THE EFFECT OF SHORT TERM REHABILITATION ON AN ELDERLY FEMALE WITH PARKINSON'S DISEASE AND ANGINA PECTORIS FOLLOWING RECTAL SURGERY

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ABSTRACT

Introduction: By addressing impairments that result from Parkinson's Disease, physical therapists have the opportunity to help individuals improve function and need for assistance in everyday life. Case Description: The patient is an 86 year-old short-term resident of a skilled nursing facility with Parkinson's Disease, angina pectoris, a history of multiple falls, and was there for rehabilitation following rectal surgery. Intervention: Interventions in the rehabilitation period included gait training, functional training, flexibility and strengthening exercises for the LE. Outcomes: After 5 weeks of daily physical therapy intervention, the patient demonstrated the following improvements in outcome measures: the Berg Balance Score improved from 21 to 26, the Timed Up and Go Test score improved from 34 seconds to 30 seconds, the Five Times Sit to Stand Test score improved from 43 to 39 seconds, the ABC score improved from 5% to 30%. These improvements indicated a reduced falls risk although not meeting the fall risk cut off score for any test. Conclusion: Physical therapy intervention in a skilled nursing facility had a positive effect on this individual, allowing her to return to her prior living situation with her daughter with improved functional ability recently following rectal surgery.

Suggested Key words:

Parkinson's Disease, Rehabilitation, Interventions, Co-morbidities, Rectal surgery, Angina
Introduction

Chronic illness and limitations in activities of daily living (ADL's) occur more often in the elderly. It is more common for the elderly to go through a series of conditions or disease processes than influence functional abilities, quality of life and mortality.\(^1\) A decline in functional status may occur during a hospital episode. Long term care facilities offer a variety of rehabilitation services. Skilled nursing facilities (SNF) provide short term rehabilitation for individuals post acute hospitalization. These individuals receive care to prevent longstanding disability following hospitalization or surgery.\(^2\) People recently discharged from a hospital are at increased risk of falls and readmission to hospital.\(^3\) The increased fall risk associated with medical problems is likely exacerbated by acute illness and relative inactivity while in the hospital.\(^3\) Generally, rehabilitation goals are to decrease impairments and functional limitations and to limit disability in ADL's.\(^4\) Intentions of these goals include restoring the individual to his/her prior level of function before returning home or improving the individual’s current level of function for permanent residence at the SNF or adult residence thereby enhancing the individual’s quality of life.\(^4,5\) Physical therapy (PT), occupational therapy (OT), or speech language therapy (SLT) are daily services provided to patients that reside in SNF's. Health care professionals in the SNF determine the patient's length of stay and how much therapy to provide.\(^4,6\) As mentioned previously, a decline in functional status may occur for various reasons (acute disease process, rectal surgery, incurable neurological disease, angina, etc) and SNF’s provide rehabilitation to help patients maintain current functional status or help restore them to their prior level of function.

Rectal prolapse is a medical condition more commonly occurring in females that occurs when all or part of the rectum protrudes through the anus and can be visible outside of
the body.\textsuperscript{7,8} It has been linked with chronic constipation and straining during defecation.\textsuperscript{7,8} A full thickness rectal prolapse is essentially all or part of the wall of the rectum projecting through the anus and can be addressed surgically.\textsuperscript{7,8} Rectal surgery is performed to repair the prolapse, continence and evacuation and limit constipation.\textsuperscript{7,8} The abdominal surgical approach involves suture rectopexy or sigmoid resection/colectomy with suture rectopexy which attaches the rectum in place to the abdominal cavity and repairs loose attachments.\textsuperscript{7,8,9} This procedure prevents rectal prolapse by keeping the rectum from slipping back down into the pelvis.\textsuperscript{7,8} Recurrence rates are typically low for abdominal approaches.\textsuperscript{8}

An ostomy is the surgically created opening in the body, usually the abdomen, that allows fecal matter to collect to a bag attached to the skin.\textsuperscript{8} Complications of an ostomy can include skin irritation, problems changing the bag, prolapse of the ostomy, or retracted stoma.\textsuperscript{8} It is important to note that the placement of an ostomy can result in psychological changes such as changes in a patient's self image, self-esteem and psychosocial changes.\textsuperscript{8,10} Patients have reported humiliation from some of the inconvenience the appliance may cause: contents can leak from ostomies; patients have reported escape of flatus uncontrollably; some types of clothing may get in the way of the ostomy.\textsuperscript{8} Nevertheless, the presence of an ostomy does not typically prevent individuals from continuing to live a regular lifestyle without restrictions or complications.\textsuperscript{8}

Parkinson’s Disease (PD) is a common, incurable, progressive neurodegenerative movement disorder with impairments that impact function and participation in activities of daily living (ADL).\textsuperscript{11,12,13,14} Risk factors include age, genetic, and non-genetic factors.\textsuperscript{11} PD affects nearly 1-2\% of the population of the US age 65 and older and prevalence increases in the age group of 85 and older.\textsuperscript{12,13} PD is caused by a degeneration of dopamine-producing
cells in the substantia nigra in the brain. Diagnosis relies on the appearance of clinical signs, however, by that time most dopaminergic neurons have been permanently destroyed. Physical, occupational and speech and language therapies in addition to medication can be effective in controlling and managing symptoms. Persons with PD that are admitted to a hospital are often hospitalized for reasons other than primary management of PD and typically have longer stays. Reasons may include falls, acute disease process, or dementia. Upon discharge, patients with PD are more likely to be placed in a short-term rehabilitation facility or SNF.

Common impairments of body structure and function in the PD population include tremor, rigidity, bradykinesia, and postural instability. Musculoskeletal compromise includes weakness, decreased extensibility, decreased range of motion (ROM), and postural instability and deformity. Postural and balance reactions are also impaired. A tremor is an uncontrollable shaking movement that typically affects the upper extremity and can be worsened by anxiety or stress. Rigidity is described as muscular stiffness or inflexibility and can cause pain or cramping. Bradykinesia is defined as the slowness of movement. Individuals with PD may have difficulty with moving quickly or starting a movement, such as getting out of a chair or rolling in bed. Exercise maintains movement, strengthens muscles and increases mobility. Non-motor symptoms may include incontinence and constipation, swallowing problems, dizziness, difficulty sleeping, depression and anxiety. Dementia is also prevalent among people with PD.

Limitations in functional abilities include difficulty with ambulation that manifests in different ways. Initial indicators of PD include gait disorders and alterations in ambulation ability. Limitations in the participation of ADL’s are restricted by gait...
disorders. Festination, hypokinesia (reduced movement amplitude and speed resulting in decreased step length) and freezing in addition to postural instability lead to frequent falls.\textsuperscript{11} As individuals loose balance and equilibrium reaction in addition to postural instability, their risk of falls increases.\textsuperscript{16} In persons with PD, falls frequently accompany gait disorders and are a leading cause of mortality.\textsuperscript{11,18} The fall rate in 50-70\% of persons with PD is at least one fall per year.\textsuperscript{19} Long, complicated movement patters or dual task requirements are problematic for individuals with PD and often the reason why people with PD fall.\textsuperscript{18} Turning during walking, carrying objects, stepping on various surfaces is particularly problematic.

The leading cause of death in the United States is ischemic heart disease.\textsuperscript{20} Coronary artery disease is the main cause of angina.\textsuperscript{21} Angina pectoris is defined as chest pain with possible referred pain resulting from lack of oxygen supplied by the heart.\textsuperscript{21} According to Tobin et al\textsuperscript{21} angina results from increased myocardial oxygen demand or decreased myocardial oxygen supply. The most common symptom of angina pectoris is left-sided chest pain or pressure and can involve referral pain patterns to the back and both upper extremities.\textsuperscript{21} Prinzmetal (variant) angina pectoris is characterized by attacks of angina at rest often caused by vasospasm or ischemic episodes, either on a normal coronary artery or at the site of a coronary atherosclerotic stenosis.\textsuperscript{22,23} These recurring attacks of chest pain are severe, usually occurring at rest between midnight and early morning and are not brought on by exercise or emotional stress.\textsuperscript{22,24,25} The episodes tend to be short in duration and resolve with rest and sublingual administration of nitroglycerin.\textsuperscript{21,24,25} Prinzmetal angina can lead to acute myocardial infarction, fatal arrhythmias, and sudden death.\textsuperscript{24,25} Routine screening for depression should accompany the general evaluation of all patients with cardiovascular disease.\textsuperscript{21} The purpose of this case report is to describe the effect of short term rehabilitation
on an elderly female with PD with an extensive past medical history that includes but is not limited to the following: status post rectal surgery with permanent colostomy, PD and angina pectoris. This research has been approved by the Institutional Review Board at the Sage Colleges.

Case Description

Examination

History

The patient was an 86 year-old widowed-female with PD treated in a SNF post rectal surgery where I met her as a physical therapy student. The patient and her daughter were both interviewed to obtain a patient history. The purpose of the interview was to obtain information regarding the patient’s prior functional status before initial admission to the hospital, what her house environment looked like, what barriers the patient would have in the house, what kind of assistance the patient would be receiving in the home, to what degree would the patient have to be independent and what the patient’s goals were. She had a history of long standing rectal prolapse which became increasingly difficult to reduce. She was initially admitted to the hospital with a very painful prolapse that would not stay reduced. A colonoscopy showed redundant mucosa and a very loose sphincter muscle. She underwent anterior colectomy, rectopexy and permanent colostomy. She developed non-cardiac chest pain post-operatively and required nitroglycerine. She gradually began eating on her own and passing some stool. In addition to her conditions, she also had progressively worsening urinary incontinence and she was on a toileting schedule prior to rectal surgery. She was transferred to a swing bed unit where she developed a Stage II sacral decubitus ulcer
secondary to urinary incontinence, had another episode of chest pain requiring nitroglycerine and had an episode of mesenteric angina requiring morphine. She was then transferred to the SNF one month post rectal surgery for further rehabilitation before returning home to independent living with her daughter in a two story house. Prior to surgery, she was fairly independent given her frailties and advanced age and ambulated with a cane or walker. Post surgery she had definite weakness and debilitation due to the surgery and PD. She was unable to independently care for her colostomy. In the SNF she was to receive education in independently caring for her colostomy.

The patient was a native of Germany with a high school education who immigrated to America at age 27. She spoke excellent English with a German accent. She lived with her daughter and had a son who lived out of state. The patient would only be utilizing the first floor of her daughter’s house that was accessible for using a front wheeled walker. The daughter reported that there are 7 stairs to enter the front of the house with a railing on the left and 2 wide and deep stairs for entry in the back of the house. The daughter also reported potential plans to install a ramp or make the back stairs narrower and less deep for easier ability to climb.

The patient’s past medical history included fairly mild PD (diagnosed 10 years ago), angina pectoris, mesenteric artery syndrome, hypertension (controlled), hyperlipedemia, gastroesophageal reflux, constipation, post-nasal drip, osteoporosis and depression. She had chronic bilateral leg swelling and pain at night. She also had a moderate thoracic kyphosis and Parkinsonian list (scoliosis) to the left. Her Parkinsonian symptoms included bradykinesia, mild rigidity, and postural instability. She displayed decreased step length and cadence in addition to decreased postural and equilibrium reactions.
Her past surgical history was significant for tonsillectomy, appendectomy, cholecystectomy, sinus surgery, left total knee replacement and total abdominal hysterectomy. She had been operated on for bilateral cataracts. She was a life-long non-smoker and rarely drank alcohol. Her medications upon admission to the SNF included: Simvastatin 20 mg per oral (po); Plavix 75 mg po daily; Norvasc 5 mg po daily; Sinemet 25/100 one po three times daily; Evista 60 mg po daily; Prozac 30 mg po daily; Flonase two sprays in each nare daily; Lasix 20 mg po daily; Imdur SR 60 mg po daily; Requip 0.5 mg po; MVI one po daily; Vitamin E 400 units po daily; Calcium 500 mg / Vitamin D 250 IU 2 tablets po daily; Atenolol 50 mg po daily; Miralax one tablespoon po daily; Senokot one tablet po twice daily; Protonix 40 mg po daily; VESIcare 10 mg po daily; Lortab 5/325 one po 4 hours per need for pain; Zofran 4 mg po per need for nausea. She also had an allergy to sulfa drugs.

**Systems Review**

Upon initial examination the patient had a resting heart rate of 62 beats per minute, blood pressure 130/62 in sitting, respiratory rate of 14, and had 1+ pitting edema in both ankles. She displayed decreased endurance as the evaluation progressed. Her skin integrity was intact and her extremities were cold to the touch. She had a colostomy bag in place. She was alert to person, place, time, and situation. She had poor/fair safety judgment as all her prior falls had occurred due to her impulsivity and forgetfulness in using her walker or cane. She had a loss of hearing in her left ear. Her communication skills and cognition were normal and she was in good spirits.

**Tests and Measures**

Visual inspection was used to determine functional ROM. She moved all her
extremities symmetrically and gross ROM was within functional limits. For the upper extremity (UE) ROM screen, the patient was asked to extend her arms out in front of her, out to the side, up to the ceiling, and then to touch the back of her head while seated. Through observation, it was determined that the patient demonstrated UE ROM that was within functional limits for her age. Functional limits consists of the ability to perform ADL’s independently without normal ROM and strength. For the lower extremity (LE) ROM screen, the patient was asked to bend her knees to the best of her ability to assess knee flexion and lift her legs up one at a time to assess hip flexion while in supine. In sitting, she was asked to extend her legs out one at a time to assess knee extension. Through observation, it was determined that the patient LE ROM was also within functional limits for her age.

Muscle strength was determined by manual muscle tests (MMT.) Only LE muscle strength was assessed since the occupational therapist in this facility managed UE issues. The patient demonstrated 4-/5 strength throughout her left LE, 4/5 strength throughout her right LE and her trunk strength was 3/5.

Visual observation of sitting and standing posture revealed the following impairments: a forward head position, moderate thoracic kyphosis, and a scoliosis C curve to the left. Cleland et al. established a less than chance interrater agreement for visual assessment of forward head posture. By visual observation it was determined that the patient demonstrated good- sitting static and dynamic balance and fair+ standing static and dynamic balance.

The ability to perform ADL’s is considered self care management. Visual observation was used to determine assistance level in the following ADL's: bed mobility, transfers, toileting and ambulation. The bed mobility assessment involved visual observation
of the patient performing rolling, bridging, scooting, and supine to sit and sit to supine transfer. The patient demonstrated independence in rolling to the right and left side; she was able to perform one bridge (keeping her feet on the bed and lifting her pelvis up); and she was able to scoot upward in the supine position independently. The patient required minimal assistance of one person for all transfers; when performing a supine to sit transfer in order to push her upper body into the sitting position; when performing a sit to supine transfer to help her left leg into bed; stand - sit; and she required verbal cues for proper hand placement. As a result of her weakness from surgery and a shuffling gait pattern with decreased heel strike secondary to the PD, the patient required the use of a front wheeled walker for ambulation 50 feet at the minimal assistance level of one person.

The patient participated in the following clinical tests and measures to determine baseline measurements and after week 4 of the intervention period: the Berg Balance Scale (BBS), the Timed Up and Go test (TUG), timed assessment of performing 5 Times Sit to Stand Test (FTSST), and the Activities-Specific Balance Confidence Scale (ABC). The BBS and TUG were used to assess the patient's balance and gait adaptation. The ABC scale was selected to assess the patient’s confidence level while performing a variety of tasks that require proper balance.

The BBS developed by Katherine Berg, is a gold standard for balance measures and is an excellent predictor of falls for older adults. The BBS measures balance in adults by assessing the performance of functional tasks and it is used to determine effectiveness of interventions. The BBS score appears to be a good overall measure of function in people with PD and correlates with scores of the other tests of functional performance in the PD population. It has good internal consistency, sensitivity, specificity, content and
construct validity, and inter-rater reliability (ICC = .99 interrater, .98 intrarater reliability; 91% sensitivity, 82% specificity)\textsuperscript{36} Less than 45/56 indicates fall risk in the older adult. A score of 36/56 or below places the individual at 100% risk for falls. At the initial evaluation, the patient scored 21/56 which puts her at 100% risk for falls. A minimal detectable change (MDC) refers to the minimal amount of change that reflects true change by a patient rather than measurement error.\textsuperscript{37,38} An MDC of 5 points in the BBS in an older adult is clinically significant and not due to chance.\textsuperscript{39}

The TUG correlates with the BBS (r = -.78) and measures functional mobility and gait speed.\textsuperscript{38} It involves timing the patient performing a transfer from a sitting position to a standing position, ambulation and turning, all of which are frequently impaired in people with movement disorders.\textsuperscript{12,35,40} The patient was instructed to sit in a chair with armrests, stand, walk to a point 10 feet away, turn around, walk back to the chair and sit down. The patient was allowed to use her assistive device. It has good content validity, construct validity, inter-rater reliability, sensitivity and specificity (ICC = .99 for inter-rater and intrarater reliability; 87% sensitivity and specificity)\textsuperscript{39,41,42} Adults who take more than 30 seconds are considered dependent in ADL’s.\textsuperscript{40} Adults who take more than 14 seconds to perform the test are considered a high falls risk.\textsuperscript{40} At the initial evaluation, the patient scored 34 seconds which placed her in the dependent with ADL’s category. An MDC of 2 seconds has been reported in the literature especially for the PD population and is clinically significant.\textsuperscript{43}

The FTSST times how fast a person can perform five sit to stand transfers.\textsuperscript{44} It is used to assess postural control, lower extremity strength, fall risk and correlates with gait speed.\textsuperscript{44} Community dwelling adults are able to rise from a chair independently and this transfer plays a necessary role in their independence.\textsuperscript{45} Individuals without balance disorders rise from a
chair more quickly than those with balance disorders.\textsuperscript{45} When the FTSST was measured in individuals with and without balance disorders, its positive predictive value was 61\%\textsuperscript{44}. Greater than 15 seconds predicts falls (ICC = .99 for interrater reliability; 75\% sensitivity, 68\% specificity)\textsuperscript{46} The MDC for the FTSST has not been identified in the literature for people with PD. During the initial evaluation, it took the patient 43 seconds to complete the test.

The ABC correlates with the TUG (Pearson r = -.54) and is used to assess a person's confidence (0\%=no confidence, 100\%=completely confident) in abilities to perform an array of functional activities. It includes 16 different activities ranging from ambulating within her home or the SNF to outside on an icy sidewalk. 85\% or less indicates balance dysfunction in the elderly; a score of 67\% or less indicates a risk of falling.\textsuperscript{44} The patient scored 5\% and admitted that she did not feel confident in performing nearly all activities independently. The MDC values for the ABC scale in the older adult have been identified as a range of 18\% to 38\%.\textsuperscript{36,47}

Given that the patient reported a low level of confidence in all aspects of the ABC in addition to low scores on the BBS, TUG and FTSST and demonstrated decreased endurance and functional mobility post surgery, restorative physical therapy in the form of a variety of interventions was warranted in order to return the patient to her prior level of function.

**Evaluation**

A review of the patient's previous medical history revealed a long list of relevant health problems. She stated her main goal was to return home to living with her daughter. This would require her to be independent with all transfers and ambulation and at most at a supervision level with stair climbing. At initial evaluation the patient reported little to no pain
and she had no instance of angina in the morning. There was minimal redness around ostomy. Blood pressure, heart rate, and respiratory rate were unremarkable. She had 1+ pitting edema in bilateral ankles. Gross ROM was slightly limited. She had decreased strength, decreased balance and decreased postural and equilibrium reactions. She was at the minimal assistance level of one for all transfers.

Impairments resulting from the surgery included pain, swelling, decreased strength throughout and endurance due to inactivity. The patient was limited in ambulation and limited in performance of ADL’s. Although the patient displayed weakness, decreased endurance, and decreased ambulation as a result of her recent surgery, the PD contributed greatly to her debility. The patient demonstrated impairments in motor function and endurance, difficulty negotiating terrains, loss of balance and frequent falls and decreased safety awareness in her home environment. Impairments that the patient experienced resulting from angina were pain, nausea, shortness of breath and sweating. The patient was limited in her ability to sleep and rest because of her symptoms.

**Diagnosis**

The patient was categorized into 3 practice patterns as found in the *Guide to Physical Therapist Practice*. Primary practice pattern was Pattern Musculoskeletal 6B: Impaired Aerobic Capacity / Endurance Associated With Deconditioning. The patient’s deconditioning following recent rectal surgery placed her in this practice pattern. Secondary Practice Pattern was Neuromuscular 5E: Impaired Motor Function and Sensory Integrity Associated With Progressive Disorders of the Central Nervous System. The patient’s PD placed her in this category. Tertiary Practice Pattern was Cardiovascular 6D: Impaired Aerobic Capacity/Endurance Associated With Cardiovascular Pump Dysfunction or Failure. The
patient’s angina and hypertensive heart disease placed her in this category. Results of the clinical tests and observations led to a physical therapy diagnosis of weakness, decreased endurance and decreased gait due to limitations in postural instability related to PD.

**Prognosis**

At time of the initial evaluation, good participation by the patient and improvements towards meeting all goals was anticipated. Over the course of 4 weeks, the patient was expected to demonstrate optimal level of performance and achieve highest level of functioning described in the anticipated goals.

**Plan of Care**

**Short Term Goals**

Short term goals (STG) were determined during the initial evaluation and were set as follows for a two week time frame:

1) The resident was expected to demonstrate an increase in LE strength by ½ a grade to 4/5 bilaterally to assist with all transfers and ambulation. 2) The resident was expected to demonstrate good-dynamic standing balance to improve transfers and ambulation. 3) The resident was expected to demonstrate safe ambulation with an improved gait pattern using front wheeled walker with contact guard assistance for at least 75 feet on even surfaces. 4) The resident was expected to demonstrate transfers from bed to chair and chair to bed with contact guard assistance.

**Long Term Goals**

Long term goals were set as follows:

1) The resident was expected to demonstrate independence with all transfers for a safe return to prior living arrangement. 2) The resident was expected to climb 10 stairs with an
alternating pattern using one hand on the railing at the supervision level. 3) The resident was expected to demonstrate safe ambulation with an improved gait pattern using a front wheeled walker at the supervision level for at least 200 feet on even surfaces and independence with ambulation for 100 feet. 4) The resident was expected to demonstrate good safety awareness and judgment with all transfers and ambulation.

**Intervention**

The main goal of this physical therapy program was to improve and enhance the patient’s functional abilities for safe discharge. Interventions included decreasing impairments, reducing functional limitations, decreasing fall risk, and promoting a healthy adjustment to the psychological impact of the surgery and disease. Interventions in the treatment sessions included strengthening exercises, stretching, balance exercises, trunk rotation exercises, stair climbing, education in compensatory strategies, safety education with transfers and ambulation and an ambulation program that involved improving adaptation. External cueing was used to improve gait speed and step length. Cognitive movement strategies to improve bed mobility and transfers were taught. Exercises to improve joint mobility and strength and balance training were incorporated into the treatment plan.

The patient was seen for 30-45 minute sessions 5 times a week for approximately 5 weeks. They were given at the same time of day. Treatment sessions for the 5 week duration were provided by a student physical therapist (SPT) or a physical therapist assistant (PTA). Each session typically consisted of gait training, ROM, flexibility, strengthening, and functional exercises. Vitals (blood pressure, heart rate and oxygen saturation) were taken at the beginning of every treatment session to obtain a baseline measurement and ensure that therapy can be provided. Daily sessions began with gait training for approximately 5-10
minutes in the hallway as a warm up. The patient ambulated 125 feet on an even surface utilizing a front wheeled walker with minimal assistance of one person during the first treatment session and progressed in distance and time with less assistance with proceeding sessions. The patient was encouraged to improve her gait by walking with large strides and correct posture. Correct posture for her involved engaging her abdominal muscles, standing tall to improve thoracic extension and thinking of shortening her left side to reduce thoracic curve. The patient was requested to walk with a wide base by separating her feet more than what she is used to and focus on heel strike in order to reduce shuffling. The patient was educated in cognitive cues such as visualizing a larger base of support and an appropriate step length in order to help her safely achieve improved ambulation distance. As the patient’s endurance and aerobic capacity increased, daily sessions also terminated with this type of gait training.

Once the patient graduated to a supervision level in ambulation, stair climbing was included into her program. A staircase with four 6” steps that lead to an enclosed 30” square platform and railings on either side was available at the physical therapy department and was used for stair training. Initially, the patient was instructed to hold both railings when navigating the stairs and perform a step to pattern. She was instructed to step up with her right leg and step down with her left. Upon first attempt, the patient navigated the staircase (4 steps, up and down) holding on to both railings with a step to pattern with contact guard assistance for balance. As her strength and balance improved, the patient progressed to climbing 16 stairs without rest with a regular step through pattern at the supervision level holding onto the railing with her left hand to simulate her home environment. Emphasis was also placed on safely turning around at the top of the platform. The patient was educated on
proper utilization of the railings for proper hand placement and was given verbal reminders to keep her body weight forward so not to shift weight onto her heels and decrease the chances of falling backward.

ROM, strengthening and stretching deficits were addressed in order to improve outcomes. PNF techniques utilizing functional patterns were used to address trunk strength and mobility. Stretching of the hamstring and gastrocnemius muscles was performed in the supine position with use of a gait belt. Stretches were performed 2 times per each leg and held for 30 seconds. Seated LE strengthening exercises were given to the patient. These included seated long arc quads (LAQ), seated hamstring curls, and seated hip abduction. To start, a yellow Theraband was used for resistance and was increased to resistance with a red Theraband. These were performed in 2 sets of 10 repetitions. As she progressed, the need for seated exercises was eliminated and standing strengthening exercises to improve trunk, hip postural muscles and knee extensor muscles were introduced into her strengthening program to make the program more functionally based. These exercises included mini-squats, heel raises, forward lunges, single leg hip flexion / abduction / extension, hamstring curls and standing marches all while holding onto the bar for balance. These were performed in 2 sets of 10 repetitions.

The PNF technique of Alternating Isometrics / Rhythmic Stabilization (AIRS) was used to encourage stability of the trunk, hip, and shoulder girdle. In AI, resistance is applied on the same side of the joint. In RS, resistance is applied on opposite sides of the joint. When AIRS was performed, the patient maintained a seated position while the therapist applied manual resistance for 2-3 seconds to her shoulders. The patient was educated that no motion should occur with her body and she was to resist the therapist’s movements. AIRS were first
performed with the patient sitting in a locked wheelchair. The exercises were progressed to challenging the patient by having her sit on a treatment table and then later on a foam surface. AIRS were performed a total of 12 times at each treatment session.

ROM exercises were incorporated to increase trunk extension and rotation. The patient participated in cone reaching with alternating upper extremities (UE) in D1 and D2 diagonal PNF patterns. These patterns were used since PNF diagonals are functional, based on normal movement and involve rotation. Cone reaching was performed sitting on a foam surface as well as in standing first using her walker and progressing to reaching without the use of her walker for balance. Cone reaching was performed 6 times with each upper extremity for each pattern.

Balance exercises focused on activities that were reactive and anticipatory within functional contexts; low velocity weight shifts, movement transitions, and physioball activities that elicit balance and equilibrium reactions and encourage pelvic and trunk mobility were incorporated in the intervention program. Weight shifts on a foam block and forward and side lunges were performed. Ball toss with a medium sized ball with the patient sitting on a foam block on a treatment table and then in standing were used to elicit the aforementioned responses. The balance exercises also included standing with a decreased base of support, forwards and sideways walking and lunging, and graded reaching activities in sitting and standing.

Functional training was an integral part of the intervention process. Since the patient’s goal was to return to her prior living arrangement, it was necessary that she become as independent as she would need to be when living with her daughter. Sit to stand and toilet transfers were practiced. Bed mobility activities included rolling from supine to sitting
position and from sitting to supine. Effective strategies were taught for rolling over, pushing up to sit up and getting in and out of bed. Since the patient had a tendency not to lean far enough forward when standing up, a common problem in people with PD, sit-stand transfers were performed in sessions. The transfer sequence was instructed to her as follows: scoot the buttocks forward to the edge of the chair and shift the body forward, place the feet flat on the floor, lean the trunk forward, and stand up while thinking of leaning forward and up. At least a total of ten sit-stands were performed at each treatment session.

Obstacle courses that incorporated all these elements previously mentioned were the highlight of the sessions in order to improve the patient’s adaptation to home environment (see figure 1.) Obstacle courses involved turning strategies, stepping over three 6 inch cones to reach the parallel bars, stepping on and off various walking surfaces (ie: foam surfaces) placed in the parallel bars while holding onto the bars for safety, starting and stopping (ie: picking up six inch cones from the floor and reaching to place them into the therapist’s hand in PNF D1 and D2 patterns), and stand-sit-supine-sit-stand transfers on the treatment table. In order to reduce boredom, the obstacle courses were varied slightly while still utilizing the same components. Table 1 summarizes interventions performed for 5 weeks.

Outcomes

At the end of week 5 of the intervention period, the patient’s BBS score increased by 5 points, from 21 to 26. Five specific components showed the most improvement. The patient was able to stand independently using her hands compared requiring minimal assistance to stand or stabilize from the initial examination. The patient was able to stand safely for 2 minutes without any assistance when the BBS was lastly administered. Upon initial examination, the patient was only able to stand for 30 seconds unsupported. The patient was
able to sit safely and securely with her arms folded for 2 minutes, compared with her ability to sit unsupported for 2 minutes under supervision. The patient's transfers improved from requiring one person to assist to being able to transfer safely with the definite need for hands. The patient's functional reach greatly improved. Upon the initial test, the patient was able to reach forward with an outstretched arm with supervision only. After the intervention period, the patient was able to safely reach forward 5 inches.

The patient also showed improvement in her TUG score as she was able to complete the TUG in 30 seconds versus 34 seconds at the initial examination, a reduction of 4 seconds. The patient completed the FTSST in 39 seconds, as compared to a performance of 43 seconds during initial administration of the test. Her ABC scale score improved from 5% to 30%, a 25% increase. Upon the end of the intervention, the patient reported improvements in her confidence level while performing activities that required balance and ambulation. She commented that she felt that she was walking straighter, that she had more energy to participate in activities in the nursing home, and that she had more confidence to go home.

Upon the end of the 5 week intervention period, the patient met all the goals specified. Her functional levels at discharge were as follows: independence with all transfers, good static and dynamic sitting balance, good- static and dynamic standing balance. Her LE strength improved to 4+/5 throughout. The patient ambulated at least 250 feet with a front wheeled walker independently. She was able to negotiate at least 16 stairs while remaining at a supervision level due to safety.

Discussion

A number of factors including the ostomy placement, angina attacks, impairments secondary to recent surgery, as well as the Parkinson's Disease process all contributed to the
plan of care for this patient. Rectal surgery is performed to repair the prolapse, continence and evacuation and limit constipation. Recovery time after rectal surgery takes approximately 5 days and is about the same for the younger adults and the elderly. The patient in the case report was hospitalized for 7 days and lagged slightly behind a typical recovery period which may be attributed to her multiple co-morbidities and PD. Rectal surgery may result in psychological changes that include depression. Although the patient in this report had a history of depression, she did not display signs of depression during the course of her physical therapy treatment nor did she appear to be negatively concerned regarding her ostomy. Physical therapy treatment was not affected by any emotional changes the patient may have had. The patient appeared to handle her permanent ostomy very well, voicing several times that she just needs 'to get used to it' and that she requires more education in caring for her ostomy as she felt this would be the biggest challenge for her and her daughter when she returns home.

The patient had 5 separate instances of prinzmetal angina requiring sublingual nitroglycerine while on program. These recurring attacks of chest pain occur without regard to cardiac workload and are typically not precipitated by exercise or emotional stress and exercise tolerance tends to be normal. These recurring episodes affected her physical therapy treatment. As a result of the early morning angina attacks the patient was more fatigued than usual. On the days of these episodes, physical therapy treatment times were shortened in order to decrease the amount of time the patient was performing more strenuous activity. Her therapy was scheduled in the afternoons, so the time of the afternoon sessions did not have to be changed and the patient had adequate time to recover from the angina prior to therapy. The patient was monitored more closely with vital signs and observation, and was
told to perform only the activities that she could tolerate. Although the patient was able to tolerate activity without precipitation of symptoms, extra measures were taken in order not to exacerbate these symptoms.

According to Stickley et al., only a small percentage of hospital admissions are for the primary management of PD and when admitted, these persons typically have a longer stay than those without the diagnosis. This holds true for the patient in this case report with her longer than average hospitalization for recovery post rectal surgery. Persons with PD are more likely to be discharged to a SNF prior to going home. Immediately following rectal surgery, the patient demonstrated significant declines in her functional mobility and endurance. She required minimal assistance of 2 people for bed mobility and sit to supine transfers and required moderate assistance of 2 people for sit to stand transfers and ambulation 20 feet with a rolling walker with increased fatigue. Her strength in all extremities ranged from 3+/5 to 4-/5 and her standing balance was Fair+.

The patient in this study responded favorably to the exercise regimen that addressed her impairments. By week 5 the patient's strength increased by at least half a grade. Some of her improvement may have been attributed to a general recovery period from surgery and hospitalization. It is difficult to distinguish between the direct effect of the strengthening program and the improved health post surgery. The literature supports the notion that exercise response is similar in adults with mild-moderate PD and adults without PD. It has been shown that exercise has beneficial effects on physical function particularly muscular strength, balance, postural instability, gait, and aerobic capacity in individuals with PD. Studies have supported a strengthening program in individuals with PD. Current studies suggest that resistive training in persons with mild to moderate
PD can increase gait speed and LE function and help decrease the risk of falls.\textsuperscript{55,56,57} Although the research is limited in parameters for exercise prescription in people with PD, the American College of Sports Medicine \textsuperscript{58} recommends that individuals with PD should perform strengthening exercises with guidelines of 1 set of 8 to 12 repetitions. The patient in this case report performed 2 sets of 10 repetitions since she was not fatigued after 1 set.

The patient made improvements in truncal flexibility and strength as noted visibly as well as in outcome measures particularly in sitting unsupported, transferring independently and in her ability to reach forward. Schenkman et al\textsuperscript{59} found that there exists a relationship between spinal flexibility and functional reach. They also found that flexibility exercises improves joint ROM in individuals with PD.\textsuperscript{59,60} The trunk is often affected in PD and associated spinal inflexibility results in impaired posture.\textsuperscript{59,60} Falling risk increases with the degree to which posture is impaired since it makes it more difficult to control the center of gravity resulting in balance and gait problems.\textsuperscript{59,60} Physical function can be improved with flexibility exercises of the spine, trunk, hips, and shoulders.\textsuperscript{59,60} PNF technique can be used for this purpose in healthy adults and it may be beneficial for individuals with PD.\textsuperscript{49}

Reaching, turning and reaching, and squatting and reaching is associated with postural instability and falls in persons with PD.\textsuperscript{61} Since the patient was to return home after rehab, it was important to improve postural stability and balance so that the patient could reach for objects on high or low shelves. For this reason, PNF upper extremity diagonal D1 and D2 patterns were used in the form of cone reaching in sitting and standing. These 2 patterns incorporate diagonal and spiral movements that mimic functional patterns occurring in ADL's.\textsuperscript{62} These movements are based on principals of proximal to distal sequencing which is important in the improvement of motor abilities.\textsuperscript{62} D1 and D2 patterns are also beneficial in
recruiting core musculature for mobility and stability. There is very limited research to justify the use of PNF in adults with the disease and research should investigate the use of PNF in rehabilitation for patients with PD.

This patient made improvements in balance as noted with improvements in clinical measures. Balance training is important in persons with PD since it helps to reduce the risk of falls. Since there are gaps in the literature as to specific balance exercises best suited for individuals with PD for improving balance and reducing the risk of falls general balance activities were used for this patient. Weight shifting on foam, single leg stance, and dynamic balance activities with the use of a therapy ball were used to elicit balance responses in the patient. The patient's improvement in balance could also be attributed to the combination of interventions she was receiving in short-term rehab. Research indicates that balance training combined with LE strength training, is more effective in improving balance than balance exercises alone in the PD population.

The patient in this study made consistent improvements in gait quality and duration. Her improvements may have been attributed to external cueing, education in visualization, and daily repetition. She responded favorably to verbal stimulation for improving posture, taking longer strides, widening stance, focusing on heel strike. The verbal cueing was provided to the patient during all forms of daily gait training. Morris et al provide evidence that movement strategies can help people with PD to balance and ambulate more effortlessly. Their research demonstrated that elderly people with moderate to severe PD were able to improve their gait with longer steps and a more normal stepping rate by compensating for hypokinesia with the use of external cues that ranged from white lines on the floor, a rhythmical beat from a metronome, and verbal commands. Morris et al
found that even without floor markers present, cognitively intact individuals with PD without significant postural instability can immediately walk with a more normalized gait pattern simply by thinking about walking with long steps. Other mental strategies researchers have found that help with improving gait in PD include mentally rehearsing the movement pattern prior to performing the action, shortening long movement sequences and verbally reciting phrases such as "long steps, or think big." In PD, movement problems occur due to a failure in the ability to automatically appropriately scale and time sequential movements. External cueing provides individuals with PD a nonautomatic drive for movement scale and timing. However, research is limited on whether this kind of education has long-term effects. Future research is needed to determine what kind of cueing and in what duration could have long-term benefits for such individuals. The randomized control trial by Morris et al reported that balance and gait disability can be decreased with a 2 week inpatient hospital program of 45 minutes twice a day, however, gains were not fully preserved at a 3 month follow up. There is evidence to suggest that persons with mild PD still have the ability to learn new motor skills. Canning et al showed that multiple task walking speed can be increased in individuals with PD with a program focusing on multiple-task gait training that incorporates gait, manual and cognitive activity.

People with PD have the ability to learn new, more effective strategies to improve gait, all transfers and ADL's. Obstacles courses that incorporate walking on and over various objects have been shown in the research to improve walking ability and movement strategies. These improvements in walking help individuals better negotiate real life environments and help improve confidence. The purpose of the obstacle courses during treatment for this patient was to improve functional ability with repetition in order to be able
to return to independent living with her daughter. The patient in this case report made improvements in clinical measures as well as visible improvement in gait quality. She voiced increased confidence in her abilities to navigate real life situations that included moving through her home environment. Her increase of confidence can be attributed to the daily repetition of the obstacle courses. Improvement in the quality of gait also reduces the risk of falls in the older population.⁷⁴ Although she did not reach the fall risk cut-off score, she did reduce her risk of falls. Studies show that daily repetition of tasks is key for retaining the new information.¹² Additionally, Lin et al⁷⁵ suggests that people with PD benefit from repetitions of tasks rather than random practice. This was especially important in this case report, as all the tasks were repeated multiple times by the patient daily.

The patient demonstrated improvements in strength, endurance and functional abilities. Her strength improved to 4+/5 throughout her bilateral LE. Her endurance improved as evidenced by increased ambulation distance. She became independent in all transfers and ambulation with a distance of 250 feet. The patient demonstrated these improvements with improved scores on the clinical measures decreasing her risk of falls although the scores were still below the fall risk cut off. Although the patient was still a risk for falls, clinically meaningful improvements were made. She had clinically significant improvements in her BBS, TUG, and ABC scores. The MDC for the BBS is 5 and her increase in the BBS score met this value. The MDC for the TUG is 2. Her TUG score changed by 4 seconds indicating a significant improvement. Her change of 25% in the ABC scale fell in the range of MDC values of 18-38%. In such a patient, eliminating her fall risk especially in such a short duration proves to be very difficult since her baseline measures are so far beyond the fall risk cut offs.
There are several limitations to this case report to consider. Results cannot be generalized to other patients with the same diagnosis receiving physical therapy care since this is a case report. A positive bias may be suggested since a single student physical therapist examined and re-examined the patient. Generally, there are gaps in the literature with regard to long term benefits of exercise programs. Further studies are needed to investigate long-term follow ups to determine if gains that are made can be maintained long-term. Research should investigate how much and what kind of specific obstacle course functional training should persons with mild PD receive for long-term benefits. Lastly, there is very limited research to justify the use of PNF in adults with the disease and research should investigate the use of PNF in rehabilitation for patients with PD.

**Conclusion**

In this case report, an 86 year-old short-term resident of a SNF with an extensive past medical history that included but was not limited to rectal surgery with permanent colostomy, PD and angina pectoris participated in 5 weeks of physical therapy that included gait training, functional training, balance training, ROM, flexibility and strengthening exercises for the LE. The goal of short-term rehabilitation was to restore the patient to her prior functional level in order for her to safely return to her prior living arrangement. This main goal was met by addressing the motor impairments resulting from the disease process while taking into account her other co-morbidities such as her angina episodes and recent surgery. Functional training involved repetitions of task-specific exercises. Balance activities encouraged postural and equilibrium reactions in functional situations. Gait training incorporated verbal cues with turning strategies and improving adaptation to obstacles in the environment. PNF techniques were used to increase trunk strength and flexibility. The patient
demonstrated improvements in strength, endurance and functional abilities. The patient demonstrated these improvements with improved scores on the clinical measures decreasing her risk of falls although the scores were still below the fall risk cut off. She made clinically significant improvements in her BBS, TUG, and ABC scores. Upon discharge from the SNF, the patient met all physical therapy goals set at the initiation of treatment and returned home to independent living with her daughter thereby demonstrating favorable effects of short-term rehabilitation.
References:


Table 1. Interventions for the 5 Week Period.

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
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<tbody>
<tr>
<td>LE seated strengthening</td>
<td>2 x 10</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gait training (distance)</td>
<td>50 ft</td>
<td>125 ft</td>
<td>175 ft</td>
<td>200 ft</td>
<td>250 ft</td>
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<tr>
<td>Functional mobility training</td>
<td>All transfers</td>
<td>X</td>
<td>X</td>
<td>Sit - stand</td>
<td>X</td>
</tr>
<tr>
<td>Stair climbing (# of stairs)</td>
<td>-</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Balance activities</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Obstacle Course</td>
<td>-</td>
<td>2x</td>
<td>4x</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LE standing strengthening</td>
<td>-</td>
<td>-</td>
<td>2 x 10</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PNF (D1, D2)</td>
<td>-</td>
<td>-</td>
<td>2 x 6</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

X Repeated
- Not performed

Table 2. Outcome Measures of Balance and Gait at Week 1 and Week 5 with MDC values and Fall Risk Cut-Off Scores.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Week 1</th>
<th>Week 5</th>
<th>Change</th>
<th>MDC</th>
<th>Fall Risk Cut-Off Score</th>
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<tbody>
<tr>
<td>BBS (0-56)</td>
<td>21</td>
<td>26</td>
<td>5*</td>
<td>5</td>
<td>49</td>
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<tr>
<td>TUG (s)</td>
<td>34</td>
<td>30</td>
<td>4*</td>
<td>2</td>
<td>14</td>
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<tr>
<td>FTSST (s)</td>
<td>43</td>
<td>39</td>
<td>4</td>
<td>N/A</td>
<td>15</td>
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<tr>
<td>ABC (0-100%)</td>
<td>5%</td>
<td>30%</td>
<td>25%*</td>
<td>18-38%</td>
<td>67%</td>
</tr>
</tbody>
</table>

*Clinically significant
Figure 1. Obstacle course.
September 13, 2011

Anna Chetnik
The Sage Colleges
Physical Therapy Program
65 1st Street
Troy, NY 12180

IRB PROPOSAL # 10-11-116
Reviewer: Susan C. Cloninger, Chair

Dear Ms. Chetnik:

The Institutional Review Board has reviewed your application and has approved your project entitled “The Effect of Short Term Rehabilitation on an elderly Female with Parkinson’s Disease and Angina Pectoris following Rectal Surgery.” Good luck with your research.

When you have completed collecting your data you will need to submit to the IRB Committee a final report indicating any problems you may have encountered regarding the treatment of human subjects

Please refer to your IRB Proposal number whenever corresponding with us whether by mail or in person.

Please let me know if you have any questions.

Sincerely,

Susan C. Cloninger, PhD
Chair, IRB

To Be, To Know, To Do.