Pill rolling” between fingers and thumb



Bradykinesia

- Essential feature!
- Movements get smaller and slower
  - ➢ Especially with repeating the same movement



Rigidity

Tightness and stiffness in muscle

“Cogwheeling” = “notch-like” movements due to tremor



Shuffling Feet / Stooped Posture

- Smaller and shorter steps
  - Feet “shuffle”
- Arms do not swing as much
- Lean forward, “stooped”

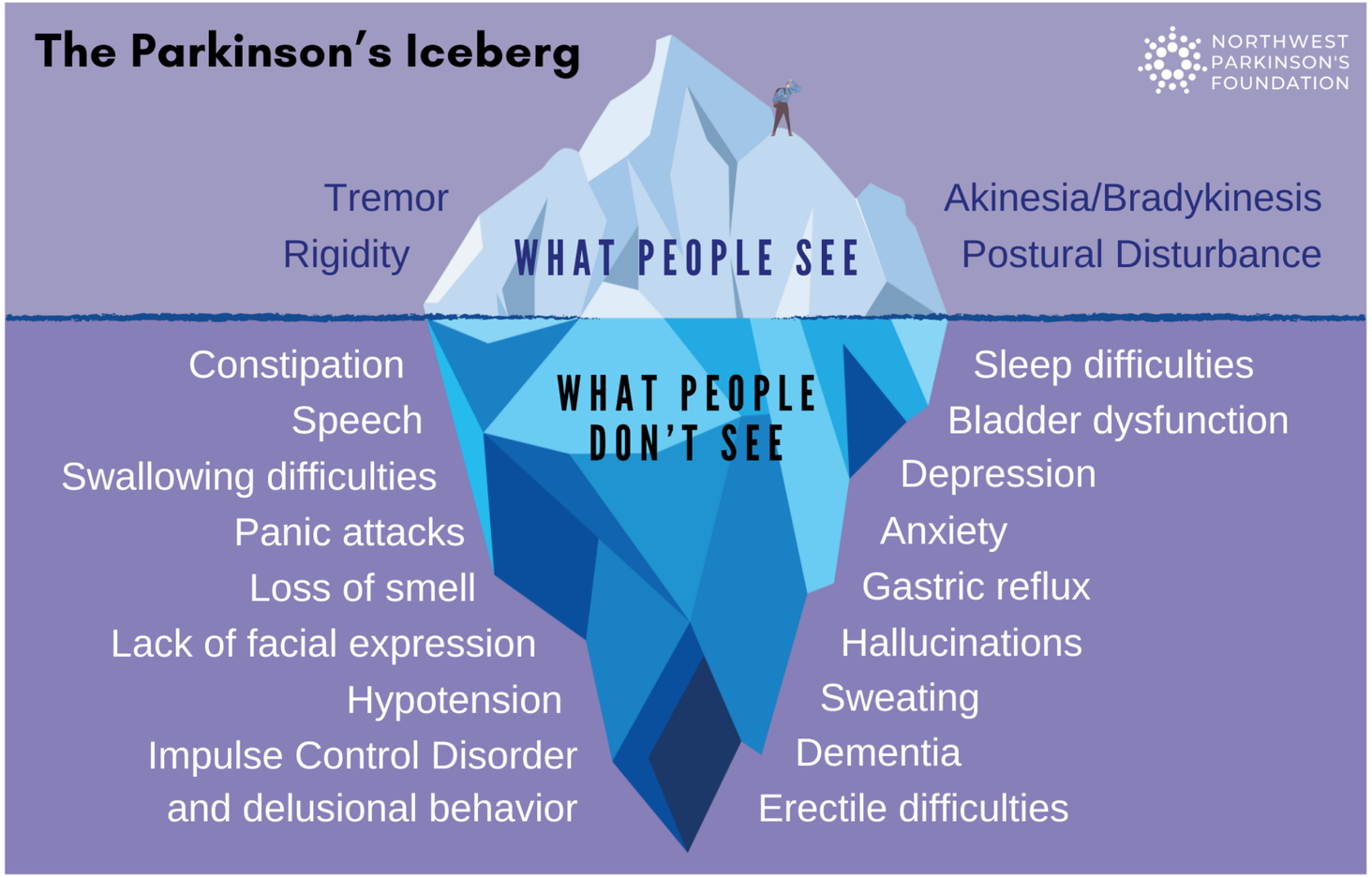


Why Diagnosing PD Can be Challenging

Why is it so hard to diagnose?

PD is complicated!

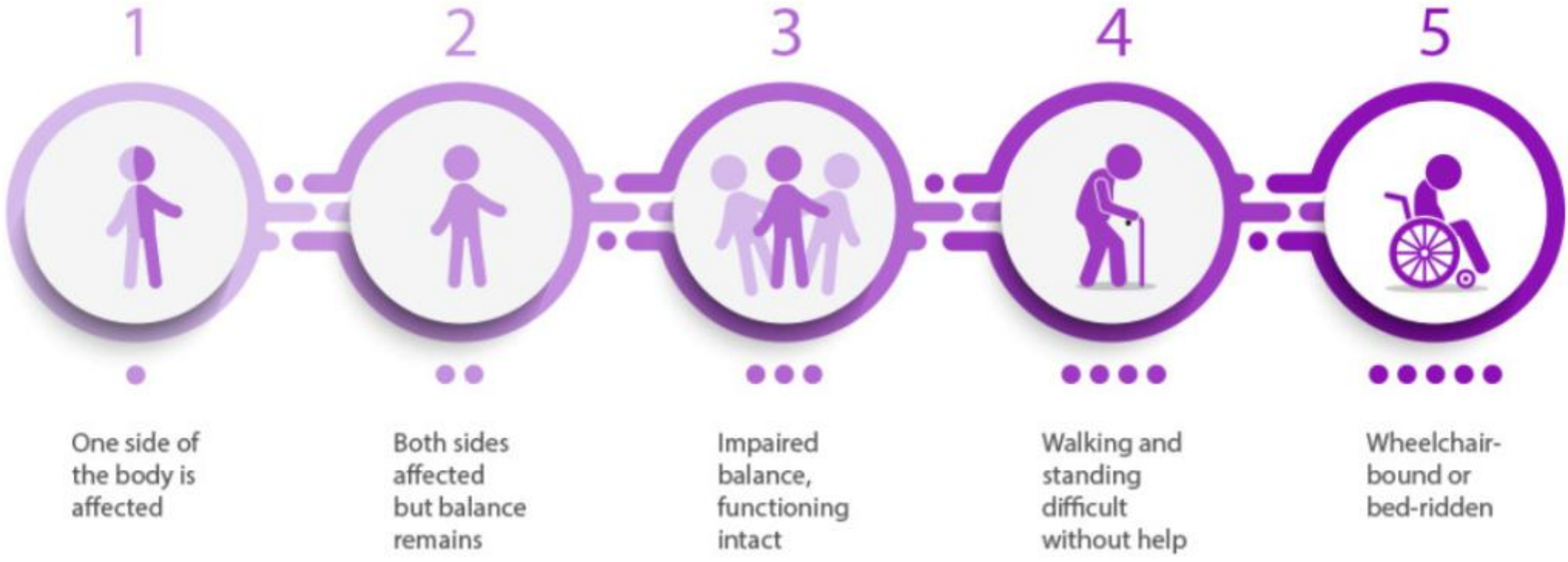
- **Every patient has different symptoms**
- Every patient progresses at a difference pace
- Treatment response can be different



Why is it so hard to diagnose PD?

PD is complicated!

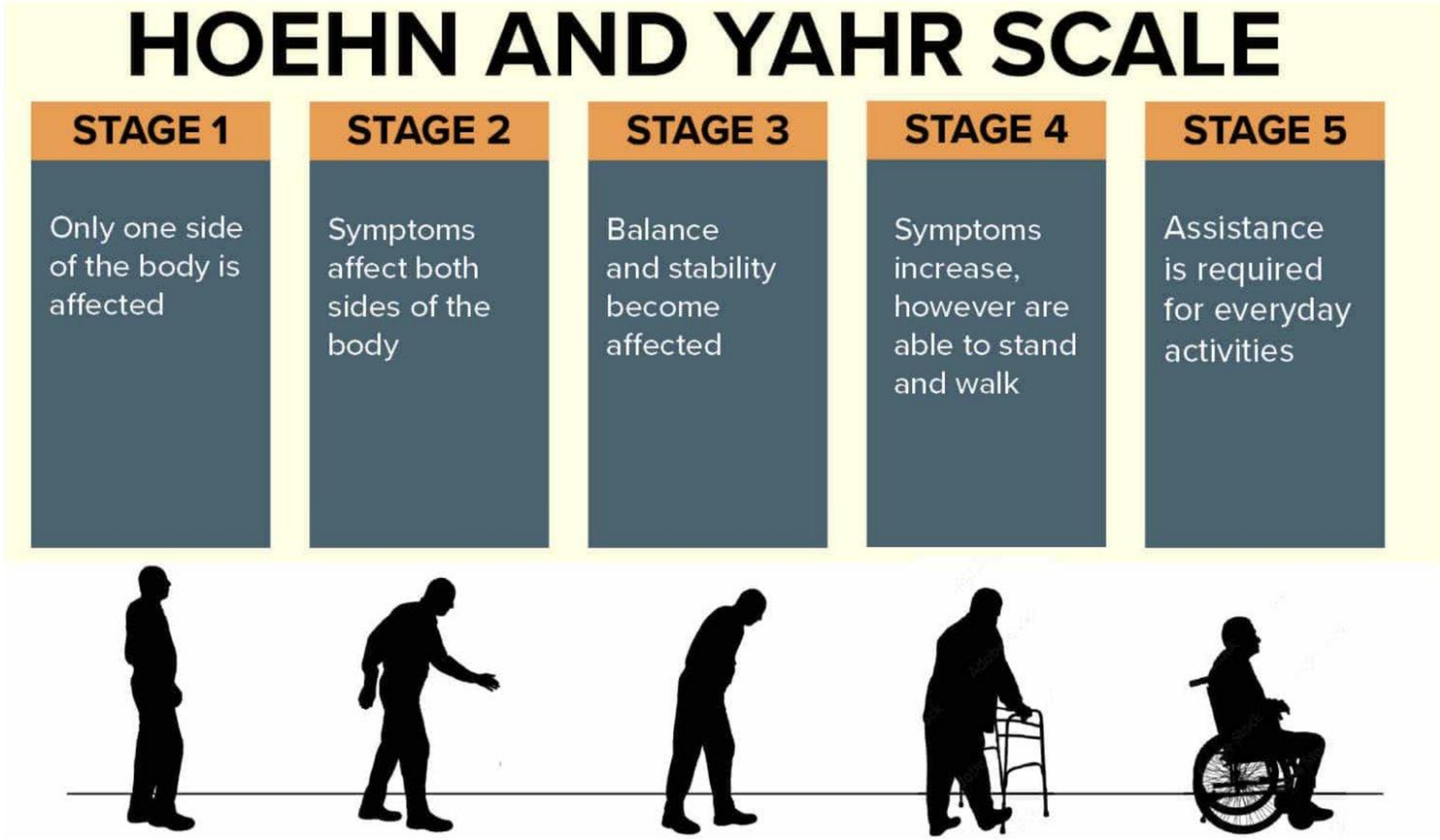
- Every patient has different symptoms
- **Every patient progresses at a difference pace**
- Treatment response can be different



What Stage Am I?

- Used for motor (physical symptoms) only
- Progression is NOT linear
- It's different in every person

"Stage" is best used for research purposes



You set your own pace with PD!

Don’t forget:
EXERCISE SLOWS PD DOWN!



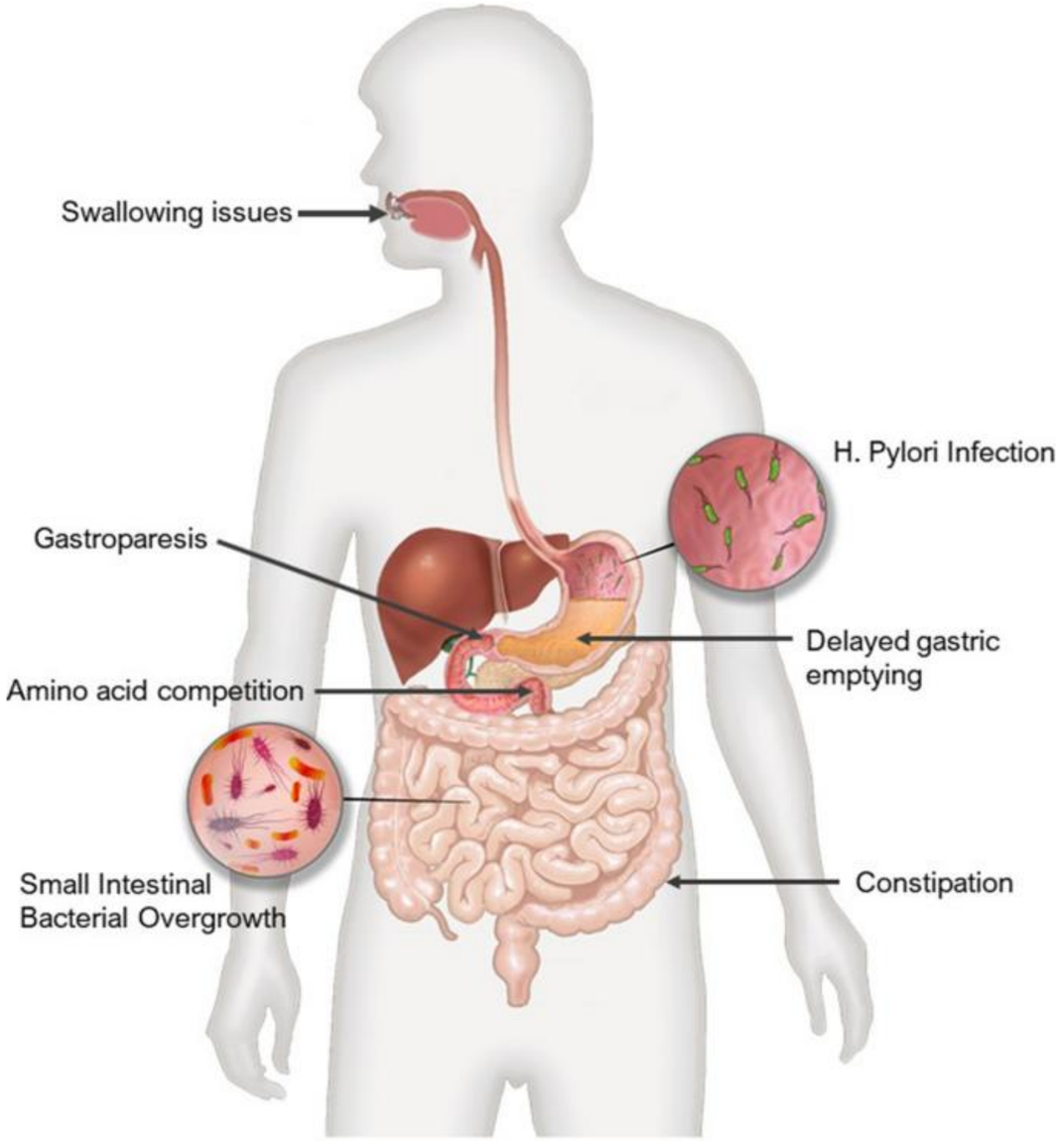




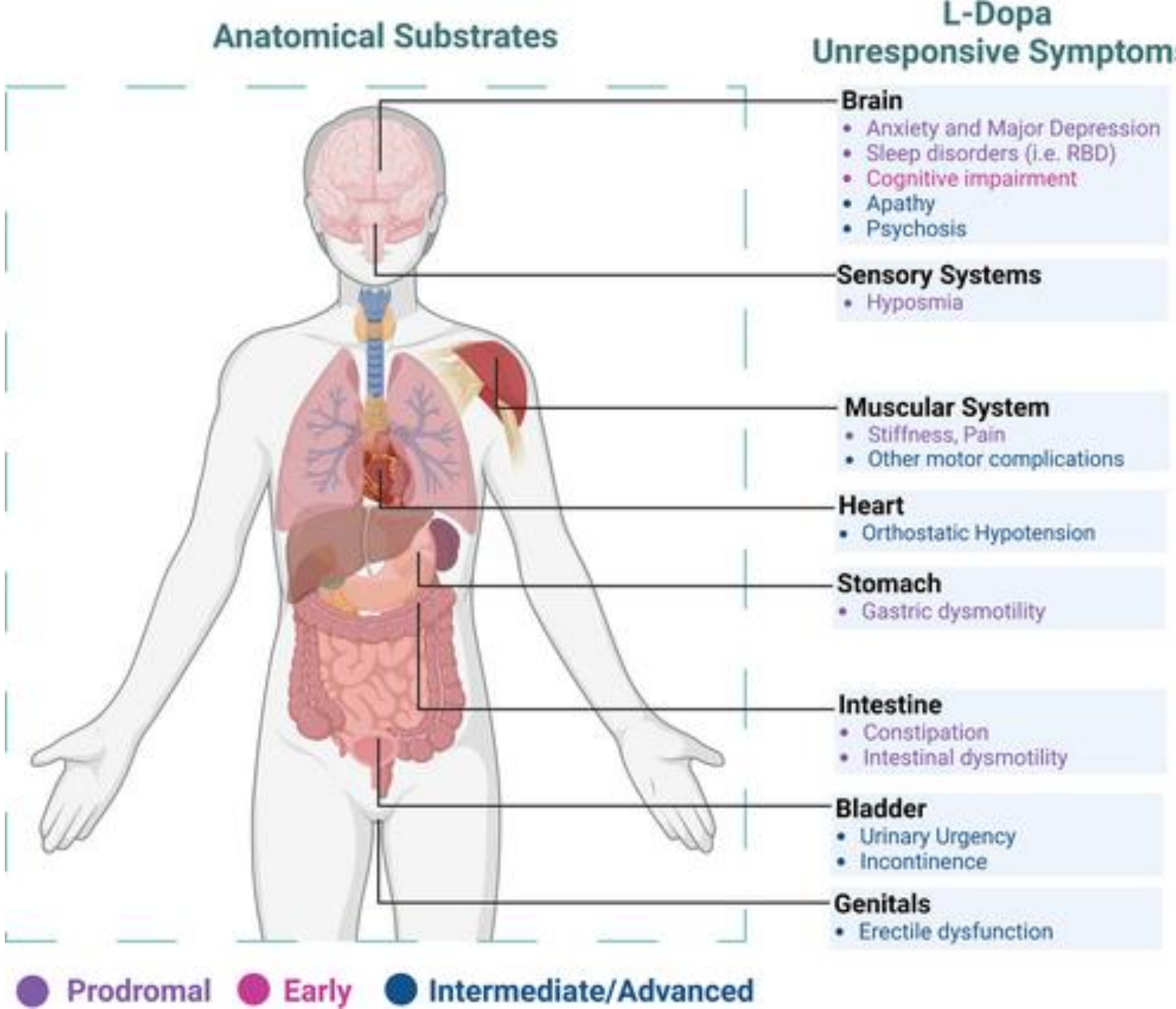
Why is it so hard to diagnose? (cont)

PD is complicated!

- Every patient has different symptoms
- Every patient progresses at a difference pace
- **Treatment response can be different**



- Different dose needs
- Swallowing problems
- Slowed gut movement
- Absorption problems
- Nausea
- Low blood pressure



The Movement Disorders Society Diagnostic Criteria for PD

Diagnostic Criteria

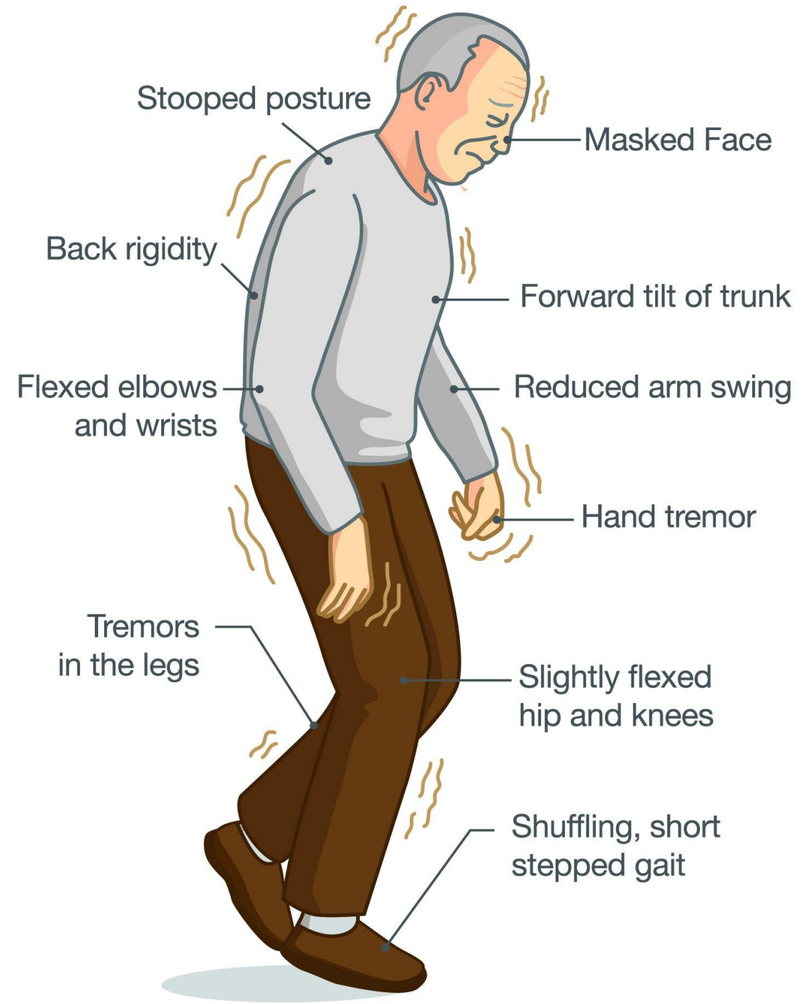
Movement Disorders Society (MDS) 2015:

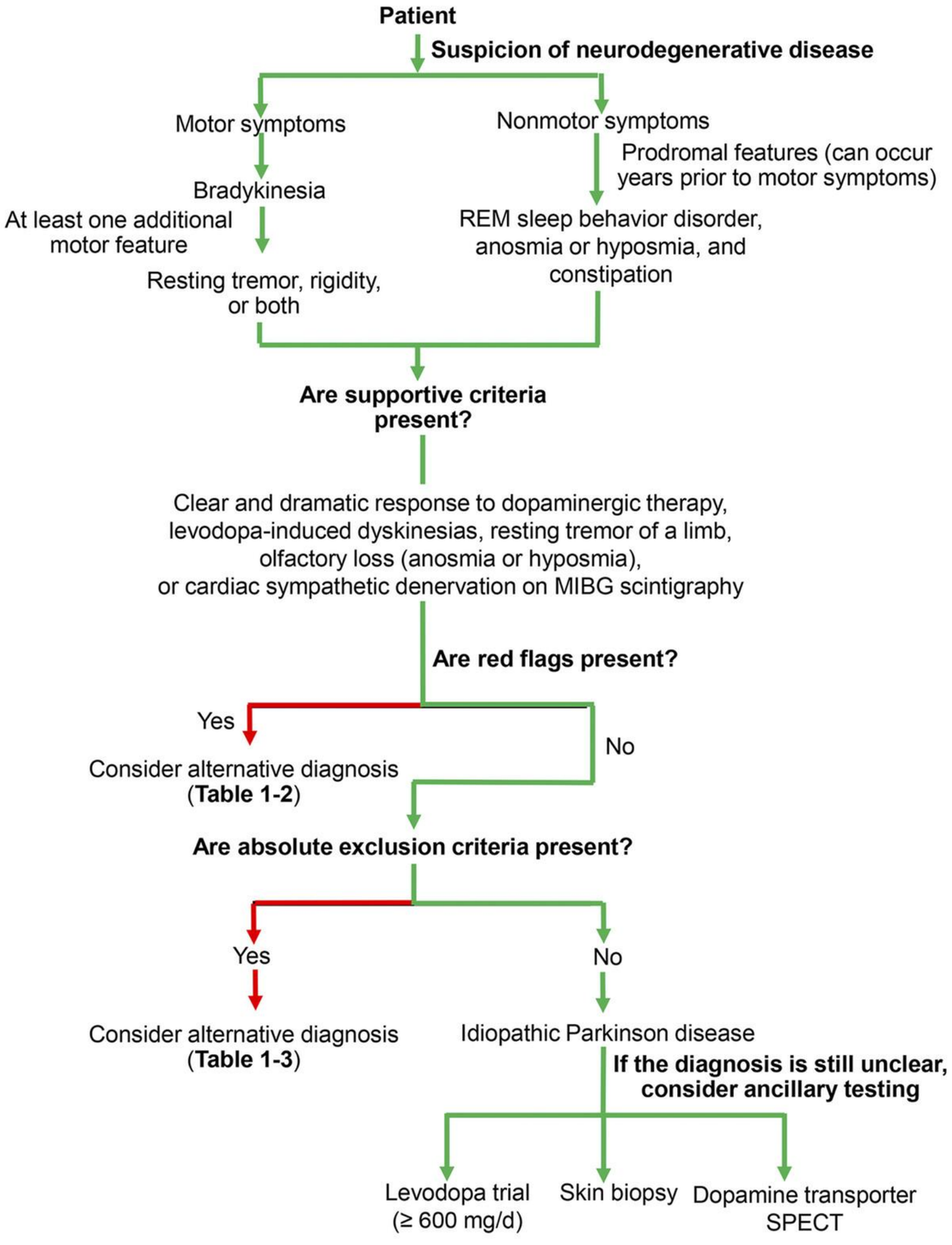
Bradykinesia PLUS
Tremor AND/OR Rigidity

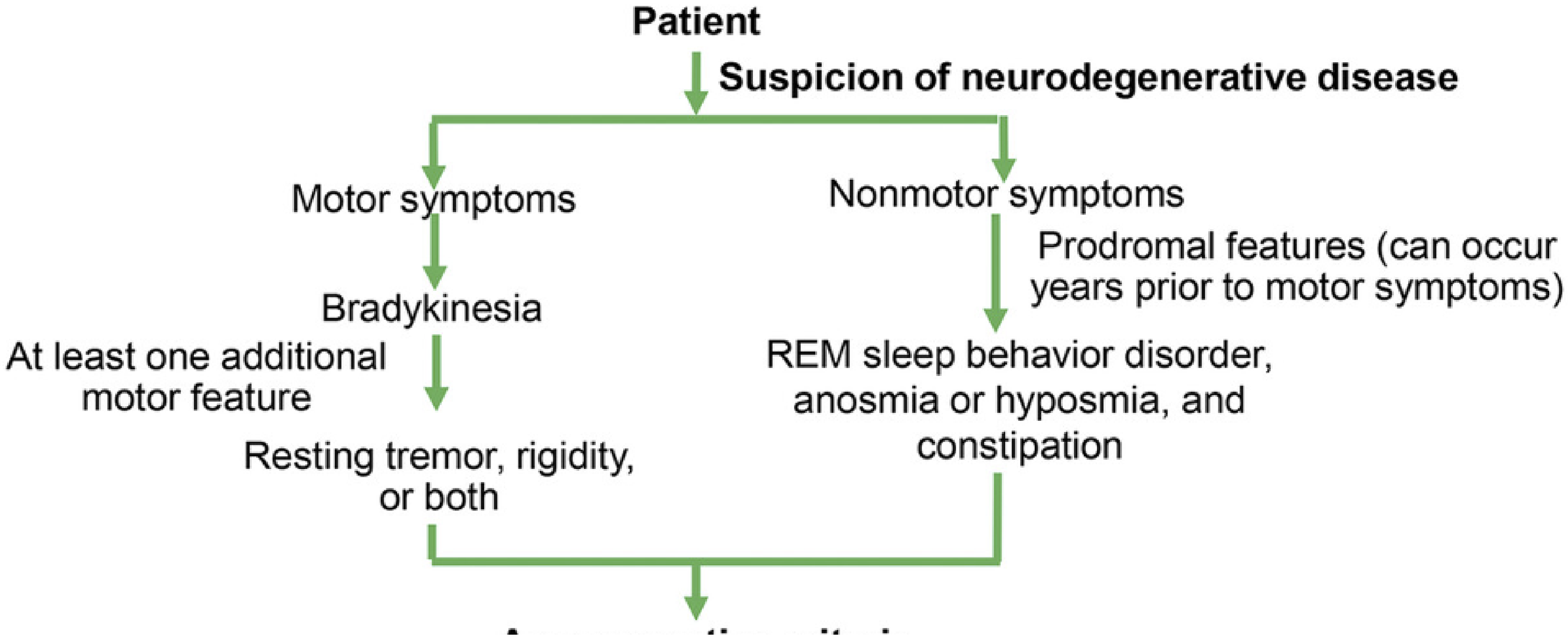
+/- Early “non-motor” signs: REM Behavior Disorder (RBD), change in sense of smell, constipation

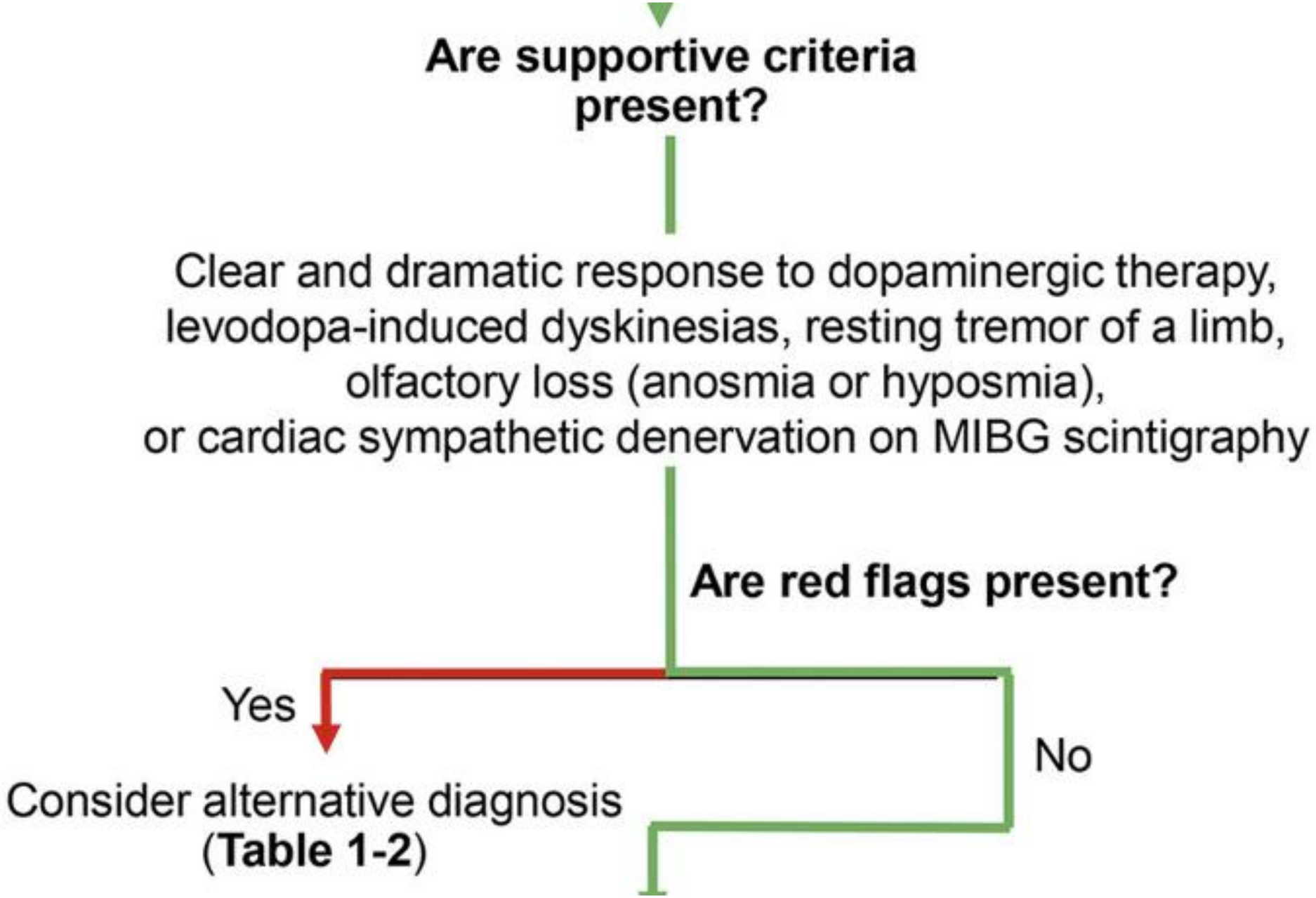
Supportive features:

- Response to levodopa
- Dyskinesias (!!)
- Loss of sense of smell



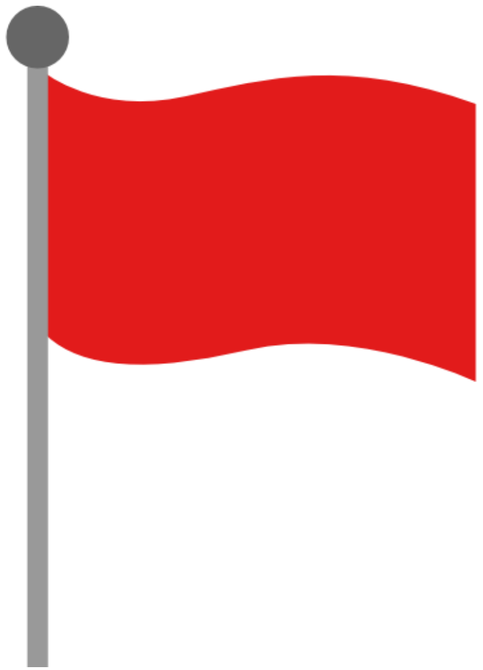

Patient
Suspicion of neurodegenerative disease
Motor symptoms
Nonmotor symptoms
Bradykinesia
At least one additional motor feature
Resting tremor, rigidity, or both
Prodromal features (can occur years prior to motor symptoms)
REM sleep behavior disorder, anosmia or hyposmia, and constipation
Are supportive criteria present?
Clear and dramatic response to dopaminergic therapy, levodopa-induced dyskinesias, resting tremor of a limb, olfactory loss (anosmia or hyposmia), or cardiac sympathetic denervation on MIBG scintigraphy
Are red flags present?
Yes
Consider alternative diagnosis (Table 1-2)
No
Are absolute exclusion criteria present?
Yes
Consider alternative diagnosis (Table 1-3)
No
Idiopathic Parkinson disease
If the diagnosis is still unclear, consider ancillary testing
Levodopa trial (≥ 600 mg/d)
Skin biopsy
Dopamine transporter SPECT


Patient
Suspicion of neurodegenerative disease
Motor symptoms
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REM sleep behavior disorder, anosmia or hyposmia, and constipation
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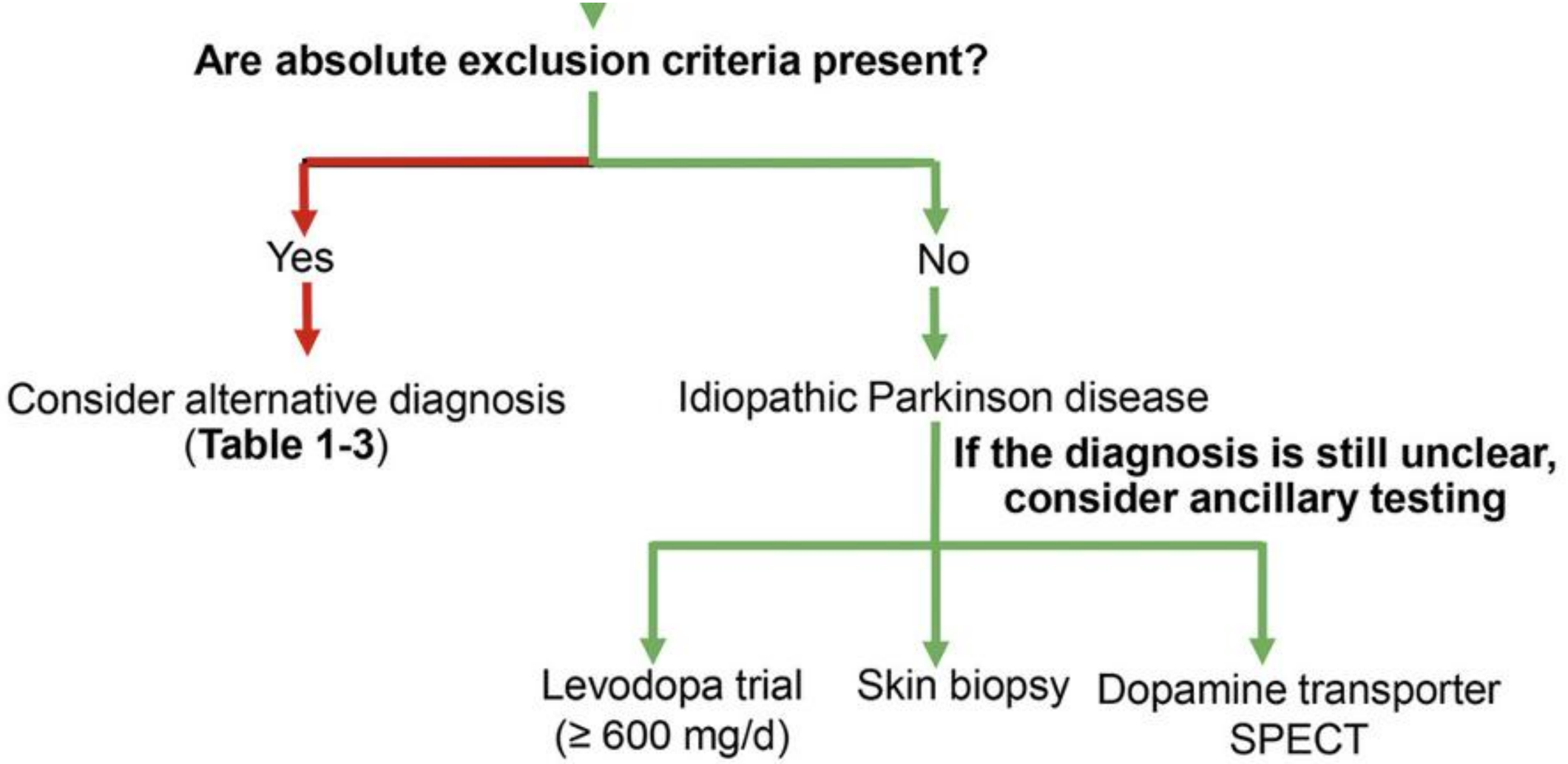

Are supportive criteria present?
Clear and dramatic response to dopaminergic therapy, levodopa-induced dyskinesias, resting tremor of a limb, olfactory loss (anosmia or hyposmia), or cardiac sympathetic denervation on MIBG scintigraphy
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Yes
No
Consider alternative diagnosis (Table 1-2)

What are the “Red Flags”??

Features that make us consider a different diagnosis

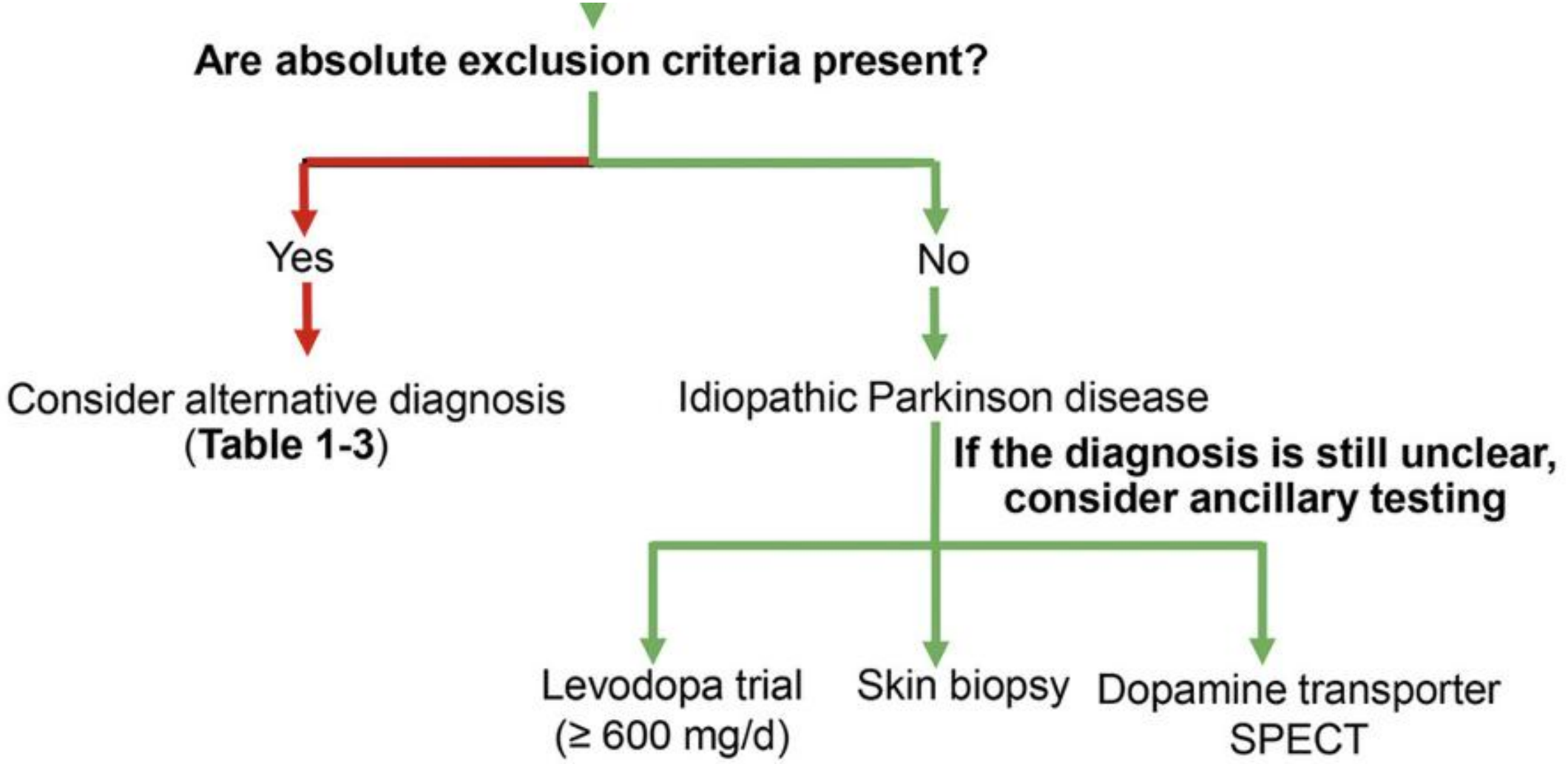


Red Flag Examples:
Rapid progression
Needing a wheelchair within 5 years
Early slurred speech or trouble swallowing
Severe blood pressure issues within 5 years
Repeated falls within 3 years
Absence of nonmotor symptoms
Symptoms on both sides right away


Are absolute exclusion criteria present?
Yes
No
Consider alternative diagnosis
(Table 1-3)
Idiopathic Parkinson disease
If the diagnosis is still unclear,
consider ancillary testing
Levodopa trial
(≥ 600 mg/d)
Skin biopsy
Dopamine transporter
SPECT

Absolute Exclusion Criteria
(ie, who does NOT have PD?)

Exclusion Criteria	Other Possible Diagnosis
Unexplained coordination issues (ataxia)	Multiple System Atrophy (MSA), ataxia caused by something else
Eye movement problems	Progressive Supranuclear Palsy (PSP)
Early behavioral changes or language issues within 5 years	Frontotemporal Dementia (FTD), Alzheimer's Dementia
Use of a dopamine-blocking drug known to mimic Parkinson's	Drug-induced Parkinsonism
No response to Carbidopa/Levodopa at doses higher than 6 tablets a day	Atypical parkinsonism


Are absolute exclusion criteria present?
Yes
No
Consider alternative diagnosis
(Table 1-3)
Idiopathic Parkinson disease
If the diagnosis is still unclear,
consider ancillary testing
Levodopa trial
(≥ 600 mg/d)
Skin biopsy
Dopamine transporter
SPECT

Testing for Parkinson's Disease

Least Invasive:

- Observation over time
- Levodopa trial

Supportive Tests:**

- Skin biopsy
- Spinal fluid testing
- Dopamine transporter (DAT) scan

**Caveat: These tests do not "rule out" Parkinson's and they are not useful to measure disease severity, response to treatment, or disease progression

”Testing for PD”: Levodopa Trial

- Safe for most people
- Cost effective

Requirement: > 600 mg
(that’s > 6 tablets a day!)

Caveat: Some people still need higher doses than this



How do I know if levodopa is working?

Common benefits:

- Less tremor
- Less stiffness
- Less slowness
- Easier to walk

Less common benefits:

- Easier swallowing
- Faster thinking
- Improved mood & sleep



Levodopa Trial Limitations

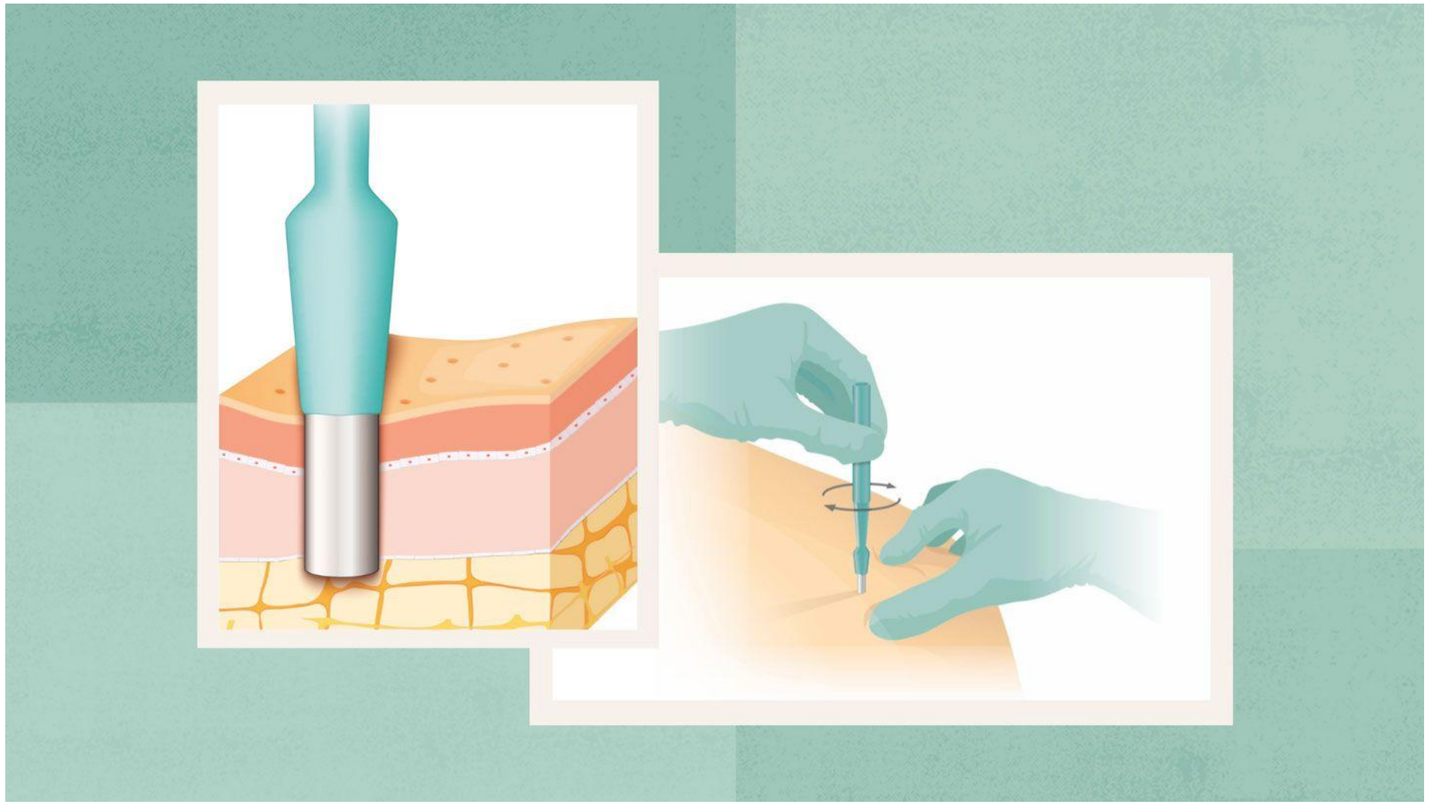


- Side effects limit dose
  - Nausea
  - Low blood pressures
  - Hallucinations
- ”Better” is hard to measure
- Expectations vary

Supportive Tests: Skin Biopsy

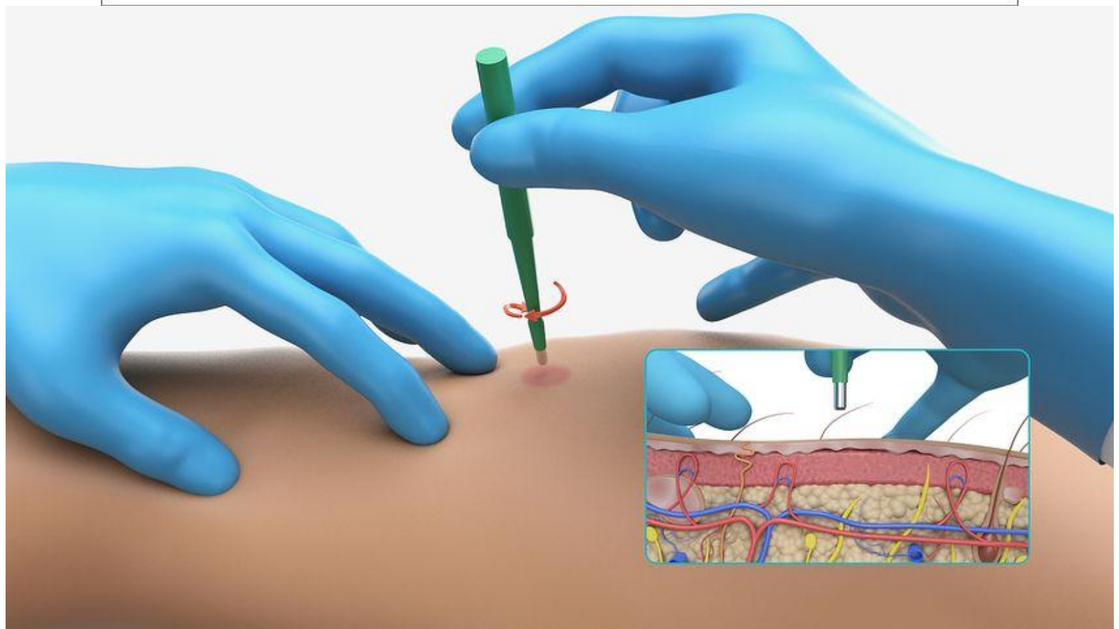
Concept:

- Alpha synuclein clumps can be seen in places besides the brain
  - Skin, cerebral spinal fluid (CSF), intestines, spit glands
- Skin samples are easy to get



Supportive Tests: Skin Biopsy Test

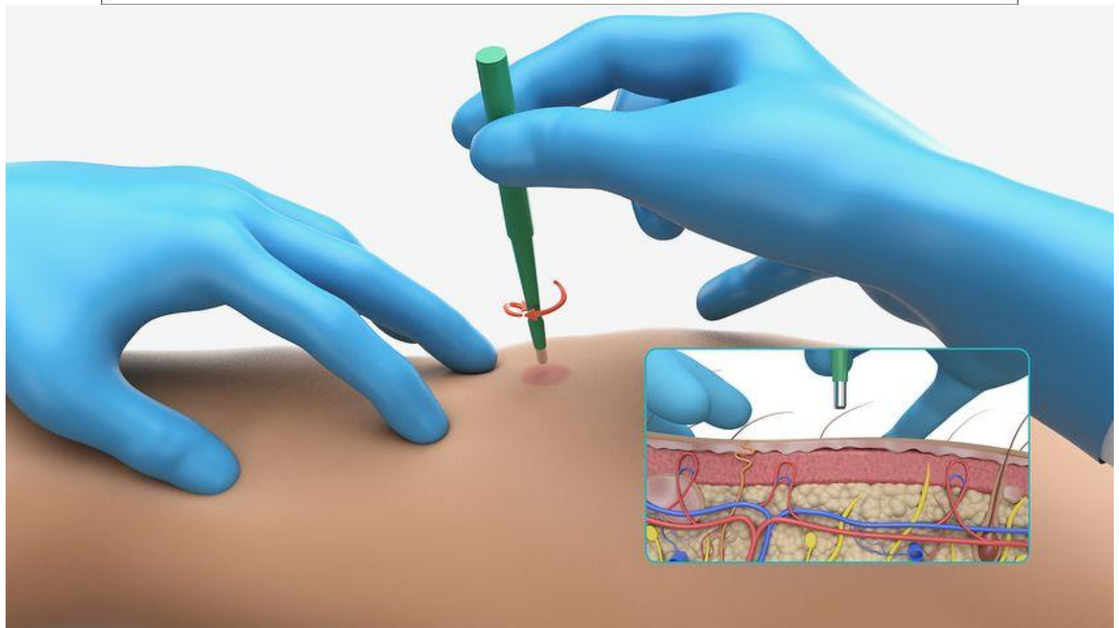




- Three Sites:
  - Shoulder (close to neck)
  - Above knee
  - Above ankle
- Collected in vials
  - Shipped to company
- 4-6 weeks for results

Supportive Tests: Skin Biopsy (cont)





Good at <u>supporting</u> PD

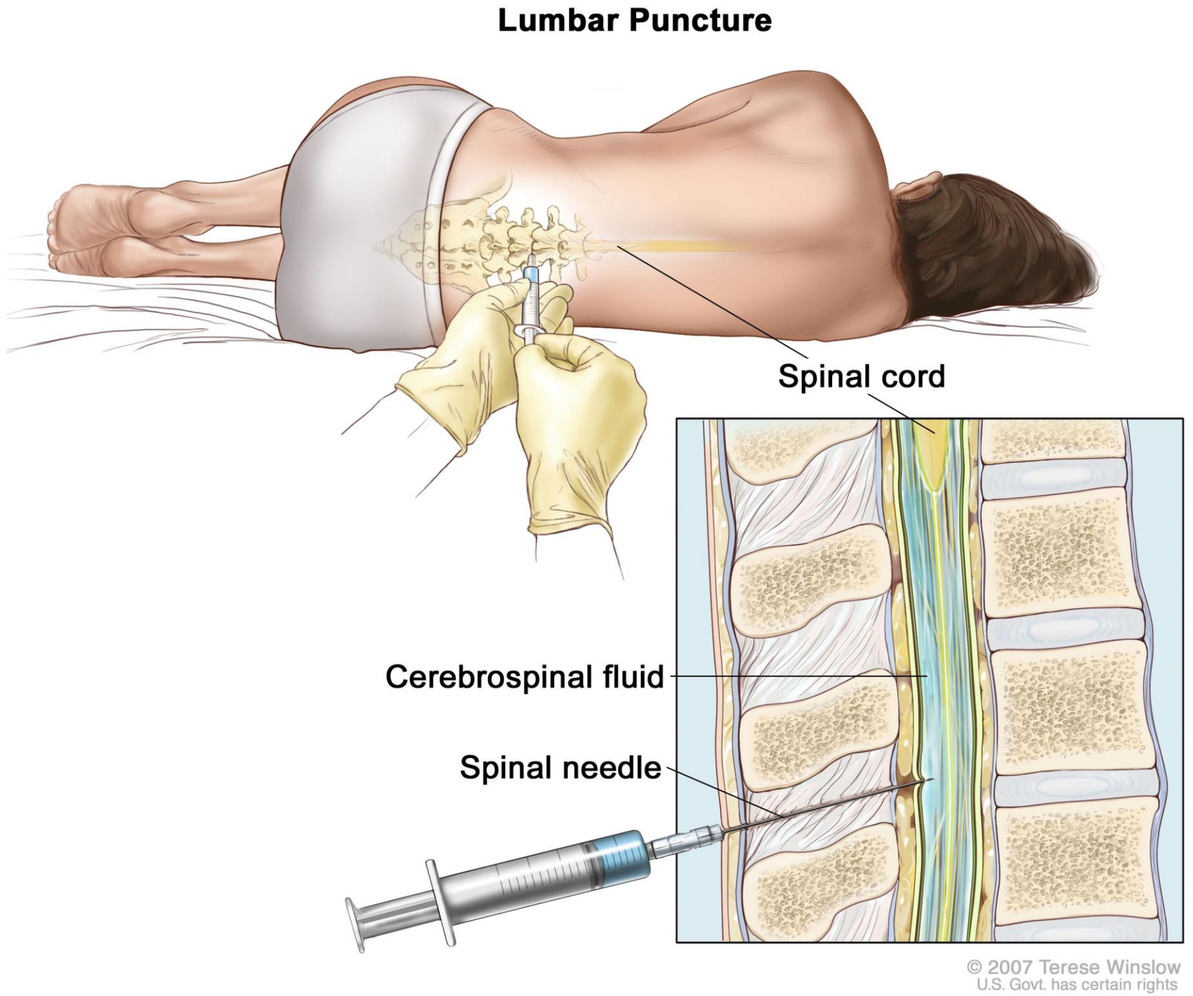
- **Rare false positives**
- **Can have false negatives**

Supportive Tests: Spinal Fluid

Concept:

Alpha synuclein is also present in the cerebrospinal fluid (CSF)

- More invasive test
- Not available a very many institutions



Support Tests: Dopamine Transporter (DAT) Scans

- Nuclear scan
  - *CAT scans and MRIs don't show PD!*

- Tracer injected through IV
  - ➢ Attaches to dopamine transporters in brain
  - ➢ Takes 3-4 hours

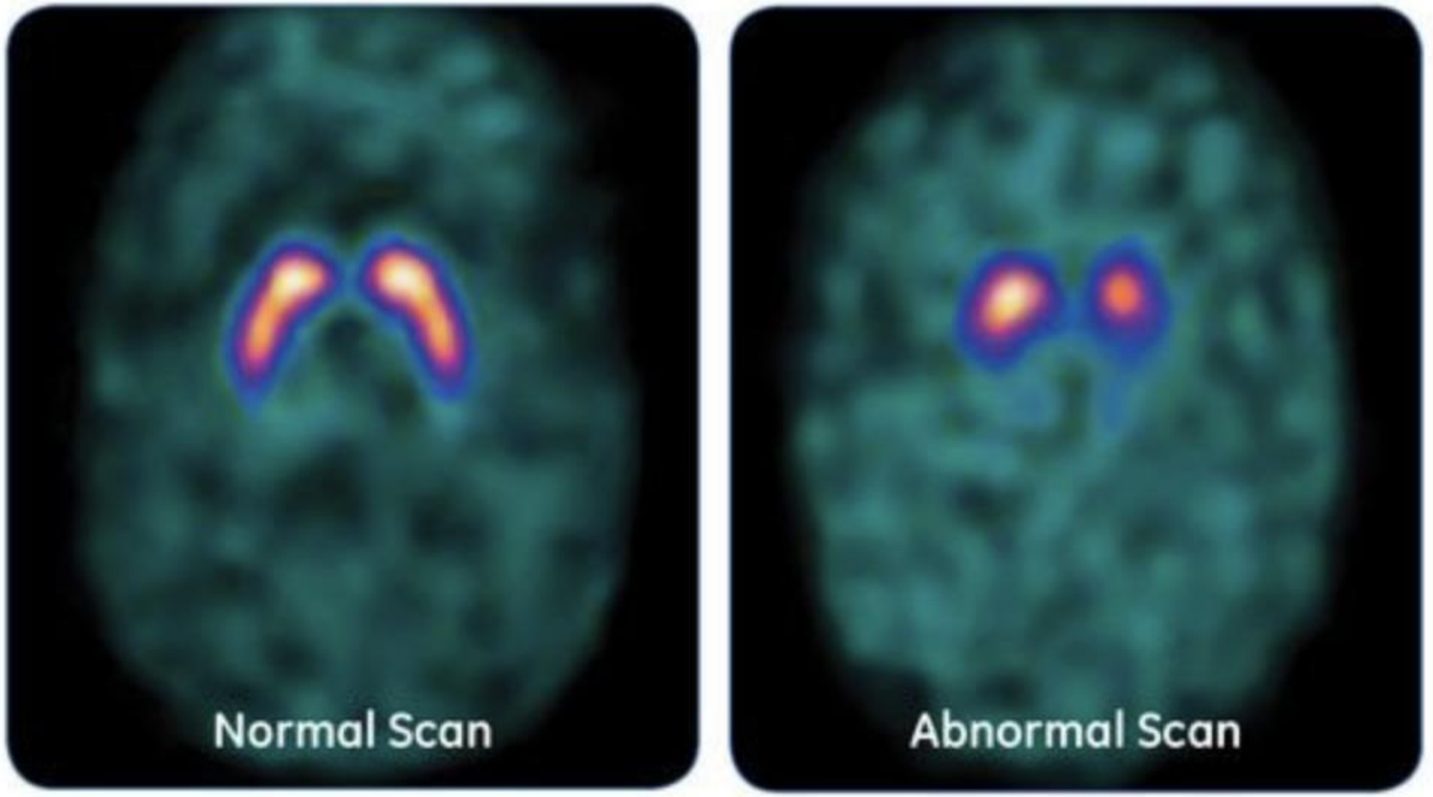


Support Tests: Dopamine Transporter (DAT) Scans with PD

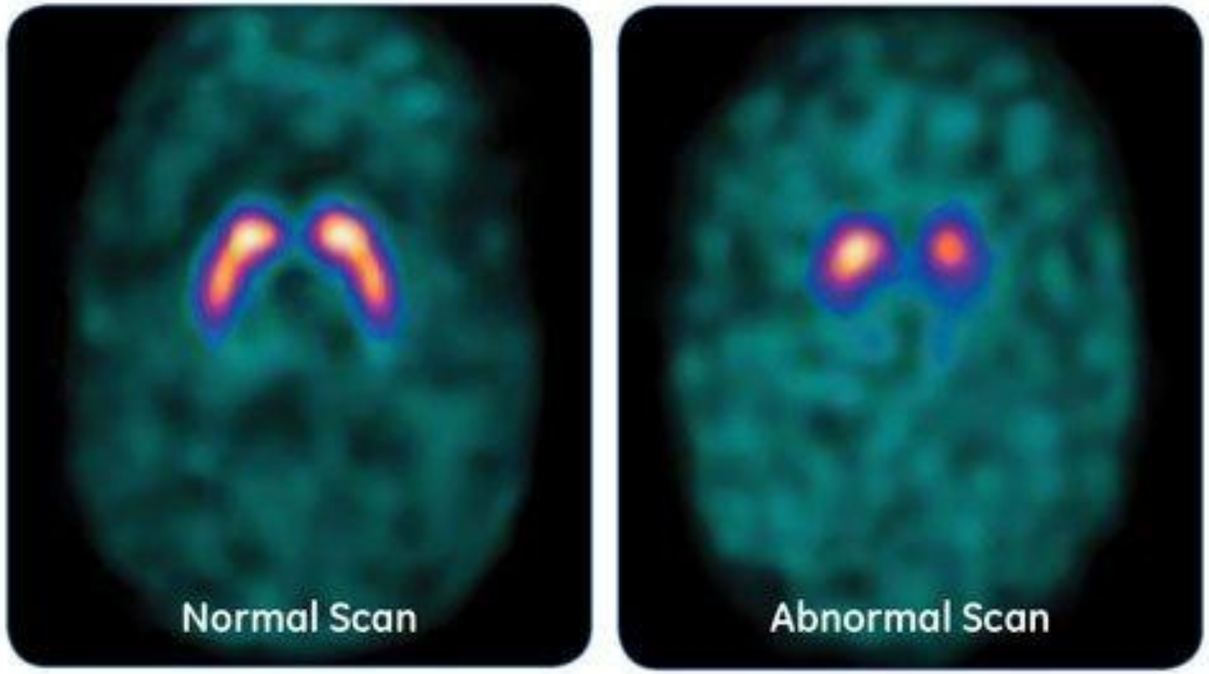
Parkinson's brains have weaker signals

Either abnormal or not:

- Doesn't help stage PD
- Can't measure:
  - progression
  - treatment response



Support Tests: Dopamine Transporter (DAT) Scans (cont.)



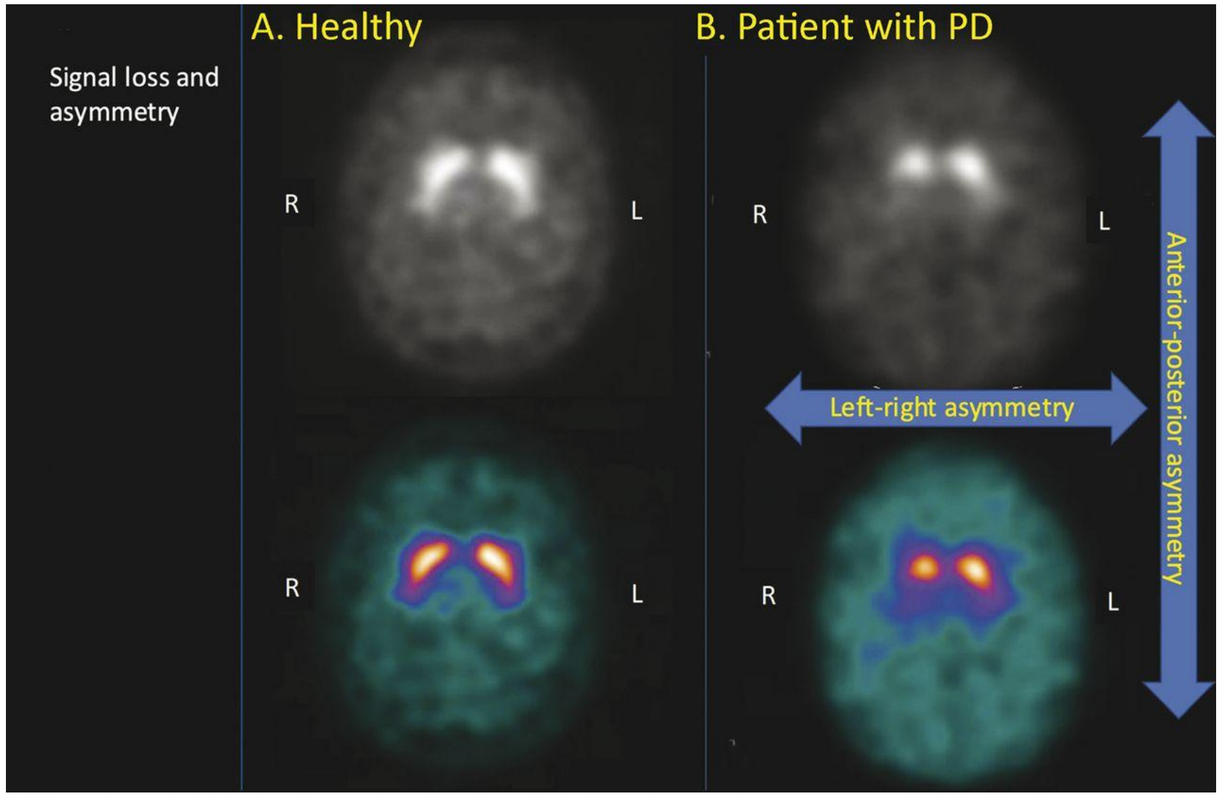
"Comma"-shaped
Possible essential tremor

"Period"-shaped
Possible parkinsonian syndrome

Pitfalls:

- Accuracy not much better than clinical exam
- Other diseases have positive DAT scans
  - ➢ ”Parkinson’s Plus Syndromes,” Dementia with Lewy Bodies

Support Tests: Dopamine Transporter (DAT) Scans (cont)



Best Uses for a DAT Scan:

- Presentations with “red flags”
- Lack of progression
- Separate PD from similar tremors
  - ➢ Essential Tremor
- Check for PD in people on dopamine blocking drugs that mimic PD

Support Test Limitations

Do not ”rule out” Parkinson’s

(Positive test is supportive, negative test does not rule it out)

They are not useful to measure:

1. Disease severity
2. Response to treatment
3. Disease progression

The Future of Diagnosing Parkinson's Disease

Using AI to Diagnose PD

- Analyzing exam (eg, finger tapping exercise)
- Smartwatches, sensors, and wearable devices
  - Arm swing
  - Walking speed
  - Turning stability





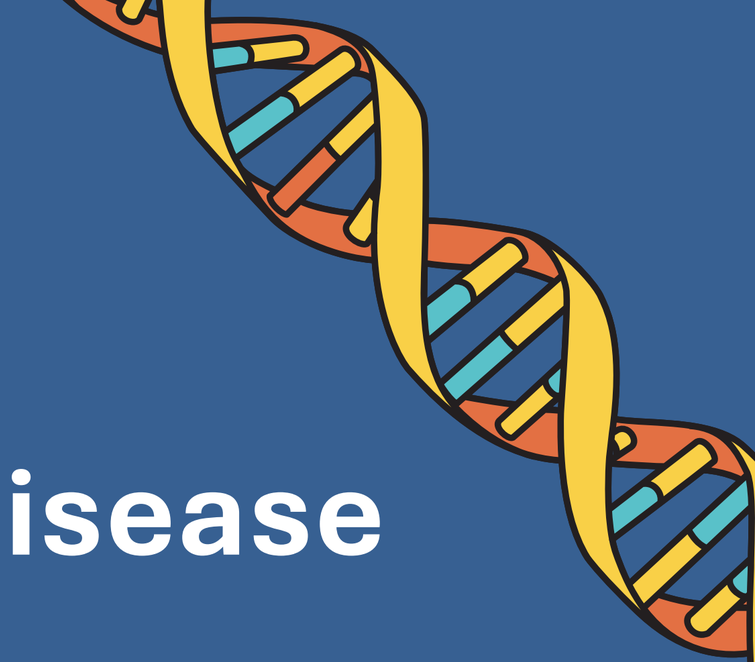
Today's Objectives with PD

1. Define Parkinson's Disease (PD)
2. Talk about why it's so hard to define PD
3. Review the underlying causes of PD
4. Understand how your neurologist makes the diagnosis of PD
5. List the Movement Disorder Society (MDS) criteria
6. Look into the future of diagnosing PD
   - Imaging
   - Biomarkers
   - Artificial Intelligence



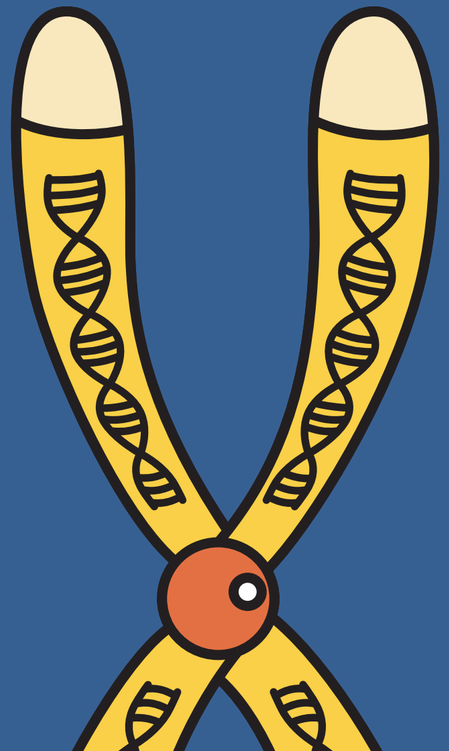
University of Nebraska Medical Center





Genetics in Parkinson Disease

Jorge Patino, MD
Movement Disorders Fellow
University of Cincinnati







What does "*genetic*" mean?











A ***genetic variant*** is simply a difference in our DNA

Type	What it means
Disease-causing variant	Can directly cause disease
Risk variant	Raises the chance of disease
Benign variant	Doesn't cause disease
Unknown significance	We don't yet know what it means



Is Parkinson disease genetic?

Genes matter (12-15%), but **they are only part of the story**







Original Investigation | Neurology

Proximity to Golf Courses and Risk of Parkinson Disease

Brittany Krzyzanowski, PhD; Aidan F. Mullan, MA; E. Ray Dorsey, MD; Sai Shivani Chirag, MS; Pierpaolo Turcano, MD; Emanuele Camerucci, MD; James H. Bower, MD; Rodolfo Savica, MD, PhD







Low-dose Carbon Monoxide (HBI-002) Trial to Evaluate Safety, Tolerability, PK, and Biomarkers in Parkinson's Disease (LoCaMoTE-PD)

ClinicalTrials.gov ID NCT07005180

Sponsor Hillhurst Biopharmaceuticals, Inc.

Grotewold N et al. Parkinsonism Relat Disord. 2024 Aug;125:107026. doi: 10.1016/j.parkreldis.2024.107026.
Krzyzanowski B et al. JAMA Netw Open. 2025 May 1;8(5):e259198. doi: 10.1001/jamanetworkopen.2025.9198.
Costa J, et al. J Alzheimers Dis. 2010;20 Suppl 1:S221-38. doi: 10.3233/JAD-2010-091525.
Rose KN,et al. Mov Disord. 2024 Feb;39(2):267-272. doi: 10.1002/mds.29707.

JAMA Neurology | Original Investigation

Loneliness and Risk of Parkinson Disease

Antonio Terracciano, PhD; Martina Luchetti, PhD; Selin Karakose, PhD; Yannick Stephan, PhD; Angelina R. Sutin, PhD

Social isolation and the risk of Parkinson disease in the UK biobank study

Check for updates

Tingting Geng[1] ✉, Yaqi Li[1], Yinshun Peng[1], Xiao Chen[1], Xinming Xu[1], Jian Wang[2], Liang Sun[1] & Xiang Gao[1] ✉

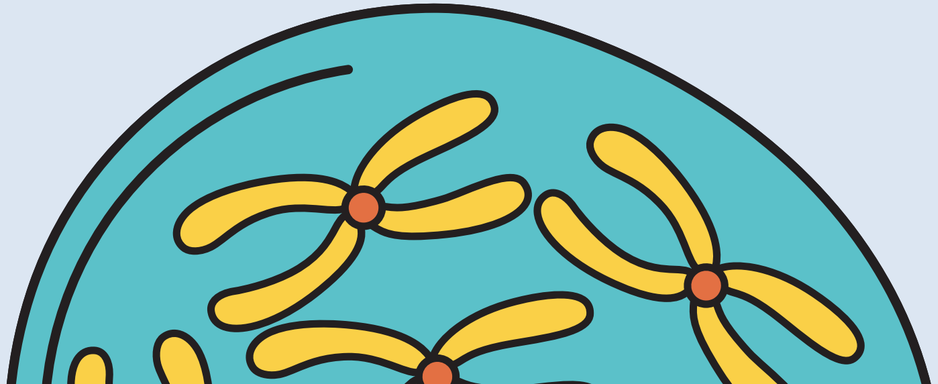


Terracciano A, et al. JAMA Neurol. 2023 Nov 1;80(11):1138-1144. doi: 10.1001/jamaneurol.2023.3382
Geng, et al. npj Parkinsons Dis. 10, 79 (2024). https://doi.org/10.1038/s41531-024-00700-7





How can genes influence Parkinson disease?



Some genes can:

1. Cause Parkinson disease

2. Increase the risk of Parkinson disease

3. Modify the disease

Genes ≠ destiny

Penetrance





Only a proportion of individuals with the same variant fully express the disease phenotype

A positive genetic result is information about *risk*—not necessarily a prediction of your *future*.

Important genes in Parkinson disease

23andMe®

THE MICHAEL J. FOX FOUNDATION FOR PARKINSON'S RESEARCH

2009

30K+

LRRK2 + GBA1

Parkinson's Foundation

PD Generation

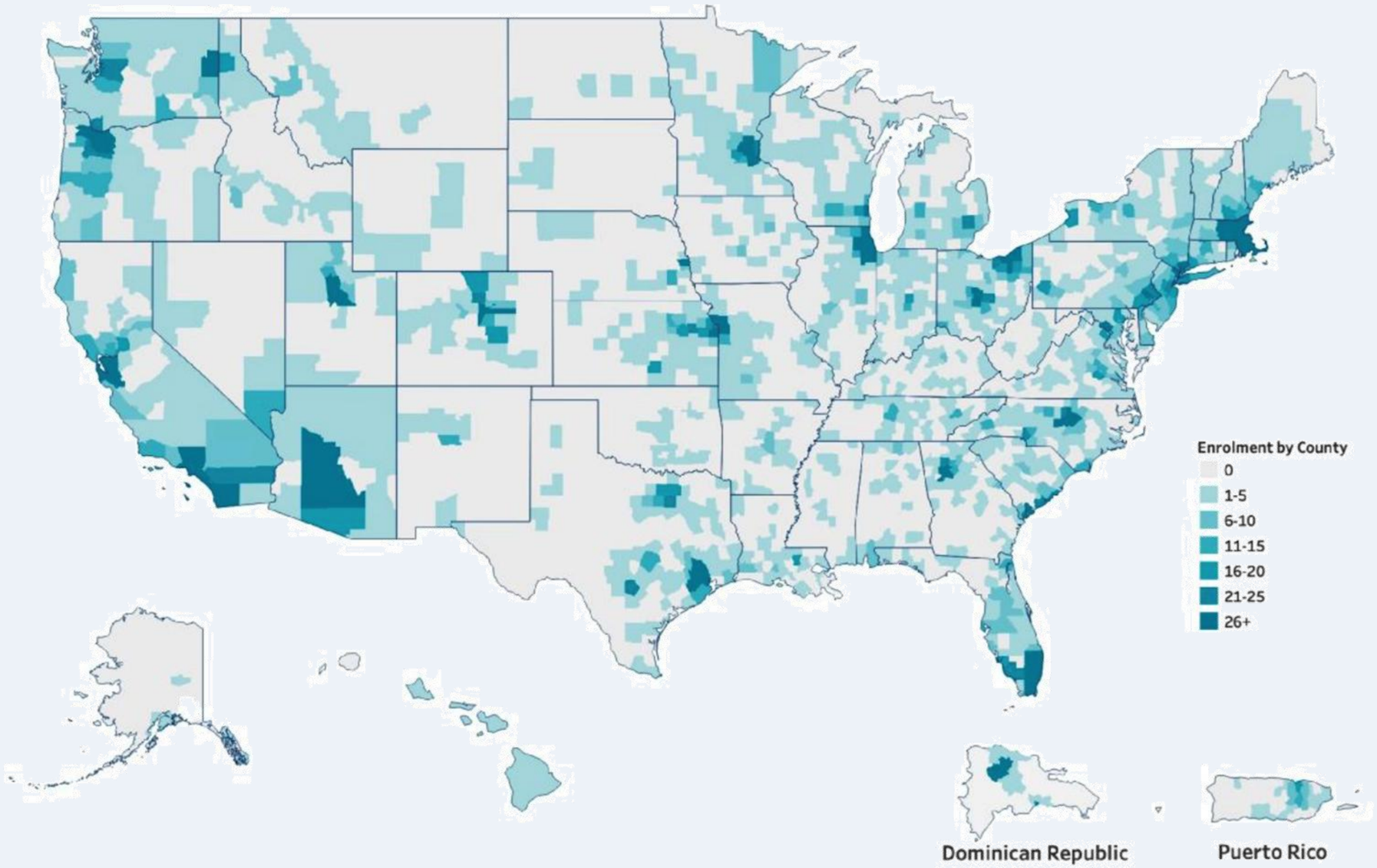
Loci	Chromosome	Gene
PARK1/4	4q21.3-q22	*SNCA*
PARK2	6q25.2-27	*PRKN*
PARK3	2p13	*unknown*
PARK5	4p13	*UCH-L1*
PARK6	1p36.12	*PINK1*
PARK7	1p36.23	*DJ-1*
PARK8	12q12	*LRRK2*
PARK9	1p36	*ATP13A2*
PARK10	1p32	*unknown*
PARK11	2q36-q37	*GIGYF2*
PARK12	Xq21-q25	*unknown*
PARK13	2p13.1	*HTRA2*
PARK14	22q13.1	*PLA2G6*
PARK15	22q11.2-qter	*FBXO7*
PARK16	1q32	*unknown*
PARK17	16q12	*VPS35*
PARK18	3q27-qter	*EIF4G1*
PARK19	1p31.3	*DNAJC6*
PARK20	21q22.11	*SYNJ1*
PARK21	3q22.1	*DNAJC13*
PARK22	7p11.2	*CHCHD2*
PARK23	15q22.2	*VPS13C*
PARK24	10q22.1	*PSAP*
-	1q21	*GBA1*

GBA1
- Important genetic risk factor
- Also associated with Gaucher disease

LRRK2
- Can cause inherited Parkinson disease
- Risk is not 100%

PRKN
- Particularly important in young-onset Parkin
- Usually recessive

SNCA
- Rare
- Can cause inherited Parkinson disease

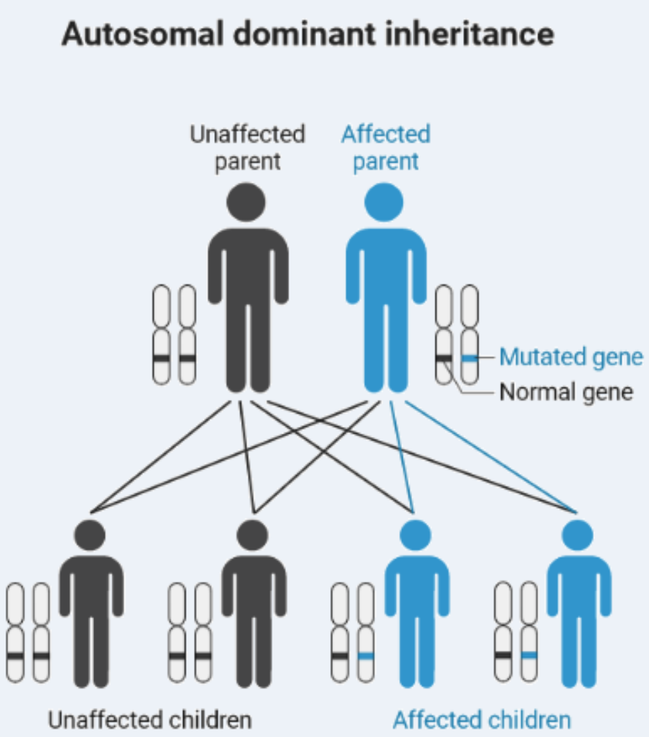


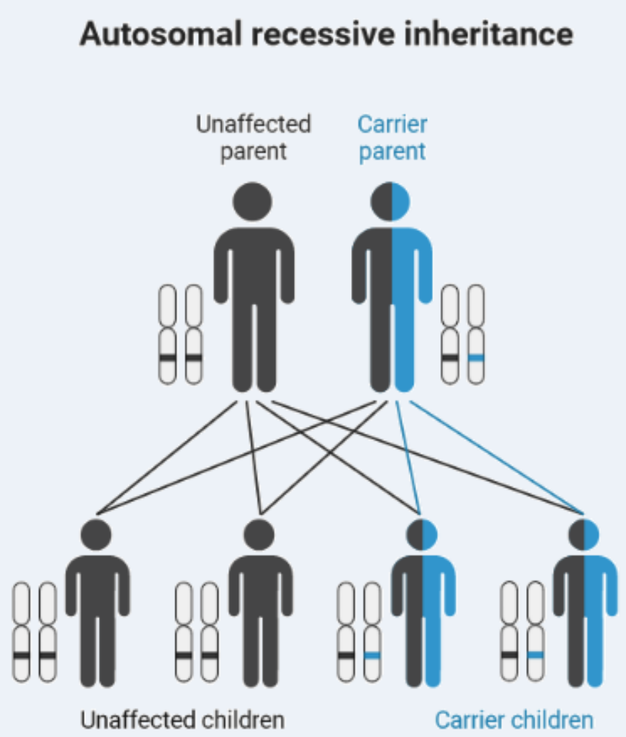
Cook L, et al. Brain. 2024 Aug 1;147(8):2668-2679.

Inheritance patterns







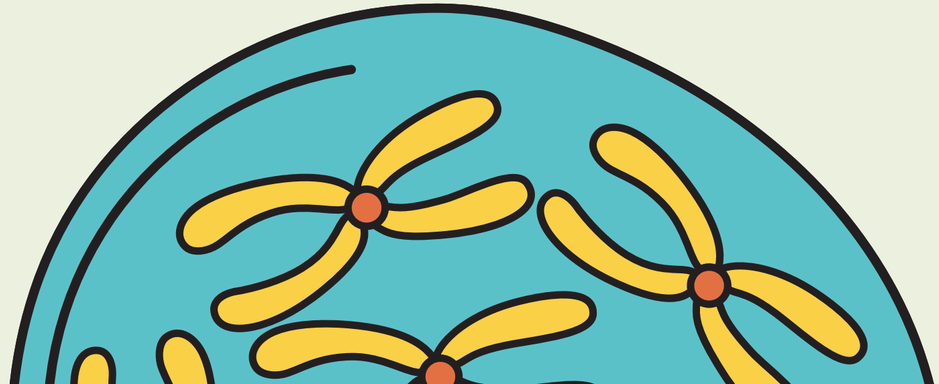
Autosomal dominant
- LRRK2
- SNCA
- VPS35

Autosomal recessive
- PRKN
- PINK1
- PARK7/DJ-1





What does this mean for my family?



Will my children get Parkinson disease?

For most families:

- Risk is increased somewhat
- But the disease is **not inherited in a simple pattern**

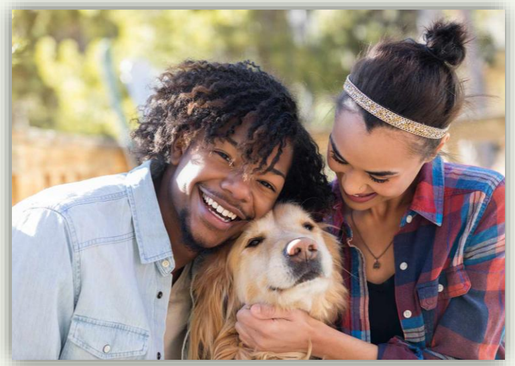
If a specific pathogenic variant is found:

- Inheritance may be clearer
- The risk may be substantially different
- **Genetic counseling becomes especially important**

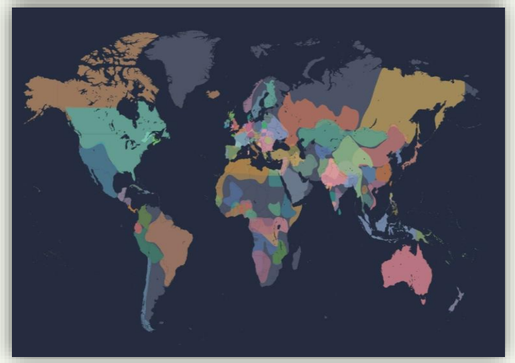




When should I get genetic testing?









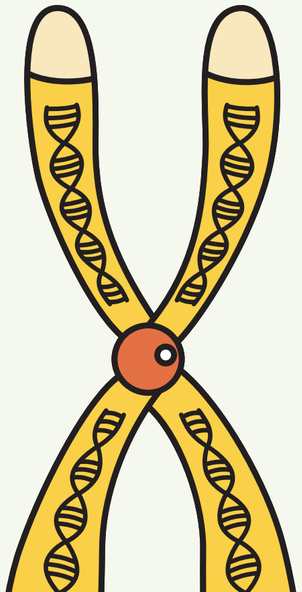
But testing is a personal choice.
Genetic counseling can help.

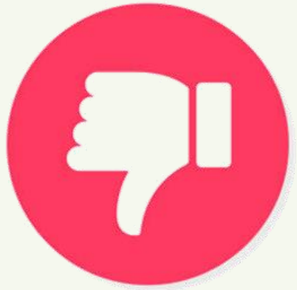
What can genetic testing tell me?





- Identify certain PD-associated variants
- Help explain Parkinson disease in some families
- Clarify inheritance in selected families
- Help determine eligibility for some clinical trials
- Contribute to precision-medicine research



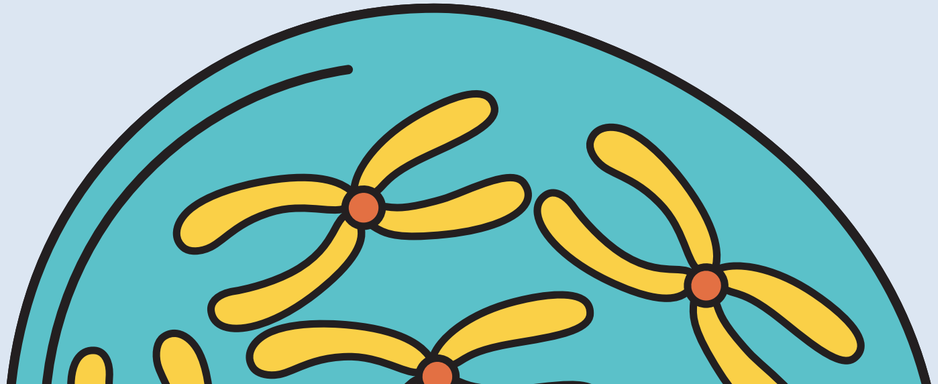


- Predict exactly when Parkinson disease will occur
- Always explain why someone developed PD
- Guarantee that a carrier will develop PD
- Guarantee that a negative test means “no genetic risk”





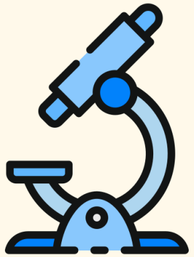
Genetics gives us *hope*



Genetics is helping us understand



Why neurons become vulnerable



Which biological pathways are involved



Which patients may respond to targeted treatments

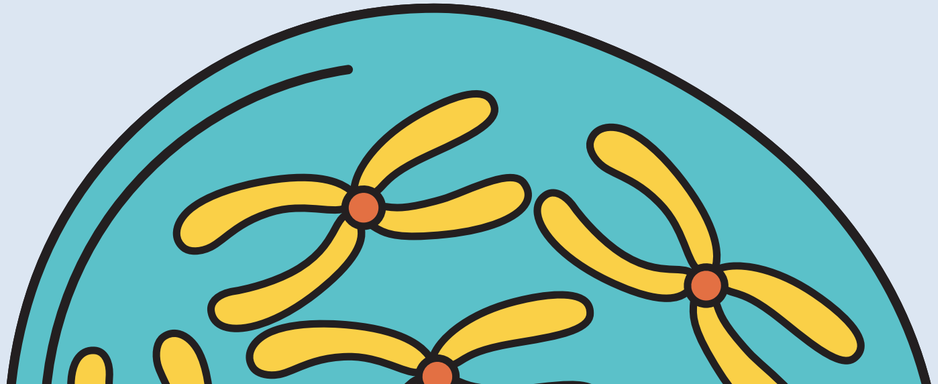


New approaches to treatment





Take-home messages







Parkinson disease has a genetic component



Most Parkinson disease is **not inherited in a simple way**



Some genes cause Parkinson disease; others increase risk



A genetic variant does not mean the disease is inevitable



If you are considering genetic testing, **talk with your neurologist or a genetic counselor**





Where can I learn more?

UNMC

Movement Disorders

Genetics

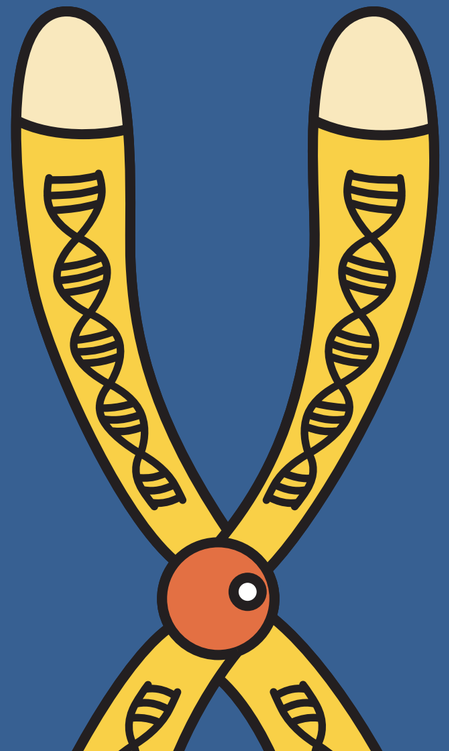
Parkinson's Foundation

PD GENEration





Thank you!







BREAK

Please visit our sponsor tables

UNMC
COLLEGE OF ALLIED HEALTH PROFESSIONS

LIVING WITH PARKINSON'S DISEASE



PRACTICAL TIPS FOR LIVING WITH A CHRONIC CONDITION

Parkinson's Disease Diagnosis

- Daunting
- Shock
- Change in identity
- Relieved
- Frustrated
- Angry





Acceptance of PD diagnosis

- A concept that is applicable for both recently diagnosed and a longer-standing diagnosis

- Why is acceptance of the diagnosis important?
  - Denial can lead to refusal of appropriate treatments and medication
  - Persistent negative thinking leading to vicious cycle of poor self-care
    - Stress, poor sleep, rumination, feelings of apathy, inactivity

PATH TO ACCEPTANCE

- Knowledge
- Support
- Practicing Mindfulness
- Professional Guidance



Knowledge is Power!

Parkinson's Foundation

DAVIS PHINNEY Foundation for Parkinson's

THE MICHAEL J. FOX FOUNDATION FOR PARKINSON'S RESEARCH

Parkinson's Nebraska

apda AMERICAN PARKINSON DISEASE ASSOCIATION

Strength in optimism. Hope in progress.

Beware of Dr. Google, Social Media and Influencers (even if they have large platforms)

Support – building a support system

- You are NOT alone; PD affects more than 1 million people in the US; with nearly 90,000 diagnosed each year
  - Formal and informal support groups
    - Parkinson's Nebraska maintains list of area groups
  - Online groups
    - Parkinson's Buddy Network associated with *MJF foundation*
    - PD Conversations found on *Parkinson's Foundation* website
    - PD Ambassadors Program from the *Davis Phinney Foundation*
    - Virtual Support Groups via *APDA* website
  - Friends/Family
    - Can include religious support



Disclosing the Diagnosis

- Inner circle of family and trusted friends
  - It can give an opportunity for questions
  - Open discussions of things you would or would NOT like help with
- "If they ask…"
- Telling co-workers or employers
  - Will vary on the type of work
  - Consider disclosing to trust employer especially if accommodations will prolong your career (if desired)
    - PD is covered in ADA: must provide "reasonable accommodations"
    - Workplace discrimination or "second guessing"



Alan Alda Reflects On Living With Parkinsons Finding Humor Daily







Disclosing the Diagnosis of Parkinson's Disease

"When you **take away the secrecy** and you allow yourself to participate in the community and **connect with people** on a broader and more open level, you start to see how those connections **allow you to live so much better** with Parkinson's."



Practicing Mindfulness

- Helpful not only in coping with a new diagnosis but also with negative feelings related to disease progression/new challenges
- Stress and stressful situations can worsen motor symptoms (tremor, freezing of gait, dyskinesia)
- Easy, cheap and effective option to *complement* standard PD treatments
  - In studies improved scores in motor symptoms, pain, depression/anxiety and emotional stability



Practicing Mindfulness & Tools

Mindfulness Based Practices:

Tools that train your attention to focus on the present moment without judgment



Practicing Mindfulness – Resources

- Structured Programs
  - **Mindfulness Base Stress Reduction** (MBSR); developed by Jon Kabat-Zinn; an 8-week structured program
    - Goodtherapy.org to find a local therapist who focuses on this
  - **Mindfulness-Based Cognitive Therapy** (MBCT); combining mindfulness training and cognitive behavioral therapy
    - Psychologytoday.com to find a local therapist who practices this; can use filters

- Other online options:
  - "Mindfulness tools for Parkinson's" found on Parkinson's UK.org
  - Mindfulness Apps – like Healthy Minds Program; Headspace
  - **UMass Memorial Health** – Mindfulness Online programs; Retreats
  - YouTube has many videos and guides



Professional Guidance

- Finding a “Therapist”
  - Mental Health Counselors
  - Licensed Professional Counselor
  - Licensed Clinical Social Worker
  - Psychologist

- Depression and anxiety are very common in PD
  - Affecting up to 40-50% of people with PD
  - Brain chemistry deficit





Professional Guidance continued

- How can counseling or therapy be helpful in Parkinson's Disease?
  - Adjustment issues with a new diagnosis or a change in the disease process or progression
  - Treatment of anxiety, depression, teaching sleeping skills – through talk therapy such as Cognitive Behavioral Therapy
  - Teaching coping skills and strategies
  - Reframing catastrophic or maladaptive thinking patterns
  - Relaxation techniques
  - A 3rd party to validate frustrations



For many people with PD: quality of life is more often determined by emotional or non-motor symptoms more than motor symptoms



Professional Guidance- Resources

Websites:

- Psychology Today
- Therapy Den
- Mental Health Match
- Better Help – purely an online service



Common questions that arise

- How do I know if I am on enough/too much carbidopa/levodopa?

- What should I be monitoring for?

How much medication?



- Don’t compare your journey with others
- Each person with PD will have differing:
  - Absorption rates
  - Bothersome symptoms
  - Goals
  - Side effects to medications
- The “BIG 4” limitations of carbidopa/levodopa:
  - Nausea
  - Blood pressure drops*
  - Dyskinesia
  - Hallucinations*



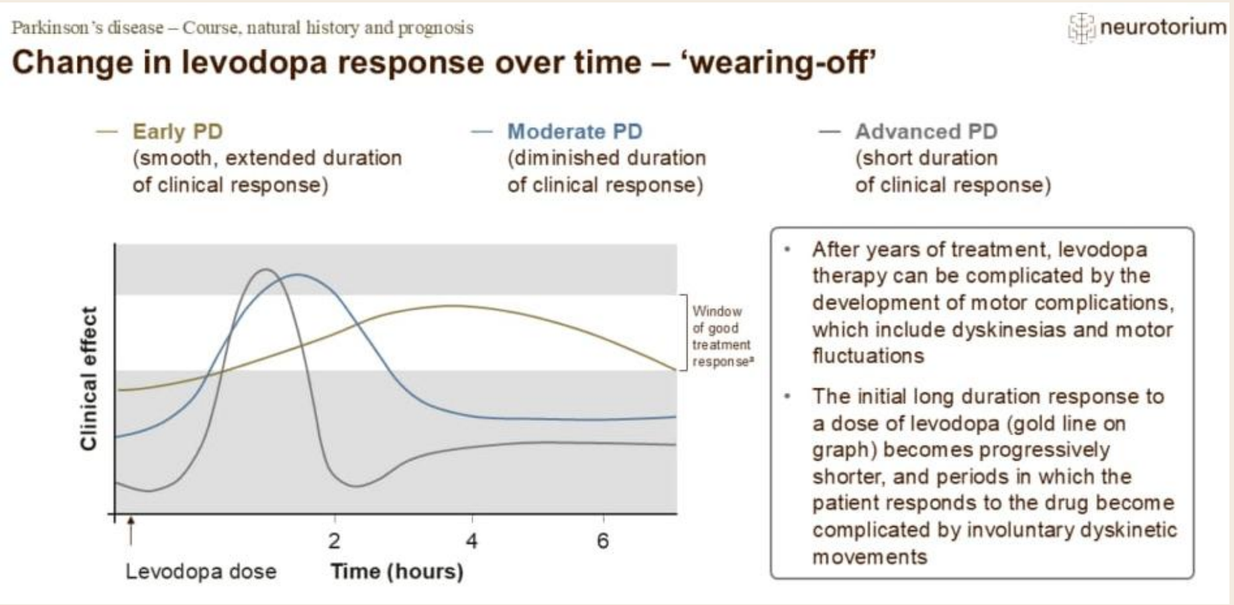


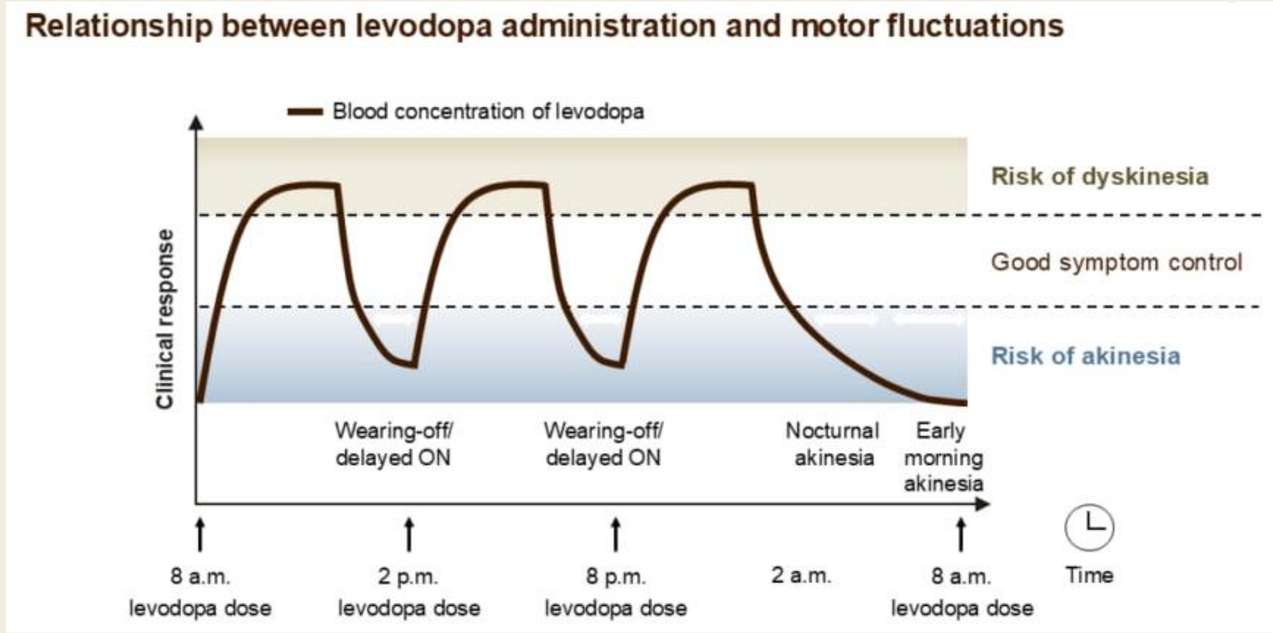
Improve your quality of life

How much medication to take?

What should I be monitoring?

- The side effects of medication – namely the "Big 4"
- Wearing off effects of medications:
  - AKA as Motor Fluctuations





What should I be monitoring with changes?

- Sudden or acute changes in PD symptoms
  - PD does not progress overnight
  - “Call your neurologist…”
  - Team approach



What should I be monitoring? (cont.)

Reasons for Sudden Worsening of Symptoms
Infections or illness: urinary tract infections (bladder infections); viruses: upper respiratory illness, flu virus, Covid, ect
Medical issue or recent surgery: electrolyte abnormalities; dysfunction of the kidneys or liver; heart condition, cancer, lung issues, other neurological issues (stroke, seizure, migraine)
Medications: change in dose/frequency, miscommunication about medication changes, accidental increase or missed dose, sudden withdrawal of medication, starting a medication (even if not PD related)
Constipation
Dehydration
Poor sleep
Stress, Anxiety, Depression

What should I be monitoring - Medications?



Higher risk medications in PD

- Centrally acting medications: mood medications, pain medications, muscle relaxants, PD medications
- Blood pressure medications
- _____: make sure it does not block dopamine!
- Anti-psychotic medications

Haloperidol	Chlorpromazine
Aripiprazole	Ziprasidone
Paliperidone	Lurasidone
Olanzapine	Risperidone
Cariprazine	Brexpiprazole
Prochlorperazine	Metoclopramide
Promethazine	

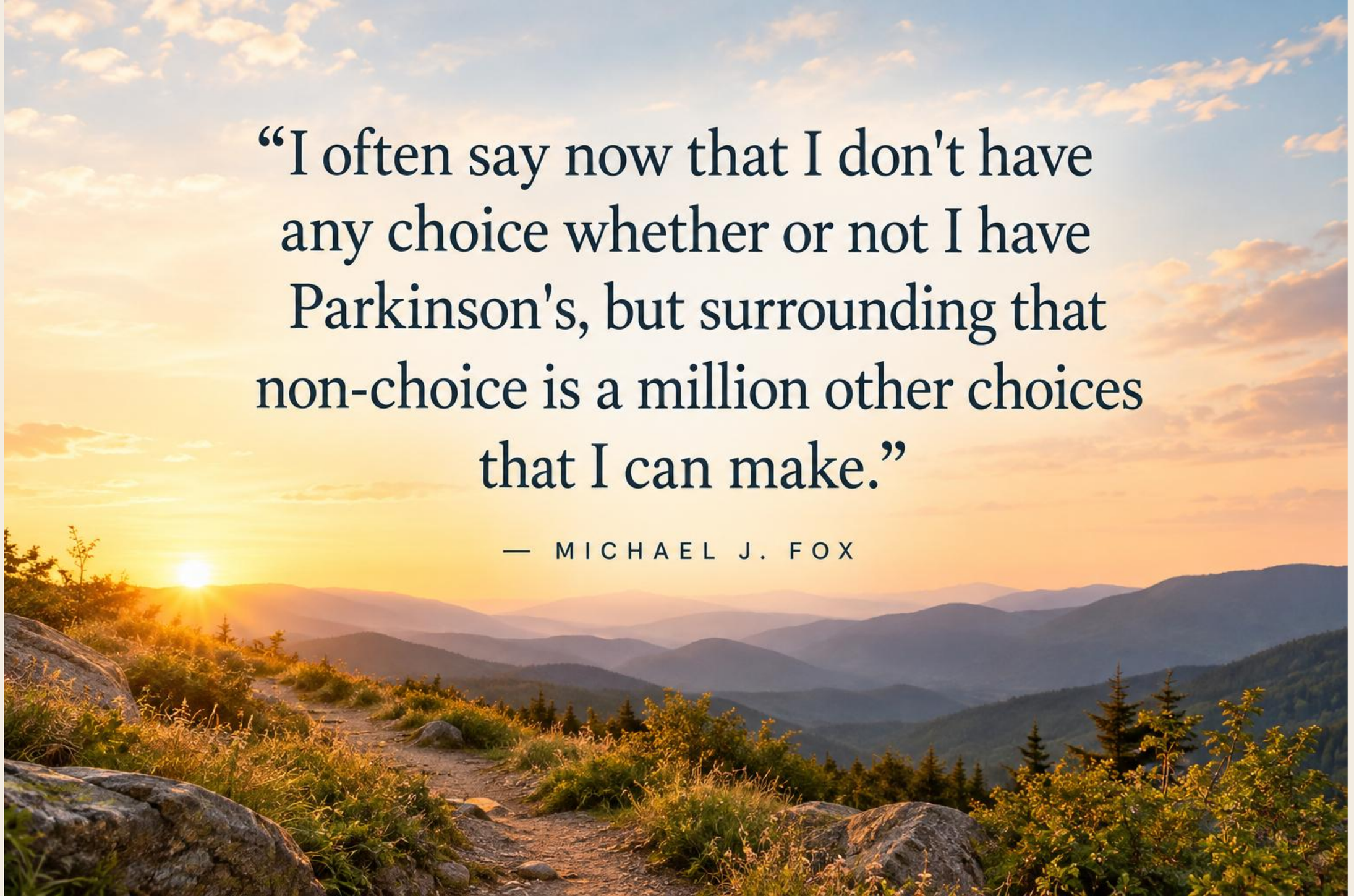
What should I be monitoring with PD?

- Hospitalizations and Surgery in Parkinson's Disease
  - Change in routine – sleep, medication timing
  - New medications
  - Unfamiliar environment
  - Anesthesia from procedures
  - When confusion, agitation or hallucinations occur contraindicated medication could be given!

Parkinson's Foundation has a FREE - Hospital Safety Guide



PD Safe Medication	Reason Given
Ondansetron	Anti-nausea
Quetiapine (Seroquel)	Agitation, confusion, hallucinations
Clozapine (Clozaril)	Agitation, confusion, hallucinations
Pimavanserin (Nuplazid)	Hallucinations; delayed effect


“I often say now that I don't have any choice whether or not I have Parkinson's, but surrounding that non-choice is a million other choices that I can make.”
— MICHAEL J. FOX

UNMC[SM]

COLLEGE OF ALLIED HEALTH PROFESSIONS



University of Nebraska Medical Center

Understanding Psychiatric Changes in Parkinson's Disease

Parkinson's Disease

Patient and Caregiver Symposium - 2026

Kiel Woodward, MD

University of Nebraska Medical Center℠

Objectives

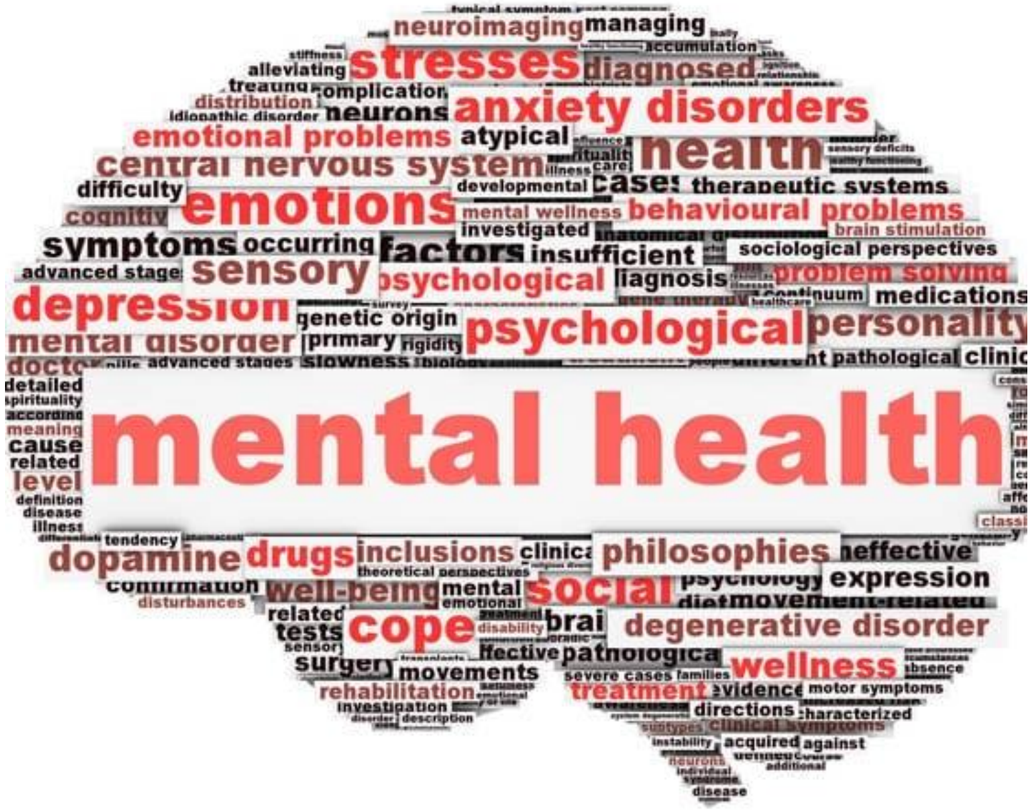
Discuss importance of mental health in Parkinson's Disease

Explain how to recognize depression, anxiety, apathy, and psychosis

Discuss potential treatment options and other tips for improving mental health



https://sites.widener.edu/caps/mental-health-video-library/



Depression

Apathy

Anxiety

Why is mental health important today?

Mental health greatly affects quality of life

- It affects how we think, feel, and act
- It can exacerbate other Parkinsonian symptoms
- Depression and anxiety can affect overall health and quality of life at least as much the motor symptoms of PD

Depression can be deadly – increases risk of suicide

Why is mental health important?

Mental health disorders are very common in PD

- Depression: 30% PD vs. 15% normal
- Apathy: 40% PD vs. 2% normal
- Anxiety: 40% PD vs. 33% normal

Despite being common, they are underrecognized and undertreated

Aarsland D, et al. Depression in Parkinson disease--epidemiology, mechanisms and management. Nat Rev Neurol. 2011 Dec 26;8(1):35-47.
den Brok MG, et al. Apathy in Parkinson's disease: A systematic review and meta-analysis. Mov Disord. 2015 May;30(6):759-69.

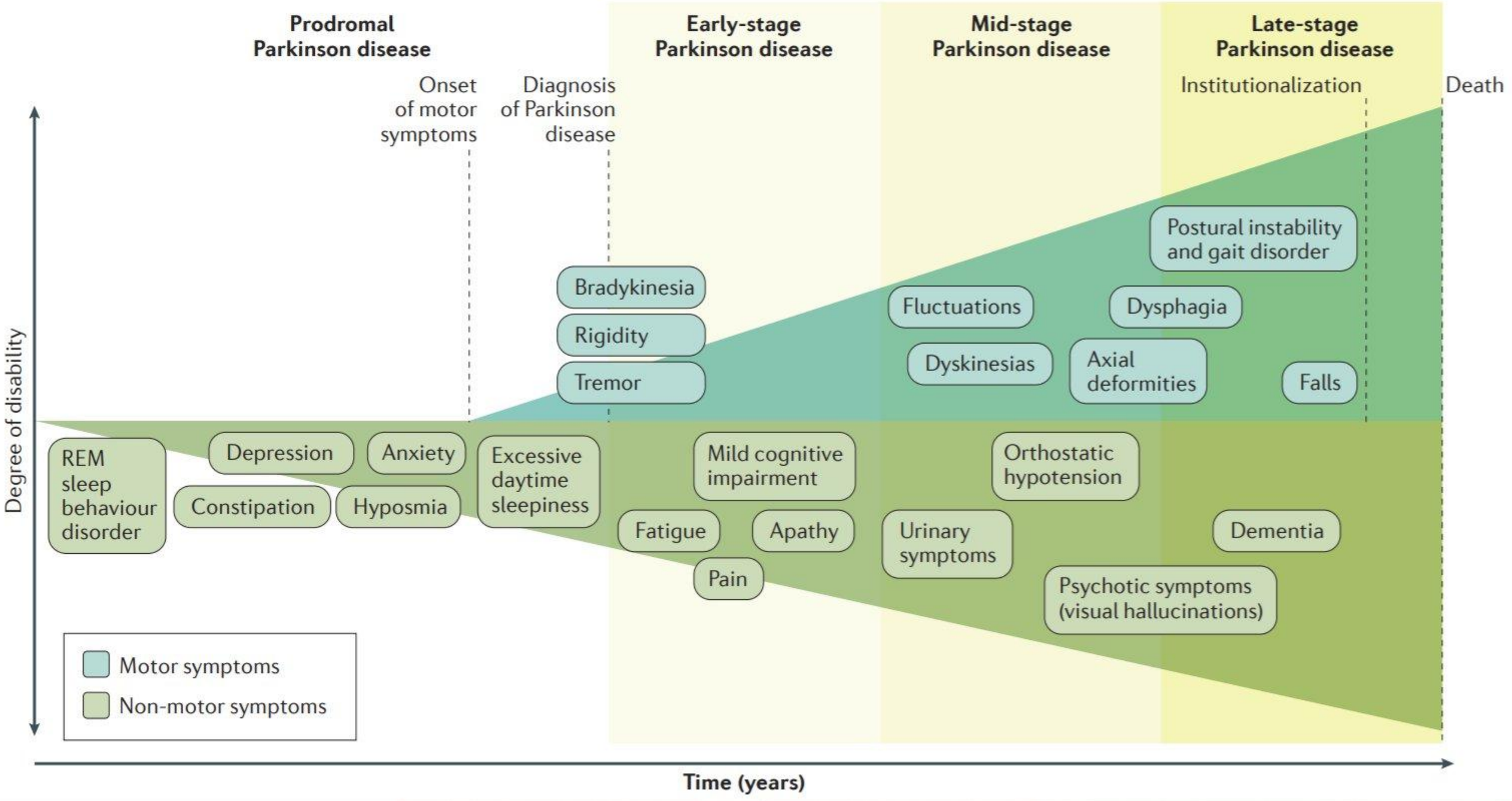
Why are mental health issues so common in PD?

Reactionary

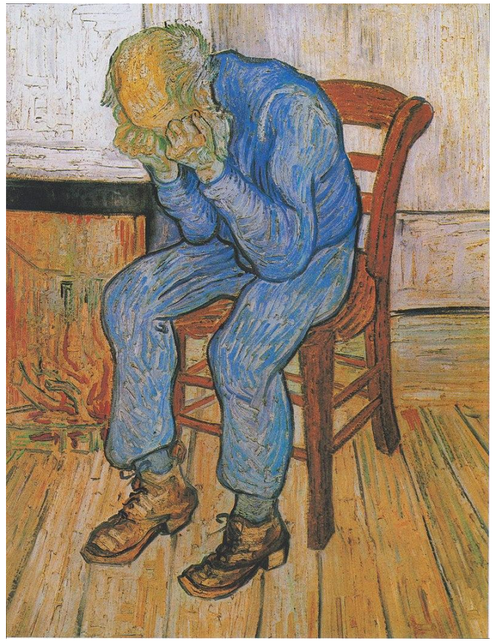
- Limited activities
- Reduced independence
- Chronically progressive disease without a cure

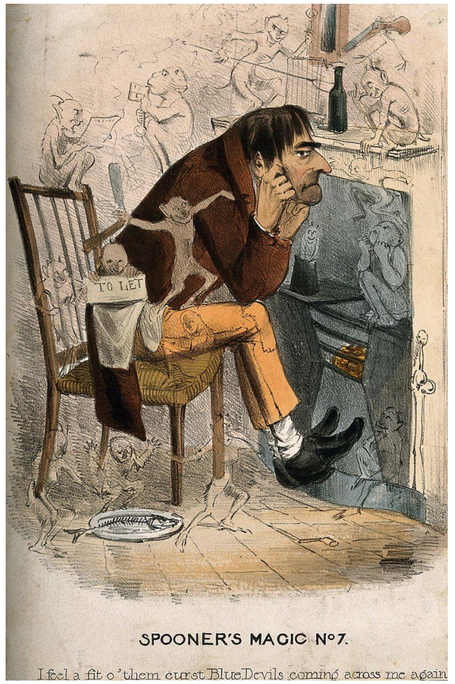
Intrinsic to Parkinson's Disease

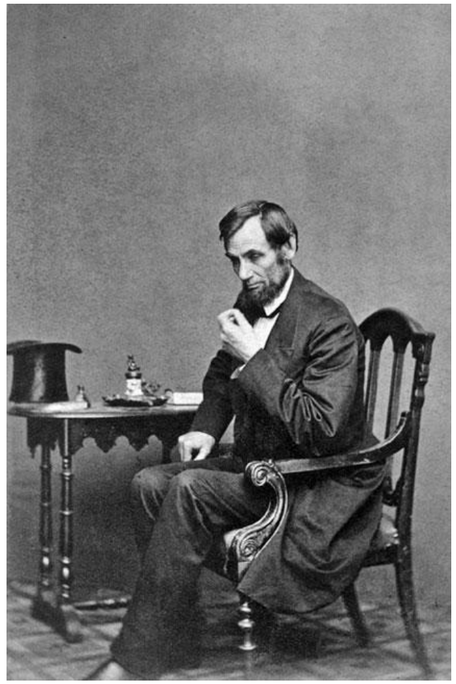
- Loss of brain cells producing dopamine, serotonin, and norepinephrine
- These chemicals are responsible for regulating mood, energy, motivation, appetite, and sleep


Prodromal Parkinson disease
Early-stage Parkinson disease
Mid-stage Parkinson disease
Late-stage Parkinson disease
Onset of motor symptoms
Diagnosis of Parkinson disease
Institutionalization
Death
Degree of disability
Time (years)
Bradykinesia
Rigidity
Tremor
Fluctuations
Dyskinesias
Dysphagia
Axial deformities
Postural instability and gait disorder
Falls
REM sleep behaviour disorder
Depression
Anxiety
Constipation
Hyposmia
Excessive daytime sleepiness
Mild cognitive impairment
Fatigue
Apathy
Pain
Orthostatic hypotension
Urinary symptoms
Dementia
Psychotic symptoms (visual hallucinations)
Motor symptoms
Non-motor symptoms









What is Depression?

What is Depression? (cont.)

Major Depressive Disorder (MDD)

DSM-V criteria (Diagnostic and Statistical Manual of Mental Disorders):

- 2 weeks of at least 5 of the following:
  - Depressed mood**
  - Loss of interest in activities/pleasure (anhedonia)**
  - Fatigue/low energy
  - Changes in weight (gain or loss)
  - Sleep changes (insomnia or excessive sleep)
  - Motor slowness or agitation
  - Feelings of worthlessness/guilt
  - Decreased concentration
  - Thoughts of death/suicide
- Symptoms must cause significant distress or impairment

Risk Factors for Depression

Female gender

Young onset of motor symptoms (<40 years old)

Severe cognitive impairment

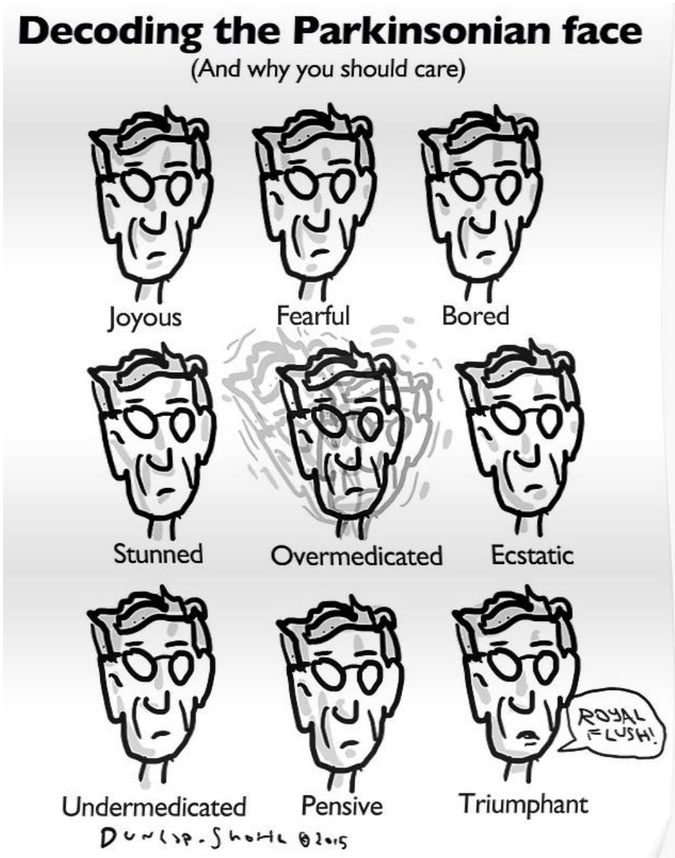
Other medical problems (e.g., heart disease, arthritis, diabetes)

Family history of depression

Baquero, M, Martín, N. Depressive symptoms in neurodegenerative diseases. World J Clin Cases. 2015;3(8):682–693

Difficulties in diagnosing depression in PD

- Many symptoms of depression overlap with symptoms of PD
- Reduced facial expression in PD makes it more difficult to express emotion
- Depression in PD often involves frequent, shorter changes in mood versus a constant state of sadness daily
- Many people with Parkinson's do not recognize they have a mood problem or are unable to explain symptoms



Apathy



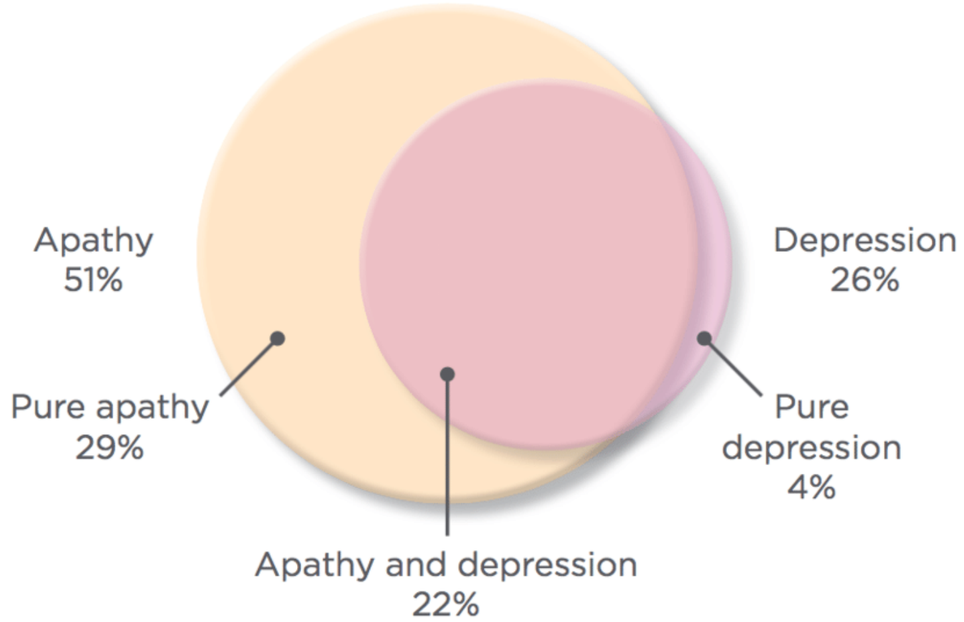
What is Apathy?

A lack of motivation, failure to initiate goal-directed behavior

Examples of apathetic behavior

- Difficulty initiating activities
- Needing prompting or reminding
- Low activity levels
- Lack of effort/reduced productivity
- Not completing tasks that were started
- Not concerned about issues that used to be important

Often seen with depression, but commonly can present as pure apathy



Kirsch-Darrow L, et al. Apathy and depression: separate factors in Parkinson's disease. J Int Neuropsychol Soc. 2011 Nov;17(6):1058-66.

Depression vs. Apathy

Depression – Mood disorder

- Sadness
- Worthlessness
- Guilt
- Hopelessness
- Helplessness
- Pessimism
- Suicidal ideation

Apathy – Motivation disorder

- Decreased initiative
- Less interest in starting new activities
- Less interest in the world
- Emotional indifference
- Decreased emotional reactivity

Overlap

- Anhedonia (inability to feel pleasure)
- Less interest in usual activities
- Increased slowness

Why is Apathy Harmful?

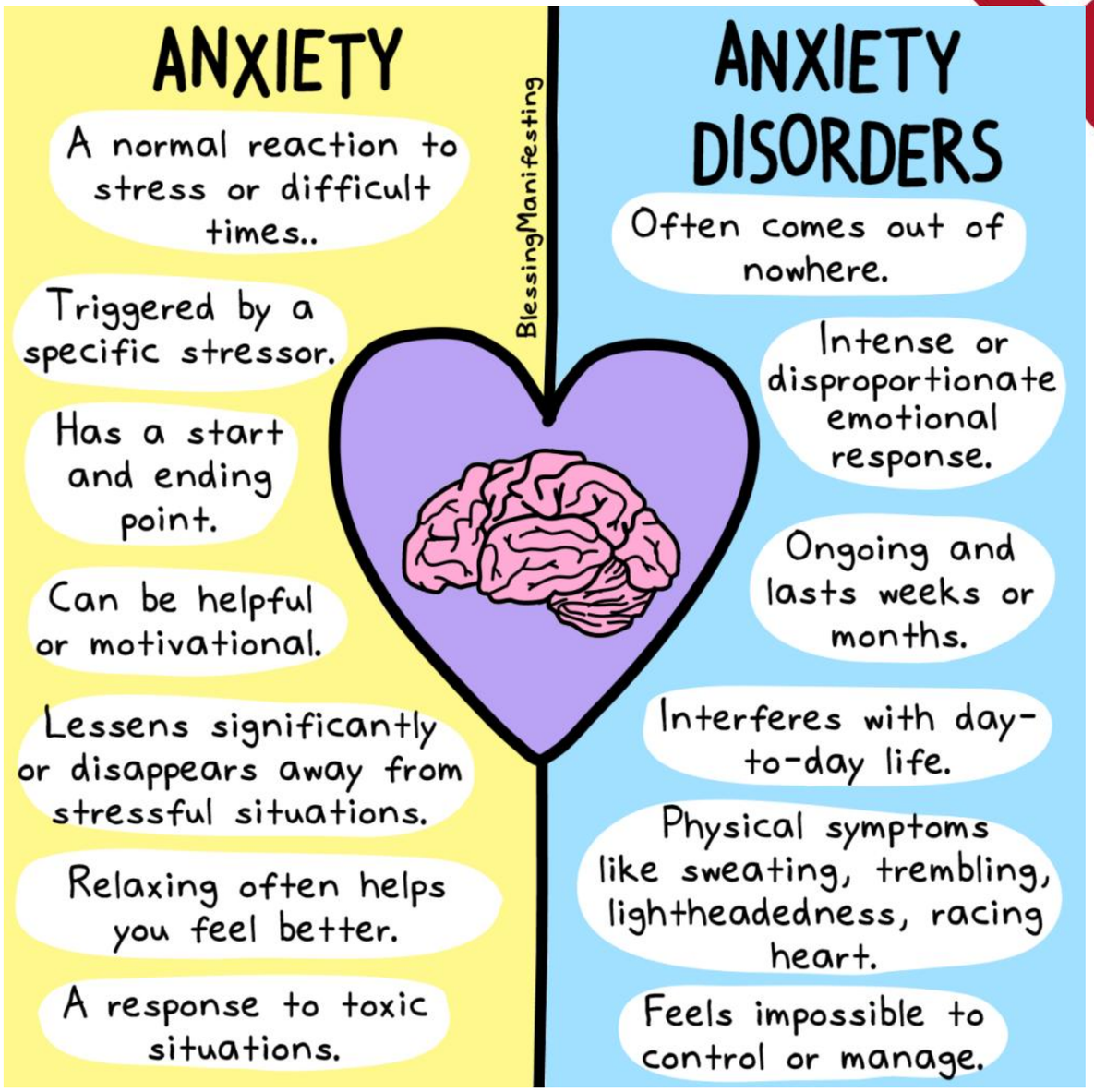
Reduced daily functioning and activity
Increased caregiver stress/distress
Poor treatment compliance
Worse rehabilitation outcome

Higher Morbidity and Mortality


Anxiety

What is an Anxiety Disorder?

Feelings of constant worry or nervousness that are present more than what would be considered normal and result in a significant impact on daily functioning and quality of life



http://invermeresummityouthcentre.org/anxiety/

What is an Anxiety Disorder? (cont).

Common manifestations:

- Excessive worry
- Avoidance
- Seeking reassurance
- Easily upset
- Insomnia
- Eating disorders
- Physical complaints
- Panic attacks

What are 3 types of Anxiety Disorder

The 3 most common types of anxiety in PD are

- Generalized anxiety disorder
- Social anxiety
- Anxiety/panic attacks

How does anxiety cause problems?

Exacerbates motor symptoms of PD

Impaired concentration and memory

Interferes with sleep

Medication side effects

Friction with friends and family

Suicide

Approximately 30% of PD patients have had thoughts about suicide

Danish study found that people diagnosed with PD were 2.2x more likely to commit suicide than the general population

When you or a loved one has suicidal thoughts:

- Use your social support network – find a support group, stay socially engaged
- Seek professional help: psychiatrist, psychologist, neurologist, social worker
- Prioritize self-care
- Use emergency support services. Call 911 there is immediate need

Erlangsen A, et al. Association Between Neurological Disorders and Death by Suicide in Denmark. *JAMA*. 2020;323(5):444–454.
Lee T, et al. Increased suicide risk and clinical correlates of suicide among patients with Parkinson's disease. *Parkinsonism Relat Disord*. 2016 Nov;32:102-107.

Suicide Resources

National Suicide Prevention Lifeline

1-800-273-8255

The Lifeline provides 24-hour-a-day, free and confidential support for people in distress, prevention and crisis resources for you or your loved ones and best practices for professionals
https://suicidepreventionlifeline.org/

The Substance Abuse and Mental Health Services Administration National Helpline

800-662-HELP (4357)

Confidential, free, 24-hour-a-day, 365-day-a-year, information service, in English and Spanish, for individuals and family members facing mental and/or substance use disorders
https://www.samhsa.gov/

Crisis Text Line

Text HOME to 741741

Crisis Text Line provides free, 24/7 mental health support via text message
https://www.crisistextline.org/

How can we treat mental health?

Medications

Psychotherapy

Exercise

Social Support

Medications for Depression and Anxiety

Very few controlled trials of medications for depression specifically in PD. No trials for anxiety in PD.

First line therapies:

- SSRIs: citalopram (Celexa), paroxetine (Paxil), sertraline (Zoloft), others

Second line therapies:

- SNRIs: venlafaxine (Effexor), duloxetine (Cymbalta)
- TCAs: amitriptyline (Elavil), nortriptyline (Pamelor)
- **Antipsychotics: quetiapine (Seroquel), clozapine (Clozaril)
- Others: mirtazapine (Remeron), trazodone (Desyrel), bupropion (Wellbutrin)
- May use benzodiazepines for refractory anxiety

Bomasang-Layno E, Fadlon I, Murray AN, Himelhoch S. Antidepressive treatments for Parkinson's disease: a systematic review and meta-analysis. Parkinsonism Relat Disord. 2015;21(8):833.

Medications for Apathy

Currently no approved treatments specifically for apathy

First line

- Optimizing Parkinson's medication regimen
  - Carbidopa/levodopa
  - Ropinirole (Requip), pramipexole (Mirapex), rotigotine (Neupro)

Second line

- Cholinesterase inhibitors: donepezil (Aricept), rivastigmine (Exelon)
- SNRIs
- Stimulants: Methylphenidate

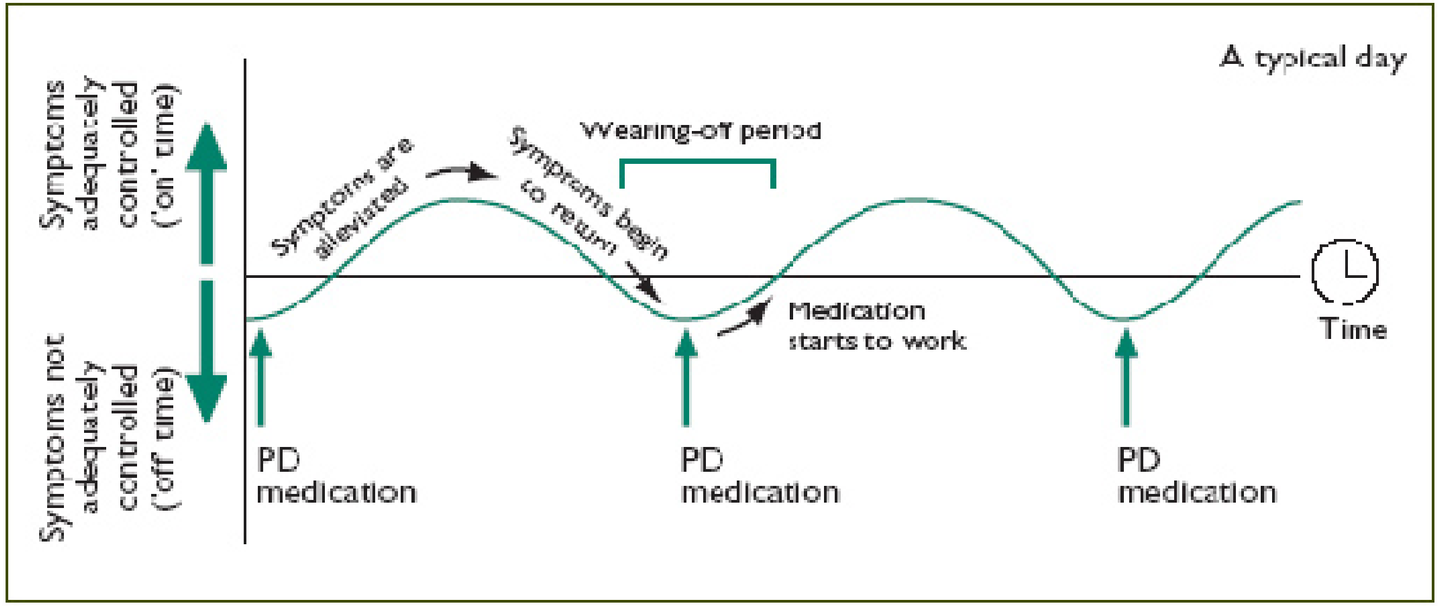
Mele B, et al. Diagnosis, treatment and management of apathy in Parkinson's disease: a scoping review. BMJ Open. 2020 Sep 9;10(9)

Special Considerations for PD

As PD progresses, fluctuations in symptoms can occur with changing levels of medication in your body

Not only motor symptoms! Mental health can fluctuate, as well

Adjustment of PD medications often required for optimal treatment



Other Medical Interventions

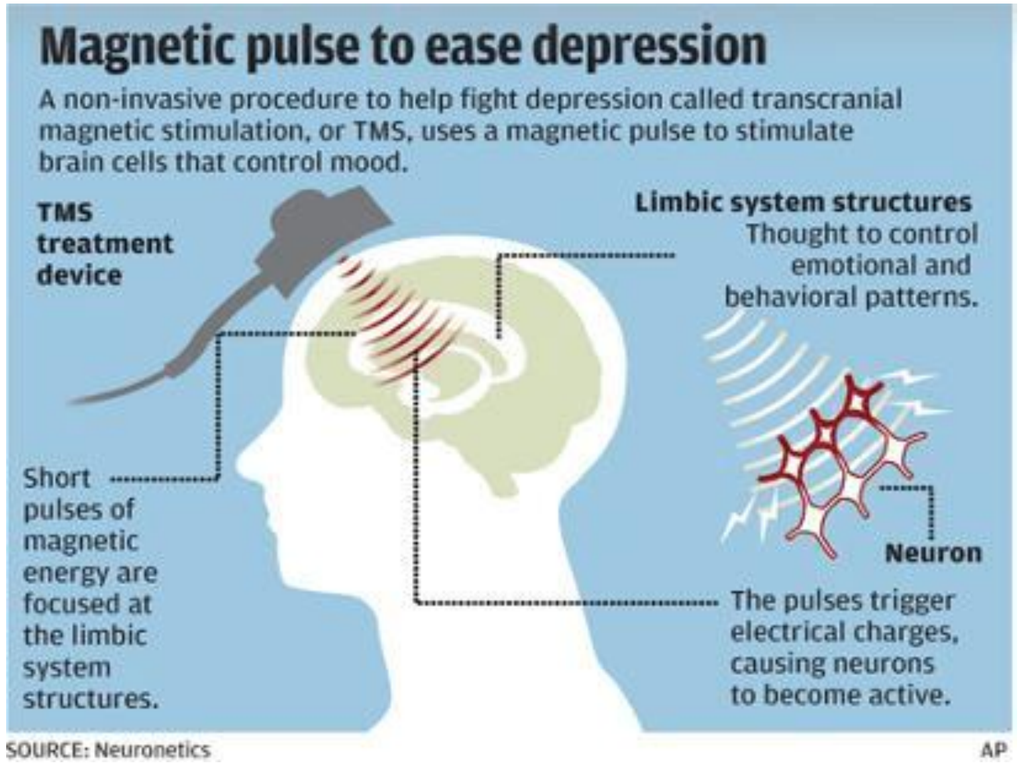
Deep brain stimulation (DBS)

Electroconvulsive therapy (ECT)

- Longstanding therapy for severe, intractable depression. No trials specifically for PD
- Safe and effective – may cause temporary confusion/delirium
- Incompatible with DBS

Transcranial magnetic stimulation (TMS)

- Recently FDA-approved for depression
- Under investigation for effects on mood and motor symptoms in PD



Psychotherapy

Cognitive behavioral therapy (CBT)

- A therapy technique aimed at changing negative thinking and behavior patterns. Helps establishing coping techniques and thinking positively
- The most studied intervention for depression and anxiety in PD. Shown to be at least as effective than use of medication alone

Resource to find a local therapist: psychologytoday.com



Dobkin RD, et al. Cognitive-behavioral therapy for depression in Parkinson's disease: a randomized, con-trolled trial. Am J Psychiatry. 2011;168(10):1066-1074

Exercise

Exercise improves physical and psychiatric symptoms of Parkinson's Disease

Examples:

- Walking
- Stretching
- Yoga
- Tai-Chi
- Lifting weights
- Whatever gets you moving!



Wu PL, Lee M, Huang TT. Effectiveness of physical activity on patients with depression and Parkinson's disease: a systematic review. PLoS One. 2017;12(7)


Light therapy
Relaxation techniques
Massage therapy
Acupuncture
Aromatherapy
Meditation
Music therapy

Social Support

Your network of people that you can turn to in times of need (and vice-versa)

Family, friends, work, support group, religious community, etc.

Helps build healthy habits, cope with stress, and improve motivation



Types of social support

- Emotional support
- Instrumental support – physical support (e.g., hot meal, rides)
- Informational support – guidance, advice, mentoring




Preschool
Diploma
For completing preschool at
Norman Rockwell Elementary
5/27/2026
Miss Caldwell
Teacher



Support Groups

Helpful for both PD patients and caregivers!

Information on local support groups can be found at:

- www.ParkinsonsNebraska.org
- www.Parkinson.org
- www.APDAParkinson.org
- www.MichaelJFox.org

Also, many on-line support groups

Psychosis



What is Psychosis?

When the brain sometimes perceives things that are not real

Common in Parkinsons Disease to varying degrees, estimated to affect 1 in 3 people at some point

- The risk of developing psychosis increases with duration of disease and with increasing age

Tends to occur most often at night or during times of fatigue

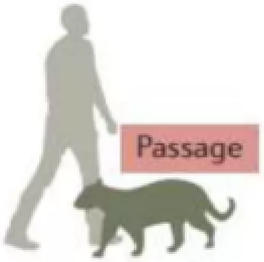
Early Signs of Psychosis

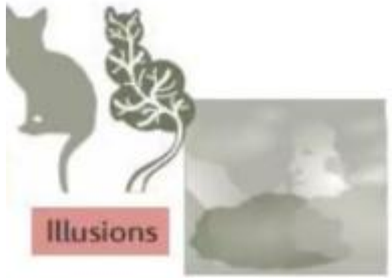
These subtle experiences often come first and are easy to miss or dismiss.

- **Sense of presence:** feeling someone is in the room when there is no one there
- **Passage hallucinations:** briefly seeing something move at the edge of your vision
- **Illusions:** mistaking a real object for something else

Although these may seem like minor problems, mention to your healthcare provider if you experience these







More Noticeable Symptoms

These symptoms are often more obvious to family and caregivers, and may be distressing

- **Visual hallucinations:** seeing people, animals, or other figures that are not there at all
- **Other sensory hallucinations:** hearing, feeling, or smelling things that are not there (uncommon)
- **Delusions:** strongly held false beliefs, such as thinking a spouse is unfaithful, that people are stealing, or that strangers are living in the home

There may be awareness that the hallucinations are not real (insight), or there may be lack of insight

What Causes Psychosis?

Usually a combination of factors:

- Degenerative changes in the brain from Parkinsons Disease itself
- Parkinsons Medications
- Cognitive/memory impairment
- Other triggers: other medications, underlying illness, poor nutrition/dehydration, poor sleep, unfamiliar surroundings. **Any body stressor or big change**

First Steps in Management of Psychosis

Start by looking for fixable causes:

- Testing for underlying infection or other medical problems
- Reviewing all medications
- May need to adjust Parkinsons medications to balance bothersome psychosis while preserving movement
    - **Do not stop or adjust medications without medical guidance**



Medications for Psychosis

Only used when psychosis symptoms are bothersome or intrusive, and after initial steps fail

The medications most often used are:

- Pimavanserin – the only FDA approved medication specifically approved for PD psychosis
- Quetiapine – commonly used in low doses, usually with little effect on motor symptoms. Can be sedating
- Clozapine – very effective, but requires frequent blood test monitoring to avoid potentially dangerous side effects

Most medications to treat psychosis must be avoided in Parkinsons Disease, as they can worsen motor symptoms.

Tips for Caregivers

If your loved one is experiencing intrusive psychosis:

- **Stay calm** and reassuring
- **Do not argue** or try to convince that their visions/beliefs are not real, acknowledge feelings and gently redirect
    - May require intervention if behaviors are dangerous
- **Ensure safety** – clear the environment of hazards
- **Turn on lights** to reduce confusing shadows. Keep glasses, hearing aides available.
- Note what happened – time, triggers, and content – to share with healthcare provider

Take-Home Points

- Depression, anxiety, apathy, and psychosis are common in PD
- Not a personal failing/weakness, it is a part of PD and a chemical imbalance in the brain
- Affects quality of life as much as motor symptoms
- Depression increases risk of suicide
- Underdiagnosed: recognition of the symptoms is key!
- Can be difficult to recognize, mood disorders can mimic motor symptoms of PD
- Discuss your mental health and subtle signs with your doctor annually. If possible, bring along a family member or friend

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Disease-Modifying Therapies: A light at the end of the tunnel

Miguel Situ-Kcomt, MD
Associate Professor
Division of Movement Disorders
Department of Neurological Sciences

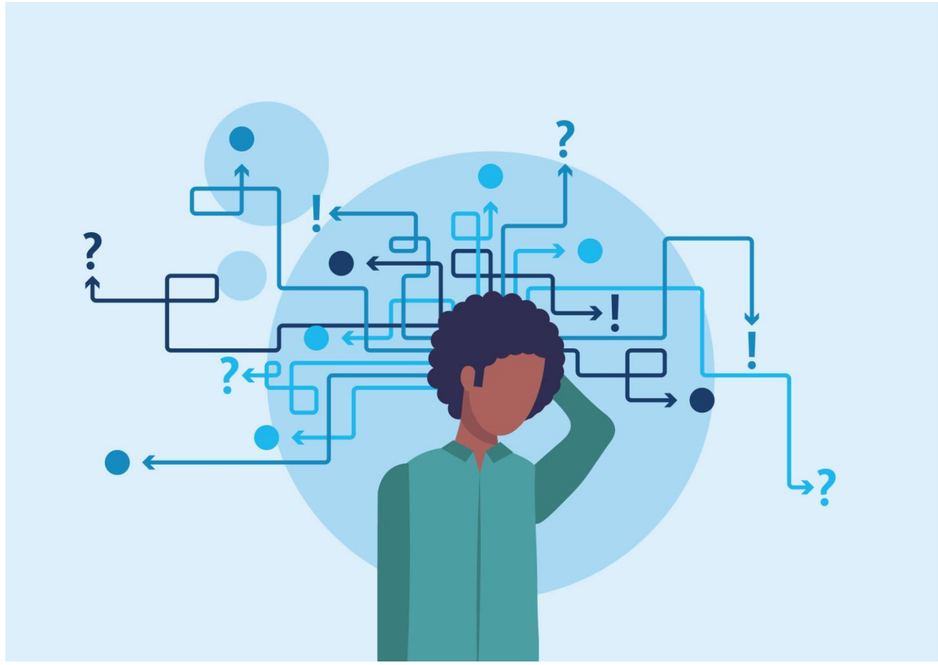
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Disclosures

None relevant to this talk

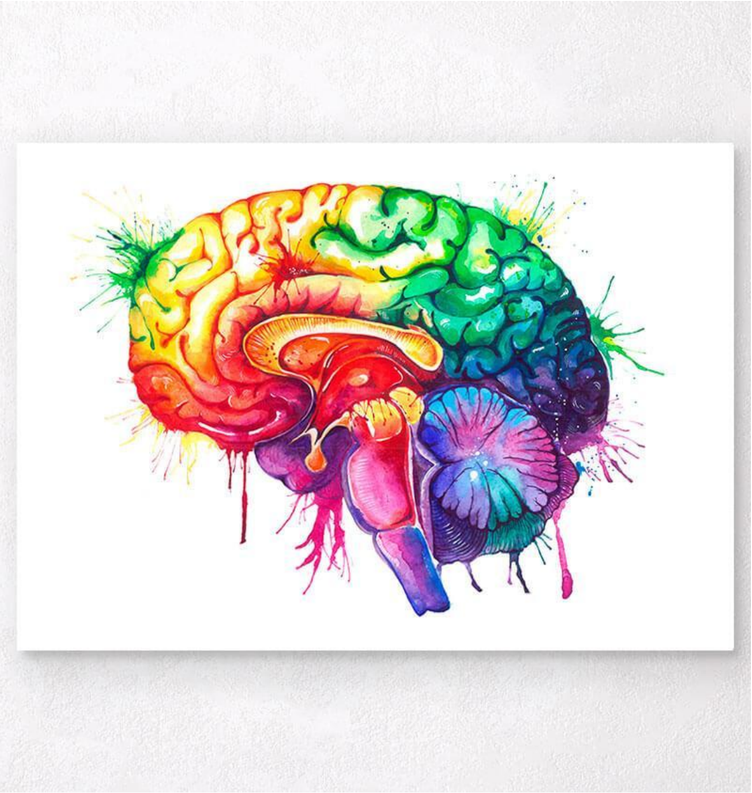
Others:
- Consulting & talk fees from Abbott Neuromodulation



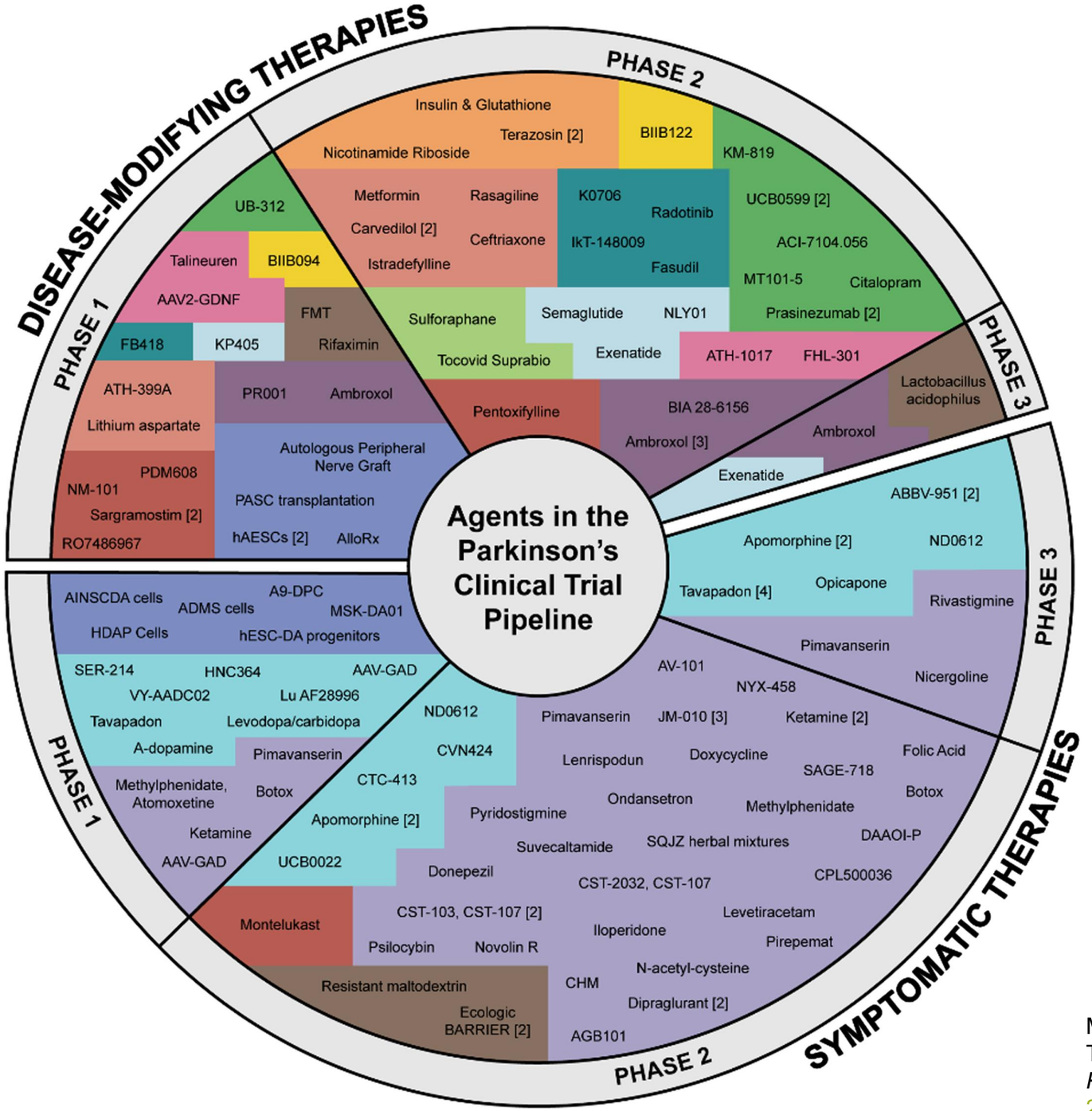


The Problem

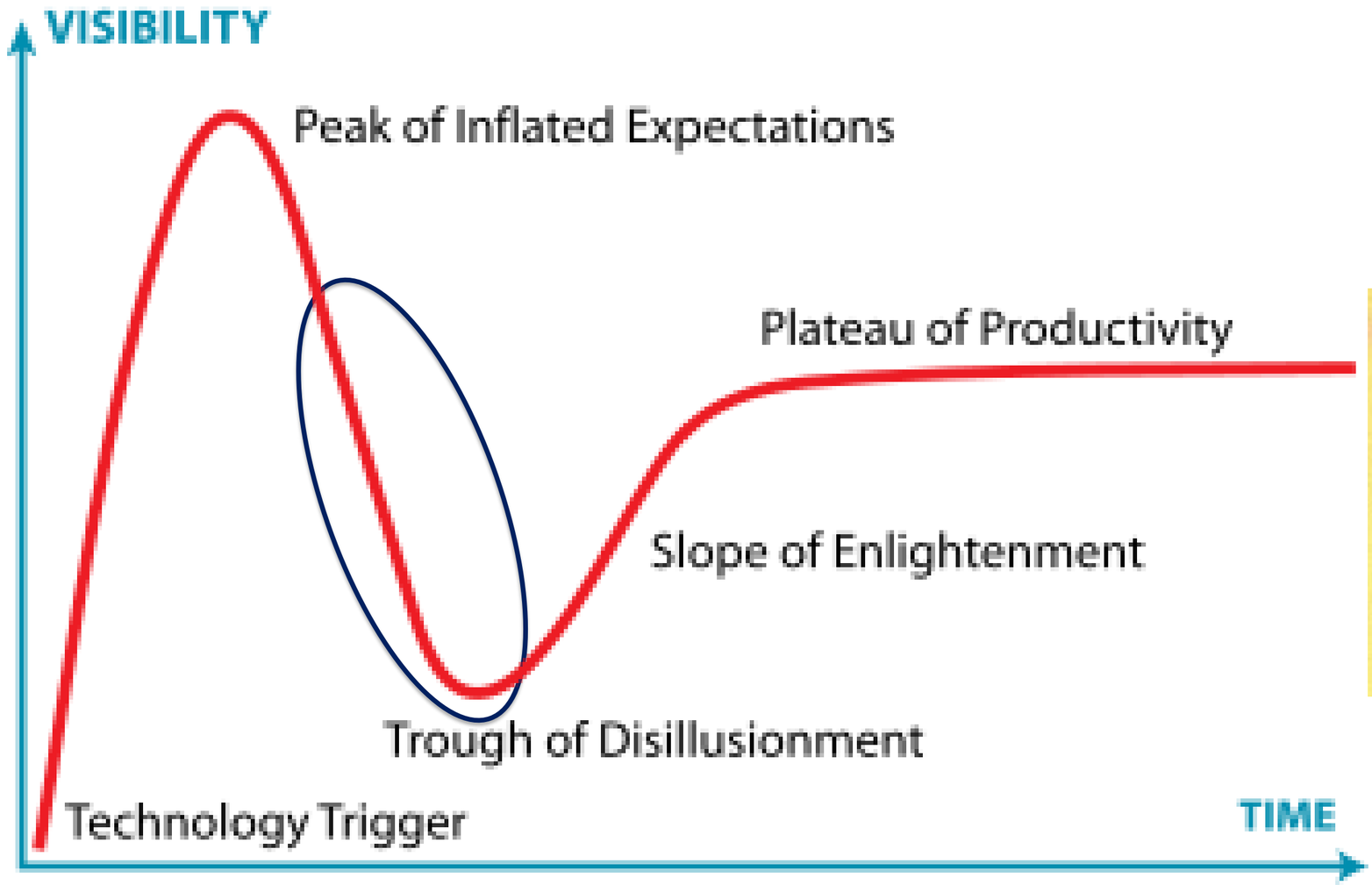
Parkinson “Disease”



- PD is a slow-moving condition where effects may take weeks, months or years.
- We lack an exact starting point to detect the condition.
  - Clues about the mechanism – but no unifying source
- Lifestyle changes in society may take generations



McFarthing K, Buff S, Rafaloff G, et al. Parkinson's Disease Drug Therapies in the Clinical Trial Pipeline: 2024 Update. *Journal of Parkinson's Disease*. 2024;14(5):899-912. doi:10.3233/JPD-240272





Gartner Hype Cycle

What’s the bad news?



How many therapies have been?

At least **33 different medications/molecules/agents** have not met meaningful disease-modifying properties.

Completely failed:

CoQ10, creatine, TCH346, CEP-1347, GDNF, AAV-neurturin, Cogane, pioglitazone, isradipine, inosine, nilotinib, deferiprone, K0706, cinpanemab, minzasolmin, NLY01 and exenatide.

Helps with symptoms but not alter disease:

tocopherol, selegiline, rasagiline, levodopa, pramipexole, ropinirole, minocycline, GM1, GPI-1485, paliroden and liraglutide.

α-Synuclein directed therapies

Therapy	Trial	Disease	Phase	Approx. patients	Efficacy outcome
Rifampicin	NCT01287221	MSA	III	100	**Failed** — no slowing of UMSARS progression; p=0.82 (PubMed)
EGCG (epigallocatechin gallate)	PROMESA / NCT02008721	MSA	II/III	92	**Failed** — no difference in UMSARS progression; p=0.51 (PubMed)
Cinpanemab (BIIB054)	SPARK / NCT03318523	PD	II	357	**Failed** — no significant MDS-UPDRS benefit; trial stopped for lack of efficacy (New England Journal of Medicine)
Prasinezumab* (PRX002)	PASADENA / NCT03100149	PD	II	316	**Failed** — primary endpoint not met; no meaningful global clinical/imaging benefit
Minzasolmin (UCB0599)	ORCHESTRA / NCT04658186	PD	II	450	**Failed** — primary disease-progression endpoint and other endpoints not met
Prasinezumab (PRX002)	PADOVA / NCT04777331	PD	IIb	586	**Failed** — primary endpoint not met; HR 0.84, p=0.066
Amlenetug (Lu AF82422)	AMULET / NCT05104476	MSA	II	64	**Failed** — predefined primary endpoint not met; Bayesian probability 89.4% vs 97.5% threshold

- **REMEMBER**

Studies in animals does not equate to results in humans

What works anecdotally cannot be generalized

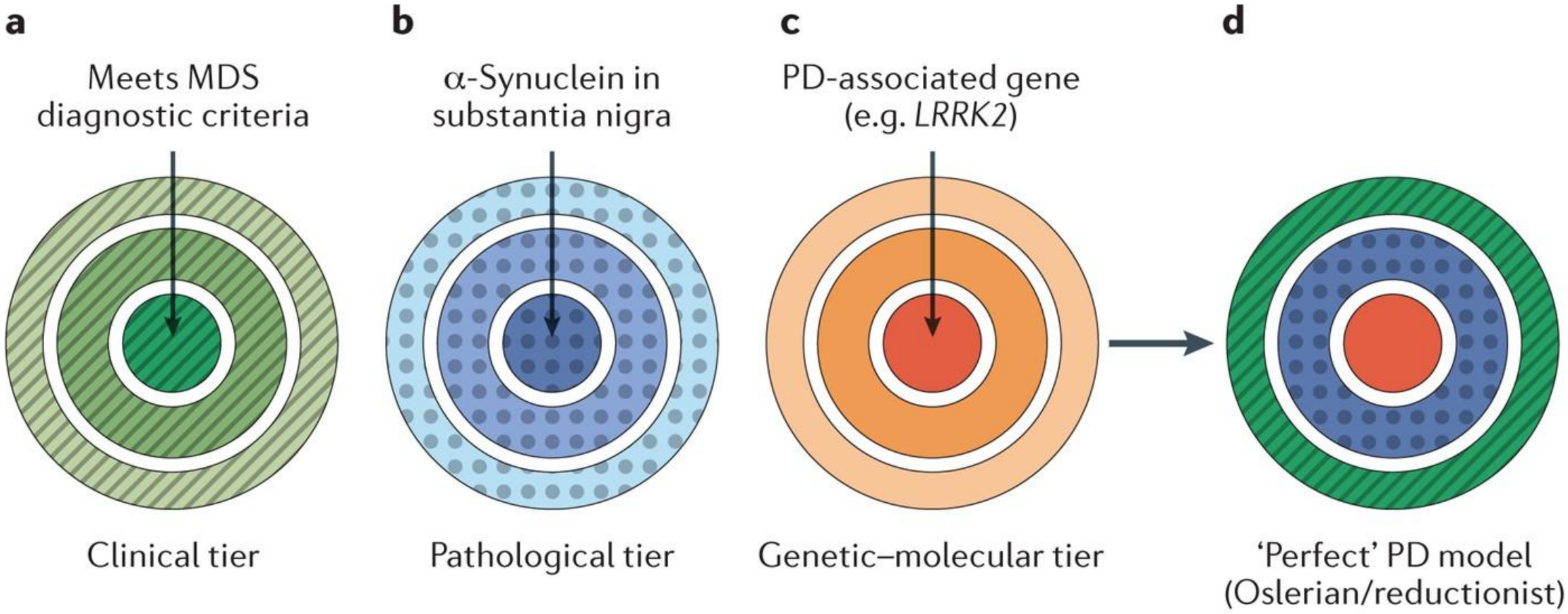


What’s the ongoing hope?

13 ongoing clinical trials

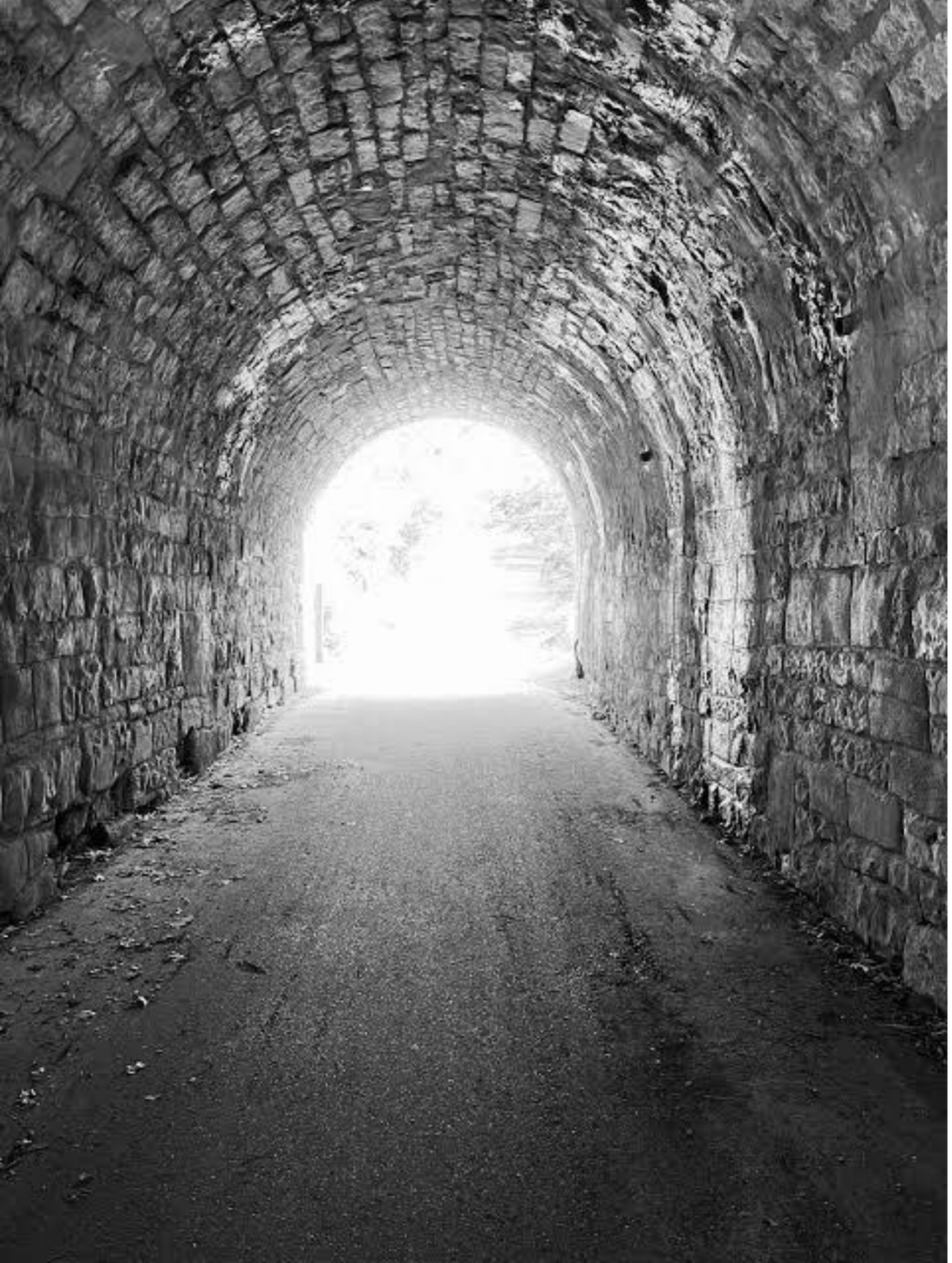
- One **α-synuclein vaccination**
  - PD01A
- Two **α-synuclein targeted** therapies
  - Prasinezumab*
  - Exidavnemab
- Three **LRRK2 mutation** specific therapies
  - BIIBB122/DNL151
  - NEU-411
  - ARV-102
- Three **GBA-1 associated** PD specific therapies
  - Ambroxol
  - BIA 28-6165
  - GT-02287
- One **GBA-1 Gene** Therapy
  - PR001 (LY-3884961)

A paradigm shift in the field



Nature Reviews | Neurology

Espay, A., Brundin, P. & Lang, A. Precision medicine for disease modification in Parkinson disease. *Nat Rev Neurol* **13**, 119–126 (2017). https://doi.org/10.1038/nrneurol.2016.196

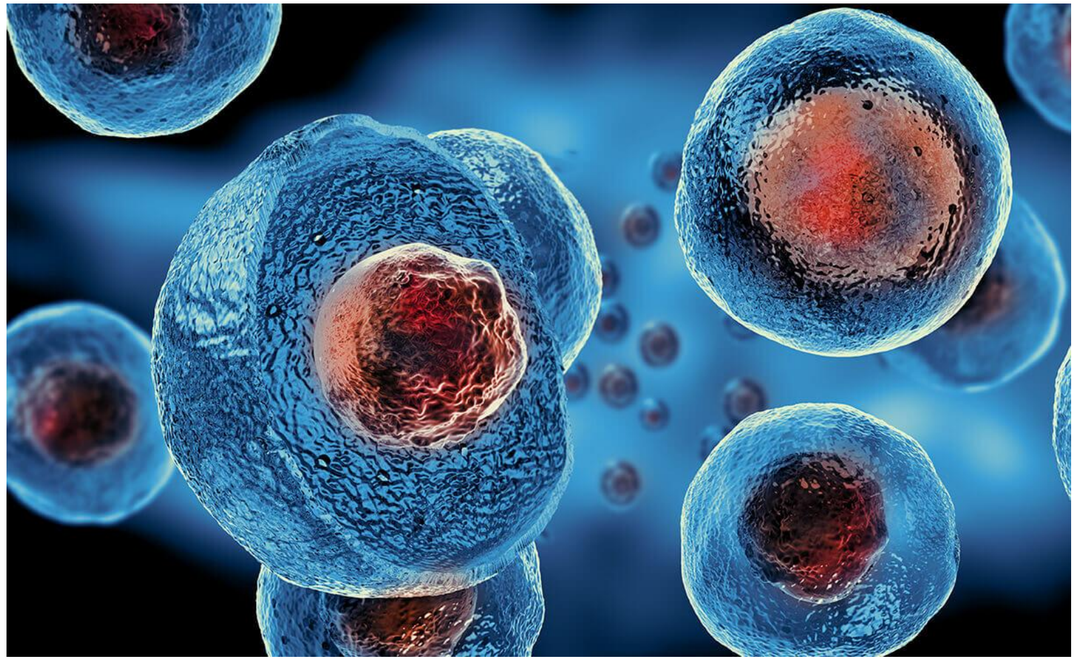


What is the promising light?

Stem Cell Therapy

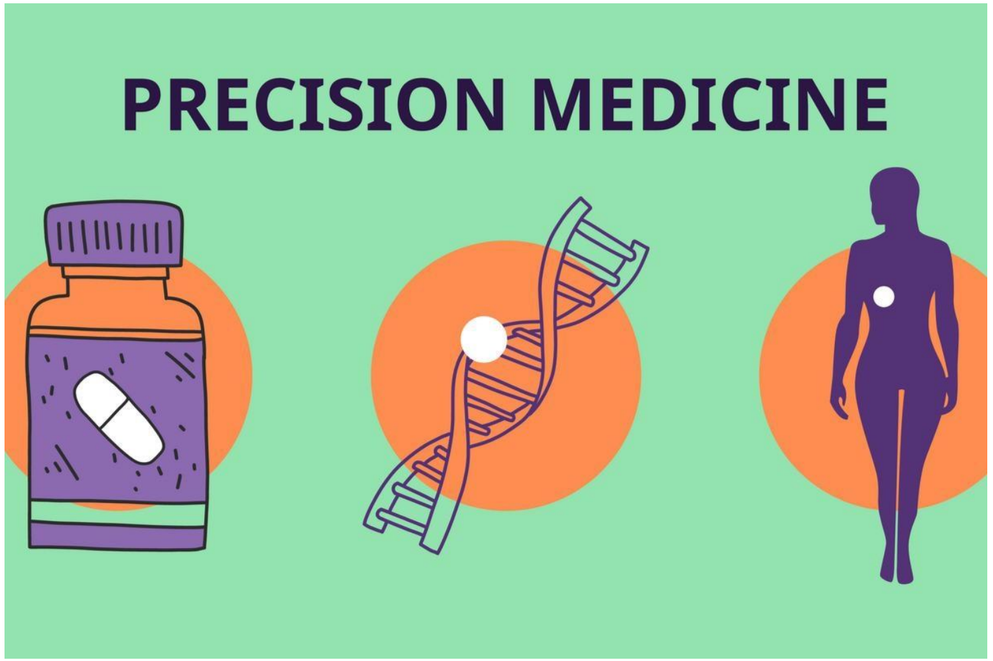
- iPS-cell therapy
  - Japanese trial had 7 patients transplanted with pluripotent-stem-cell-derived dopamine progenitor cells.

- STEM-PD trial
  - Embryonic-stem-cell-derived dopamine progenitor cells in 8 patients.



1. Sawamoto, N., Doi, D., Nakanishi, E. *et al.* Phase I/II trial of iPS-cell-derived dopaminergic cells for Parkinson's disease. *Nature* **641**, 971–977 (2025). https://doi.org/10.1038/s41586-025-08700-0
2. Reinisch N, Mancini A, Elsherbini A, Yuen J, Lozano A. Homogenous Cell Transplantation Trials in Parkinson's Disease: A Systematic Review and Meta-Analysis. Mov Disord Clin Pract. 2026 Sep;13(9):2093-2103. doi: 10.1002/mdc3.70647. Epub 2026 May 3. PMID: 42076911; PMCID: PMC13339419.

Again! Precision Medicine…



Though in most trials the general endpoint failed, **in a few patients** in the trials, they **did get better**.

- If we find **YOUR** unique biology, we can get to the right therapy for you.
- The earlier we find a way to detect the disease, the better chances.

…what about exercise?

- A series of trials (SPARX) have shown promising results, albeit with difficult interpretation
  - SPARX: in animals it did show neuroprotection (2013)
  - SPARX2: it seem to improve in 128 patients but too small of a change (2018)
  - SPARX3: 370 patients over 18 months – results pending
- In widespread clinical experience, it **DOES** help.





Patterson CG, Joslin E, Gil AB, et al.; SPARX3-PSG Investigators. Study in Parkinson's disease of exercise phase 3 (SPARX3): study protocol for a randomized controlled trial. Trials. 2022 Oct 6;23(1):855. doi: 10.1186/s13063-022-06703-0. PMID: 36203214; PMCID: PMC9535216.

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University of Nebraska Medical Center

Research Update: Therapeutics & Diagnostics

Nada Ahmed, M.B.B.S.
Assistant Professor
Movement Disorders
UNMC Department of Neurological Sciences

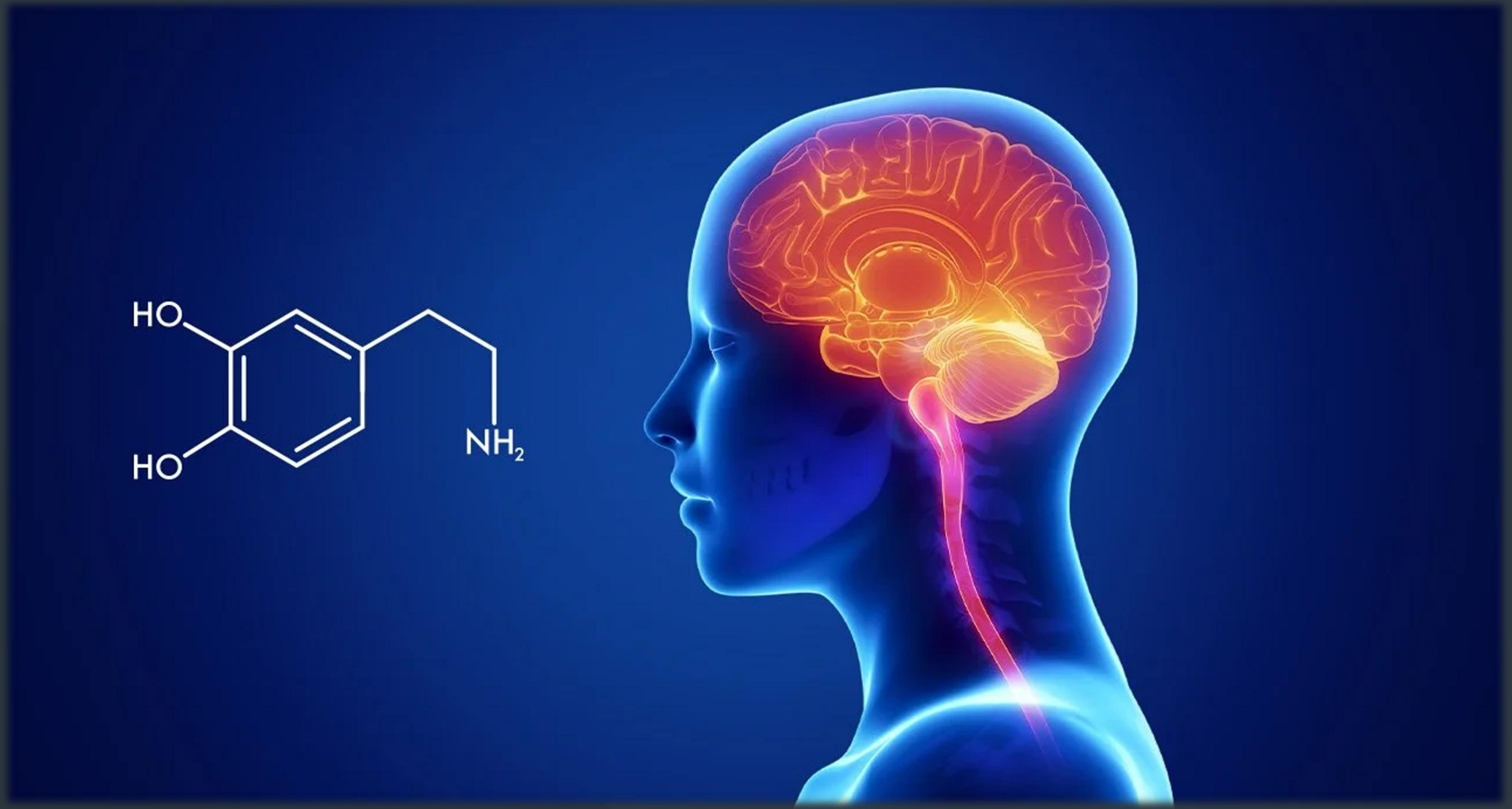
University of Nebraska Medical Center

Nebraska Medicine

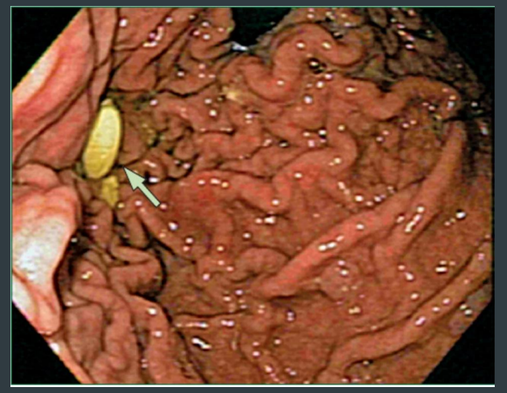
Objectives To Cover

- ✓ New **treatments** for **symptoms**
- ✓ What's new in **diagnosis** & where we are headed
- ✓ How to **get involved**

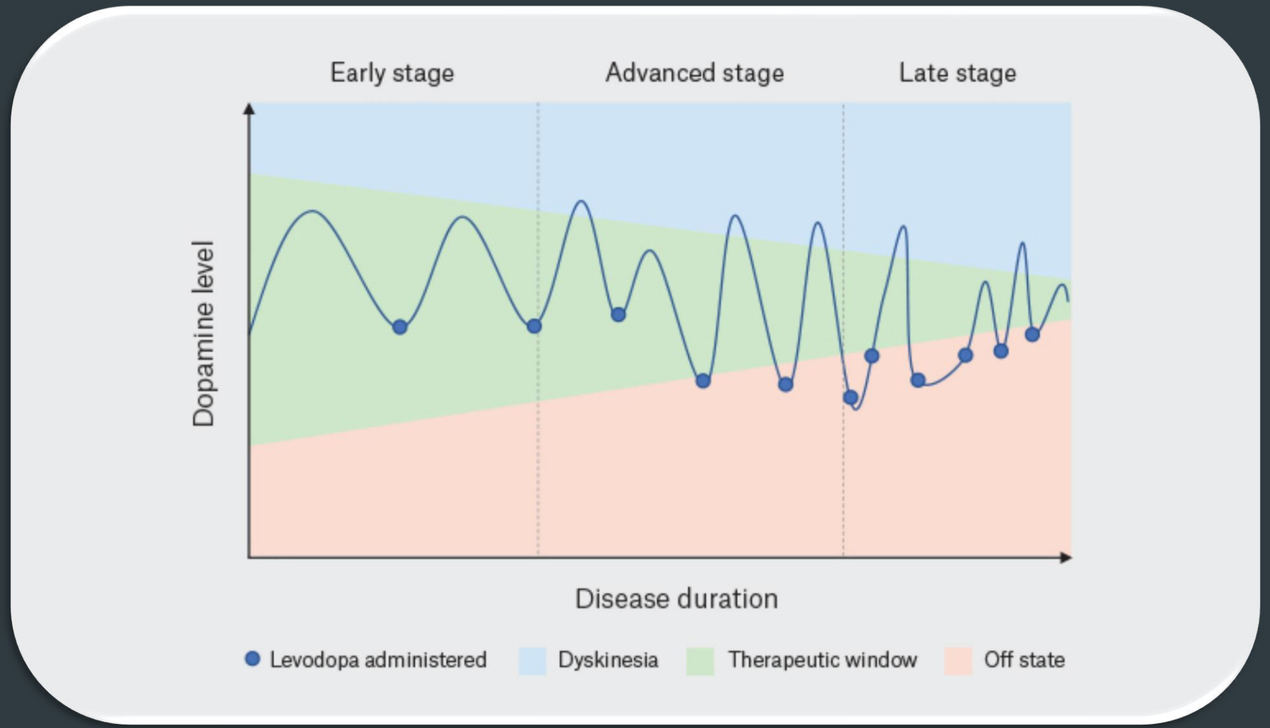
New Symptomatic Treatments



LEVODOPA:
Still the GOLD STANDARD



- **Levodopa** is **still the most effective** medicine for Parkinson's movement symptoms
- **Motor fluctuations:** wearing off between doses (“OFF" times) and can cause extra movements ("dyskinesia")
- Most new treatments are about giving **levodopa more smoothly and steadily**



Longer-Lasting Levodopa

Same foundation. Smoother delivery.

RYTARY®

FDA approved **2015**

(carbidopa and levodopa)
Extended-release capsules





IR + extended-release beads

VS

CREXONT®

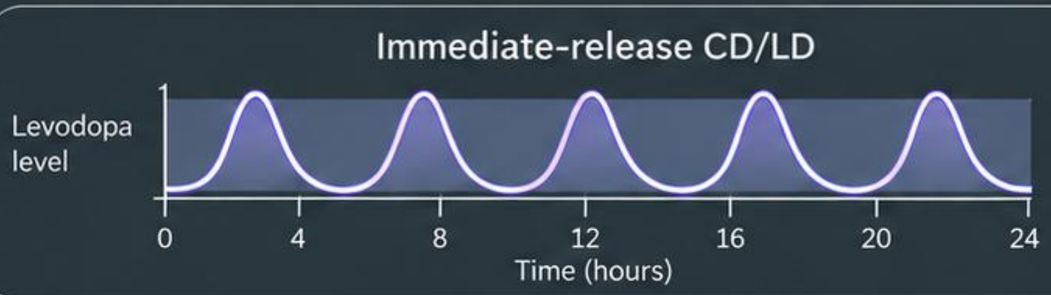
FDA approved **2024**

(carbidopa and levodopa)
Extended-release capsules





IR granules + extended-release pellets





Goal: extend levodopa benefit → fewer daily doses → less OFF time

Foslevodopa/foscarbidopa (Vyalev)
FDA-approved 2024



- A **small pump** delivers levodopa **continuously under the skin** - 24 hours a day.
- Reduced "off" time and increased good "on" time in its trial (about 2 to 3 extra good hours per day)
- **No surgery!**
- Main downside: **skin reactions** at the needle site are common

Fast "Rescue"
Treatments for Sudden Off Times



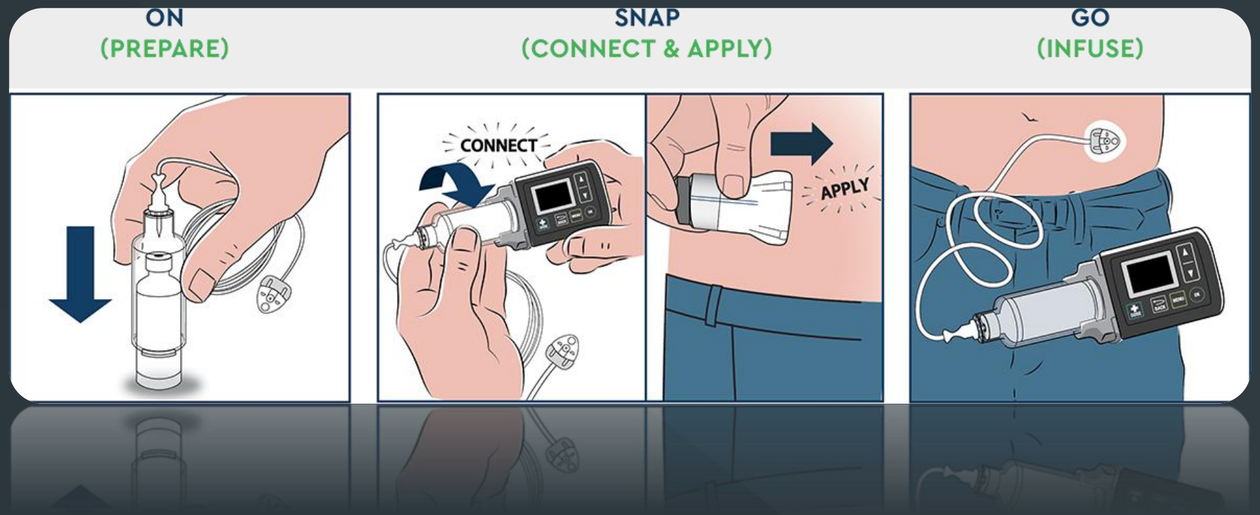


- These meds are add-ons for sudden "off" episodes, **not replacements for daily pills**
- **Inhaled levodopa (Inbrija) 2008:**
  - **Breathe it in** for a **fast rescue** when a dose wears off early
  - Works within **~10 minutes**
  - Main side effect: **cough**
- **Apomorphine injection (Apokyn) 2004:**
  - Generic approved in **2022**
  - Works in **~10–20 minutes**
  - Main side effect: **Nausea/vomiting**



Apomorphine Pump (Onapgo)
FDA-approved 2025

- Same medicine - new job
- **Wearable pump** - flips the strategy from "rescue" to "prevention”
- Delivers the medicine **steadily all day** (~16 hrs) to prevent OFF time



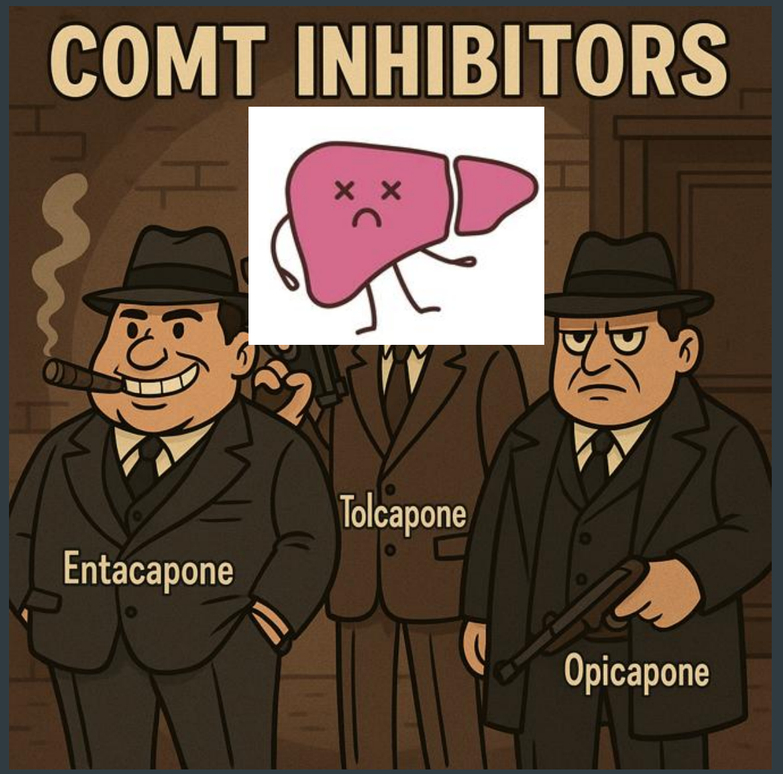


Newer Add-On Pills

Opicapone (2020)

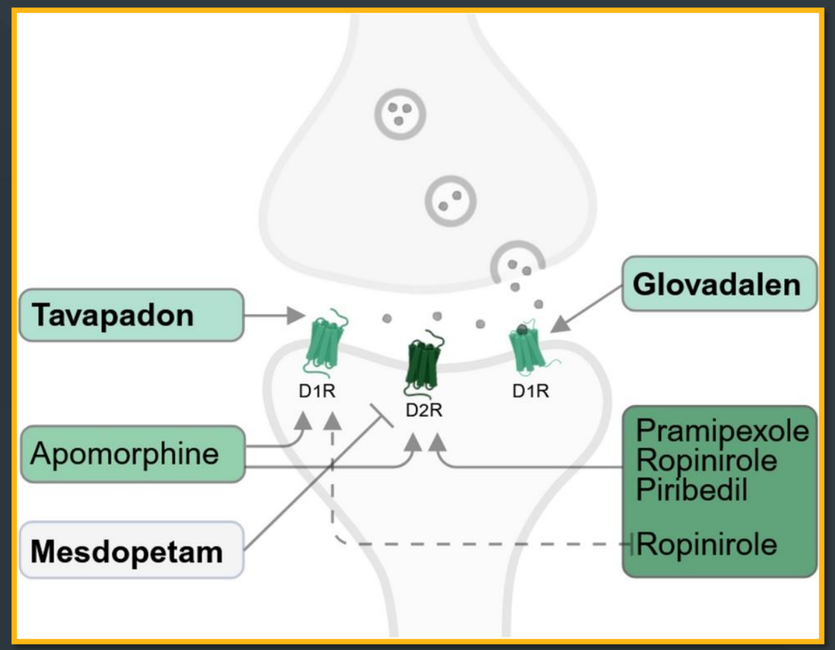
- Once daily pill compared to entacapone





Tavapadon (under FDA review)

- Investigational – **NOT FDA approved yet**
- **Once-daily** pill
- **Targets different brain receptors "switches"**(D1/D5 receptors) versus older dopamine agonists (D2/D3)
- **Improve ON time** without as many side effects?
- **Lower rates** of impulse-control problems and sleepiness



JAMA Neurology

RCT: Tavapadon as Adjunctive Treatment for Parkinson Disease

POPULATION

321 Male, 186 Female

Adults with Parkinson disease with a stable levodopa regimen who are experiencing motor fluctuations

Mean age, 64.9 y (range, 43-80 y)

SETTINGS / LOCATIONS

148 Sites across 14 countries

INTERVENTION

507 Patients randomized, **487** Patients analyzed

245 Placebo
Oral placebo once daily

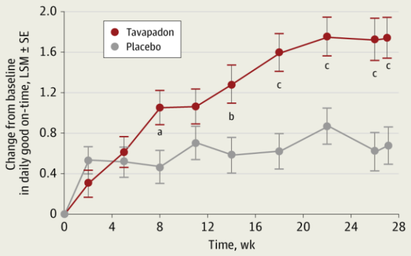
242 Tavapadon
Oral tavapadon, 5-15 mg, once daily

PRIMARY OUTCOME

Change from baseline to week 26 in total daily on-time without troublesome dyskinesia (good-on-time) using the Hauser diary, which records mobility status as on-time with or without troublesome dyskinesia or off-time

FINDINGS

Tavapadon demonstrated a statistically significant increase in total daily good-on-time from baseline to week 26 compared with placebo

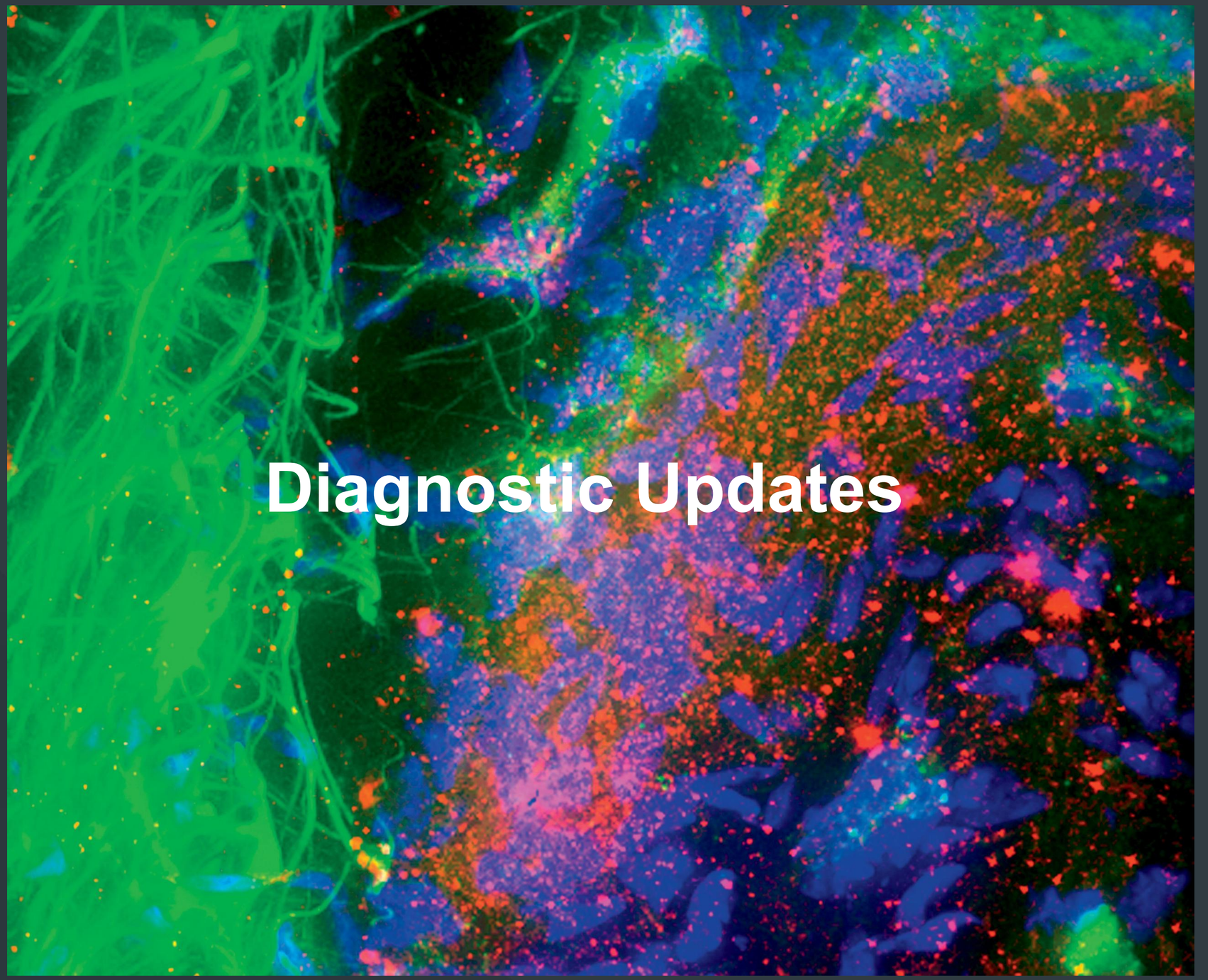


Change in good on-time from baseline
Placebo: 0.6 h
Tavapadon group: 1.7 h
Treatment difference, 1.1 h; 95% CI, 0.6-1.7; *P* <.001

Fernandez HH, Isaacson SH, Hauser RA, et al. Tavapadon as adjunctive treatment for Parkinson disease: the TEMPO-3 randomized clinical trial. *JAMA Neurol*. Published online March 20, 2026. doi:10.1001/jamaneurol.2026.0590

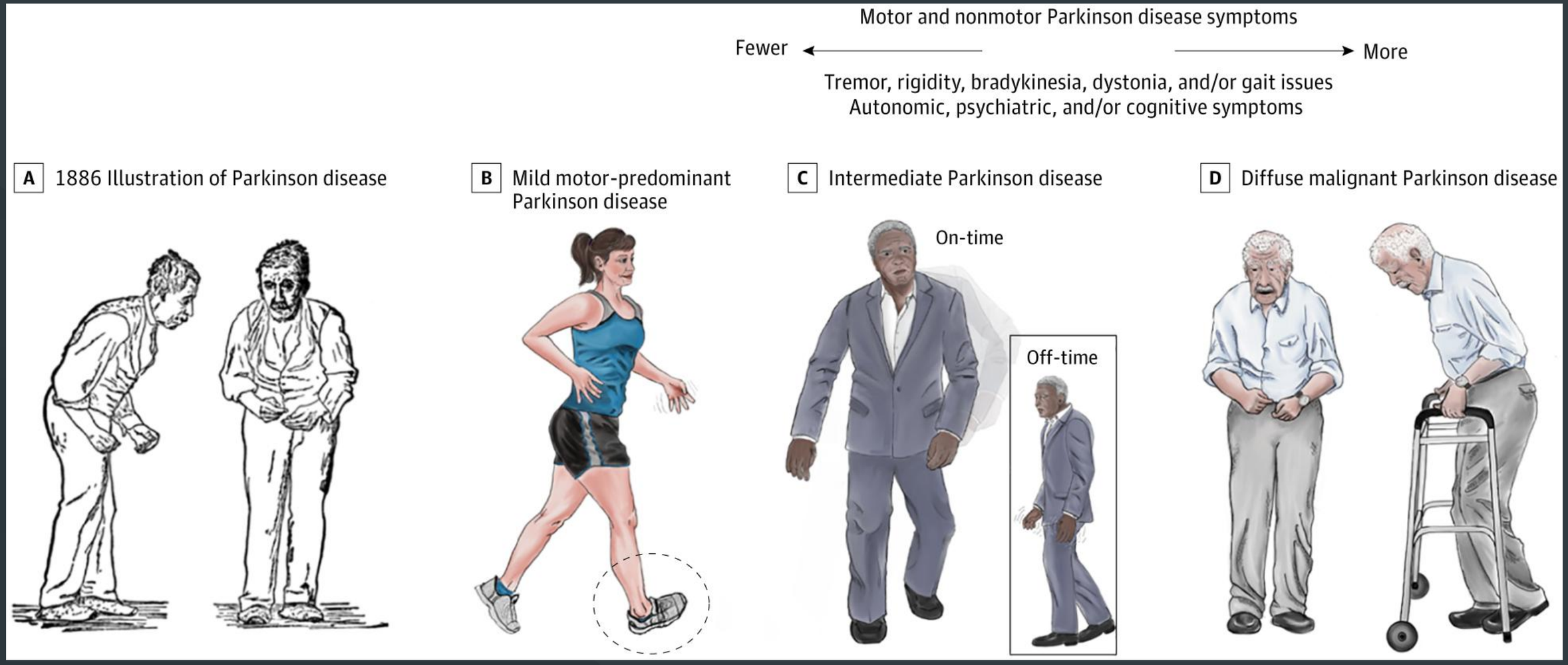
© AMA

Diagnostic Updates



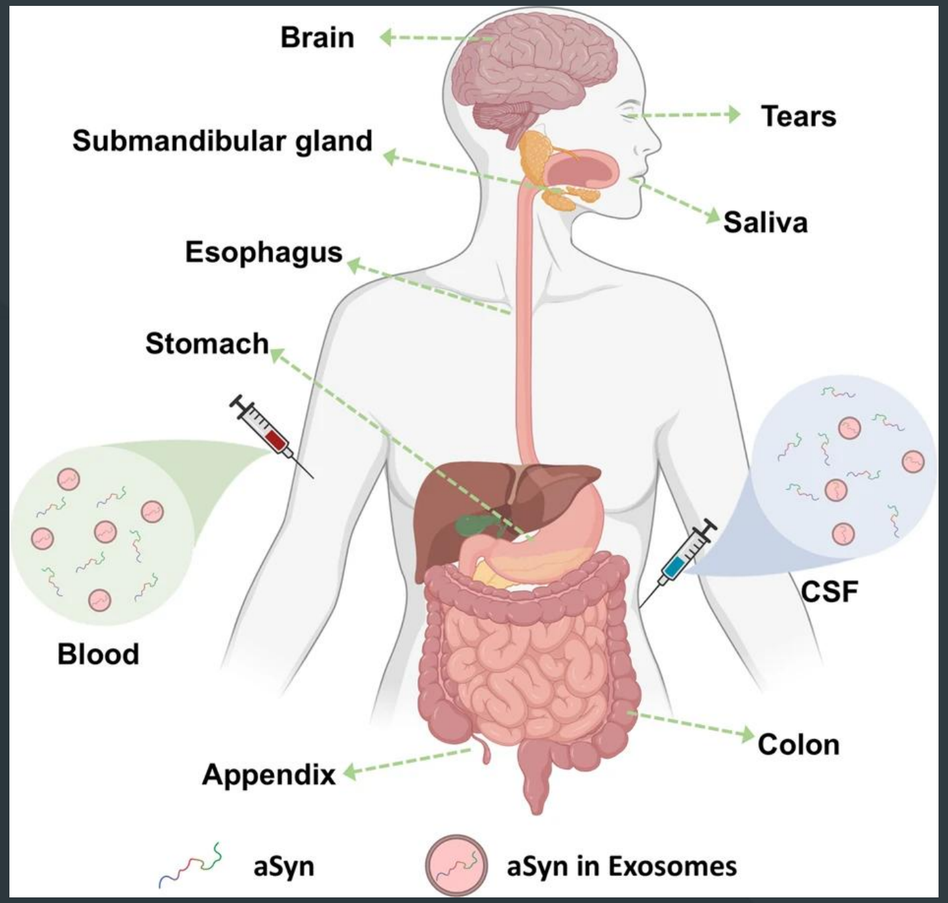
Photograph by Mya C. Schiess, Roger Bick, UT Medical School / Science Photo Library

PD has always been a clinical diagnosis…

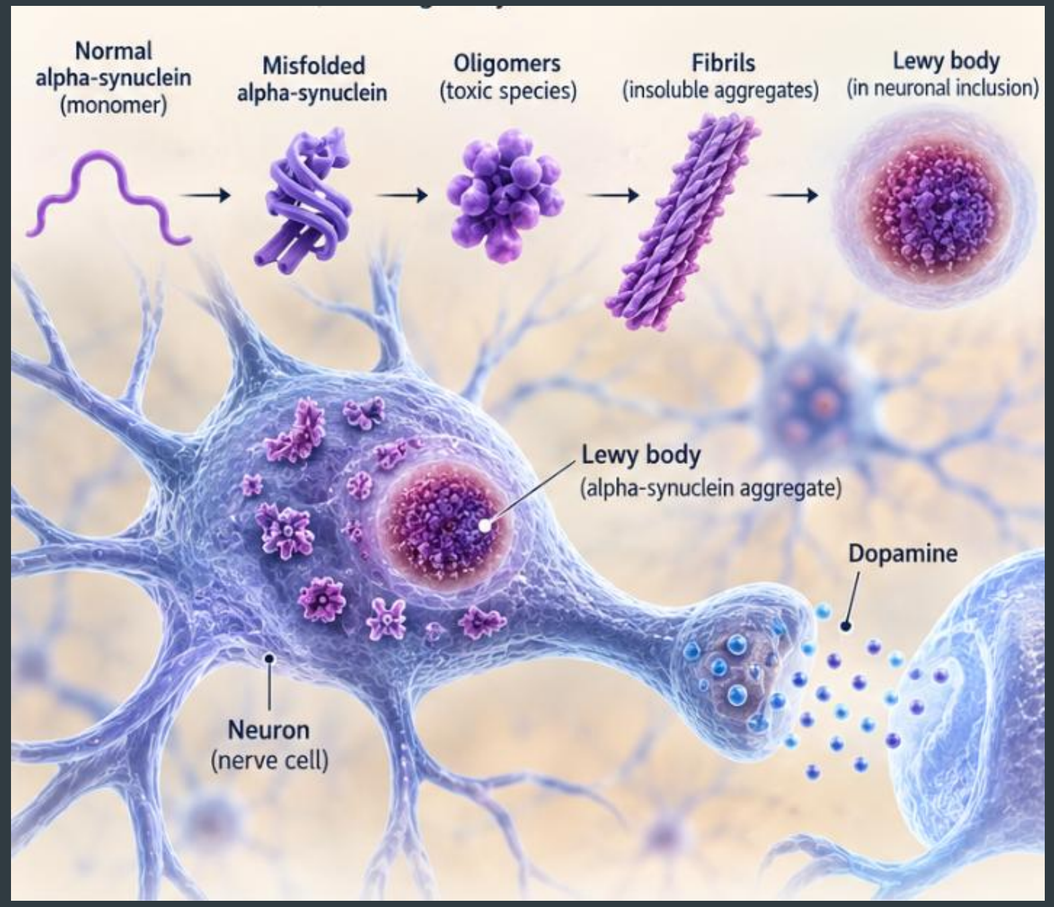


Armstrong MJ, Okun MS. Time for a New Image of Parkinson Disease. *JAMA Neurol.* 2020;77(11):1345–1346. doi:10.1001/jamaneurol.2020.2412

Alpha-Synuclein



Magalhães, P., Lashuel, H.A. Opportunities and challenges of alpha-synuclein as a potential biomarker for Parkinson's disease and other synucleinopathies. *npj Parkinsons Dis.* **8**, 93 (2022). https://doi.org/10.1038/s41531-022-00357-0



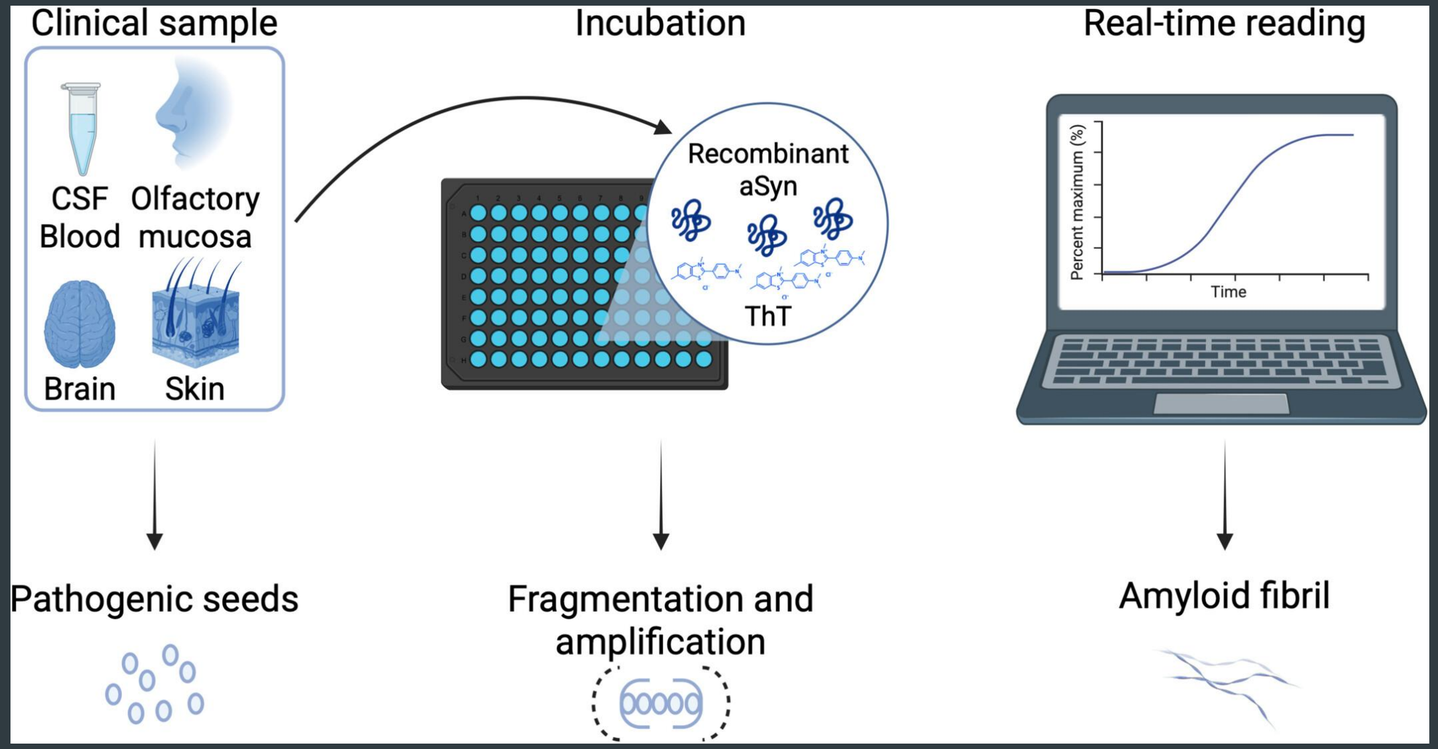
Adapted conceptually from: Lashuel HA, Overk CR, Oueslati A, Masliah E. The many faces of α-synuclein: from structure and toxicity to therapeutic target. *Nat Rev Neurosci*. 2013;14(1):38-48. doi:10.1038/nrn3406

Let’s test for the protein?

Alpha-synuclein
“Seed Amplification Assay”

- A lab test that detects the misfolded Parkinson's protein in **spinal fluid**, even in tiny amounts[1]
- Accuracy is **high**: correctly identifies about **88–93% of people with Parkinson's**, and correctly rules it out about **95% of the time**[1-3]
- It can turn positive **years before** obvious symptoms in some people[2]

Now available at UNMC

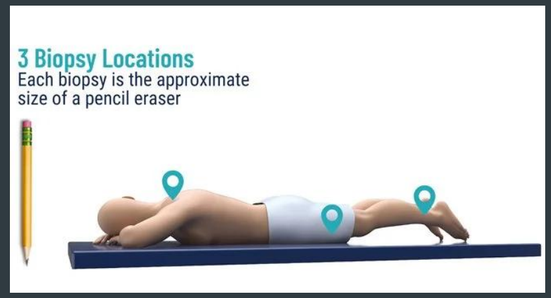


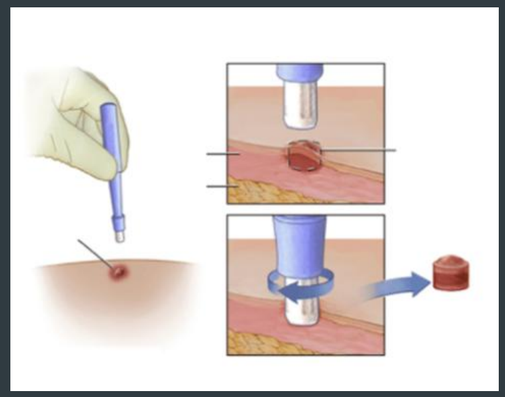
Amaral-do-Nasciemento et al. [4]

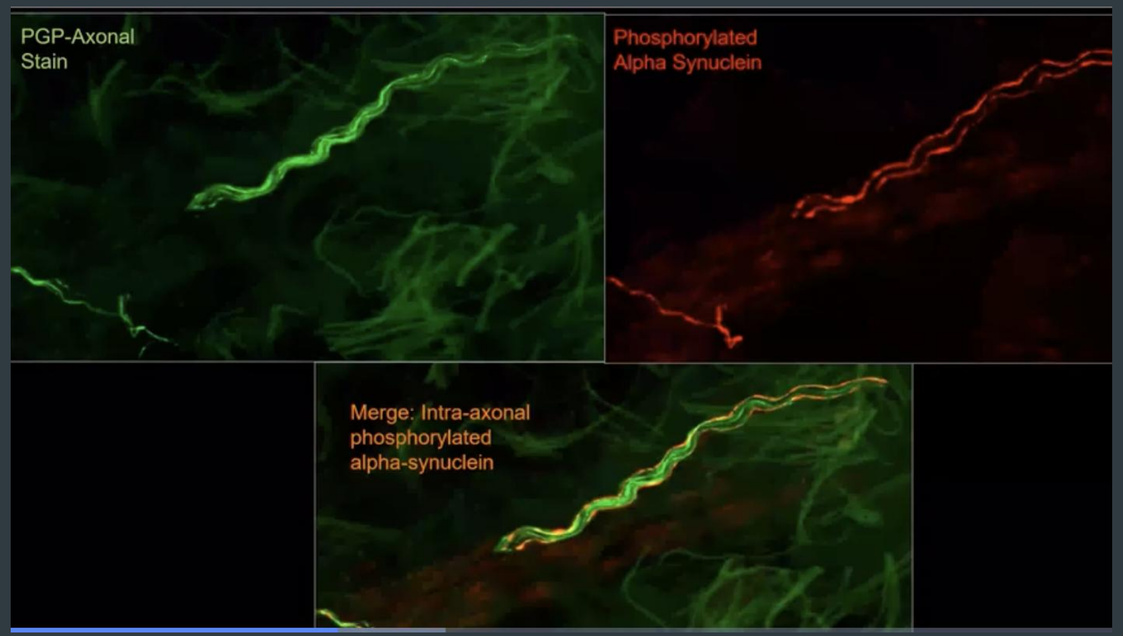
1. Parnetti et al. *Lancet Neurol.* 2019; Tolosa et al. *Nat Rev Neurol.* 2026.
2. Siderowf et al. *Lancet Neurol.* 2023; Wood. *Nat Rev Neurol.* 2023; Leclercq et al. *J Neurol.* 2026.
3. Li et al. *J Neurol.* 2025; Chiu et al. *Ann Neurol.* 2026.
4. Amaral-do-Nascimento et al. *Ann Clin Transl Neurol.* 2026.

Skin Biopsy

- A tiny skin punch (about 3 mm) can **detect the abnormal protein** in the nerves of the **skin** [1]
- Detects the abnormal protein in about **93% of people with Parkinson's** [1-2]
- Already **commercially available**
- In one real-world study, skin-biopsy results changed the diagnosis or care plan in about **78% of patients** tested [3]







1. Coughlin et al. *Neurology.* 2026;106:e214648.
2. Agin-Liebes et al. *Lancet Neurol.*
3. Isaacson et al. *Front Neurol.*
4. Gibbons et al. *Biomark Med.* 2022;16:499–509.

The Next Frontier: A Simple Blood Test

- Researchers are looking at ways to pull Parkinson's protein and other signals out of **blood** [1-2]
- Early study: **blood-based protein panel** identified Parkinson's and flagged some people up to 7 years before symptoms [3-4]
- Even **saliva and urine** are being tested as painless options[3-4]
- Not available just **yet!**

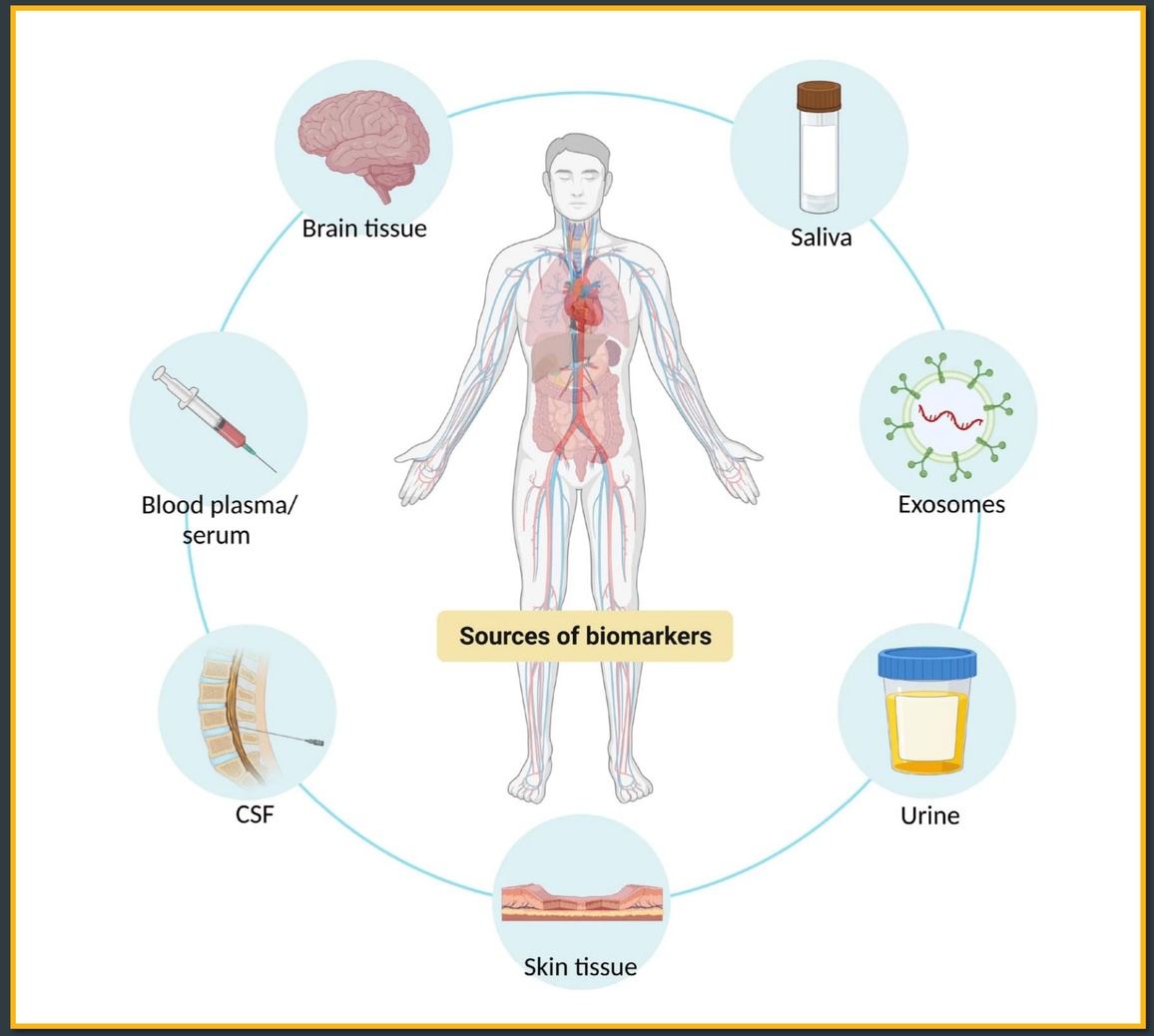
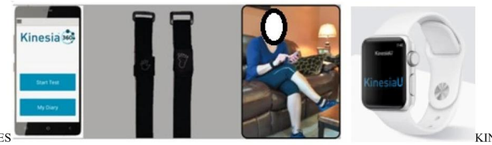


Image source: Chopra A, Outeiro TF. NAPS Consortium for REM Sleep Behavior Disorder.

1. Tolosa E, Poewe W, Noyce AJ, et al. *Nat Rev Neurol*. 2026;22:139–151.
2. Zarkali A, Thomas GEC, Zetterberg H, et al. *Nat Commun*. 2024;15:5661.
3. Hällqvist J, Bartl M, Dakna M, et al. *Nat Commun*. 2024;15:4759.
4. Gan YH, Ma LZ, Zhang Y, et al. *Nat Aging*. 2025;5:642–657.

Your Smartwatch, Smartphone, and AI

- Smartwatches and phone sensors can **measure tremor, slowness, walking, even voice**
- In one large study, movement data from a wrist device flagged Parkinson's **up to 7 years before diagnosis**
- **AI** is learning to spot Parkinson's **patterns in scans, speech, and movement**
- Still being **standardized**

Device's name, Manufacturer, battery details	Device/ Body Position
PD Monitor®, PD Neurotechnology, 8-10 hours (mandatory data download before re-use)	 5 DEVICES
PKG®, GKC, 7 days while recording 24h/24h	 1 DEVICE
STAT-ON®, Sense4care, 7 days / 8 hours per day	 1 DEVICE
DynaPort7, McRoberts 5 days battery life	 1 DEVICE
Kinesia 360®/Kinesia U, GreatLakes Neurotechnologies, 16 hours for Kinesia 360 and 24 hours for KinesiaU	 KINESIA 360: 2 DEVICES KINESIA U, 1 DEVICE
Mobility Lab®, APMD 12 hours if collecting data at the 128Hz sample rate set in Mobility Lab software. 1-2 hours to fully recharge the battery each day	 6 DEVICES
FeetMe Monitor Insoles®, 16 hors of walking, (if no gait activity battery should be charged each 3 days)	 2 INSOLES

Moreau C, Rouaud T, Grabli D, et al. npj Parkinsons Dis. 2023;9:153.

1. Chunga N, Reddy V, Barbosa W, et al. *Curr Neurol Neurosci Rep*. 2026;26:13.
2. Mirelman A, Siderowf A, Chahine L. Neurology. 2022;99(7 Suppl 1):52–60.
3. Phokaewvarangkul O, Yamutai S, Bhidayasiri R, et al. *J Neural Transm*. 2026.
4. Lim WS, Fan SP, Chiu SI, et al. *npj Parkinsons Dis*. 2025;11:111.

Ways You Can Get Involved in Parkinson's Research

1 Ways to Participate

- **Clinical trials** — test new medications, devices, or therapies; eligibility varies
- **Observational & online studies** — share health information over time, often from home
- **Registries** — join a database that may connect you with future studies
- **Patient advisory & advocacy** — help shape research priorities and study design
- **Care partners welcome** — many studies also enroll family members and healthy volunteers

2 Find Studies & Learn More

- **ClinicalTrials.gov** — search the national database of clinical studies (www.clinicaltrials.gov)
- **Parkinson's Foundation** — fact sheets, toll-free Helpline, research resources (www.Parkinson.org)
- **Michael J. Fox Foundation** — Fox Trial Finder matching tool and patient guide (www.michaeljfox.org/trial-finder)

? Questions Before Joining

- **What is the purpose?** — What would I be asked to do?
- **How much time?** — How long does it last and how many visits are involved?
- **Risks, costs & travel?** — Are there possible risks, side effects, costs, or reimbursement?
- **Placebo?** — Might I receive placebo instead of the active treatment?
- **Current PD medications?** — Can I stay on my usual medicines?
- **Questions later?** — Who should I contact with questions or concerns?

Thank you!



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COLLEGE OF ALLIED HEALTH PROFESSIONS

Mobility Devices and Adaptive Equipment

Anne Mahnke, MOT, OTR/L

Jennifer McKune, MPT

Nebraska Medicine

Mobility

The ability to move your joints, muscles, and body easily, freely, and purposefully through your daily life.

Mobility comprises all skills required for everyday living: endurance, strength, balance, coordination, range of motion, walking, getting out of bed, climbing stairs, and completing daily chores.

Mobility helps us avoid falls and participate in meaningful activities.

Harvard Health Publishing March 30, 2026

Why Mobility Matters:

One third to half of individuals 65 and older will be affected by loss of mobility.

Statistics from the CDC indicate that approximately 12% of American adults have some kind of mobility issue that impacts their ability to walk and climb stairs.

Improving Mobility

- Aerobic activity: 3 days/week for at least 30 minutes of continuous activity with intermittent bouts of moderate-intensity.

- Strength training: 2-3 times/week. 10-15 repetitions of exercise for major muscle groups

- Balance and agility exercises.

- Stretching: at least 3 times/week with preference toward daily stretching.

Recommendations:

Research from the Parkinson's Foundation Parkinson's Outcomes Project suggests that people with PD do at least 2.5 hours of exercise each week for better quality of life.

Parkinson's Foundation May 25, 2021

Physical Therapy

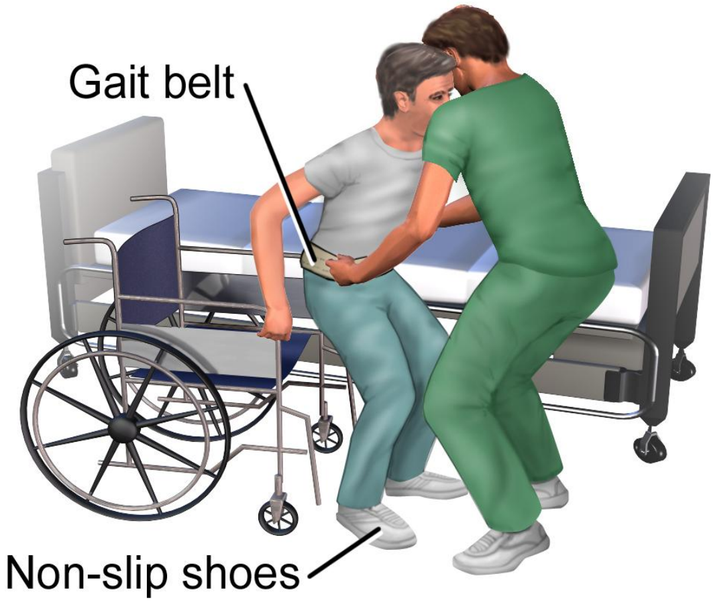
Provide education and instruction in appropriate exercises for your current mobility and aim to improve function through a personalized program designed to address your particular needs and goals.

Evaluate for an appropriate assistive device when mobility is compromised.

When Mobility is impaired:

Assisted transfer

Gait belt assist with another person



Pivot Transfer

Sit-to-Stand Lift



Hoyer Lift



Single Point Cane



Quad Cane



Walkers





Specialized Walkers





Occupational Therapy

"Occupational therapy can help you participate in life activities (occupations) and provide recommendations for:

- Activities of daily living (such as bathing, dressing, and eating)
- Adaptive equipment (such as shower chairs, or equipment to make daily tasks easier)
- Caregiver and family training
- Planning and making the most of daily routines
- Returning to work, school, and leisure activities
- Techniques to aid in memory, concentration, and executive functioning (e.g., planning and prioritizing, functional cognition)
- Falls prevention and home safety and accessibility"

American Occupational Therapy Association, 2026

Manual and Transport Wheelchairs





Power Scooter



Power Wheelchair





Activities of Daily Living

"The fundamental self-care tasks people do every day to take care of their own bodies and live independently"

American Occupational Therapy Association, 2014

Bathing

Tub Transfer Bench



Shower Chair



Long Handled Sponge



Eating

Weighted utensils – Bunmo brand (7oz each)





Eating

Dycem



High edge divided plate



Writing

Big Fat Pen



More Dycem!



Mobility Equipment + Therapy = Success!

- Some equipment can be purchased online and trialed at home
- Other equipment needs physician order and formal therapy evaluation for approval
- All of the equipment will be more successfully used with guidance from therapy on body mechanics and proper set-up.

We are here to help!

Exercise is still important

Equipment is great to help compensate

Exercise and mobility training with therapy will support independence with and without equipment!

Nebraska® Medicine



Deep Brain Stimulation and Focused Ultrasound for Parkinson's Disease

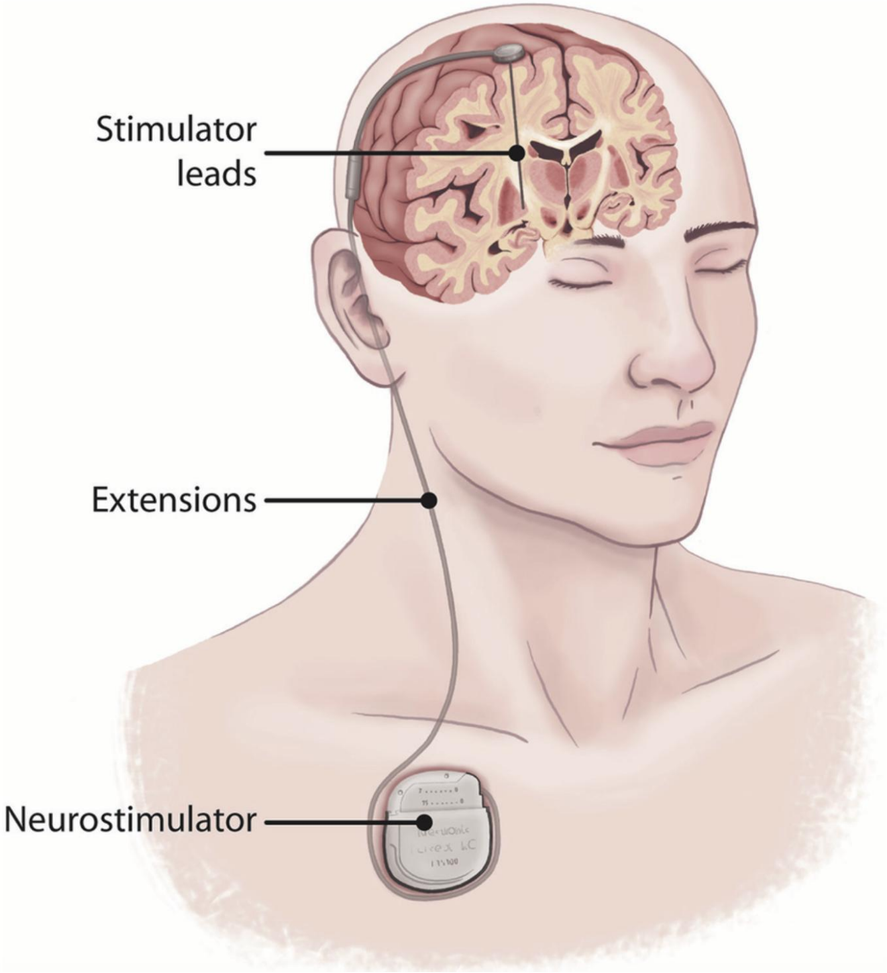
Nisha Giridharan, MD

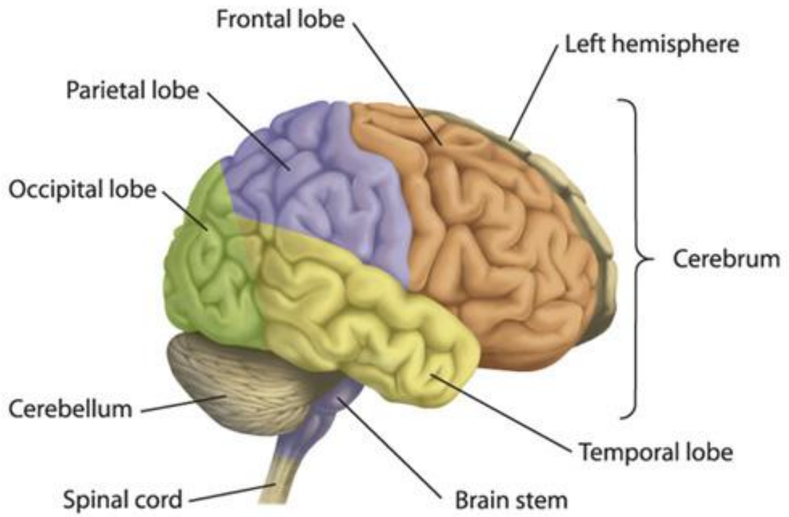
Stereotactic and Functional Neurosurgeon

Assistant Professor of the Department of Neurosurgery

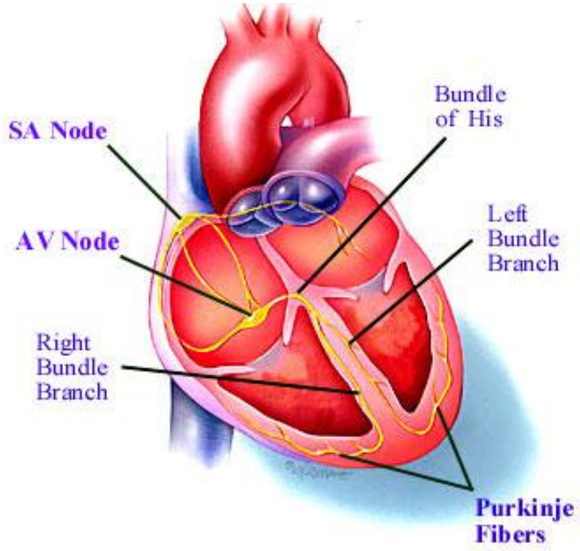
University of Nebraska Medical Center

What is DBS?







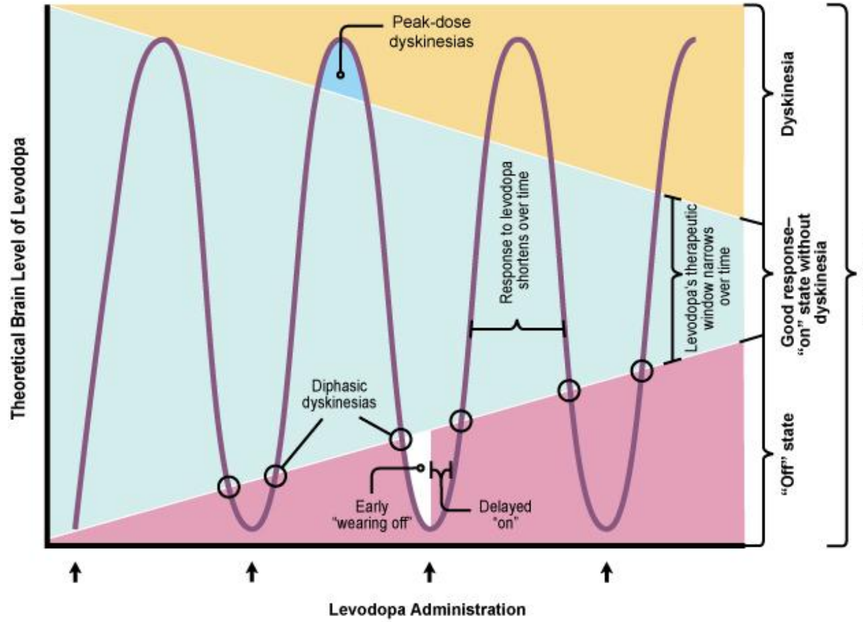


The Brain, much like the Heart is an electrical organ

Deep Brain Stimulation (DBS)>>*Brain Pacemaker*

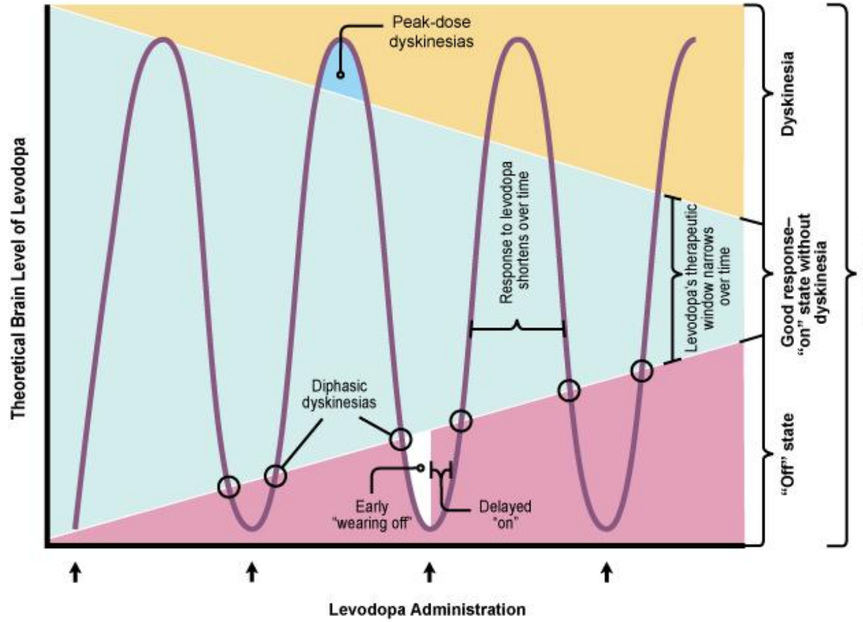
When to Consider DBS

- Too much “off” time…“up and downs”



When to Consider Deep Brain Stimulation

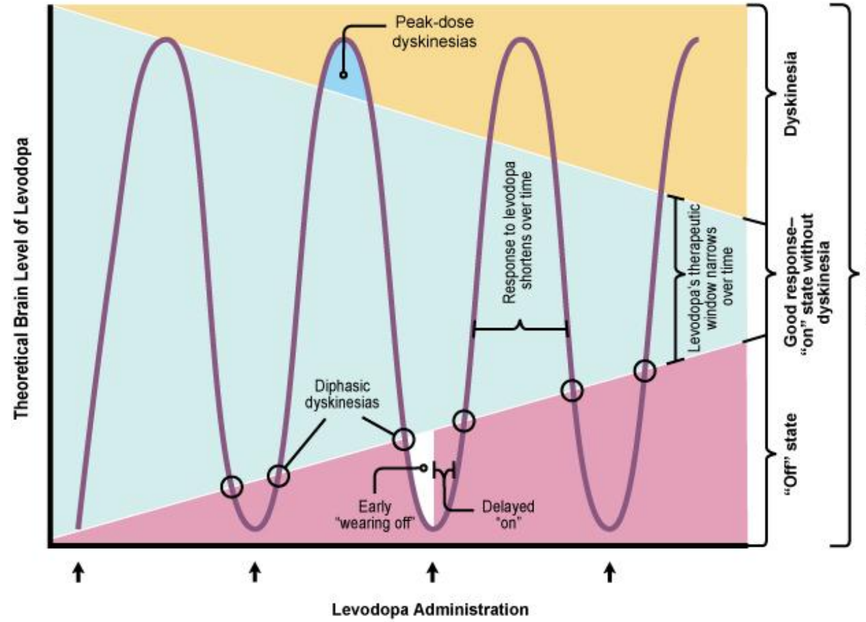
- Too much “off” time…“up and downs”
- Intolerable side-effects of meds





When to Consider DBS (cont.)

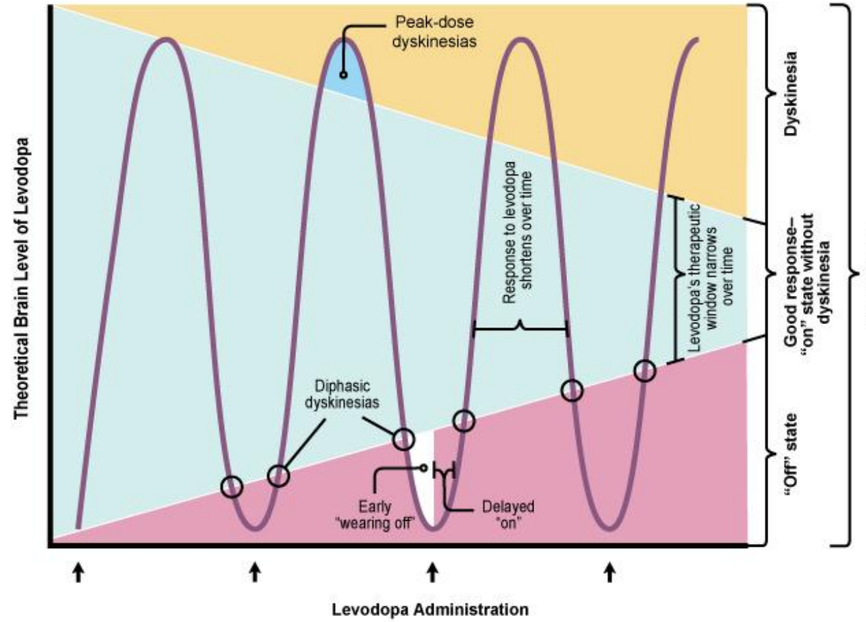
- Too much “off” time…“up and downs”
- Intolerable side-effects of meds
- Insufficient tremor control





When do you Consider DBS

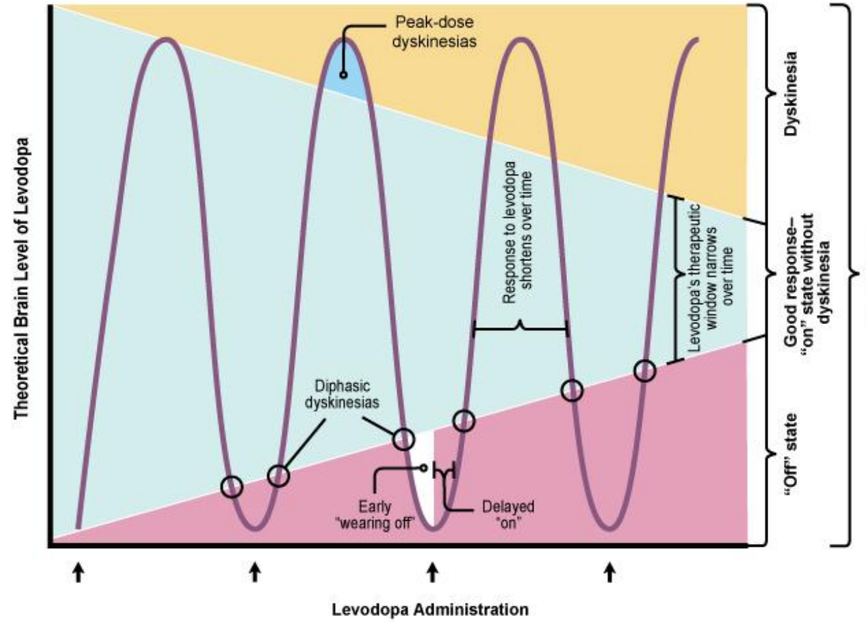
- Too much “off” time…“up and downs”
- Intolerable side-effects of meds
- Insufficient tremor control
- Troublesome dyskinesias





When do I Consider DBS

- Too much “off” time…“up and downs”
- Intolerable side-effects of meds
- Insufficient tremor control
- Troublesome dyskinesias
- Thinking about stopping hobbies/job





How we define candidacy?

Team:

- Neurologists
- Neurosurgeons
- Neuroradiologists
- Neuropsychologists
- Advanced practice providers
- Anesthesiologists
- Neurophysiologists
- Psychiatrists





How we define candidacy? (cont.)

Workup:

- History & Neurological examination
- Levodopa responsiveness ON/OFF
- UPDRS
- Imaging
- Diagnosis
- Co-morbidities: Psychiatric
- Conservative treatments tried
- Neuropsychological evaluation

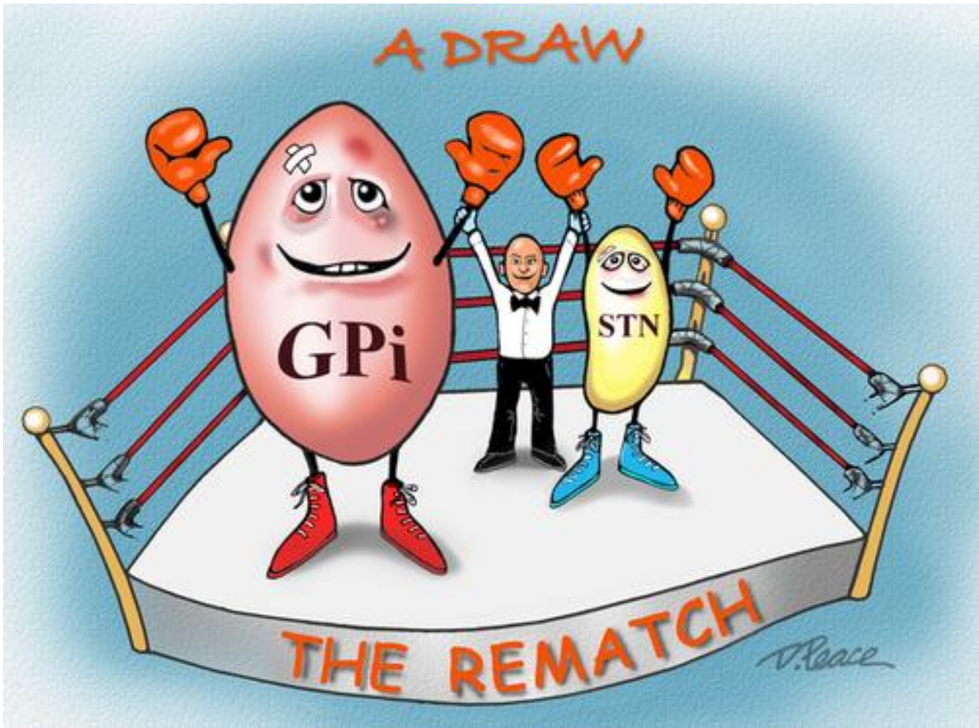
Expectations

- 70% reduction in dyskinesias
  - 50% medication reduction
- 80% reduction in resting tremor
- 60% reduction in bradykinesia
- 70% reduction in rigidity
- 60-70% reduction in dystonia

- 70% improvement in peak ON-time
- 70% reduction in worst OFF-time

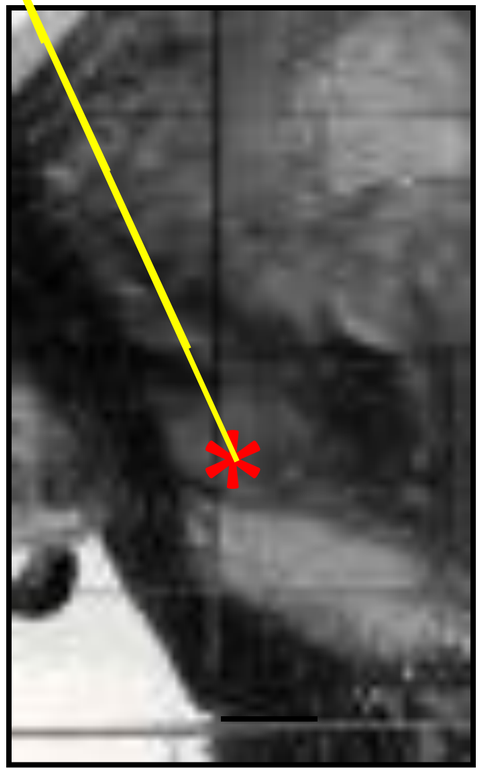
Targets: GPi and STN

- Both targets equivalent in overall motor benefit
- Team expert with both targets
- Personalize based on patient needs!



Procedure: Recordings

Position of electrode

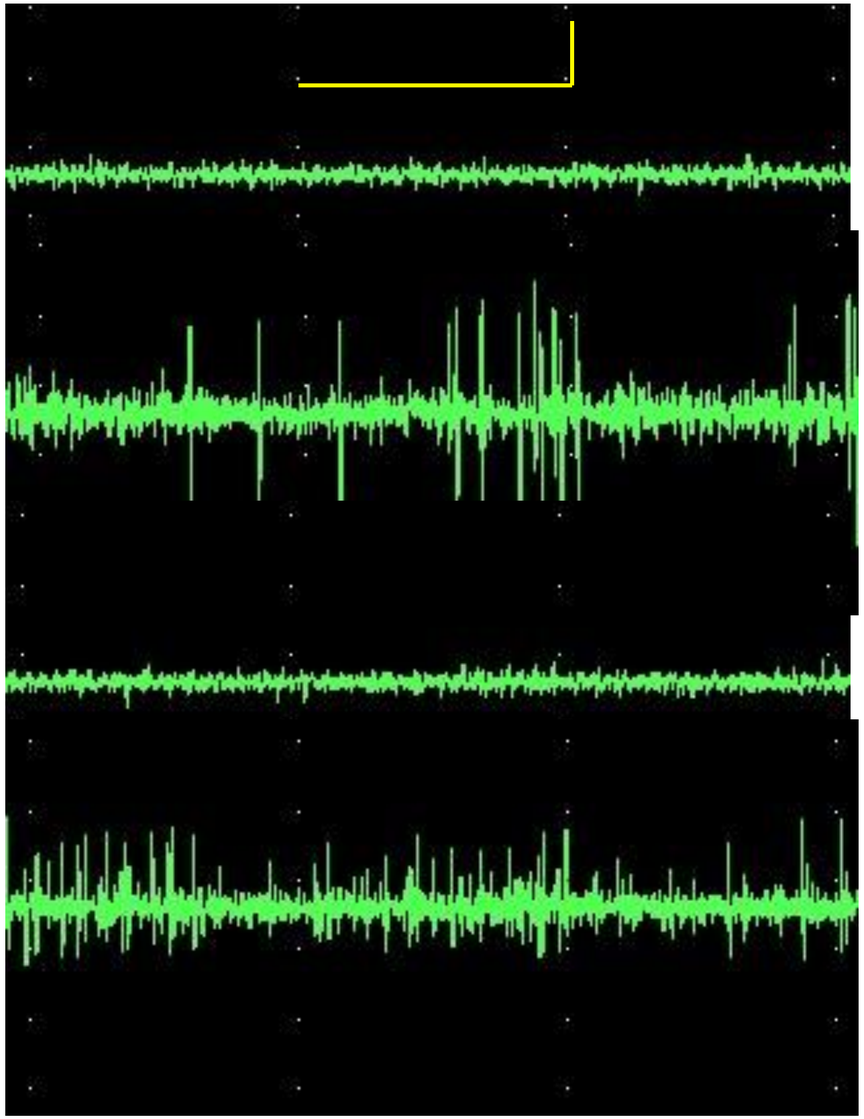


White matter

Thalamus

Zona incerta

STN



After surgery

What is important after surgery?

- Parkinson's medication
  - DBS is not ON
- Early ambulation
  - Speeds up recovery
  - Discharge next day after surgery

What is important after surgery? (cont.)

- Communication Communication Communication Communication

- Check your incisions!

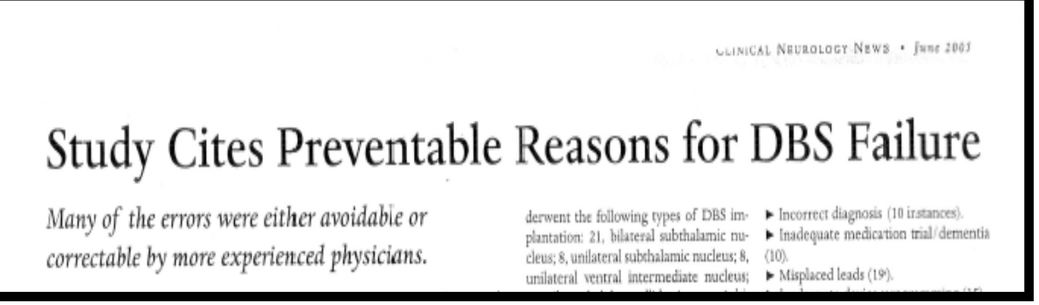
What is happens after surgery?

- Precise Programming
  - Movement Disorder Neurologist
  - Advanced practice provider
  - Nurses

  - Time and patience!

- Medication and stimulation adjustments





CLINICAL NEUROLOGY NEWS • June 2003

Study Cites Preventable Reasons for DBS Failure

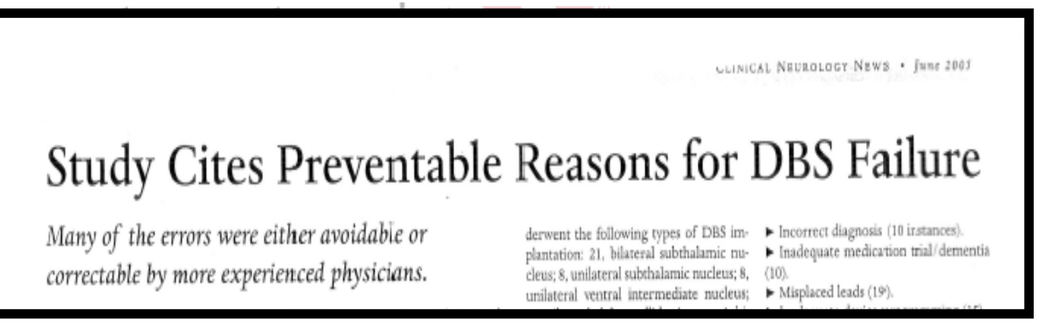
Many of the errors were either avoidable or correctable by more experienced physicians.

derwent the following types of DBS implantation: 21, bilateral subthalamic nucleus; 8, unilateral subthalamic nucleus; 8, unilateral ventral intermediate nucleus;

- Incorrect diagnosis (10 instances).
- Inadequate medication trial/dementia (10).
- Misplaced leads (19).

Conclusions

- Experience counts: More experience > better outcomes
- Proper patient selection



CLINICAL NEUROLOGY NEWS • June 2003

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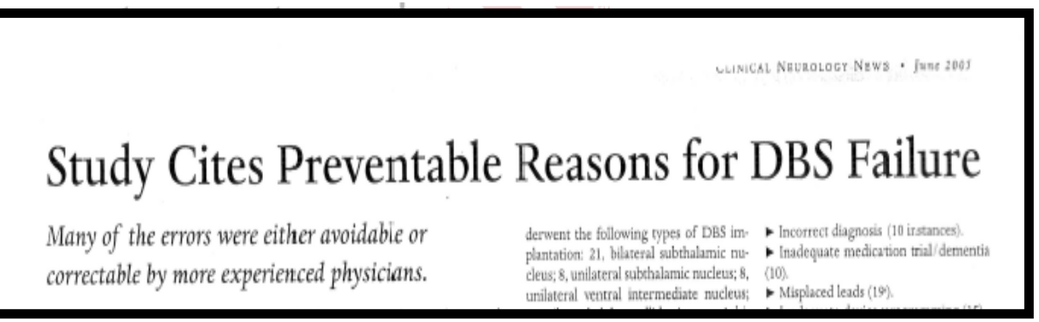
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Conclusions (cont.)

- Experience counts: More experience > better outcomes
- Proper patient selection
- Minimize complications: Safe surgical technique



CLINICAL NEUROLOGY NEWS • June 2003

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Conclusions Today

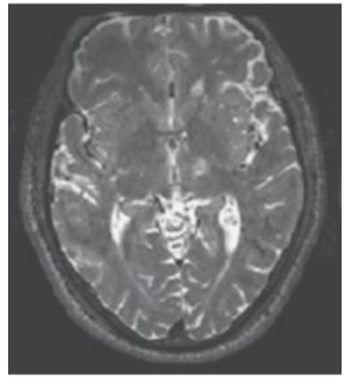
- Experience counts: More experience > better outcomes
- Proper patient selection
- Minimize complications: Safe surgical technique
- Maximize benefit: Accurate electrode placement

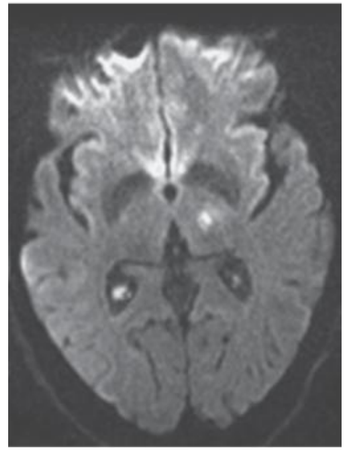
MR-guided Focused Ultrasound

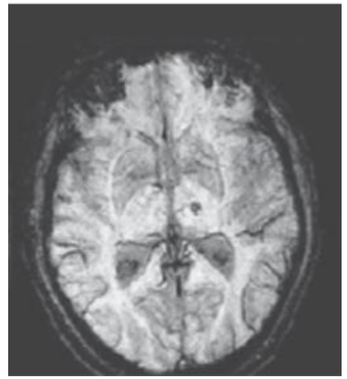
MR-guided Focused Ultrasound (MRgFUS)





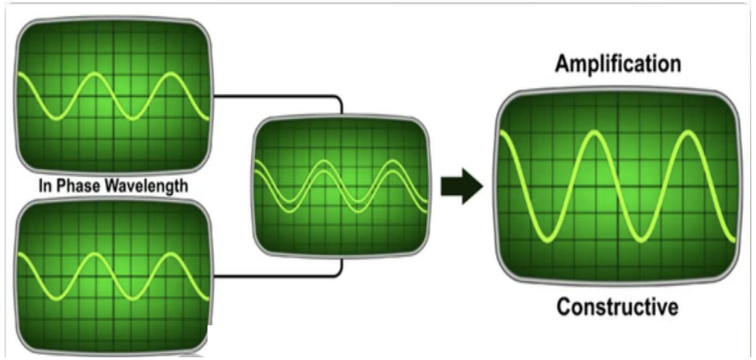


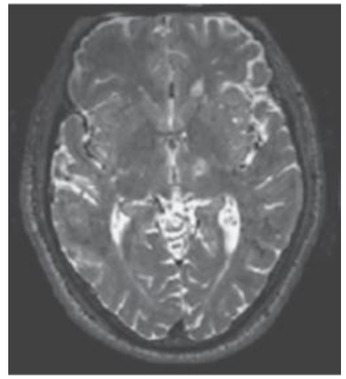


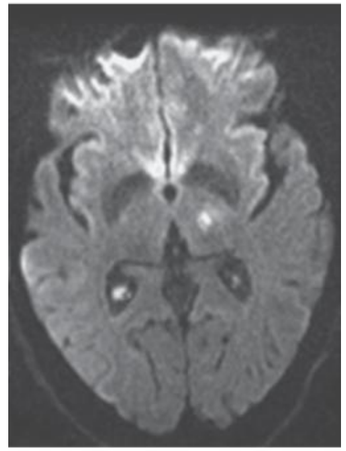


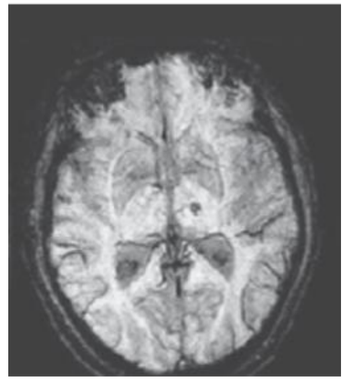
The Biophysics of MRgFUS

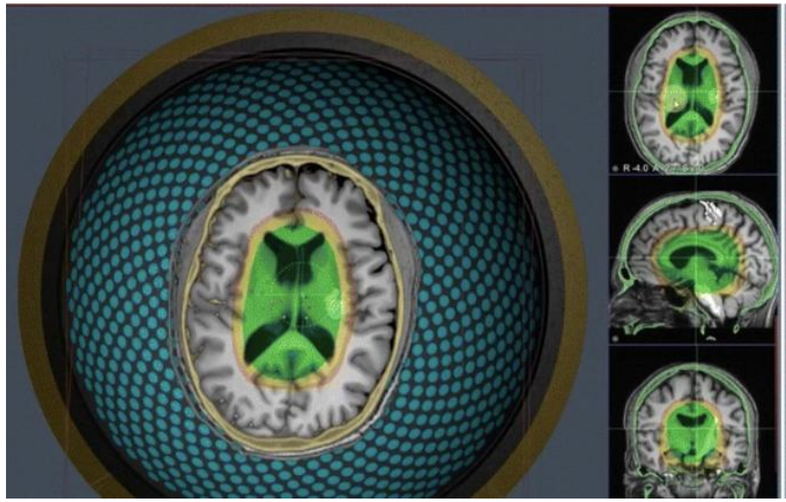
- *Constructive interference*
- 60C lesion: 2-6 mm in diameter, ~1mm precision
- Treatment limited to ~4cm sphere

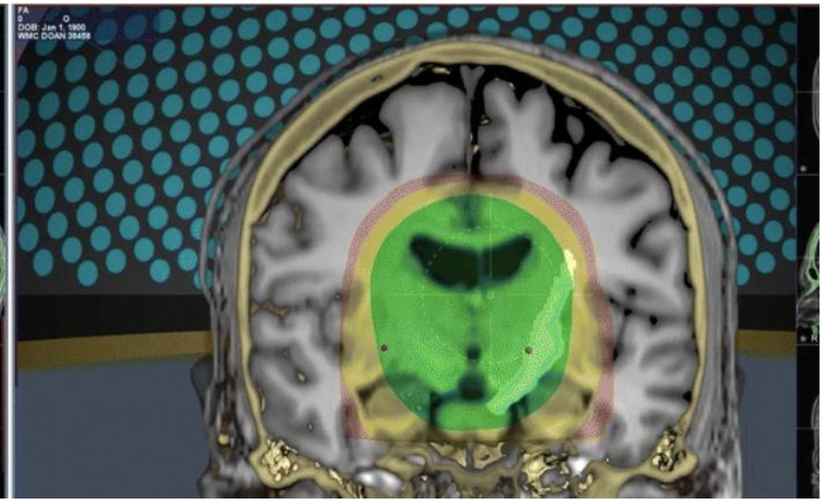






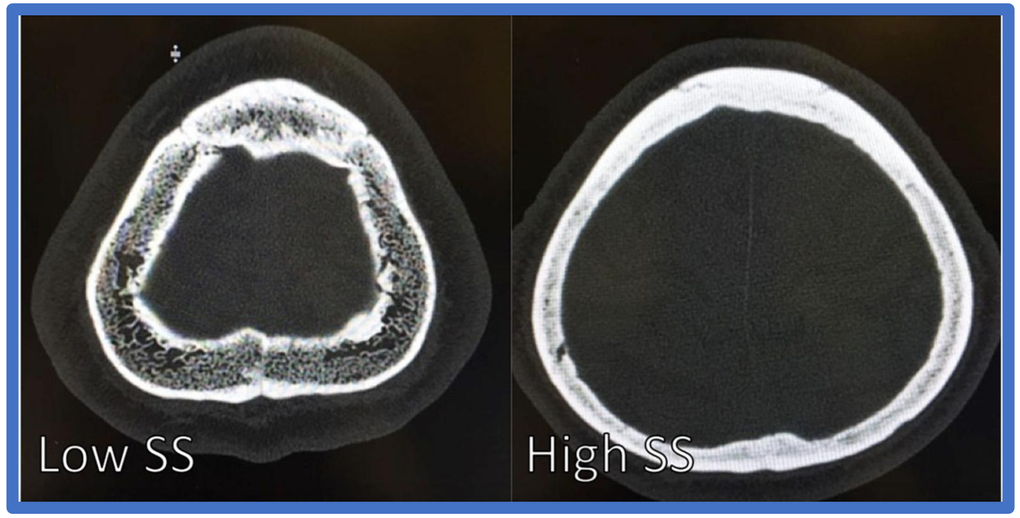






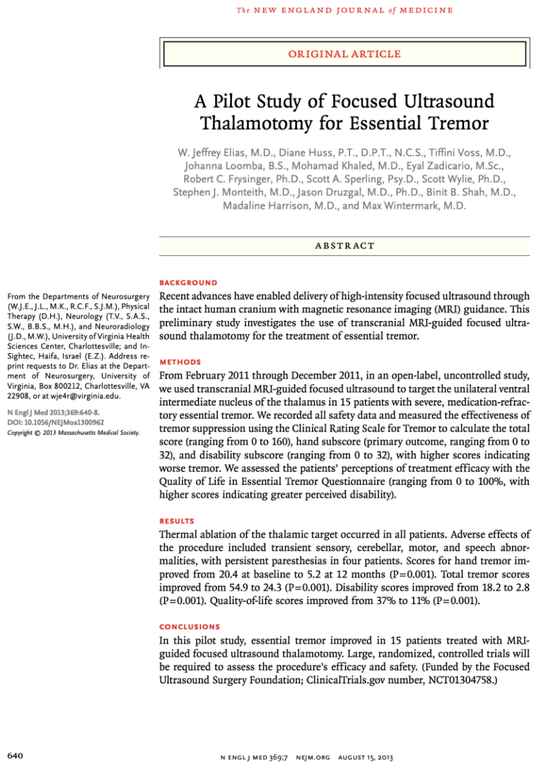
The Biophysics of MRgFUS (Cont.)

- Skull Density Ratio (SDR)
  - Average of the ratio between the trabecular and the cortex bone CT values (in Hounsfield units)
  - A homogeneously compact skull (i.e., trabecular layer is negligible) has an SDR score of 1, whereas a skull characterized by a highly represented trabecular layer has a smaller SDR score (closer to 0)
  - The higher the SDR, the more efficient the transmission of the energy
  - **0.4 cutoff** often used



Focused Ultrasound

- First published in 2013
- FDA approval for unilateral tremor, 2016



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Pilot Study of Focused Ultrasound Thalamotomy for Essential Tremor

W. Jeffrey Elias, M.D., Diane Huss, P.T., D.P.T., N.C.S., Tiffini Voss, M.D., Johanna Loomba, B.S., Mohamad Khaled, M.D., Eyal Zadicario, M.Sc., Robert C. Frysinger, Ph.D., Scott A. Sperling, Psy.D., Scott Wylie, Ph.D., Stephen J. Monteith, M.D., Jason Druzgal, M.D., Ph.D., Binit B. Shah, M.D., Madaline Harrison, M.D., and Max Wintermark, M.D.

ABSTRACT

BACKGROUND

Recent advances have enabled delivery of high-intensity focused ultrasound through the intact human cranium with magnetic resonance imaging (MRI) guidance. This preliminary study investigates the use of transcranial MRI-guided focused ultrasound thalamotomy for the treatment of essential tremor.

METHODS

From February 2011 through December 2011, in an open-label, uncontrolled study, we used transcranial MRI-guided focused ultrasound to target the unilateral ventral intermediate nucleus of the thalamus in 15 patients with severe, medication-refractory essential tremor. We recorded all safety data and measured the effectiveness of tremor suppression using the Clinical Rating Scale for Tremor to calculate the total score (ranging from 0 to 160), hand subscore (primary outcome, ranging from 0 to 32), and disability subscore (ranging from 0 to 32), with higher scores indicating worse tremor. We assessed the patients' perceptions of treatment efficacy with the Quality of Life in Essential Tremor Questionnaire (ranging from 0 to 100%, with higher scores indicating greater perceived disability).

RESULTS

Thermal ablation of the thalamic target occurred in all patients. Adverse effects of the procedure included transient sensory, cerebellar, motor, and speech abnormalities, with persistent paresthesias in four patients. Scores for hand tremor improved from 20.4 at baseline to 5.2 at 12 months (P=0.001). Total tremor scores improved from 54.9 to 24.3 (P=0.001). Disability scores improved from 18.2 to 2.8 (P=0.001). Quality-of-life scores improved from 37% to 11% (P=0.001).

CONCLUSIONS

In this pilot study, essential tremor improved in 15 patients treated with MRI-guided focused ultrasound thalamotomy. Large, randomized, controlled trials will be required to assess the procedure's efficacy and safety. (Funded by the Focused Ultrasound Surgery Foundation; ClinicalTrials.gov number, NCT01304758.)

From the Departments of Neurosurgery (W.J.E., J.L., M.K., R.C.F., S.J.M.), Physical Therapy (D.H.), Neurology (T.V., S.A.S., S.W., B.B.S., M.H.), and Neuroradiology (J.D., M.W.), University of Virginia Health Sciences Center, Charlottesville; and InSightec, Haifa, Israel (E.Z.). Address reprint requests to Dr. Elias at the Department of Neurosurgery, University of Virginia, Box 800212, Charlottesville, VA 22908, or at wje4r@virginia.edu.

N Engl J Med 2013;369:640-8.
DOI: 10.1056/NEJMoa1300962
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The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Focused Ultrasound Thalamotomy for Essential Tremor

W. Jeffrey Elias, M.D., Nir Lipsman, M.D., Ph.D., William G. Ondo, M.D., Pejman Ghanouni, M.D., Ph.D., Young G. Kim, M.D., Ph.D., Wonhee Lee, M.D., Ph.D., Michael Schwartz, M.D., Kullervo Hynynen, Ph.D., Andres M. Lozano, M.D., Binit B. Shah, M.D., Diane Huss, D.P.T., N.C.S., Robert F. Dallapiazza, M.D., Ph.D., Ryder Gwinn, M.D., Jennifer Witt, M.D., Susie Ro, M.D., Howard M. Eisenberg, M.D., Ph.D., Paul S. Fishman, M.D., Ph.D., Dheeraj Gandhi, M.D., M.B., B.S., Casey H. Halpern, M.D., Rosalind Chuang, M.D., Kim Butts Pauly, Ph.D., Travis S. Tierney, M.D., Ph.D., Michael T. Hayes, M.D., G. Rees Cosgrove, M.D., Toshio Yamaguchi, M.D., Ph.D., Keiichi Abe, M.D., Takaomi Taira, M.D., Ph.D., and Jin W. Chang, M.D., Ph.D.

ABSTRACT

BACKGROUND

Uncontrolled pilot studies have suggested the efficacy of focused ultrasound thalamotomy with magnetic resonance imaging (MRI) guidance for the treatment of essential tremor.

METHODS

We enrolled patients with moderate-to-severe essential tremor that had not responded to at least two trials of medical therapy and randomly assigned them in a 3:1 ratio to undergo unilateral focused ultrasound thalamotomy or a sham procedure. The Clinical Rating Scale for Tremor and the Quality of Life in Essential Tremor Questionnaire were administered at baseline and at 1, 3, 6, and 12 months. Tremor assessments were videotaped and rated by an independent group of neurologists who were unaware of the treatment assignments. The primary outcome was the between-group difference in the change from baseline to 3 months in hand tremor, rated on a 32-point scale (with higher scores indicating more severe tremor). After 3 months, patients in the sham-procedure group could cross over to active treatment (the open-label extension cohort).

RESULTS

Seventy-six patients were included in the analysis. Hand-tremor scores improved more after focused ultrasound thalamotomy (from 18.1 points at baseline to 9.6 at 3 months) than after the sham procedure (from 16.0 to 15.8 points); the between-group difference in the mean change was 8.3 points (95% confidence interval [CI], 5.9 to 10.7; P<0.001). The improvement in the thalamotomy group was maintained at 12 months (change from baseline, 7.2 points; 95% CI, 6.1 to 8.3). Secondary outcome measures assessing disability and quality of life also improved with active treatment (the blinded thalamotomy cohort)as compared with the sham procedure (P<0.001 for both comparisons). Adverse events in the thalamotomy group included gait disturbance in 36% of patients and paresthesias or numbness in 38%; these adverse events persisted at 12 months in 9% and 14% of patients, respectively.

CONCLUSIONS

MRI-guided focused ultrasound thalamotomy reduced hand tremor in patients with essential tremor. Side effects included sensory and gait disturbances. (Funded by InSightec and others; ClinicalTrials.gov number, NCT01827904.)

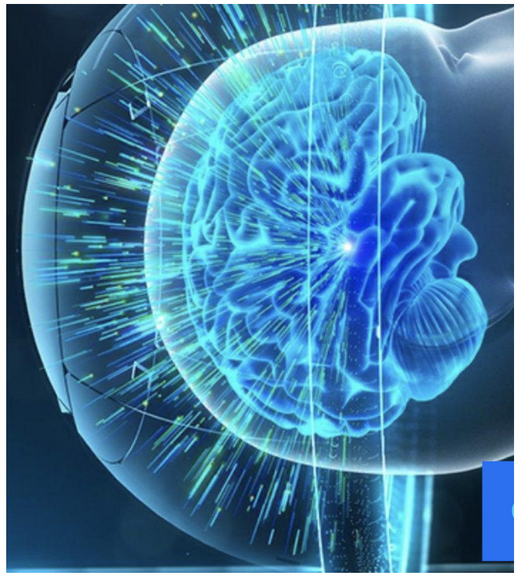
From the University of Virginia Health Sciences Center, Charlottesville (W.J.E., B.B.S., D.H., R.F.D.); Toronto Western Hospital (N.L., A.M.L.) and Sunnybrook Health Sciences Centre (M.S., K.H.), Toronto; Methodist Neurological Institute, Houston (W.G.O.); Stanford University School of Medicine, Stanford, CA (P.G., C.H.H., K.B.P.); Yonsei University College of Medicine, Seoul, South Korea (Y.G.K., W.L., J.W.C.); Swedish Neuroscience Institute, Seattle (R.G., J.W., S.R., R.C.); University of Maryland School of Medicine, Baltimore (H.M.E., P.S.F., D.G.); University of Miami School of Medicine, Nicklaus Children's Hospital, Miami (T.S.T.); Brigham and Women's Hospital, Boston (M.T.H., G.R.C.); and Shin-yurigaoka General Hospital, Kawasaki (T.Y.), and Tokyo Women's Medical University, Tokyo (K.A., T.T.) — both in Japan. Address reprint requests to Dr. Elias at the Department of Neurological Surgery, University of Virginia, Box 800212, Charlottesville, VA 22908, or at ksh5m@virginia.edu.

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MRgFUS

- Insightec ExAblate Neuro
  - July 2016 FDA approval









FOCUSED ULTRASOUND TRANSDUCER SYSTEM

- Helmet-shaped phased array transducer with 1024 elements, which can be controlled individually to refocus the ultrasound beams to a common focal point
- Ultrasound frequency 620-720Khz
- Ultrasound pulses from 5 to 60 second duration are delivered to ablate the target area by multiple sonications
- Four mechanical degrees of freedom for access to treatment target: linear motion along 3 axes: superior-inferior, right-left and anterior-posterior axes and angular motion of the pitch axis
- Focal spot location is controlled by electronic steering



MRgFUS (cont.)





- Outpatient
- Procedure done in MR scanner—3-4 hours
- Conscious sedation
- Headframe Placement
- Target Acquisition
- Low-energy test “Lesion”
- Full-energy Lesion/Sonication

MRgFUS for Tremor: Pivotal Trial Results

- **76 patients**
  - 3:1 randomization treatment:sham
  - >= 2 on CRST
- Unilateral tremor suppression
  - 40% reduction @ 12 months (sham group 0%)
- QOL measures:
  - 46% improvement @ 3 months vs (3% sham)
- Adverse Events:
  - Transient Ataxia: 36%
  - Transient Paresthesias: 38%
  - Persistent Ataxia @12 months: 9%
  - Persistent Paresthesias @ 12 months: 14%
  - Persistent Weakness @ 12 months: ~2%
  - Persistent Dysmetria @12 months: 4%



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Elias et al, NEJM 2016

MRgFUS for Tremor: Current Literature

- Several high-quality long-term follow up studies
  - 12 -36 month follow up
- Unilateral tremor suppression
  - 38-60% reduction
    - Tends to worsen over time-Disease Progression effect?
- QOL measures:
  - 27-62% improvement
    - ~45-53% DBS @ 16 months avg
- Adverse Events:
  - Transient Ataxia: 36%
  - Transient Paresthesias: ~40%
  - Persistent Ataxia: ~9%
  - Persistent Paresthesias: 14%
  - Persistent Weakness @ 12 months: ~2%
  - Persistent Dysmetria @12 months: 1-4%



Giordano et al, J Neuro Neurosurg Psych 2020
Halpern et al, Neurology 2019

MRgFUS for Parkinson's disease

- FDA approval Nov 2021: unilateral pallidotomy
- Data is sparser than tremor experience

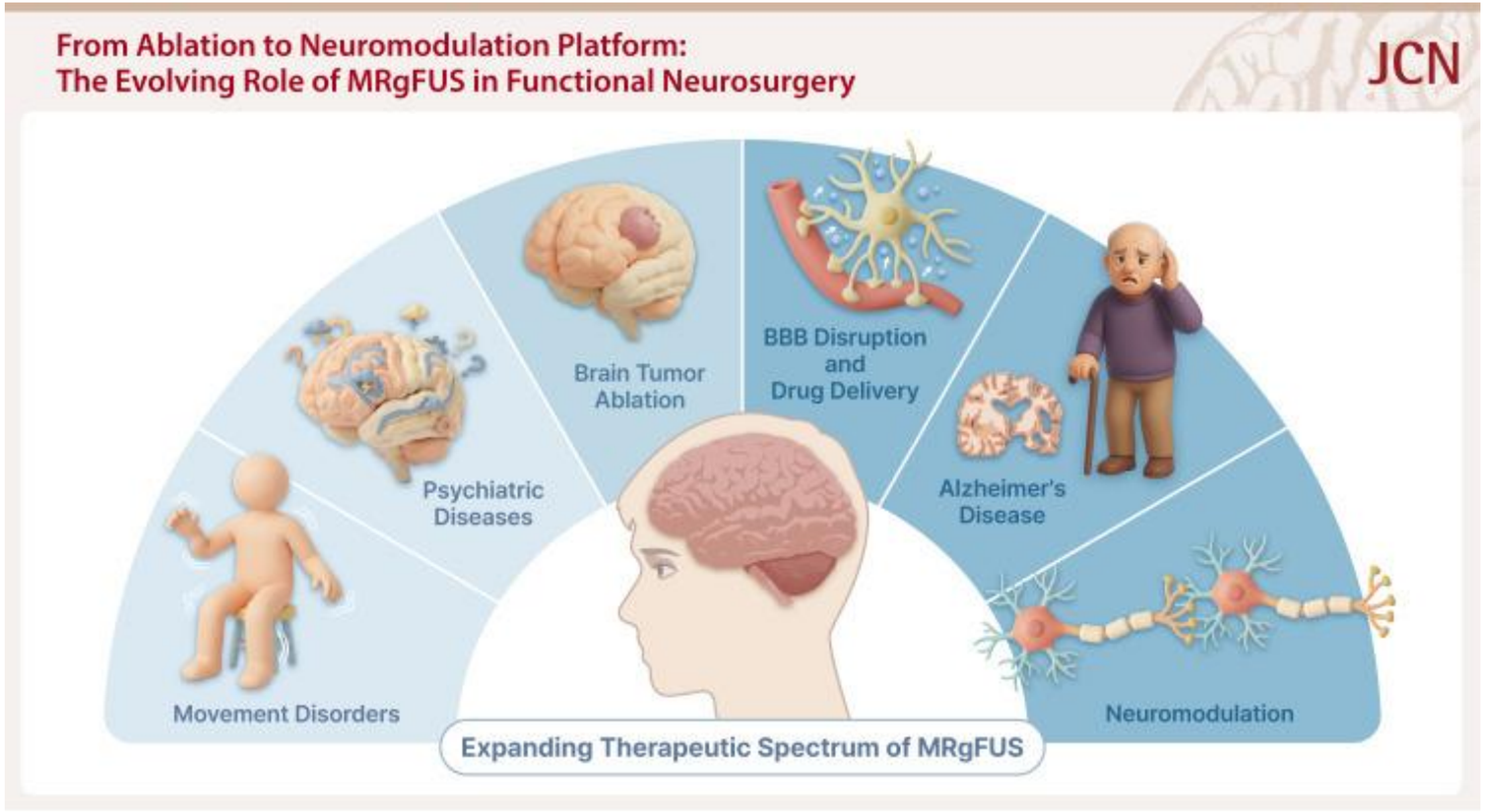
- UPDRS III improvement 39-45% @ 12months

- Limitations of pallidotomy learned from the RF-era
  - Bilateral cases with high rates of dysarthria

MRgFUS for Parkinson's disease (cont.)

- FDA approval 2025: staged bilateral pallidothalamic tractotomy for Parkinson's disease
- Based on a clinical trial conducted at nine centers across the U.S., Europe, and Asia

MRgFUS: How it might evolve



2026 Deep Brain Stimulation and Focused Ultrasound for Parkinson's Disease

Nisha Giridharan, MD

Stereotactic and Functional Neurosurgeon

Assistant Professor of the Department of Neurosurgery

University of Nebraska Medical Center



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University of Nebraska Medical Center

Nebraska Medicine

Questions and answers

Amy Hellman, MD

UNMC Parkinson's Disease Patient and Caregiver Symposium 2026

University of Nebraska Medical Center

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Are seizures common in Parkinson's Disease?

- No

What is the cause?

- Usually other things

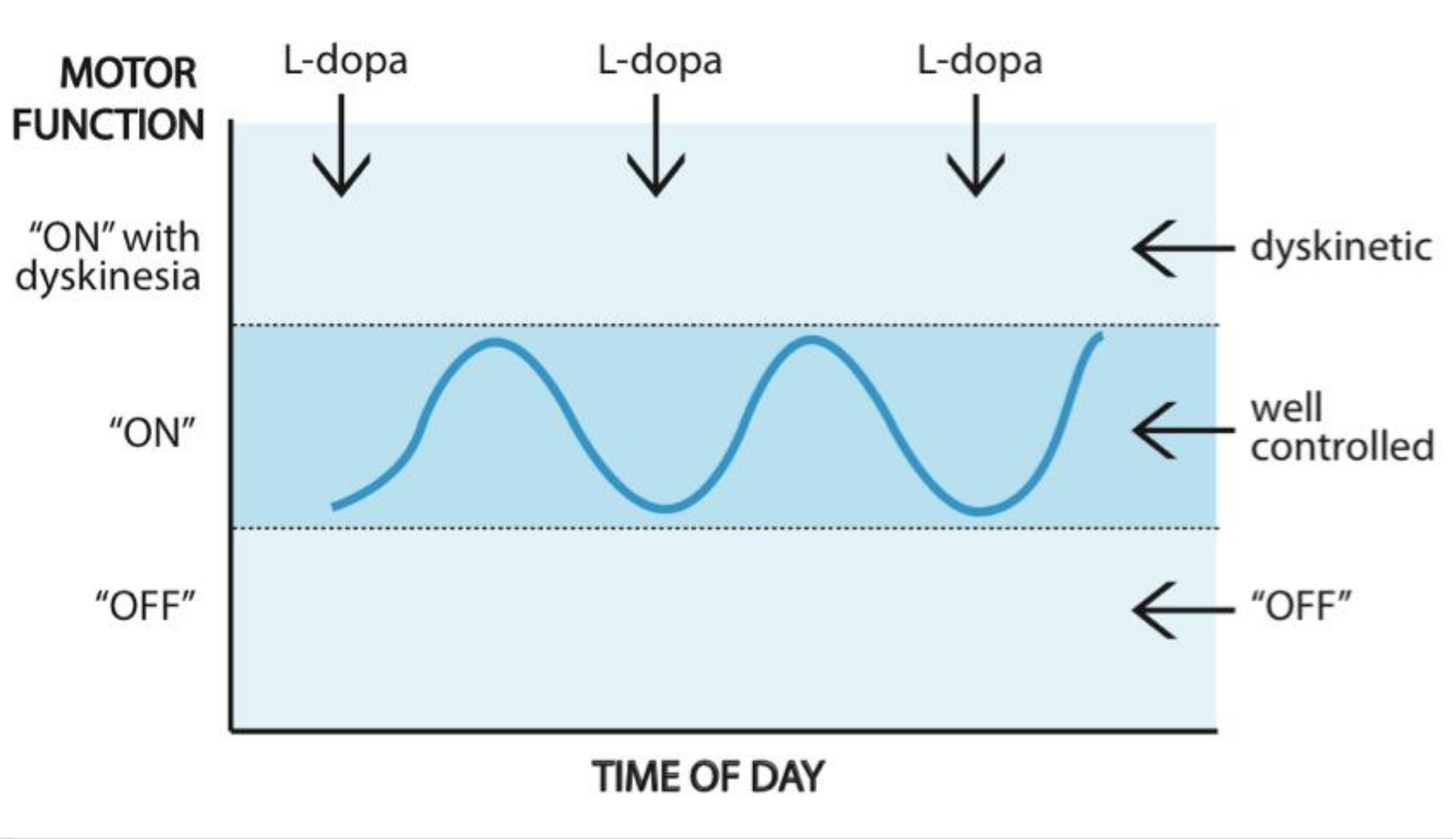
Is there treatment?

- Yes

Is orthostatic hypotension common in Parkinson's Disease? Are there medications for it?



How to take my meds based on on/off time journals?



Suggestions for getting a good night's sleep

- Address sleep disturbances
- Follow good sleep hygiene
- Melatonin is generally safe
- Discuss other options with your doctor



Sleep hygiene

- Regular sleep schedule
- Exercise daily
- Get plenty of exposure to light during the day
- Sleep in a quiet, dark environment
- Avoid looking at screens nearing bedtime
- Avoid caffeine after lunch
- Don’t eat a big meal just before bed
- Avoid alcohol within 3 hours of bedtime
- Do something relaxing before bedtime
- Associate your bed with sleep

How to practice getting up off the floor?



Freezing of gait



How do I maintain my strength?







Practical ideas for exercise and maintaining cognitive abilities for older people (80-95)

- Treat other medical problems
- Get good sleep
- Cognitive training
- Physical exercise
- Mediterranean diet

CoRe, RehaCom, Smartbrain Pro, NEUROvitalis (senseful), Neurotablet®, and immersive VR systems

https://www.unmc.edu/engage/

Boxing as therapy

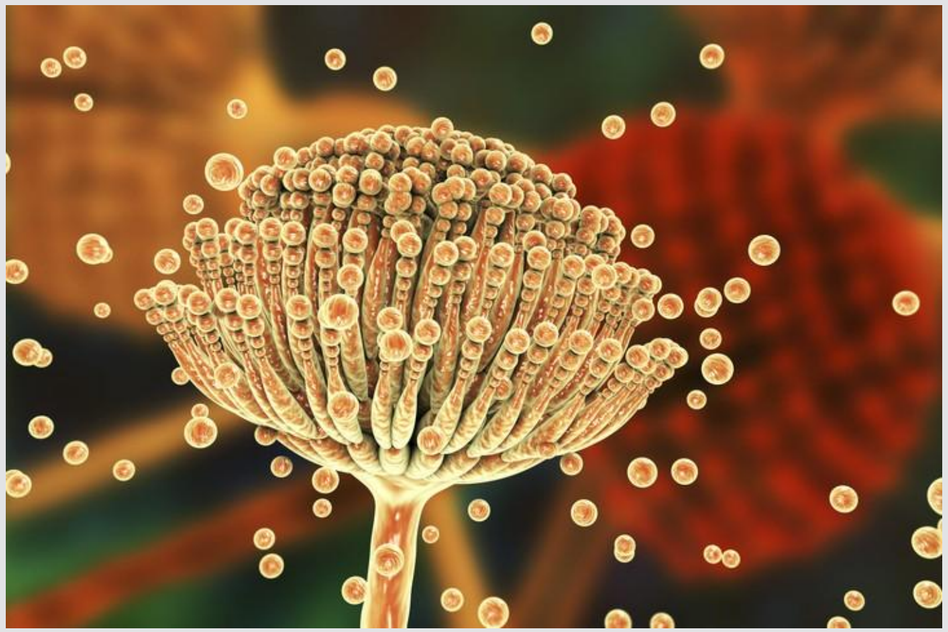




What can be done about low energy level in PD?

- Optimize the quality of your sleep – sleep hygiene
- Minimize other causes of fatigue
  - Address underlying sleep disorders
  - Screen for nutritional/hormonal abnormalities
  - Reduce medication burden, as able
- Take naps when needed

What are the findings regarding mycotoxins and Parkinson's? Are they a factor in the onset of Parkinson's?



Nicotine

- Smoking is associated with a lower risk of developing PD
- Preclinical studies were promising
- NIC-PD showed no benefit
- Nicotine patches are not recommended for PD

NeuralRegen and colostrum studies



NeuralRegen™

Has Ivermectin been used to determine if the medication helps clear any problem with Parkinson's?



Info on research studies for those with symptoms but no diagnosis



THE MICHAEL J. FOX FOUNDATION
FOR PARKINSON'S RESEARCH



What are some new treatments for Parkinson's

- Juvmo (tavapadon)
- Infusion therapies
- Adaptive DBS
- Focused ultrasound



Young-onset Parkinson's

PMDAlliance
Young Onset Parkinson's Network

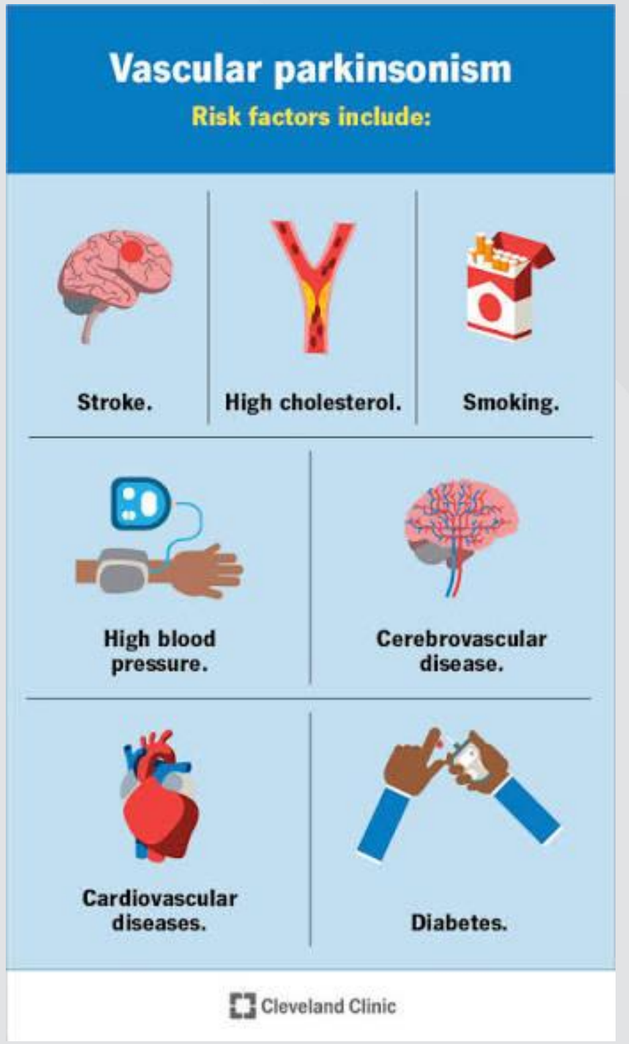
yopnetwork.org
Clinicaltrials.gov

The purpose of using "isms" when referring to Parkinson's

- Parkinsonism = bradykinesia + rigidity, rest tremor, postural instability

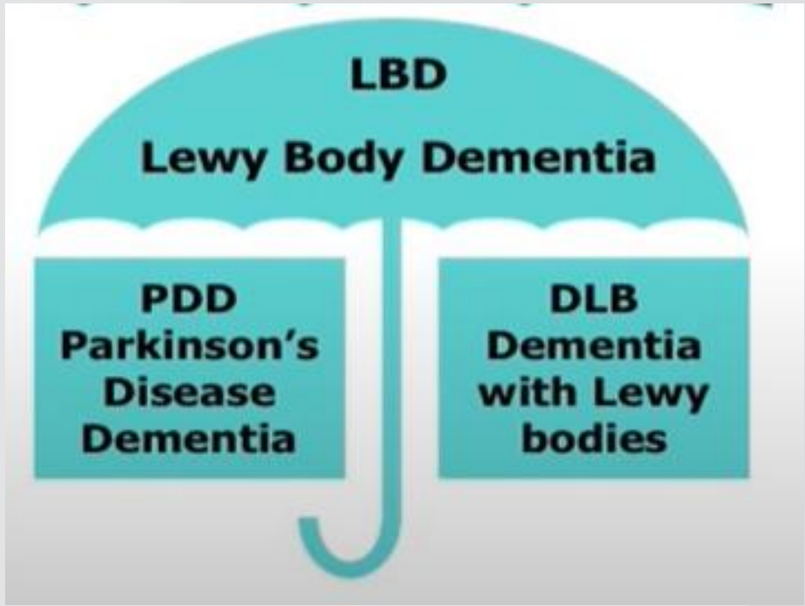
Is there anything that can help with vascular parkinsonism?

- Manage risk factors
- Levodopa
- PT, OT



Please clarify different types of Parkinson's dementia

- Lewy body dementia
  - Parkinson’s disease dementia
  - Dementia with Lewy Bodies
- Parkinson’s disease + dementia



What relevant things should I look for in searching for care facilities?

- PD-specific expertise
- On-time medication delivery
- Access to PT, OT, and ST
- Advanced therapies and complex regimens
- Communication and planning

How do I deal with my spouse's diagnosis of Parkinson's when he doesn't want to talk about it or let others know about it?



How to help when the person with Parkinson's is in denial and won't plan ahead



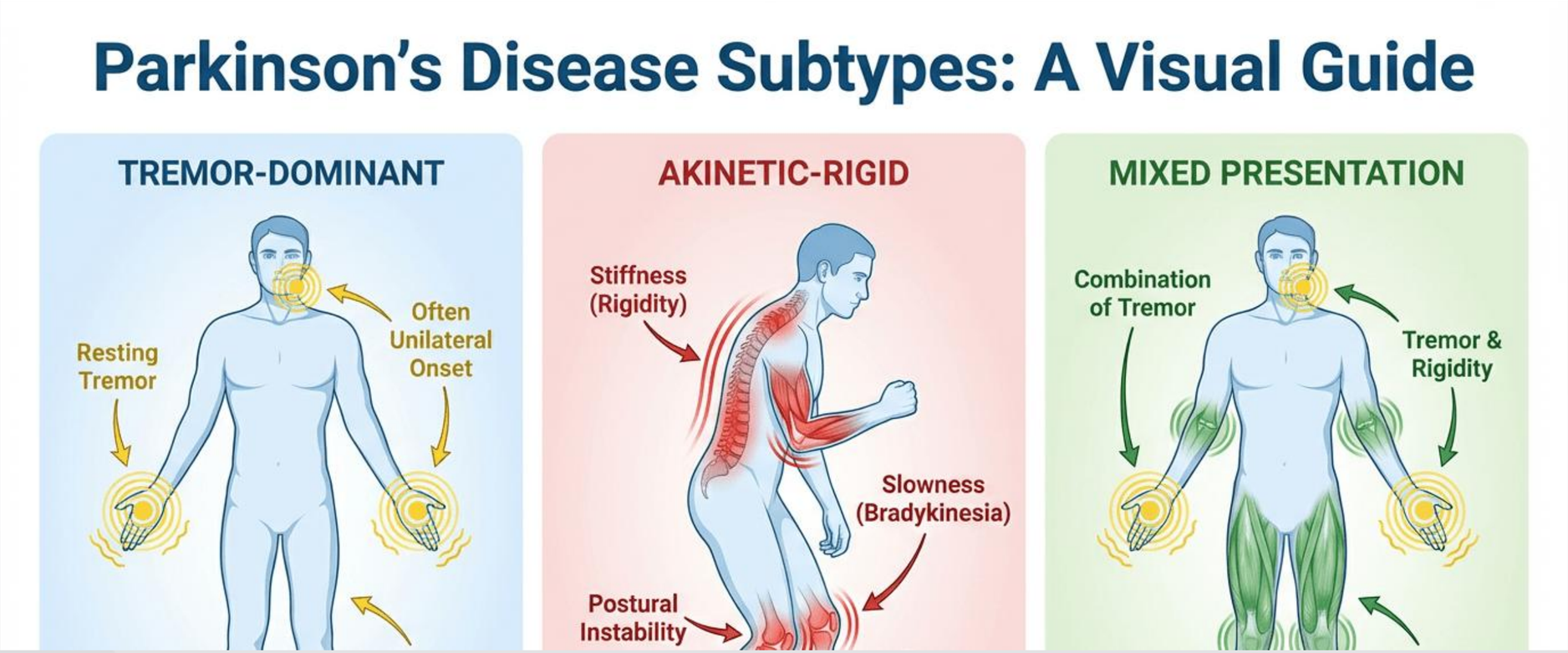
Why do I need so much more magnesium to prevent cramps at night than I used to?



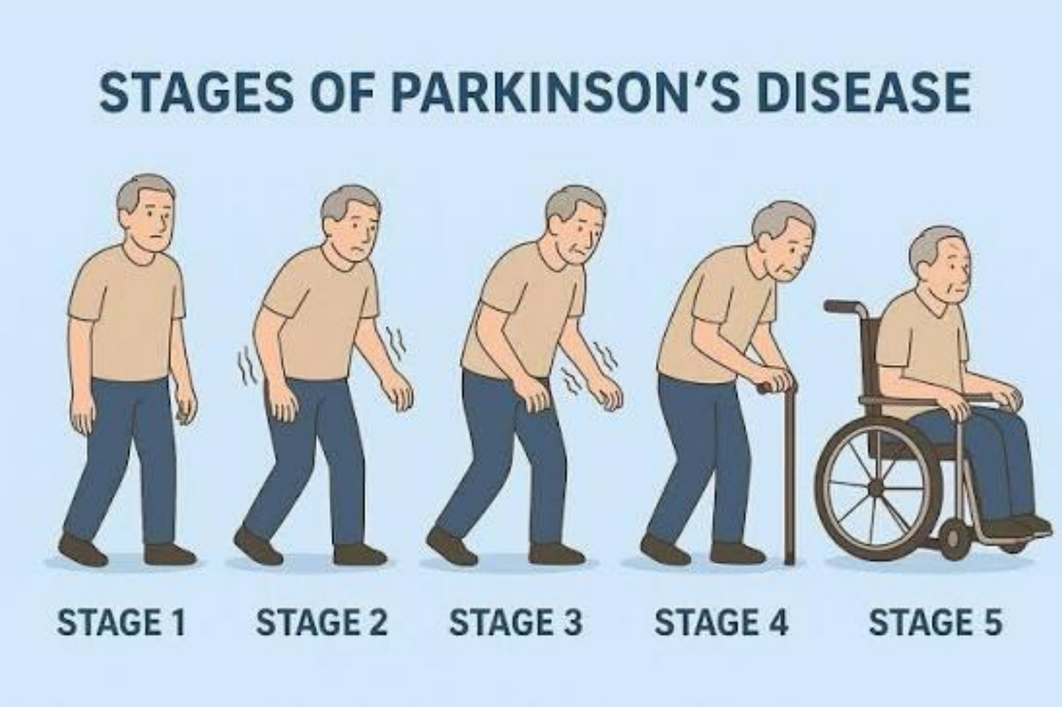
What do you think about Xara Shilajit?



Are there 2 types of Parkinson's?



How are Parkinson's Disease stages diagnosed?



Is there a blood test to diagnose PD?



What are the top 3 recommendations for people with PD?

- Exercise!!!!
- Eat a Mediterranean diet
- Get good sleep



What about a cure???



What are we most excited about over the next 5-10 years?

- Stem cells
- Improving biological methods of diagnosis for earlier diagnosis
- Policy chances to reduce environmental risks (regulation and banning of harmful herbicides, pesticides, chemical solvents)
- Improving selection methodology and technologies for neurostimulation



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Thank you for attending. Please fill out your evaluation form and put it in the box by check-in. Thank you!

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