



7-2020

## Application of LSVT-BIG Protocol Intervention in 74-Year-Old Female with Parkinson's Disease: A Case Report

Abigail Stroup  
*University of North Dakota*

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# Application of LSVT-BIG Protocol Intervention in 74-Year-Old Female with Parkinson's Disease: A Case Report

by

Abigail Stroup  
Bachelor of General Studies with Emphasis in Health Sciences  
University of North Dakota, 2019

A Scholarly Project Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

University of North Dakota

in partial fulfillment of the requirements for the degree of

Doctor of Physical Therapy

Grand Forks, North Dakota  
July, 2020

This Scholarly Project, submitted by Abigail Stroup in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

*Mohamed Elhamadany*

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(Graduate School Advisor)

DocuSigned by:

*David Kelling*

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(Chairperson, Physical Therapy)

## PERMISSION

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## **ACKNOWLEDGEMENTS**

I would like to thank my classmates (Alyssa Theede, Hannah Brennan, McKenzie Dumm, and Taylor Nord) for their peer reviews and helpful suggestions throughout the completion of this case study. I also acknowledge my clinical instructor who provided valuable supervision and guidance throughout the episode of care.

A special thank you to Professor Mohamed Elhamadany, PT, PhD, DPT, PCS for his guidance and effort in helping me create a meaningful case study to be proud of.

## ABSTRACT

**Background and Purpose.** Parkinson’s disease (PD) is a chronic, progressive neurodegenerative condition affecting 60,000 Americans each year.<sup>1</sup> This case study evaluates the effectiveness of physical therapy, including the LSVT-BIG protocol, for an individual with Parkinson’s.

**Case Description.** The patient was a 74-year-old female diagnosed with PD who received outpatient physical therapy services four times per week for four weeks.

**Intervention.** The therapeutic interventions provided included dynamic, large amplitude exercises per the LSVT-BIG protocol as well as gait, stair, and bed mobility training.

**Outcomes.** Outcome measures included the Lower Extremity Functional Scale (LEFS), Timed “Up & Go” (TUG), Five-Times-Sit-to-Stand (FTSST), and 30-Second Chair Stand test. Over the course of treatment, the patient demonstrated significant improvement in each outcome measure, as well as significantly improved her gait pattern and speed. At discharge, the patient increased functional independence at home and in the community.

**Discussion.** The patient responded positively to physical therapy treatment and met all established short-term goals as well as two out of three long-term goals. However, more research needs to be done to assess long-term outcomes of the LSVT-BIG protocol for the treatment of Parkinson’s Disease.



## CHAPTER I

### BACKGROUND AND PURPOSE

Parkinson's disease (PD) is the second most common neurodegenerative disorder, second only to Alzheimer's disease, as 60,000 Americans are diagnosed with PD each year.<sup>1</sup> This chronic disease is increasing in prevalence and demanding new and effective options for management to slow down its progressive, detrimental effects. Symptoms associated with PD include a decline in movement coordination, balance and gait abnormalities, resting tremors, decreased speech volume, rigidity, and bradykinesia.<sup>2</sup> Parkinson's is an all-encompassing multifactorial disease with a strong link to age, as the average age of onset is 60 years old.<sup>3</sup> There is no known cause of PD, but aging, genetics and environmental toxin exposure are considered to contribute. Dopamine, a neurotransmitter produced by the basal ganglia, plays a vital role in the brain and body and is responsible for various tasks including learning and movement.<sup>4</sup> In individuals with PD, the basal ganglia becomes dysfunctional and produces an insufficient amount of dopamine which leads to the initial motor symptoms. The progression of Parkinson's disease is slow and will present differently for each patient.<sup>2, 3</sup>

Despite recent research and ongoing testing, there is no cure for Parkinson's disease. However, current treatment approaches support the use of both pharmacological intervention and therapy for management of PD symptoms and improvement in quality of life. The use of medication, primarily Levodopa and dopamine agonists, is effective in minimizing the progressive motor impairments of PD.<sup>5</sup> But medication alone is not a cure-all for those suffering from PD. A physical therapy initial evaluation will determine a baseline for motor, and non-motor, function of the patient.<sup>6</sup> A physical therapist can then

determine an effective plan of care for the patient to improve balance, posture, gait, muscle strength and address patient specific goals. Physical therapy also plays a proactive role in preventing falls and slowing the progression of PD associated impairments.

The Lee Silverman Voice Treatment (LSVT) BIG and LOUD protocol is an evidence-based program developed for patients with Parkinson's to address impairments with movement and speech. Of the two-part program, speech language pathologists utilize the LSVT-LOUD protocol to work with individuals with PD to train their voices to control volume and quality. Physical therapists certified in LSVT-BIG use the protocol to address motor, and non-motor, impairments. The LSVT-BIG program design has been found to increase activity tolerance by requiring four consecutive days of physical therapy treatment for four consecutive weeks as compared to shorter protocols or general exercise. An emphasis on large-amplitude movements to encourage patients with PD to move "big" is the program's distinguishable feature.<sup>7</sup> The intention is to use exercise and neuromuscular re-education to recalibrate how patients perceive their own movements and actions.

The purpose of this case study is to report the potential benefits of LSVT-BIG on gait, balance, and functional performance in 74-year-old female with mild PD. Current literature supports the use of LSVT-BIG for improvements in motor control and endurance, but has yet to demonstrate the impact physical therapy can have on functional task skills and activity of daily living (ADL) performance of individuals with PD.

## **CHAPTER II**

### **CASE DESCRIPTION**

The patient was a 74-year-old female diagnosed with Parkinson's disease in 2018. She resided alone in a three-story house and was independent with most ADLs. Her home contained one flight of stairs to the basement and one flight up to her bedroom, each with a unilateral hand railing. She was a retired pharmacy technician and spent her days volunteering, attending her grandchildren's sporting events, and visiting with family. She enjoyed walking to her volunteer location, which was half a mile down the road. According to the patient, this distance had recently become unbearable, as she fatigued quickly after a quarter of a mile. The patient was referred to physical therapy by her primary care physician to improve gait, balance, bed mobility and ADL performance.

In addition to her fatigue from walking, she also reported recent difficulty with bed mobility, fine motor kitchen tasks (i.e. cutting food with a knife, replacing the garbage bag) and stated that she "has lost her walk." The patient was able to drive and take care of her basic ADLs, but she did have assistance from her son with difficult tasks like carrying heavy objects up/down the stairs and lawncare. The patient's past medical history was significant for right hip developmental dysplasia. She also had a past surgical history including bilateral total knee replacements and unilateral right total shoulder arthroplasty (TSA).

The patient's goals were to (1) improve her gait in order to walk to her volunteer location, (2) negotiate one flight of stairs with a unilateral handrail to carry laundry bin up from downstairs, and (3) improve quality and efficiency of ADLs.

Since her initial diagnosis, the patient's symptoms such as a resting tremor, festinating gait pattern, and quiet speech had been well controlled by medication (Carbidopa-Levodopa). Levodopa is effective in treating common bradykinetic symptoms of Parkinson's and can improve quality of life.<sup>8</sup>

Throughout the subjective history and examination, the patient was calm and communicated clearly. A systems review was completed and can be found in Table 1. The patient's medical diagnosis of Parkinson's disease was confirmed by her primary care provider, so there were no differential diagnoses required. After the history, the patient was deemed appropriate for physical therapy and a potential candidate for the LSVT-BIG protocol.

### **Examination, Evaluation and Diagnosis**

Initial observation of the patient indicated no resting tremors and normal cognitive functioning. The patient presented with rounded shoulder and forward head posture in sitting and standing. She walked into the therapy department with an abnormal gait pattern consisting of forward flexed trunk, short and shuffled steps, and lacking any apparent bilateral arm swing. Examination procedures included range of motion (ROM) measurements, manual muscle testing (MMT), Tinetti, Timed "Up & Go" (TUG), Five-

Times-Sit-to-Stand Test (FTSST), 30-Second Chair Stand test, and Lower Extremity Functional Scale (LEFS).

Measurements of ROM were assessed for the shoulder, hip, knee and ankles with a standard goniometer.<sup>9,10</sup> The patient's past surgical history of a right TSA led to minimal decreased ROM throughout right shoulder motions. See Table 2 for ROM findings.

MMT was assessed grossly for the shoulders, hips, knees, and ankles. Manual muscle testing is essential component of a neuromuscular evaluation.<sup>11</sup> Testing strength isometrically and comparing both sides of the body provides valuable insight for motor deficits. MMT measurements can be found in Table 2. The most significant strength assessment finding was a deficit in bilateral knee extension and foot dorsiflexion which was a suspected factor in the patient's abnormal gait and balance.

Several balance and gait functional measures were assessed to determine a mobility baseline for the patient. The Tinetti Assessment Tool measures both gait and balance. The Tinetti has a sensitivity and specificity of 0.68, 0.56 respectively.<sup>12</sup>

The TUG is easily administered and provides good insight on fall risk for older adults dwelling in the community.<sup>13</sup> The TUG's sensitivity is 0.76 and specificity is 0.49.<sup>12</sup> Performing a TUG during the initial evaluation is important as to determine a baseline to compare progress to throughout the episode of care.

The FTSST and 30-Second Chair Stand test are both utilized to assess the functional sit to stand motion. The FTSST is a valid measurement of dynamic mobility in older females.<sup>14</sup>

A functional outcome measure was utilized during the initial evaluation and again at discharge to obtain objective information regarding change during the episode of care. The Lower Extremity Functional Scale (LEFS) was used for this episode of care. The reliability of the LEFS is 0.88.<sup>15</sup> The patient's scores on the balance and gait assessments during the initial evaluation can be found in Table 2. From information gathered throughout the initial examination, an enablement model was utilized to organize the many factors influencing the plan of care. The International Classification of Functioning (ICF) is useful for this purpose. (See Appendix 1).

A problem list and diagnosis were generated based on the information and observations gathered from the initial evaluation and examination. The patient was presenting with impairments directly related to her medical diagnosis of Parkinson's disease. The initial session with the patient also provided necessary information to determine the patient was an appropriate candidate for the LSVT-BIG program.

A physical therapy diagnosis was utilized to guide the plan of care within the PT scope of practice. Using the ICD-10 coding system, the patient's PT diagnosis included R26.2 Difficulty with walking, not elsewhere classified and R26.89 Other abnormalities of gait and mobility. The clinical decision-making process to accept this patient for care included considering factors such available time and resources for the 16 appointments, the supervising PT was certified in the LSVT-BIG protocol, and the patient was highly motivated. Throughout this episode of care, the patient was treated by two therapists. This included a student physical therapist and a supervising clinical instructor (LSVT-BIG certified). Collaboration between the two therapists included daily discussions

about plan of care and progressions. Documentation of daily treatment sessions was performed after each therapy visit by the student and supervising therapist.

### **Prognosis and Plan of Care**

The patient's prognosis at initial evaluation was determined to be good based on the patient's positive outlook and motivation for improvement, family support, good cognition, and the time and resources available for the intensive treatment program.

The plan of care included four 60-minute formal PT treatment sessions per week for four consecutive weeks, as is consistent with the LSVT-BIG protocol.<sup>7</sup> Physical therapy sessions were focused on addressing the patients problem list, which included an abnormal gait pattern, impaired balance, impaired ability to complete ADLs (cutting food, taking out the trash, buttoning shirt buttons, etc.), inability to walk two blocks to volunteer location, and decreased grip strength.

The focus of the plan of care was on improving gait pattern, balance, strength, functional ADL performance, bed mobility and endurance. Short term goals, to be met in two weeks, included (1) patient will ambulate 600 ft with reciprocal arm swing increased step length, (2) improve LEFS score to >53/64, (3) improve Tinetti score >25/28, (4) demonstrate independent performance of initial HEP.

Long term goals, to be met in four weeks, included (1) patient will ambulate ½ mile with minimal gait deviations in order to safely walk to volunteer location, (2) improve LEFS score >58/64, (3) improve Tinetti score >26/28, (4) transition to independence with updated HEP and maintain compliance with LSVT-BIG program. The plan of care was within the PT scope of practice and no referrals were necessary at this time.

## **CHAPTER III**

### **INTERVENTION**

The LSVT-BIG protocol follows a specific schedule that requires four consecutive weeks of treatment with four 1-hour therapy sessions per week.<sup>7</sup> The program also requires a supplemental home exercise program for the patient to complete independently. This schedule has been researched against other shorter protocols and general physical therapy exercises, and the results prove the structure of the 16 sessions to be beneficial for improving overall motor function, faster TUG time, and 10-meter walk test.<sup>7,16</sup>

The LSVT-BIG program's emphasis is on large-amplitude exercises with high repetition and progressing difficulty throughout the course of the 16 sessions.<sup>16</sup> The seven fundamental, full-body exercises are performed at an 80% intensity level and emphasize moving "big." These exercises were completed using the standard protocol for which exercises were to be completed seated or standing. For the first week of treatments, the patient required unilateral support of a chair for balance while completing the standing exercises. This included stepping, reaching, twisting, and stretching with increasing complexity and the addition of dual-task components.<sup>17</sup> Counting aloud for exercises that required isometric movements and "flicking" (flexing/extending) fingers during reaching exercises are two examples of dual-tasks used in the program. The modified exercises for the LSVT-BIG protocol include substituting the standing exercises for a seated alternative.



To best teach to this patient's learning style, physical demonstration of each exercise was performed by the PT as a visual guide for the patient as she completed her LSVT-BIG exercises each day. Auditory cues were provided to correct technique. Cues for exercises included, "twist to look behind you," "reach far," "shift your weight," as well as reminders to count aloud. The patient's HEP included pictures and detailed instructions to assist with independent program completion at home. Having awareness of a patient's learning style is supported by the literature to enhance the rehabilitation process and improve compliance.<sup>18</sup>

In addition to the exercises, there is a goal-focused component of the LSVT-BIG program. The goals are determined by the patient and therapist based on the individual goals and priorities of the patient in terms of ADLs and functional mobility. Specific tasks this patient wanted to improve on included bed mobility, cutting food with a knife, signing her name, and buttoning buttons of a shirt. Goals and priorities were assessed weekly.

When one functional task became too easy, a progression to the next would be initiated. Interventions to address ADL and functional tasks were creative and utilized the PT clinic's resources to play food and kitchen cutlery, the patient's button up shirt, and a garbage bin and plastic bag. Goals were assessed objectively via timing the patient for efficiency of task, by therapist observation, and by patient report depending on the task. Using the same button-up shirt, the patient was timed to assess how fast she could un-button and re-button the shirt three times. Improvement for tasks like handwriting and cutting food with a knife were subjectively reported by the patient and observations were made by the therapist.

Other functional training included sit-to-stands and dual-task gait exercises. Sit-to-stands were progressed by adding a foam mat under the patient's feet to work on proprioception and balance on an uneven surface.<sup>19</sup> To address the functional movement of looking over one's shoulder while ambulating, the patient ambulated 20 feet while twisting her trunk to toss a ball to the PT following behind.<sup>20</sup>

The home exercise program included the seven LSVT-BIG exercises for the patient to complete for 8-12 repetitions, once per day on therapy days and twice per day on non-therapy days. The LSVT-BIG program provides a structured educational packet for the patient to keep with pictures and descriptions of each exercise, as well as the modifications for each exercise if needed.

Gait training with external cueing from the PT initially emphasized keeping the patient's gaze out ahead and taking larger strides by cueing her to strike her heel to the floor. The patient learned to distinguish the sound of her feet shuffling along the floor as compared to a step with a clear heel strike. Both external cueing and self-instruction have been proven to be beneficial for providing input while gait training with a patient with PD. These cueing methods are effective in both patients with a festinating (freezing) gait pattern or without.<sup>21</sup>

Furthermore, stair training was utilized as an intervention to address the patient's functional goal of carrying a large object while negotiating one flight of stairs with a unilateral handrail. The patient practiced negotiating stairs in the therapy department using different methods, including reciprocal negotiation and one step at a time. Stair negotiation is a common difficulty for individuals with PD due to the heavy reliance on lower extremity leg musculature as a compensation for reduced ankle and

knee ROM.<sup>22</sup> This was evident in the case of this patient as well, as she fatigued quickly from ascending one flight of stairs.

As suggested by the LSVT-BIG protocol, after the four weeks of therapy sessions, the patient was scheduled for a re-evaluation in 6 months to follow up and assess need for additional therapy sessions or referrals. This patient had exceptional compliance with her home program and attended each of the 16 therapy sessions. These factors greatly impacted the outcomes of this physical therapy episode of care.

## **CHAPTER IV**

### **OUTCOMES**

After four weeks, and the completion of 16 treatment sessions following the LSVT-BIG protocol, the patient was evaluated for discharge. At discharge, the patient demonstrated significant improvements in functional abilities, gait, stair negotiation, and balance. See Table 2.

The patient met all short-term goals and two out of the three established long-term goals. Although she did not improve her LEFS score >58/64 (as was the final long term goal), she did improve by two points (from 25% impairment to 23% impairment).

Of significant importance was the patient's improvement in gait. Initially, the patient could ambulate a maximum of one city block (about 400 ft). At discharge, the patient ambulated 1000 ft without any reported fatigue. Not only did her endurance with walking improve, but also her pattern. She was able to demonstrate reciprocal arm swing, upright posture, and increased stride length.

By improving the patient's gait and balance, the risk of falling and disease-specific degeneration were reduced. The patient initially scored 24/28 on the Tinetti Balance scale, which indicates she was at risk of falling. At discharge, she scored 27/28. Individuals who score above 25 on the Tinetti are not deemed to be at risk for falling.<sup>12</sup> By reducing her risk of falls and increasing her body awareness through "big" movements and neuromuscular re-education, it can be assumed that the patient will be able to stay independent in her home and avoid the medical costs of falling.

Functional tasks that the patient deemed to be difficult for her at initial evaluation improved notably as well. The patient reported bed mobility, handwriting, buttoning buttons on a shirt, cutting food, and walking while turning to look backwards had all improved. At discharge, the patient states, "I got my walk back" in reference to her improved gait pattern after completion of physical therapy. From observation, it was evident that the patient's movement patterns were smoother, with more coordination. Her handwriting was legible and less rigid, her bilateral hand management to button buttons was faster and with less difficulty, and her dual task performance was significantly improved.

The patient's response to intervention was positive. She had exceptional compliance with the entire LSVT-BIG program and was pleased with her increased independence and ease with activities that were once difficult and frustrating. It was determined at discharge that further treatment sessions were not necessary. In accordance with LSVT-BIG protocol, the patient was scheduled to be seen by PT in 6 months to follow up.

## **CHAPTER V**

### **DISCUSSION**

The plan of care established to optimize results for this patient was framed with the intent to improve functional mobility and maximize independence. The LSVT-BIG protocol was the chosen intervention to utilize for this patient with additional gait and stair training as necessary.

Using the Integrated Framework for Decision Making model, the clinical decision was made that this patient was appropriate for the LSVT-BIG program. This model brought attention to the external environmental factors, learning variables, and educational components that would impact the episode of care. This patient had the necessary time and resources, as well as the required internal motivation, to complete the therapy sessions, home program, and continued life-long commitment to combating the degenerative effects of PD. The LSVT-BIG protocol was deemed appropriate to specifically re-train movement patterns and work towards the patient's specific goals.

Though the protocol was followed, adjustments were made accordingly, depending on patient presentation each day.

Evidence supports the use of the LSVT-BIG protocol for improving motor performance in individuals with PD.<sup>17</sup> This data supports the appropriate use of the LSVT-BIG program in this case. The focus on high intensity, high repetition exercises that re-calibrate movement patterns that are transferrable to functional, daily tasks, is the unique approach of the LSVT-BIG program.

Factors that contributed to the patient's positive outcomes included patient compliance, adequate facility resources, and access to LSVT-BIG certified therapist. Factors that may have impeded on outcomes include patient's steroid injection to right hip during week 2 of therapy interventions which resulted in using the modified exercises for 3 consecutive days. The steroid injection was not suspected to impede on the patient's outcomes, it was primarily for pain relief.

In consensus with other studies, the results from this case study agreed that the LSVT-BIG protocol can improve motor function in individuals with PD.<sup>7,16,17</sup> This case study concurs that physical therapy is a safe and effective option to improve functional task performance, gait, balance, strength, and endurance for individuals with PD.

Further clinical implications of this case report could include using components of the LSVT-BIG program for individuals without PD who present with balance, gait, and/or other functional task impairments. Further studies are necessary and recommended to assess long-term outcomes after completion of the LSVT-BIG program. Further suggestions for other studies include utilization of the LSVT-BIG program by an occupational therapist to assess for differences in outcomes as compared to implementation by PTs

## **Reflective Practice**

Upon reflecting on the entirety of this case study, decisions were made that were integral for guiding the examination and interventions for this patient's episode of care. Refer to Appendix 1 for the ICF model that aided in the decision-making process.

The results of this case study can be applied to future cases for patients with a similar presentation and goals. It is important to note that components of the examination and intervention are applicable for individuals with or without PD, as to address balance, gait, and functional task performance impairments. For example, the initial examination and evaluation using functional tests to obtain objective baseline measurements for a patient with a similar presentation is efficient and useful for documenting objective improvements.

If an identical patient as the one in this case study walked into physical therapy next week, a very similar evaluation and plan of care would be developed. Based on the outcomes of this case study, it can be assumed that completing a similar evaluation and implementing the LSVT-BIG protocol is a safe and effective treatment plan for a patient with the same presentation. However, a very important component of utilizing the LSVT-BIG protocol is the patient and therapist's access to the necessary resources as well as internal environmental factors, such as a positive outlook and motivation. These factors are essential in order to obtain the positive outcomes as demonstrated in this case.



With a future patient, several history questions would be beneficial to include as to obtain a better foundation of information prior to implementing the plan of care. Inquiring about the specific stage of Parkinson's disease can provide better insight on the patient's level of disease progression. In addition, questioning the patient about their nutrition could be beneficial in understanding more on the patient's lifestyle habits as well as providing patient education. These questions were not asked in the history taking of this patient.

Additional tests and measures that were not performed in the examination and evaluation of the patient in this case study, but would be beneficial for future use, include a PD specific functional assessment, an objective gait assessment, and hand grip dynamometry measurements. Instead of the LEFS that was utilized in this case study, a PD specific clinometric, such as the Parkinson's Disease Quality of Life Questionnaire (PDQL), would potentially serve as a better functional outcome measure.

Using gait analysis technology to assess gait in terms of specific measurements for step and stride length, gait pattern, and cadence would provide a more accurate representation of the patient's impaired gait instead of a gait observation. Utilizing a hand dynamometer to establish baseline measurements for grip strength to compare bilaterally as well as to assess for change throughout treatment would be valuable.

Other disciplines that could have been included in the execution of this case, or who could benefit from this case reports, could include occupational and speech therapy, as well as primary care physicians. For patients who present similarly to this patient but have additional language impairments, a speech language pathologist would be resourced to potentially implement the LSVT-LOUD protocol and/or other speech

interventions. An occupational therapist would be beneficial for addressing some occupational impairments and activities of daily living. The primary care physician who referred the patient in this case study was vital in recognizing the patient's need for physical therapy and referring to an appropriate PT certified in the LSVT-BIG protocol.

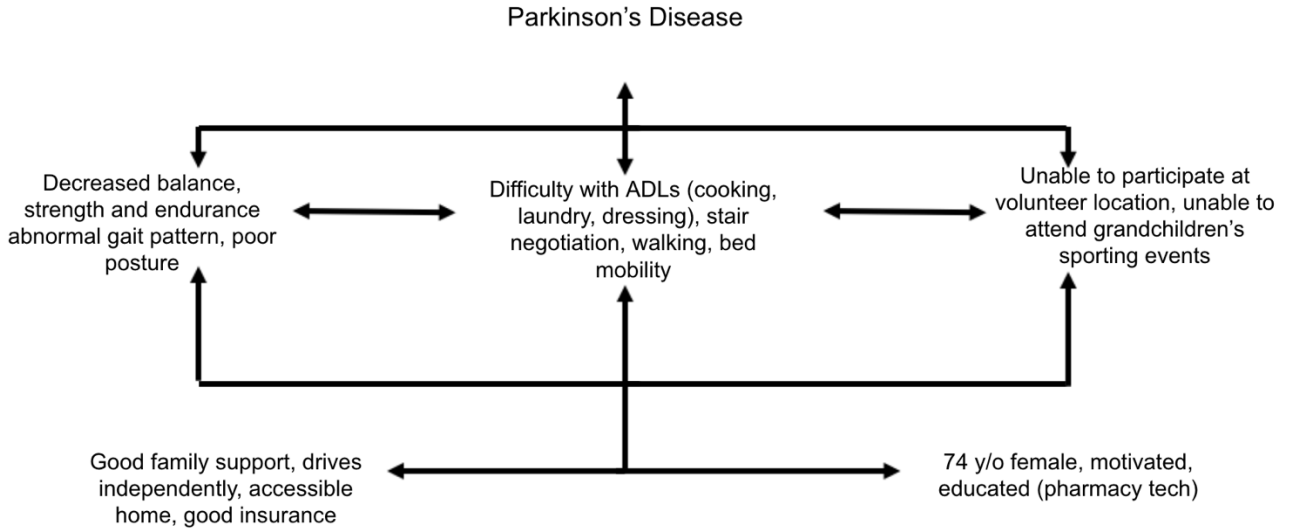
In recognizing the movement towards pay for performance in PT practice, the cost and benefit of this episode of care has been assessed. The cost of the entire episode of care was very reasonable when considering the drastic improvement in movement quality, functional task performance, gait, and balance for this patient. The overall cost of treatment was less than what it would have cost for the patient to be admitted to a long-term care facility or assisted living, as could be the potential result of loss of independence and functional mobility. These improvements carry over into preventing costs of potential falls, need for placement in a facility for additional care, and PD progression of symptoms.

The LSVT-BIG protocol, that was utilized in the episode of care for this case study, requires 16 one-hour sessions in a 4-week period. This protocol was tested against a shorter training protocol for effectiveness as to reduce costs.<sup>16</sup> The shorter protocol was found to not produce as significant of improvements as the longer duration, intensive LSVT-BIG protocol. This finding, in addition to the outcomes of this case study, suggest that reducing costs were not feasible for the management of this patient.

This case has influenced my professional development plan by instilling the goal of taking a continuing education course and obtaining my certification in the LSVT-BIG protocol. This certification will allow me to independently implement the LSVT-BIG

## APPENDIX

### Appendix 1. ICF Enablement Model



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## TABLES AND FIGURES

Table 1. Systems Review

<b>Cardiovascular/Pulmonary</b>	Unimpaired
<b>Musculoskeletal System</b>	<p>Impaired:</p> <p>Limited left knee and hip range of motion</p> <p>Decreased strength of bilateral grip and bilateral LE</p> <p>Seated and standing posture</p> <p>Increased forward trunk flexion, short/shuffled steps, no apparent reciprocal arm swing with gait</p>
<b>Neuromuscular</b>	<p>Impaired:</p> <p>Balance</p> <p>Coordination</p>
<b>Language/Communication</b>	Unimpaired
<b>Cognition</b>	Unimpaired
<b>Integumentary</b>	Unimpaired

Table 2. Results of Tests and Measures Assessed at Initial Evaluation and Discharge

<b>Measurement</b>	<b>Initial Evaluation</b>		<b>Discharge</b>	
Active range of motion:				
Shoulder flexion	Left 165°	Right 130°	Left 165°	Right 135°
Shoulder abduction	Left 165°	Right 120°	Left 167°	Right 130°
Hip flexion	Left 110°	Right WNL	Left WNL	Right WNL
Hip ER	Left 30°	Right 30°	Left 30°	Right 30°
Hip IR	Left 35°	Right 35°	Left 35°	Right WNL
Knee extension	Left 10°	Right 5°	Left 10°	Right 7°
MMT:				
Shoulder ER	Left 4/5	Right 4/5	Left 4+/5	Right 4+/5
Shoulder abduction	Left 4/5	Right 4/5	Left 4/5	Right 4/5
Hip flexion	Left 4/5	Right 4/5	Left 4+/5	Right 4+/5
Knee extension	Left 4/5	Right 4/5	Left 5/5	Right 4+/5
Ankle dorsiflexion	Left 4/5	Right 4/5	Left 4+/5	Right 4+/5
Tinetti Balance Scale	24/28		27/28	
TUG	9.11 seconds		8.13 seconds	
FTSST	12.86 seconds		11.15 seconds	
30-Second Chair Stand Test	11 stands		13 stands	
LEFS	25% impairment		23% impairment	

ER = external rotation, IR = internal rotation, 4/5 MMT score indicates strength with full ROM against gravity with minimal resistance, 4+/5 MMT score indicates with full ROM against gravity with moderate resistance, 5/5 MMT score indicates with full ROM against gravity with maximal resistance