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7-31-2019

# The Pathophysiology and Nursing Care for Parkinson's Disease

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### Recommended Citation

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# The Pathophysiology and Nursing Care for Parkinson's Disease

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## Introduction

According to the Parkinson's Disease (PD) Foundation, PD is a progressive neurodegenerative disorder that affects predominately dopamine-producing neurons in an area of the brain called the substantia nigra ("Understanding parkinson's," 2019). This impairment of neurons causes individuals with PD to have low levels or completely lack the neurotransmitter dopamine in the brain ("Understanding parkinson's," 2019). Dopamine plays a critical role in regulating motor function and movements therefore, lack of dopamine will cause diminished coordination and difficulty managing many motor skills ("Understanding parkinson's," 2019). Bradykinesia (slowness of movements), tremor at rest, and muscular rigidity are defined as the cardinal triad symptoms seen in PD related to the lack of dopamine in the brain ("Understanding parkinson's," 2019). Dopamine also plays a critical role in cognition and controls things like memory and judgment, hence the reason why some individuals with PD may suffer cognitive impairment later in the disease progression ("Understanding parkinson's," 2019). PD is a complex, multi-faceted disease (Gopalakrishna & Alexander, 2015). The etiology remains somewhat unclear, but research shows that genetic and environmental factors may play a role in the onset of the disease (Capriotti & Terzakis, 2016). There is no definitive diagnosis or cure and treatment options must be tailored to the individual (Gopalakrishna & Alexander, 2015). "Modern therapies and continuous research aim to evaluate the pathophysiology of PD and manage symptoms so that patients with the disease are living longer with increased quality of life (Gopalakrishna & Alexander, 2015, 325)."

## Case Process

A 62-year old Caucasian female presents for a routine annual visit. A full history and physical is taken and below were the findings:

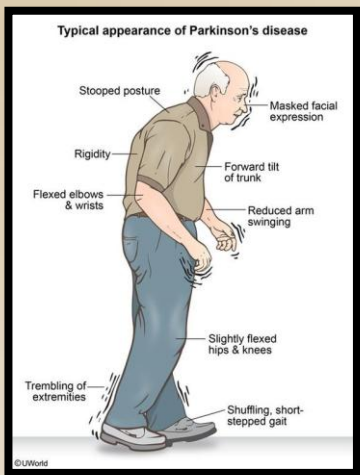
History: Elevated Cholesterol levels, Osteoporosis,

Chief Complaint: Patient reports that she has had a bilateral upper extremity fine tremor for awhile, she reports stiffness in the morning, she also states her right arm no longer swings normally like her left arm does, her husband pointed this out to her while taking the dog on their morning walks. Otherwise, she feels healthy.

After a full assessment is completed and further discussion with the patient, the APRN refers her to a neurologist for further evaluation to assist with possible diagnosis of Parkinson's disease.

Diagnosis: No definitive tests are currently available to confirm a diagnosis of Parkinson's disease (DeMaagd & Philip, 2015). Therefore, a clinical diagnosis requires a full patient history, assessment of symptoms, and rule out of any other alternative diagnoses (DeMaagd & Philip, 2015). PD can be clinically diagnosed by the presence of two or more of the cardinal motor symptoms including: rigidity (stiffness), bradykinesia (slowness of movement), or resting tremor (Cotterrell, 2018). There are no remarkable findings on MRI or CT studies typically for PD patients, and genetic markers are still being investigated to help with the diagnosis of PD (Capriotti & Terzakis, 2016).

Treatment: Currently, there is no cure for PD so the goal of treatment is providing symptom management and maintaining or enhancing quality of life (Capriotti & Terzakis, 2016). Levodopa is the gold standard pharmacologic treatment for PD patients (Gopalakrishna & Alexander, 2015). Deep brain stimulation is a procedure that can be beneficial for PD patients who have poorly controlled symptoms through medical management (Capriotti & Terzakis, 2016).



Agrawal, A. (2018, August 11). *Typical appearance of Parkinson's disease*. Retrieved from <https://www.a4clinics.com/single-post/2018/08/12/5-Things-to-Know-About-Parkinson's-Disease>

## Signs and Symptoms

The signs and symptoms of PD can vary based on the individual and the progression of the disease and can be classified as motor symptoms or nonmotor symptoms. The classic symptoms are listed below.

### Motor Signs and Symptoms:

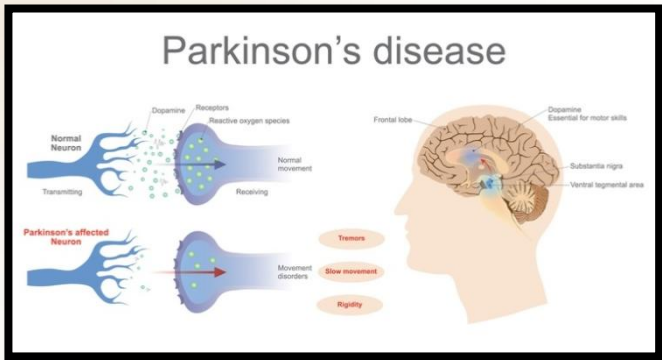
- Bradykinesia (slowness of movement)
- Rigidity
- Tremor at rest
- Postural instability
- Shuffling gait
- Stooped posture
- Dyskinesia (uncontrolled, involuntary muscle movement)
- Micrographia (small handwriting)
- Reduced arm swinging

### Nonmotor Signs and Symptoms:

- Staring appearance/Masked facial expression
- Flat affect
- Depression/anxiety
- Sleep disruption
- Fatigue
- Autonomic dysfunction including: inappropriate diaphoresis, orthostatic hypotension, gastric retention, constipation, and urinary retention
- Cognitive impairment
- Diminished speech volumes
- Unexplained sensory disturbances (pain, impaired smell, and vision) (Capriotti & Terzakis, 2016).

## Underlying Pathophysiology

- While there have not been any concrete causes established, evidence and research suggest that genetic and environmental factors contribute to the development as well as the progression of PD (Gopalakrishna & Alexander, 2015).
- A few of the gene mutations which research has identified to be associated with PD include: Alpha-synuclein gene (SNCA), Glucocerebrosidase gene (GBA), and Leucine-rich repeat kinase 2 (LRRK2) gene loci (DeMaagd & Philip, 2015).
- Environmental risk factors which research has identified to be associated with the development and progression of PD include: Elevated cholesterol, environmental toxins (ie: pesticides), head trauma, elevated body mass index (BMI), oxidative stress and the formation of free radicals from exposure to numerous carcinogens (DeMaagd & Philip, 2015).
- The hallmark pathophysiological processes for PD are the loss of dopaminergic neurons of the substantia nigra in the midbrain which are critical for smooth and fluid motor movements and the formation or presence of Lewy bodies which contribute to the cognitive impairments occasionally seen as the disease progresses into later stages (Gopalakrishna & Alexander, 2015).
- Loss of dopaminergic neurons due to Nigrostriatal dopaminergic neurodegeneration in the basal ganglia leads to an imbalance between excitation and inhibition pathways in the brain resulting in the overall decrease in motor function for PD patients (Gopalakrishna & Alexander, 2015). The presence of the nonmotor symptoms of PD support the involvement of other neurotransmitters of the glutamatergic, cholinergic, serotonergic, and adrenergic systems (DeMaagd & Philip, 2015).
- There is still much to be discovered regarding the presence of Lewy bodies in PD patients. Some research shows that the amount of Lewy bodies found in the Substantia nigra of PD patients with dementia is significantly higher than PD patients without dementia. Other research suggests a stronger association between cognitive impairment of PD with Lewy body distribution, rather than the amount, within the cerebral cortex (DeMaagd & Philip, 2015).



Parkinson's disease. (2018, November 26). Retrieved from <https://labiotech.eu/features/immunotherapy-parkinsons-disease/>

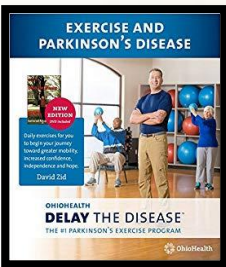
## Significance of Pathophysiology

- Dopamine plays a critical role in regulating motor functions and movements, therefore lack of dopamine will cause diminished coordination and difficulty managing many motor skills ("Understanding parkinson's," 2019).
- Dopamine also plays a critical role in cognition and controls things like memory and judgment, hence the reason why some individuals with PD may suffer from cognitive impairment later in the disease progression ("Understanding parkinson's," 2019).
- By having knowledge about the possible genetic and environmental factors associated with PD and its pathophysiology, health care providers can educate patients on potential protective factors including cholesterol levels and exercise ("Understanding parkinson's," 2019).
- By understanding the pathophysiology of PD, healthcare providers can prescribe appropriate medications such as Levodopa or other dopaminergic medications to help manage or improve symptoms by increasing the levels of dopamine in the brain ("Understanding parkinson's," 2019).
- Health care providers must understand the pathophysiology of the disease in order to tailor and individualize care to help manage the patient's symptoms, maintain the patient's independence, and enhance their overall quality of life.

## Nursing Implications

APRN's must focus their care on maintaining/enhancing the patient's quality of life and independence by tailoring care and treating the symptomatic motor and nonmotor symptoms of the disease (Bierciewicz et al., 2016).

- Education on the medications prescribed and the importance of taking medications on time as patients can go from "on" to "off" states quickly (Capriotti & Terzakis, 2016).
- Help provide the patient with Physical Therapy or Occupational Therapy as a resource to help them maintain their ability to perform ADL's and reduce the patient's risks of falls (Bierciewicz et al., 2016).
- Educate the patient on the benefits that physical exercise can have. Research has begun to show that larger amounts of moderate-vigorous exercise may slow the progression of PD, potentially protect the brain from further cognitive impairment in later stages of the disease, and improve muscle strength and walking speed for those struggling with the typical motor symptoms of PD (Paillard, Rolland, & de Souto Barreto, 2015).
- Dysphagia and constipation are two common symptoms PD patients may experience related to autonomic dysfunction or as a side effect of medications. The APRN could help encourage the patient to speak with a speech therapist and/or nutritionist to help combat these symptoms/side effects (Capriotti & Terzakis, 2016).
- APRN's can utilize the Parkinson Neuropsychometric Dementia Assessment or The Folstein Mini-Mental Status Examination to evaluate cognitive impairment for PD patient's (Capriotti & Terzakis, 2016).
- Encourage the patient to discuss their experiences of living with PD with a psychiatrist to maintain or improve their mental/ emotional state (Bierciewicz et al., 2016).
- If symptoms are not being managed well medically, the APRN could educate the patient about the option of the surgical intervention called Deep Brain Stimulation (Capriotti & Terzakis, 2016).



Delay the disease. (2017). Retrieved from <http://www.delaythedisease.com/>

## Conclusions

Watching a parent navigate a life with PD is certainly one of the reasons this topic was chosen. By understanding the pathophysiology of the disease, learning what to expect as the disease progresses, and becoming knowledgeable about treatment options as well as resources that are available to provide the best quality of life possible will make the journey through PD a little more bearable. Also, research and numbers show that more patients are being diagnosed with neurodegenerative diseases like PD (Valera & Masliah, 2016). More than 10 million people worldwide are living with PD, and approximately 60,000 Americans are diagnosed with PD each year ("Understanding parkinson's," 2019). The World Health Organization (WHO) predicts that by 2040, as the population continues to get older, neurodegenerative diseases will become the second leading overall cause of death following cardiovascular disease (Valera & Masliah, 2016). Advanced Practice Nurses (APRN's) in all settings will likely encounter patients with PD and will have a role in clinical monitoring, identifying when problems arise, and providing support and resources to their patients with PD as well as to their family (Cotterrell, 2018). PD can cause significant physical, psychological, and social effects for patients (Cotterrell, 2018). By understanding the disease and all the effects, APRN's will have the knowledge and resources necessary to provide quality care to their patients (Cotterrell, 2018). The role of the APRN is critical as they work alongside Doctors, Pharmacists, Physical Therapy, Occupational Therapy and Nutritionists (Gopalakrishna & Alexander, 2015). By learning and understanding the pathophysiology of PD and its disease process, APRN's have the opportunity to help tailor care, minimize symptoms, improve motor function, maximize patient outcomes, and provide increased quality of life for their PD patients and families (Gopalakrishna & Alexander, 2015).

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