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TITLE PAGE

Inpatient Physical Therapy Management for a Patient with Chronic Pulmonary Complications Secondary to Multiple Lobectomies: A Case Report

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The patient signed an informed consent allowing the use of her medical history for this case report. She received information on the university's policies regarding the Health Insurance Portability and Accountability Act (HIPPA).

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Key Words: Multiple lobectomies, bronchiectasis, pulmonary limitations, physical therapy

ABSTRACT

Background and Purpose: Bronchiectasis is a disease defined by abnormal dilation of the bronchi from recurrent infections and/or chronic inflammation, which can lead to irreversible lung damage. Based upon severity and patient response to conservative treatment, a lobectomy may be required to resolve their symptoms. Though surgery may provide symptom relief and improve overall quality of life, patients are likely to have long-term pulmonary complications. There are several studies regarding the treatment of patients with pulmonary limitations secondary to a lobectomy. However, there is little to no evidence regarding the long-term treatment of patients who have undergone multiple lobectomies. The purpose of this case report was to describe an appropriate intervention program for an 82-year-old female who suffered from multiple pulmonary complications secondary to multiple lobectomies.

Case Description: The patient was an 82-year-old female who had multiple lobectomies at age 18 secondary to bronchiectasis. She was admitted to a skilled nursing facility (SNF) with a diagnosis of a chronic obstructive pulmonary disease (COPD) exacerbation. Her primary symptoms included generalized weakness and increased dyspnea. The prescribed intervention program included cardiovascular endurance training, dynamic standing balance activities and bilateral lower extremity (BLE) strengthening.

Outcomes: The distance on the 6-Minute Walk Test (6MWT) increased by 36.0 meters (m) (140.8m to 176.8m), dynamic standing balance increased from fair+ to good, BLE strength increased from 3+/5 to 4/5 (fair to good) and ambulation distance improved from 150 ft using a two-wheeled walker (2WW) to 300 ft using a four-wheeled walker (4WW).

Discussion: Incorporating cardiovascular endurance training, dynamic standing balance exercises and BLE strength training appeared to have improved this 82-year-old woman's

independence with functional mobility at discharge.

Word count: 3,102

INTRODUCTION/BACKGROUND and PURPOSE

Bronchiectasis is a disease defined by abnormal dilation of the bronchi, which is a result of recurrent infections and/or chronic inflammation.[1,2,3] These recurrent infections can destroy the cilia inside the airways, causing mucus to accumulate in the lungs.[1,2,3] The excess in mucus can lead to greater inflammation which further destroys lung tissue.[1,2,3] The annual incidence of bronchiectasis in the United States is estimated at 29 per 100,000 people; for unknown reasons, the incidence has increased 8% by annually since 2001.[4] As of 2013, between 340,000 and 522,000 people in the United States are currently being treated for bronchiectasis.[4]

Based upon severity and patient response to conservative treatment, surgical repair may be required to resolve their symptoms.[3] Studies have shown that surgical approaches are effective in symptom control and improving patients' overall quality of life.[3,5,6] Depending on the extent of the damage, either a lobectomy or pneumonectomy is performed.[5] A *lobectomy* is the surgical removal of one lobe of a lung and a *pneumonectomy* is the surgical removal of an entire lung.[5] Although these two surgical procedures reduce the symptoms of bronchiectasis, patients who undergo one of these surgeries are more likely to have long-term pulmonary limitations.[3] The mortality rate of a lobectomy ranges from 9-25%.[3] The mortality rate of a pneumonectomy of the right lung (10-12%) is greater than a pneumonectomy of a left lung (1-3.5%).[7] Lobectomies decrease lung function by reducing pulmonary functional reserve and exercise capacity by 15% and 16%, respectively.[8] Pneumonectomies have a greater impact on lung function in that they reduce pulmonary functional reserve and exercise capacity by 35% and

23%, respectively.[7]

The patient described in this case report had irreversible lung damage secondary to bronchiectasis, which required multiple lobectomies. As expected based on the literature, she had multiple pulmonary limitations. There are several studies that explored the use of lower extremity (LE) strengthening exercises to improve the functional strength of patients with bronchiectasis.[2,9] A study conducted by Jenkins et al[10] concluded that LE endurance training can decrease complaints of dyspnea. Additionally, studies have supported the use of balance activities to reduce fall risk in the geriatric population.[9,11] Therefore, the prescribed intervention program incorporated therapeutic exercises aimed to improve the patient's cardiovascular endurance, dynamic standing balance and LE strength.

There are several studies regarding the physical therapy (PT) treatment of patients with pulmonary limitations secondary to a lobectomy.[3,5,8] However, there is little to no literature regarding the long-term treatment of patients who underwent multiple lobectomies. Therefore, the purpose of this case report was to describe an appropriate PT intervention program for an 82-year-old female who suffered from multiple pulmonary complications secondary to multiple lobectomies.

Patient History and Systems Review

The patient signed an informed consent form allowing all medical records to be used for this case study. The patient was an 82-year-old female who was referred to a skilled nursing facility (SNF) following a seven-day hospitalization due to an acute exacerbation of chronic obstructive pulmonary disease (COPD).

The patient's past medical history included COPD, restrictive lung disease secondary to thoracic spine kyphosis, bronchiectasis, emphysema, recurrent pneumonia, asthma, pulmonary arterial hypertension, cardiomegaly, hypothyroidism, nephrolithiasis, gastroesophageal reflux disease, osteoporosis, bilateral hearing loss, depression, anxiety and blindness secondary to Stargardt disease. The patient's vision was 20/400 and had a loss of central vision in both eyes, but retained peripheral vision. The patient wore hearing aids to address bilateral hearing loss. The patient also had a recent fall resulting in a left wrist fracture. Past surgical history included cholecystectomy, hysterectomy, bilateral knee replacement, breast cancer with total mastectomy of left breast, and lobectomy of bilateral lower lobes and right middle lobe due to bronchiectasis at 18-years of age. The patient had no history of smoking.

Prior to hospital admission, the patient lived in a one-story home alone with family nearby to assist if needed. She had one step to enter the home with no handrails. She was independent in all activities of daily living (ADLs) and used a straight cane when ascending and descending her front step and when ambulating short distances, she used a four-wheeled walker (4WW) with swivel front wheels (Medline Industries Inc, Northfield, IL) when ambulating longer distances within the community.

The patient completed a 36-week pulmonary rehabilitation program two weeks prior to hospitalization to address an exacerbation of COPD. The patient believed she could have continued to improve her cardiovascular endurance, but she was discharged from pulmonary rehabilitation before she felt ready. The patient complained of increased dyspnea and generalized weakness. The patient was on three L of oxygen continuously via nasal cannula. The patient demonstrated some control of her dyspnea through pursed lipped breathing (PLB), a

technique she learned at pulmonary rehabilitation. She was discouraged with her inability to ambulate longer distances without the occurrence of dyspnea, but was otherwise content with her pulmonary status and overall health. Following her pulmonary rehabilitation program, the patient received home PT and occupational therapy (OT) once a week. See Appendix 1 for the patient's medication list and Table 1 for systems review results.

Examination – Tests and Measures

A PT and OT evaluation was performed simultaneously in the patient's room at the SNF. The PT portion of the evaluation included taking the patient's oxygen saturation and resting blood pressure while supine, LE range of motion (ROM), LE manual muscle testing (MMT), sensation testing of bilateral lower extremity (BLE), assessment of bed mobility and functional transfers, and gait analysis.

While the patient was supine and resting, her oxygen saturation was measured by a pulse oximeter to be 93%. Her blood pressure, assessed using a sphygmomanometer on her left arm while the patient was supine and resting, was 108/62 mmHg. The patient's gross BLE strength was graded as a 3+/5 in a seated position as described by Kendall.[13] See Appendix 2: Manual Muscle Testing Grades for muscle grade description. This muscle grade indicated that the patient could move through full ROM against minimal resistance.[14] Her active ROM, which was grossly measured visually while the patient was seated, was within normal limits. The patient performed functional transfers, which included sit to and from stand and transferring from her wheelchair to her bed with a two-wheeled walker ([2WW] Medical Depot Inc., Port Washington, NY), and required contact guard assistance (CGA). She was able to ambulate

using a fixed-wheeled 2WW with CGA. The patient ambulated on an even surface 75 feet, stopped to perform PLB in an attempt to control her dyspnea, and then ambulated another 75 feet. The patient was able to decrease only some of her dyspnea through PLB. The patient also completed a 6-Minute Walk Test (6MWT) using a 2WW and three liters of supplemental oxygen during her initial evaluation to determine her exercise tolerance.[15] The 6MWT is valid for measuring exercise capacity in patients with COPD.[15] The patient ambulated 140.9 m during the 6MWT, which indicated that her exercise capacity was below average (222-562 m) for females ages 80 to 89 years old.[15] See Table 2 for detailed results of the tests and measures performed.

Clinical Impression: Evaluation, Diagnosis, Prognosis

The patient was an 82-year-old female referred to a SNF following a hospitalization for an acute exacerbation of COPD. Upon evaluation, the patient presented with BLE weakness, impaired dynamic standing balance, decreased independence with functional transfers, and impaired endurance as indicated by her limited ambulation distance. The patient's chief complaint was how quickly she experienced dyspnea after ambulating short distances. The patient's primary goals before discharge were to decrease dyspnea and to discontinue supplemental oxygen use. It was anticipated that the patient would benefit from PT that focused on therapeutic exercises, neurological re-education, gait training and therapeutic activities to improve her functional limitations.

The patient's MMT scores indicated a decrease in gross BLE strength. The results of her 6MWT indicated impaired cardiovascular endurance[10] and elicited shortness of breath. The patient initially presented with a dynamic standing balance that was rated fair plus, which

indicated that she could maintain standing balance unsupported with minimal resistance. When analyzing the patient's gait, the patient demonstrated forward flexion of the trunk, inadequate bilateral hip extension and decreased bilateral step length. The patient's primary medical diagnosis was J44.9, COPD unspecified and a secondary medical diagnosis of I51.7, cardiomegaly. PT diagnoses included R26.2, difficulty walking, not elsewhere classified, and R27.2, unspecified lack of coordination. The patient's history of falls, impaired vision and age place her at an increased risk for falls.[16] This patient was appropriate for this case report due to her complicated pulmonary medical history and impaired vision.

Every week, the patient completed the 6MWT and LE strength testing to objectively measure her progress. The patient's plan of care (POC) included endurance training, dynamic balance training, therapeutic exercises aimed to strength BLE, therapeutic activities to improve functional transfers and gait training five times a week for four weeks. See Table 3 for the patient's short-term and long-term goals. It was recommended that the patient begin outpatient pulmonary rehabilitation upon discharge to continue improving her endurance and cardiopulmonary function.

Intervention and Plan of Care

Coordination, Communication & Documentation

Through electronic medical records, the documentation from the patient's previous hospitalization was sent to the SNF. The documentation was reviewed by the PT and OT prior to the patient's initial evaluation. While at this SNF, the patient received nursing care, PT and OT. There was consistent communication with nursing in order to coordinate therapy sessions around the patient's medication schedule. Toward the end of the patient's care, there was

frequent communication with the discharge planner to ensure that the patient would be receiving a 4WW prior to discharge.[10] Communication with OT was consistent throughout the patient's care to ensure that the PT and OT treatment sessions followed after each other to avoid bringing the patient down to therapy more than once a day, if possible. Documentation for this patient included an initial evaluation, a weekly progress note and a discharge summary.

Patient-Related Instruction

The patient was educated on her prognosis as well as her POC. The patient received visual demonstrations and verbal instructions on how to perform each exercise properly and frequent verbal cues to adjust her technique to ensure that she was performing the exercise correctly to maximize the benefits. These cues became less frequent as the patient became more familiar with the exercises.

On her last day of therapy, the patient was educated on two different positions to relieve dyspnea. The first position was a seated position in which the patient was instructed to lean forward at her hips and to rest her forearms on a table. The second position was a standing position in which the patient was instructed to bend at the hips and lean her forearms on a high table or a counter top. These positions relieve dyspnea by recruiting the pectoralis major muscles, which would assist in elevating the ribcage during respiration (see Figure 1).[10] The patient was also instructed on the appropriate sequence when ascending and descending the stairs using a straight cane without a handrail, as she did not have a handrail at home.

Procedural Interventions

The patient was seen five times a week with treatment sessions ranging from 90 minutes

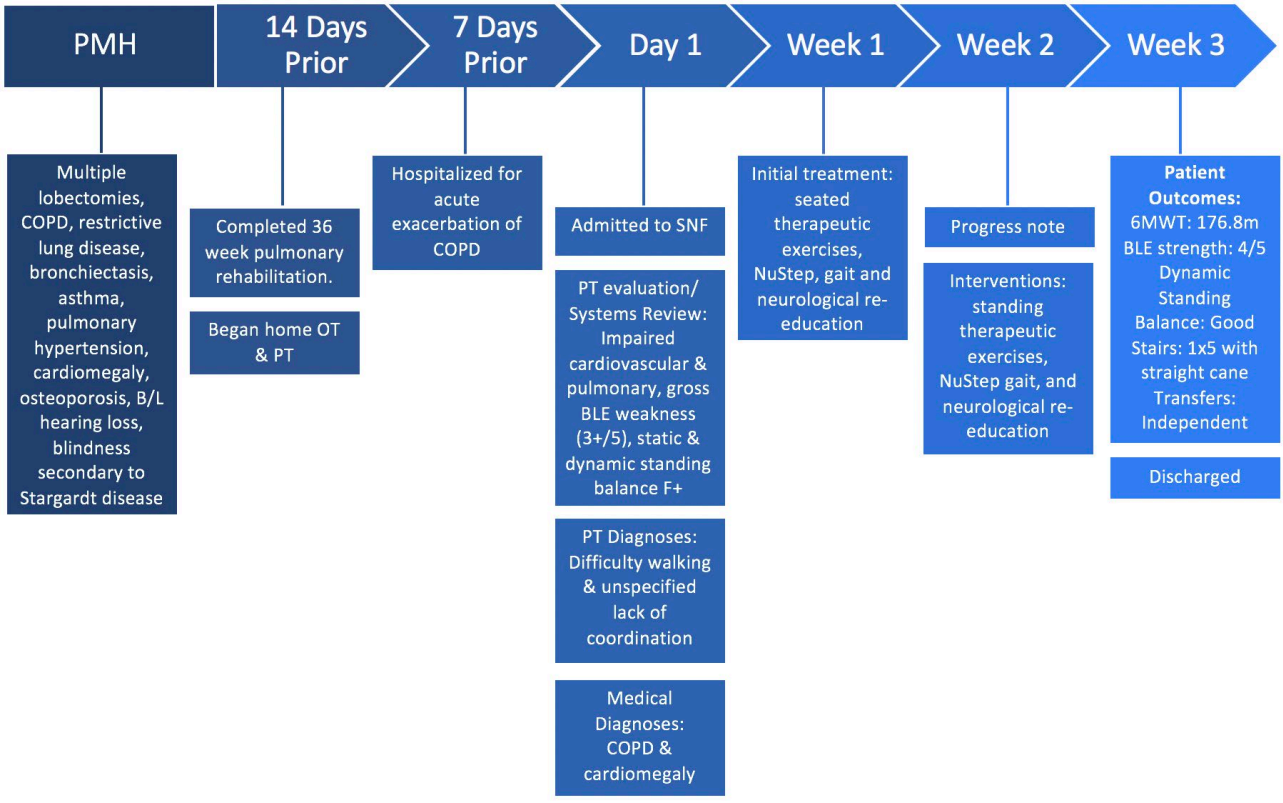
initially, to 30 minute as she progressed and approached her discharge date. The patient attended every treatment session and was eager to participate.

The interventions chosen addressed the patient's functional limitations and paralleled her goals. To prevent further decline in the patient's ability to perform ADLs, the treatment plan included therapeutic exercises aimed to strengthen the patient's BLE[2] and improve her cardiovascular endurance.[17] Strengthening exercises included hip flexion, hip extension, knee flexion, knee extension, calf raises, hip adduction, hip abduction, hip circumduction and a modified 30-second sit-to-stand exercise. Exercises were progressed once the patient was able to tolerate the repetitions without complaints of dyspnea and without requiring cues for technique. Endurance exercises included pedaling on the NuStep® (NuStep LLC, Ann Arbor, MI), ambulating with a 2WW and a 4WW with swivel front wheels (Medline Industries Inc, Northfield, IL). The NuStep® is a recumbent stepper and is one of the most preferred exercise machines among the geriatric population, specifically those with balance impairments.[15]

The patient initially ambulated with CGA using the 2WW because it provided greater stability than the 4WW. During week two, the patient changed her assistive device to the 4WW to adopt a faster gait speed and to decrease occurrence of dyspnea, as described by Jenkins.[10] In order to compensate for the patient's impaired vision, the patient was instructed to maneuver around different colored cones as she walked with a 4WW down a 75-foot carpeted hallway. The purpose of this exercise was to encourage her to scan her environment in hopes of reducing the risk of falls due to tripping over hazards and obstacles. The patient had recently fractured her left radius from a fall that occurred because she did not see a curb in front of her, causing her to misstep. This intervention was created specifically for this patient secondary to her past medical history and functional limitations. To improve the patient's dynamic standing balance,

the patient bounced a 12-inch ball with a therapist from different directions. The patient initially stood with her normal base of support (BOS). She progressed to a narrow BOS and then a semi-tandem BOS once she was able to maintain her balance for two minutes while bouncing the ball. The Airex® (Baltek Inc., Greensboro, NC), a foam balance pad, was introduced to the exercise once the patient was able to stand with a semi-tandem stance for longer than two minutes while bouncing the ball. The patient stood on the Airex® with her normal BOS and continued to bounce the ball with the therapist. The patient also shifted her weight from her heels to toes when standing at the parallel bars using bilateral upper extremity for support to improve her dynamic standing balance. Refer to Table 4 for intervention progression.

TIMELINE



OUTCOMES

Over the course of her therapy, this patient was able to increase her exercise tolerance with less complaints of dyspnea. This patient was able to improve her 6MWT by 36.0 m (from 140.8m to 176.8m) over the course of her treatment. The minimally clinical important difference (MCID) for the 6MWT is 54.0 m.[10] Although her change was less than the MCID and below the average for her age group, the patient was able to improve her distance while decreasing the need to stop due to shortness of breath. The patient was able to decrease her continuous oxygen use from three liters to two liters via nasal cannula. The patient increased her gross BLE strength from 3+/5 to 4/5 (see Appendix 2 for description of MMT values). Her dynamic standing balance improved from fair+ to good, which allowed her to perform functional transfers more easily. The patient was able to ascend and descend one step using a straight cane, which indicated that she would be able to ascend and descend the one step to enter her home once discharged. By the end of her treatment, the patient was able to independently complete all functional transfers with no verbal cueing (VC). Please see Table 5 for further detail on the patient's outcomes. Due to her enthusiastic attitude, the patient actively participated in and completed all treatment interventions. There were no adverse or unanticipated events during this patient's treatment.

DISCUSSION

As stated previously, this patient had many long-term pulmonary limitations secondary to multiple lobectomies. Patients who undergo a lung resection are likely to have long-term pulmonary complications. As supported by the literature, the patient benefited from completing

interventions that aimed to strengthen her BLE, improve her dynamic standing balance and improve her cardiovascular endurance.[2,9,10,11] Following three weeks of therapy, this patient was able to improve her 6MWT with less complaints of dyspnea. Although these results were not clinically significant, the patient demonstrated an improvement in exercise capacity.[10] The patient's BLE strength and dynamic standing balance improved, which allowed her to increase her independence with functional transfers.

Pulmonary function declines following a pulmonary resection.[18] Lobectomies have been shown to have a greater decrease in pulmonary function when compared to segmentectomies and partial resections. In a study by Kobayashi et al[18] (N=445) the percentages of vital capacity, predicted vital capacity percentage, forced expiratory volume in one second (FEV_1), predicted FEV_1 percentage (FEV1%) and FEV_1/forced vital capacity (FVC) five years after a lobectomy compared to preoperative values were 90.0 $\pm$11.5%, 92.9$\pm$11.9%, 86.2$\pm$11.9%, 91.1$\pm$12.7% and 95.9+11.5% respectively.[18] However, the rate of which pulmonary function declines following a lung resection is not dependent upon the type of surgery performed, but rather the age of the individual.[18] Overall pulmonary function decreases with age due to the physiological changes that occur within the respiratory system. These physiological changes include diminished elastic recoil of the lungs, increased chest wall stiffness, decreased strength of respiratory muscles, altered surfactant composition and increased ventilation-perfusion mismatching.[18]

One other factor that contributes to decreased pulmonary function following a pulmonary resection is the FEV_1/FVC percentage.[18,19] Patients who have an FEV_1/FVC < 70% have a greater rate of pulmonary function decline.[18,19] FEV_1/FVC values < 70% are indicative of COPD.[20] Therefore, patients with COPD who undergo a lobectomy are likely to have a

greater rate of pulmonary function decline.

One of the strengths of this case report is that the patient attended all treatment sessions and was compliant will all interventions. She was highly motivated and had a great social support system. A limitation of this case report was the lack of ability to generalize the results to the general population. The patient's lobectomies were performed over six decades ago, and since then the gold standard for surgical intervention for bronchiectasis has changed from an open thoracotomy approach to a video-assisted thoracoscopic surgery (VATS).[21] It is difficult to compare her pulmonary function with patients who have had the VATS approach considering VATS is a less invasive surgery.

A potential implication for clinical practice is that patients who have undergone multiple lobectomies may benefit from PT that incorporates cardiovascular endurance training, dynamic standing balance exercises and BLE strength training in order to improve independence with functional mobility. It is suggested that future research investigates the long-term pulmonary effects of multiple lobectomies.

To summarize, clinicians should be aware of the type of pulmonary resection performed since contemporary surgeries are less invasive and may have less long-term pulmonary limitations. Clinicians should be aware that age of the individual, and/or the presence of COPD, have a greater effect on pulmonary function decline than the type of lung resection surgery. Regardless of the surgery performed, older individuals and/or individuals with COPD will have a greater rate of pulmonary function decline following a pulmonary resection.[18,19,20]

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TABLES and FIGURES

Table 1: Systems Review Results

Systems Review	
Cardiovascular/Pulmonary	Impaired Three liters of supplemental oxygen via nasal cannula. The patient complains of dyspnea early into any activity or exercise.
Musculoskeletal	Impaired MMT indicated general BLE weakness (3+/5). The patient also has thoracic spine kyphosis.
Neuromuscular	Impaired Static and dynamic standing balance rated fair +.
Integumentary	Not Impaired
Communication	Not Impaired
Affect, Cognition, Language, Learning Style	Not Impaired Preferred learning style is verbal explanation.

MMT=Manual muscle testing, BLE=bilateral lower extremities

Table 2: Test & Measures

Tests & Measures	Initial Evaluation Results
6MWT (using a 2WW) – measures the patient's endurance. (Average range for ♀ ages 80-89 = 222-562 m.)	140.8 m – using a 2WW
Blood Pressure	108/62 mmHg
O_2 Saturation	93% (on 3L of O^2 via nasal cannula)
Gross BLE Strength	3+/5
Gross BLE ROM	WNL for all LE joints.

6MWT=6-Minute Walk Test, 2WW=two-wheeled walker, BLE= bilateral lower extremities, ROM=range of motion, WNL=within normal limits, LE=lower extremity, m=meters, L=liters, O^2=oxygen

Table 3: Short Term and Long Term Goals

Short Term Goals (2 weeks)		
IE	**PN (2 weeks)**	**DC (3 weeks)**
The patient will increase BLE strength to 4-/5 to prepare for transfers.	Goat met New goal: The patient will increase BLE strength to 4/5 to prepare for transfers.	Goal met Status: 4/5
The patient will increase dynamic standing balance to good- spontaneously righting self when needed to reduce risk for falls.	Continue goal Status: fair+	Goal met Status: good
Long Term Goals (4 weeks)		
IE	**PN (2 weeks)**	**DC (3 weeks)**
The patient will safely perform functional transfers with independence and 0% VC to push up from arms of chair in order to return to prior level of functional abilities.	Continue goal Status: CGA and 10% VC	Goal met Status: Independent and 0% VC
The patient will safely ambulate on level surfaces 300 ft using a 2WW independently with 0% VC for proper sequencing in order to return to prior living and supervision levels.	Continue goal Status: 250 ft with CGA and 5% VC	Goal met Status: 300 ft independently with 0% VC
The patient will safely ascend/descend 1 stair independently without handrails and 0% VC for proper sequencing.	Continue goal Status: did not yet attempt	Discontinued Status: 1 step

IE = initial evaluation, BLE = bilateral lower extremity, PN = progress note, DC = discharge, VC = verbal cues, CGA=contact guard assist, 2WW=two-wheeled walker, ft=feet

416 **Table 4: Interventions**
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Intervention Category	Purpose	Week 1 (5 visits)	Week 2 (5 visits)	Week 3 (3 visits)
		Seated	**Standing**	**Standing**
Therapeutic Exercise	Increase BLE strength. Reduce fall risk.[5,9]	Knee extension: 2 lb, 3x10 Knee flexion: 2 lb, 3x10 Hip abduction: Green resistance band 2x15 Hip adduction: 1x30 Hip circumduction (with knee extended): 0lb, 3x10	Hip flexion: 2.5 lb, 3x10 Hip extension: 2.5 lb, 3x10 Knee flexion: 2.5 lb 3x10 Hip abduction: 2.5 lb, 3x10 Calf Raises: 2.5 lb, 2x15 modified 30-sec sit to stand x2 (use of BUE)	Hip extension: 2.5 lb, 2x15 Hip abduction: 2.5 lb, 2x15 Calf Raises: 2.5 lb, 1x30 modified 30-sec sit to stand x2 (use of BUE)
NuStep®	Improve cardiovascular endurance.[15]	Resistance level 1 20 mins 3 30-sec RB	Resistance level 2 25 mins No RB	Resistance level 2 25 mins No RB
Gait	Improve cardiovascular endurance and gait pattern.	2WW – 300ft 3 RB 6MWT – 2WW	4WW – 850 ft 5 RB Obstacles 2d/wk 6MWT – 2WW	4WW – 1,050 ft 5 RB Obstacles 1d/wk 6MWT – 2WW
Step-ups (7 inch step; no handrail)	Improve the patient's ability to ascend the step to enter her home.			Straight Cane - 2x5
Neurological Re-Education	Improve the patient's dynamic and static standing balance.[11] Reduce fall risk.[9]	Bounced ball – narrow BOS & semi-tandem BOS weight shift from toes to heels x10	Bounced ball – (on airex) narrow BOS & semi-tandem BOS weight shift from toes to heels x10	
Education	Positions for dyspnea relief.[10]			1 seated & 1 standing position for dyspnea relief (see Figure 1)

BLE = bilateral lower extremity, lb = pounds, sec = seconds, BUE = bilateral upper extremity, mins = minutes, ft = feet, sec=seconds, RB = rest break, 2WW = two-wheeled walker, 4WW=four-wheeled walker (rollator), 6MWT=6-Minute Walk Test, d/wk = days per week, BOS = base of support.

Table 5: Patient Outcomes

Outcome Measure	Initial Evaluation	Progress Note (Week 2)	Discharge (Week 3)
6MWT	140.8 m	160.9 m	176.8 m
BLE gross strength	3+/5	4-/5	4/5
Dynamic Standing Balance	Fair +	Fair +	Good
Stairs	N/A	N/A	1x5 straight cane
Transfers	CGA 25% VC	CGA 10% VC	I 0% VC

6MWT=6-Minute Walk Test, BLE = bilateral lower extremity, CGA=contact guard assist, I=independent, VC=verbal cueing, m=meters

Figure 1: Positions for Dyspnea Relief

A.  B. 

APPENDICES (Supplemental tables and figures beyond max of six)

Appendix 1: Patient Medication List[22]

Medications	Purpose/Diagnosis
Lasix 40 mg via IV	Hypertension
Magnesium Oxide 400 mg	Dietary Supplement
Wellbutrin SR 150 mg	Depression
Celebrex 200 mg	Arthritis
Protonix 40 mg	GERD
Nebulized gentamicin	Pneumonia
Perforomist	Asthma/COPD
Xopenex	Asthma/COPD
Budesonide	Asthma/COPD
Spiriva	Asthma/COPD
Lovenox 40 mg	Anticoagulant
Synthroid 125 mcg	Hypothyroidism
Solumedrol 60 mg via IV	Asthma
Zithromax 500 mg	COPD
Singulair 10 mg	Asthma
Zoloft	Depression/Anxiety

Appendix 2: Manual Muscle Testing Grades[13]

Function of the Muscle	Grade
No contractions felt in the muscle	0
Tendon becomes prominent of feeble contraction felt in the muscle, but no visible movement of the part	1
MOVEMENT IN HORIZONTAL PLANE	
Moves through partial range of motion	2-
Moves through complete range of motion	2
ANTIGRAVITY POSITION	
Moves through partial range of motion	2+
Gradual release from test position	3-
Holds test position (no added pressure)	3
Holds test position against slight pressure	3+
Holds test position against slight to moderate pressure	4-
Holds test position against moderate pressure	4
Holds test position against moderate to strong pressure	4+
Holds test position against strong pressure	5

458 **CARE Checklist**

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CARE Content Area	Page
1. **Title** – The area of focus and "case report" should appear in the title	1
2. **Key Words** – Two to five key words that identify topics in this case report	1
3. **Abstract** – (structure or unstructured) a. Introduction – What is unique and why is it important? b. The patient's main concerns and important clinical findings. c. The main diagnoses, interventions, and outcomes. d. Conclusion—What are one or more "take-away" lessons?	2-3
4. **Introduction** – Briefly summarize why this case is unique with medical literature references.	3-4
5. **Patient Information** a. De-identified demographic and other patient information. b. Main concerns and symptoms of the patient. c. Medical, family, and psychosocial history including genetic information. d. Relevant past interventions and their outcomes.	4-6
6. **Clinical Findings** – Relevant physical examination (PE) and other clinical findings	6-8
7. **Timeline** – Relevant data from this episode of care organized as a timeline (figure or table).	11
8. **Diagnostic Assessment** a. Diagnostic methods (PE, laboratory testing, imaging, surveys). b. Diagnostic challenges. c. Diagnostic reasoning including differential diagnosis. d. Prognostic characteristics when applicable.	7-8
9. **Therapeutic Intervention** a. Types of intervention (pharmacologic, surgical, preventive). b. Administration of intervention (dosage, strength, duration). c. Changes in the interventions with explanations.	9-11
10. **Follow-up and Outcomes** a. Clinician and patient-assessed outcomes when appropriate. b. Important follow-up diagnostic and other test results. c. Intervention adherence and tolerability (how was this assessed)? d. Adverse and unanticipated events.	12
11. **Discussion** a. Strengths and limitations in your approach to this case. b. Discussion of the relevant medical literature. c. The rationale for your conclusions. d. The primary "take-away" lessons from this case report.	12-14
12. **Patient Perspective** – The patient can share their perspective on their case.	5-6
13. **Informed Consent** – The patient should give informed consent.	1