PHYSICAL THERAPY TREATMENT FOR A PATIENT WITH MYASTHENIA GRAVIS IN THE ACUTE CARE SETTING

A Doctoral Project
A Comprehensive Case Analysis

Presented to the faculty of the Department of Physical Therapy

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DOCTOR OF PHYSICAL THERAPY

by

Megan Self

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Abstract

of

PHYSICAL THERAPY TREATMENT FOR A PATIENT WITH MYASTHENIA GRAVIS IN THE ACUTE CARE SETTING

by

Megan Self

A patient with seronegative Myasthenia Gravis was seen for 16 sessions of physical therapy treatment during his stay at a large urban hospital for a 4-week period. Treatment was provided by a student physical therapist under the supervision of a licensed physical therapist.

Upon initial evaluation the patient was intubated for progressive dysphagia and progressive worsening respiratory distress and unable to participate in transfers or ambulation. During his course of stay, the following measures were used to assess his balance, strength, endurance and functional mobility: Tinetti Performance Oriented Mobility Assessment, Five Times Sit to Stand, and Two Minute Walk Test. Impairments were identified and a plan of care was established. The goals for this patient were to improve balance, endurance, functional strength and mobility, and to return to him to his prior level of function. The patient's most significant goal was to be able to return home, which required that he be able to ascend the 22-stairs to enter to his home. The primary interventions for this patient included balance, transfer, gait,

and stair training exercises with an emphasis on functional application and close monitoring of vital signs.

The patient achieved gains in balance, strength, gait, stairs and overall functional ability and independence. The patient was able to discharge home with a home exercise program and physical therapy home health services.

_____, Committee Chair
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Chapter 1

GENERAL BACKGROUND

Myasthenia Gravis (MG) is an autoimmune disorder in which antibodies target the neuromuscular junction of skeletal muscles.[1,2] At the present time, MG is an umbrella term used to describe a heterogeneous group of autoimmune diseases with a postsynaptic defect in neuromuscular transmission.[3] With MG, serum IgG autoantibodies bind to receptors on the post synaptic muscle end-plate and attack or destroy postsynaptic molecules.[2,4] This is accomplished by inducing crosslinking of antigens/antibodies, activation of complement proteins and an increase in degradation or blockage of the post synaptic receptor.[2,4]

The most common autoantibodies associated with MG are those that attack acetyl-choline receptors (AChR); up to 85% of patients with MG display these antibodies upon serum testing; i.e. they have seropositive MG.[5] The remaining 15% of patients with symptoms of MG either lack autoantibody concentrations great enough to establish positive serum tests, or exhibit other antibodies that affect the neuromuscular junction.[3,4] Patients that lack serum AChR autoantibodies are considered to have seronegative MG (SNMG).[6] In addition to autoantibody specificity, MG subgrouping is related to clinical manifestations including MG course type, age of onset and thymus pathology.[3,4]

In most populations worldwide, MG has a prevalence of approximately 150-300 per million, with an annual incidence of about 10 per million.[3] Among Caucasian populations the most common form is late onset MG, followed by early onset MG,

thymoma MG, ocular MG, SNMG, muscle-specific receptor tyrosine kinase MG and low-density lipoprotein receptor-related proteins MG.[3] The hallmark signs and symptoms of MG include muscle weakness and fatigability of skeletal muscles, which is caused by impaired signal transduction as a result of disease[1,5,7] Muscle weakness in MG can be focal or generalized and typically affects ocular, bulbar and proximal extremity muscles.[1,5,8] Respiratory muscle weakness occurs rarely but can lead to life-threatening.[1,7]

The precise etiology of MG is not known, although it is recognized that development of the disease is related to genetic and environmental components.[6,9] The risk factors for the development of MG are not well-defined, but there appears to be a strong concurrence of an additional autoimmune disease in patients with MG; e.g. Grave's disease, Hashimoto's disease, rheumatoid arthritis and thyroid disease.[5] Patients with MG tend to experience fluctuations in disease activity with periods of exacerbation, improvement and remission.[10] Maximum severity of symptoms are typically observed in the first few years after onset, followed by clinical improvement.[10,11] There is no cure for MG, but many effective medical treatments exist including anti-acetylcholinesterase agents, corticosteroids, immunosuppressant agents, thymectomy, plasmapheresis, and intravenous immune globulins.[12]

Few factors have been associated with predicting the course of disease in people with MG. Disease severity score (measured by the Myasthenia Gravis Foundation of America Classification System) at one year, and patients whose symptoms were restricted to ocular muscles alone have the most favorable outcomes

in terms of fewest exacerbations[10] Late age at onset and the presence of an additional autoimmune disease appear to be positively correlated with a higher risk of MG exacerbation within 3 years of initial disease onset.[11] Studies estimate that up to 13% of patients with MG have a coexisting autoimmune disease.[13] True remission without pharmaceutical control in patients with MG is rare, and pharmaceutical control of symptoms is achieved only in a portion of patients.[10]

Chapter 2

CASE BACKGROUND DATA

Examination – History

The patient was a 68-year old gentleman with a previous medical history of hypertension and hyperthyroidism, who presented to the hospital with progressive dysphagia and progressive worsening respiratory distress. He was transferred to a neurosurgical intensive care unit (NSICU) for neurological evaluation of progressive symptoms. The patient presented with a diagnosis of acute on chronic respiratory hypoxic failure due to unknown etiology and was later determined to have SNMG. He required intubation for one week and tracheostomy mist ventilation for 2 weeks before he could be weaned off mechanical ventilation and placed on nasal cannula with supplemental oxygen. No previous medical or surgical history could be obtained for this patient through the Electronic Medical Record.

Although the patient was unable to speak at the initial evaluation due to intubation, he was able to follow commands and answer yes or no questions by head nodding or shaking. The patient was alert and oriented to person, place, date and reason for admission. His wife was at bedside and provided a comprehensive social history, stating that the patient had served in the military, was a retired lineman living in Northern California, and had one son. Other pertinent information included the fact that the patient's house was situated on a hill, with a total of 22 stairs with bilateral railings leading up to the front door.

At initial evaluation, the patient required minimum assistance for bed mobility and two-person underarm moderate assistance for sit to stand. The patient exhibited fair static and dynamic sitting balance but poor static standing balance, along with extremely low tolerance for exercise. Initial evaluation for mobility was limited to sit to stand, as the patient demonstrated objective hemodynamic instability with concurrent subjective complaints of fatigue and lightheadedness. The patient was unable to tolerate transfers or walking.

Prior to admission the patient had been ambulating independently with occasional use of a single point cane. He was age-appropriate and independent in all activities of daily living. His primary complaints were decreases in functional ability and participation related to progressively worsening respiratory distress. The patient had considerable environmental barriers to overcome prior to returning home, including 22 stairs to enter his home. This patient's goals were to return to his prior level of function and to return home.

Systems Review

The patient's cardiopulmonary system was impaired: he was in respiratory distress requiring intubation and he experienced an inappropriate hemodynamic response; i.e. following one sit to stand, his oxygen saturation dropped from 99% to 90%, he developed arrhythmias and complained of lightheadedness and fatigue. The neuromuscular and musculoskeletal systems were impaired; i.e. upon examination, the patient experienced tremor with resistance and generalized weakness in all extremities. The integumentary system was unimpaired based on observation and patient report.

Although the patient was not able to speak due to intubation, he was able to follow commands and effectively communicate with head movements and through handwriting. His affect, cognition and learning were not impaired as evidenced by patient presentation.

Examination – Medication Table

Table 1

Medications

MEDICATION	DOSAGE	REASON	SIDE EFFECTS
Amlodipine	5mg/day, GT	Hypertension	Edema, fatigue, drowsiness, dizziness/lightheadedness, irregular heartbeat, nausea/vomiting
Ipratropium-Albuterol	3mL solution for nebulization Every 4 hours PRN	Bronchodilator to open airway and increase air flow	Uncontrollable shaking, nervousness, irregular heartbeat, muscle, bone, or back pain, difficulty breathing, difficulty swallowing, nausea/vomiting
Methimazole	10mg daily, GT	Hyperthyroidism treatment	Abnormal sensations, swelling, joint/muscle pain, drowsiness, dizziness, nausea/vomiting, skin rash
Prednisone	20mg 3x/day, PO	Immunosuppressant	Dizziness, sleep difficulties, extreme changes in mood, changes in personality, loss of contact with reality, slowed healing of cuts/bruises, extreme tiredness, weak muscles, heartburn, increased sweating, slowed healing time, extreme tiredness, weak muscles, increased sweating, depression, uncontrollable shaking of the hands, nausea/vomiting, sudden weight gain, shortness of breath, difficulty breathing or swallowing, rash
Propofol	10mg/mL, continuous IV infusion	Sedative	Hypotension, bradycardia, arrhythmia, decreased cardiac output, respiratory acidosis
Pyridostigmine	90mg every 4 hours, NGT	Myasthenia gravis	Diarrhea, vomiting, cold sweats, blurred vision, anxiousness, muscle weakness, confusion, seizures, difficulty breathing

Abbreviations: mg: milligrams; mL: milliliters; GT: Gastrointestinal tube; PRN: as needed; IV: intravenous; PO: by mouth; NGT: nasogastric tube

Chapter 3

EXAMINATION – TESTS AND MEASURES

The patient's deficits were categorized using the International Classifications of Functioning, Disability and Health (ICF) Model. The Tinetti Performance Oriented Mobility Assessment (T-POMA), Five Times Sit to Stand (FTSS) and Two Minute Walk Test (2MWT) were used to assess the patient's impairments at the body structure and function level and his activity limitations. Restrictions at the participation level were assessed using the 2MWT and a patient-specific outcome measure of his ability to safely traverse 22 stairs, thus demonstrating his appropriateness to return home and participate in his regular life activities.

The T-POMA is designed to measure balance, gait function and fall risk in the elderly population.[14,15] It consists of 16 items assessing balance and 12 items assessing gait. Higher scores on the T-POMA indicate better balance and higher level of functional mobility while a score of less than 19/28 indicates a high fall risk.[14,16] The Minimal Detectable Change (MDC_{95}) of the T-POMA for older adults is 4 points, indicating that a change in the score of 4 points must occur to demonstrate that a significant change in balance and mobility has occurred with 95% confidence.[14] The Minimal Clinically Important Difference (MCID) has not been defined for this measure.

The FTSS is a valid and reliable measure of lower extremity strength at the body structure and function level, and can serve to predict recurrent fall risk at the

activity level.[17] The FTSS is convenient to perform in the clinical setting with a standard chair and stopwatch; patients are timed during the performance of five sit to stand repetitions. Shorter times to complete the test indicate greater lower extremity strength, balance during functional activity and can help stratify older adults into fall risk groups.[18] The $MCID_{95}$ has only been defined for patients with vestibular disorders and has been determined to be greater than or equal to 2.3 seconds.[19] This indicates that at least a 2.3 second change in the total test time must occur in order to demonstrate meaningful change to the patient, with 95% confidence. The MCID and MDC for this measure have not been defined for older adults without vestibular disorders.

The 2MWT measures cardiorespiratory endurance at the body structure and function level. Additionally, walking speed, which can be determined using the 2MWT, has the potential to identify patients who will be capable of community ambulation.[20]. Community ambulators are defined as having walking speeds greater than 0.8 m/s.[20] During the 2MWT, patients are instructed to cover as much ground as possible in two minutes, assistive devices can be used and rest breaks are allowed. This measure has been found to be responsive to change, with a MDC_{90} of 40 feet in older adults.[21,22] This indicates that an increase of 40 feet in total walking distance must be achieved in order to be 90% confident that a measurable change has occurred. The MCID has not yet been defined for this measure.

Falls are a leading cause of disability, injury and death in elderly people.[17,22] The FTSS measure has been shown to have significant predictive value for recurrent

fallers in a population of community-living elderly subjects 65 years of age or older.[22] The term recurrent fallers was used to denote patients who had fallen two or more times in the past year. Subjects who required greater than 15 seconds to complete the FTSS had a 74% greater risk of recurrent falls compared to those who took less than 15 seconds.[23] Independent of other major risk factors including history of falls, living alone, female gender or number of medications, performing the FTSS in more than 15 seconds was found to have a risk ratio of 1.74 (CI 1.24-2.45).[23] This indicates that patients whose FTSS time was greater than 15 seconds were 1.74 times more likely to experience recurrent falls than those who could perform the test in less than 15 seconds.

Patients in the acute care setting are at risk of developing venous thromboembolism (VTE) or blood clots in a deep vein, which can lead to complications including deep vein thrombosis (DVT), pulmonary embolism (PE), and postthrombotic syndrome (PTS).[24-26]. Half of those diagnosed with DVT will have long-term complications, one-third will have recurrent VTE, and 10%-30% of individuals will die within one month of diagnosis.[24] The frequency of VTE has led to a clinical prediction rule assessing clinical features and the medical history including active cancer, paralysis of lower extremities, recent bedridden status, localized tenderness along a deep vein system, leg swelling, calf swelling of more than 3 cm, pitting edema, collateral superficial veins, and a previous medical history of DVT.[24,25] Each positive finding adds one point to the total score, whereas an alternative

diagnosis as likely or greater than that of DVT results in a two-point deduction from the total score.

A total score of two or more points indicates a high likelihood of DVT, while a score of less than two points indicates a low likelihood of DVT. The positive likelihood ratio (+LR) of patients with two or more points has been found to be 1.31, representing a small increase in the likelihood of the presence of DVT based on the clinical prediction rule.[24] The negative likelihood ratio (-LR) has been found to be 0.197, representing a large decrease in the likelihood of the presence of DVT based on the clinical prediction rule.[24] During this patient's treatment course, this clinical prediction rule for assessing likelihood of presence of DVT was not utilized. A retrospective review of clinical features for this patient resulted in a total score of 1 point on the clinical features scale, representing a low likelihood of DVT.

Table 2

Examination Table

BODY FUNCTION OR STRUCTURE		
Measurement Category	Test/Measure Used	Test/Measure Results
Lower extremity strength[1]	5 Times Sit to Stand	Total Time: 29.4 seconds
Cardiorespiratory endurance[1]	2 Minute Walk Test	Total distance: 250 feet with front wheel walker
FUNCTIONAL ACTIVITY		
Measurement Category	Test/Measure Used	Test/Measure Results
Balance and gait[1]	Tinetti Performance Oriented Mobility Assessment	17/28 with front wheel walker
Recurrent fall risk[1]	5 Times Sit to Stand	Total Time: 29.4 seconds
PARTICIPATION RESTRICTIONS		
Measurement Category	Test/Measure Used	Test/Measure Results
Ability to overcome environmental barriers; to return home and participate in life role	Patient's ability to safely climb up/down 22 stairs and patient report regarding restrictions.	Patient unable to climb 22 stairs, cannot return home at this time.
Ability to be classified as a community ambulatory[1]	2 Minute Walk Test	Gait speed: 0.64 meters/second with front wheel walker

[1] Patient assessed on treatment session 8 of 16

Chapter 4

EVALUATION

Evaluation Summary

The patient was a 68-year-old man with SNMG, presenting with acute onset of chronic respiratory distress and progressive dysphagia. At initial evaluation the patient required intubation and minimal to moderate assistance for bed mobility and sit-to-stand transitions. He was severely limited in his ability to tolerate activity, demonstrating hemodynamic instability including oxygen de-saturation from 99% to 90% with one sit to stand. He was not safe to ambulate. The patient was found to have an impaired cardiorespiratory system, decreased activity endurance, generalized weakness, decreased functional ability, decreased tolerance for ambulation, decreased balance, increased fall risk and increased dependence upon others for activities of daily living.

Diagnostic Impression

The patient exhibited impairments in body structure and function, activity limitations, and participation restrictions consistent with a medical diagnosis of SNMG. His body structure and function impairments of decreased LE strength and decreased activity endurance led to activity limitations in bed mobility, transfers and gait. The patient's activity limitations directly contributed to his participation restrictions, for example, by limiting his ability to climb the stairs in and out of his home.

Prognostic Statement

Prognostic factors for recovery of function after exacerbation and long-term functional capacity have not been well-defined for SNMG, however, several factors have been found to contribute to the progression of the disease.[6,10] The patient presented with the following negative prognostic factors: severe form of the disease, late age at onset of the disease, and a co-existing autoimmune disease. These factors are associated with poorer outcomes including worsening episodes and a higher risk of MG exacerbation within three years of onset of disease.[9,10]

The patient presented with no validated positive prognostic factors for course and progression of MG but there are several non-validated factors present that should be taken into account in considering this patient's prognosis.[6,10,11] These factors include a strong family support system with a healthy and able-bodied wife committed to helping him improve and become more functional. The patient himself presented with a positive attitude and strong work ethic, which facilitated his many functional gains and helped him achieve goals. In addition, the patient eats a healthy diet, maintains an active lifestyle, and refrains from alcohol and tobacco.

G-Codes

Current with modifier: G8978CM *based on the T-POMA*

Goal with modifier: G8979CJ *based on the T-POMA*

Discharge Plan

The patient strongly desired to return home once medically stable, however, he would need to achieve the ability to ascend the 22 stairs with rails to the entrance of

his home with only the amount of assistance that his wife was capable of providing. In the event that he could not demonstrate this ability, the patient would be discharged to a skilled nursing facility. If the patient was to go home, then he would be discharged home with supplemental oxygen, caregiver training for assistance, a home exercise program and home health physical therapy services.

Table 3

Evaluation and Plan of Care

PROBLEM	PLAN OF CARE		
	Short Term Goals (4 weeks)	Long Term Goals (Expected Outcomes) (8 weeks)	Planned Interventions Interventions are Direct or Procedural unless they are marked: (C) = Coordination of care intervention (E) = Educational intervention
BODY FUNCTION OR STRUCTURE IMPAIRMENTS			
Lower extremity weakness	Increase lower extremity functional strength as shown by a decrease in FTSS time of 2.3 seconds .	Increase lower extremity functional strength as shown by a decrease in FTSS time of 4.6 seconds.	Interventions for strength will progressively stress the musculoskeletal system with an emphasis on functional application. 4-5x/week in hospital In bed lower extremity strength exercises including supine bridges, heel slides, straight leg raises and ankle pumps. Mini squats and step ups at edge of bed. Practice sit-to-stand with progressively lower surfaces and decreasing levels of external support. (CC) Care coordinated with RT for respiratory support during out of bed activities (CC) Care coordinated with RN to determine optimal treatment time in coordination with medications and patient's medical stability, and during mobilizations to monitor vital signs

			(CC) Care coordinated with RN and MD to mobilize patient frequently during the day to help encourage normal circadian rhythm, decrease symptoms of ICU induced delirium and reduce risk of DVT (E) Patient educated on importance of performing in bed exercise throughout the day to increase strength and decrease the risk of lower extremity deep vein thrombosis.
Impaired cardiorespiratory endurance	Increase cardiorespiratory endurance as shown by an increase in distance during the 2MWT of 40 feet.	Increase cardiorespiratory endurance as shown by an increase in distance during the 2MWT of 80 feet.	Interventions for cardiorespiratory endurance will progressively increase patient's ability to tolerate longer periods of functional activities. (E) Patient instructed to ambulate with nursing staff and his wife outside of physical therapy hours, in order to maximize endurance benefits.
ACTIVITY LIMITATIONS			
Impaired balance and gait	Improve dynamic balance and decrease gait impairments as demonstrated by an increase in T-POMA by 4 points.	Improve dynamic balance and decrease gait impairments as demonstrated by an increase in T-POMA by 8 points.	Interventions for balance will progressively challenge postural control during functional static and dynamic activities with decreasing levels of external assistance. 4-5x/week in the hospital. Static and dynamic sitting exercises at edge of bed, including maintaining balance while reaching/leaning in all directions. Standing balance exercises at edge of bed including standing with eyes open/eyes closed; standing with feet together and eyes open/eyes closed; standing on one leg with eyes open/eyes closed, with decreasing levels of external support.

			Interventions for gait will address gait impairments and progressively challenge patient's dynamic postural control during functional ambulation activities. Gait training with front wheel walker to address gait impairments included changes in gait velocity, head turns and progressing from closed to open environments, with increasing distance (as patient tolerates) and decreasing levels of assistance/cuing; frequent rest breaks and vital sign monitoring. 4-5x/week, ~10 minute sessions. (CC) Care coordinated with RT for respiratory support during out of bed exercises (CC) Care coordinated with RN to determine optimal treatment time in coordination with medications and patient's medical stability, and during mobilizations to monitor vital signs. (CC) Care coordinated with RN and MD to mobilize patient frequently during the day to help encourage normal circadian rhythm, decrease symptoms of ICU induced delirium and reduce risk of DVT. (E) Instruction on importance of pursed lip breathing for mitigating shortness of breath during exertional activities. (E) Caregiver education given to demonstrate optimal skills for cuing, assisting and monitoring patient during gait.

Increased risk of recurrent falls	Decrease in recurrent fall risk as demonstrated by a decrease in FTSS test time of 10 seconds.	Decrease in recurrent fall risk as demonstrated by a total FTSS test time to <15 seconds.	Progressively challenging transfer training with decreasing levels of assistance and increases in task difficulty. (CC) Care coordinated with RT for respiratory support during out of bed exercises (CC) Care coordinated with RN to determine optimal treatment time in coordination with medications and patient's medical stability, and during mobilizations to monitor vital signs. (CC) Care coordinated with RN and MD to mobilize patient frequently during the day to help encourage normal circadian rhythm, decrease symptoms of ICU induced delirium and reduce risk of DVT. (E) Caregiver education given to demonstrate optimal skills for cuing, assisting and monitoring patient during transfers.
PARTICIPATION RESTRICTIONS			
Inability to return home and participate in life role due to inability to ascend/descend 22 stairs with rail at entrance of home, Decreased ability to ambulate in community and safely cross street	Patient will be able to walk up/down 22 stairs with stand-by level assistance and 2 rest breaks, using 1 rail. Increase in ability to be a community ambulator, demonstrated by	Patient will be able to walk up/down 22 stairs with supervision level assistance and 0 rest breaks, using 1 rail. Increase in ability to safely cross the street, as demonstrated by achieving gait speed of	Stair training progressively challenged functional ability to tolerate stair climbing until patient could safely traverse up to 3 flights of stairs, frequent rest breaks utilized and vital signs closely monitored. (CC) Care coordinated with RT for respiratory support during out of bed exercises (CC) Care coordinated with RN to determine optimal treatment time in coordination with medications and patient's medical stability, and during mobilizations to monitor vital signs.

	increase in walking speed to 0.8 m/s during 2MWT (cut off speed 0.8 m/s)	1.2 m/s during 2MWT (cut off speed 1.2 m/s)	(CC) Care coordinated with RN and MD to mobilize patient frequently during the day to help encourage normal circadian rhythm, decrease symptoms of ICU induced delirium and reduce risk of DVT. (E) Instruction on importance of pursed lip breathing for mitigating shortness of breathing during exertional activities. (E) Caregiver education given to demonstrate optimal skills for cuing, assisting and monitoring patient during stair climbing.

Abbreviations: T-POMA: Tinetti Performance Oriented Mobility Assessment; FTSS: Five Times Sit to Stand; 2MWT: 2 Minute Walk Test; RT: Respiratory Therapist; RN: Registered Nurse; MD: Doctor of Medicine; ICU: Intensive Care Unit; DVT: Deep Vein Thrombosis; SpO2: Oxygen Saturation Level.

Plan of Care – Interventions

See Table 3

Overall Approach

The primary treatment philosophy utilized during this course of physical therapy, once the patient was medically stable, was to progressively challenge the cardiorespiratory, musculoskeletal, and balance systems in a way that emphasizes improving functional mobility. The overload principle was utilized to increase aerobic capacity and thus endurance by influencing energy pathways, cardiovascular function and respiratory function. The overload principle was also employed to improve musculoskeletal strength and endurance by increasing mitochondria density and skeletal mass while improving lactate degradation. The balance system was addressed via task-specific intensive and repetitive practice of progressively challenging the three balance pathways: somatosensory, vestibular and visual.

The incorporation of functional tasks with decreasing levels of assistance, increasing complexity of task, and increased frequency and repetition into each component of this physical therapy plan of care was emphasized. All interventions were chosen carefully to ensure that the plan of care was meaningful to the patient and had application to his life outside the hospital. Due to respiratory complications and hemodynamic instability, special consideration was given to the status of this patient before, during and after physical therapy treatments by closely monitoring his vital signs.

PICO question

For an elderly patient with MG (P), is an exercise program that incorporates strength, balance and endurance exercises (I) more effective than no exercise intervention (C) at improving functional mobility (O)?

In a single-subject research design case series study (level of evidence: 4), six individuals with non-specified MG participated in a 16-session exercise intervention that combined balance, strengthening and endurance training tailored individually to each patient's physical ability as determined by initial assessment. Patients in this study served as their own controls. Inclusion criteria consisted of MG diagnosis, and medical stability of patients. Patients were excluded from the study if they were experiencing cognitive deficits or had co-existing neurological or musculoskeletal conditions affecting mobility. The mean age of patients was 53.9 years old, 50% of the patients were male, and mean time from first symptom onset was 7.9 years.

Outcome measures utilized to track efficacy of the intervention included the Quantitative Myasthenia Gravis Score (QMG), the Six Minute Walk Test (6MWT), the Timed Up and Go (TUG) test, and Standing Stability on Foam with eyes closed (FoamEC). The results of this study showed significant change to the QMG (median change 28.6%) and the FoamEC (median change 28.6%) post-intervention.[27] Statistically significant change was not achieved in the 6MWT or the TUG, although improvements in outcome measures scores were seen post-intervention in all but one patient.

Although this study has limitations such as small sample size and lack of a control group or blinding, the results suggest that patients with MG can make improvements in balance, strength and endurance following physical therapy exercise intervention. Upon review of the most relevant literature regarding exercise interventions for patients with MG, I believe this study applies to my patient, although due to his medical instability during his hospital stay, he would not have been included in this study. The similarity of my exercise interventions to the study's exercise interventions was sufficient enough to draw parallels and justify the use of this study as evidence to support using balance, strengthening and endurance exercises to enhance functional mobility among patients with MG.

Very few studies have been conducted demonstrating the use of exercise intervention in patients with MG.[27] A systematic review of the literature in support of exercise interventions for neuromuscular diseases endorsed the effectiveness of respiratory muscle exercises for patients with MG, and other studies have shown improvements in strength with resistance exercise in patients with neuromuscular diseases.[28-31] Despite the fact that statistically significant change was not demonstrated among all outcome measures, the results of this study serve as the most compelling evidence to date supporting the use of functional balance, strengthening and endurance exercises to address impairments and improve functional outcomes in patients with MG.

Chapter 6

Outcomes

Table 4

Outcomes

OUTCOMES				
BODY FUNCTION OR STRUCTURE IMPAIRMENTS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met? (Y/N)
2 Minute Walk Test	250 feet	300 feet	+50 feet; MDC for older adults = 40 feet	Y
5 Times Sit to Stand	29.4 seconds	19.4 seconds	-10 seconds; cut off score for reduced risk for recurrent falls <15 seconds	Y
ACTIVITY LIMITATIONS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met ? (Y/N)
The Tinetti Performance Oriented Mobility Assessment	17/28	23/28	+6 point; MDC for older adults = 4 points	N
5 Times Sit to Stand	29.4 seconds	19.4 seconds	-10 seconds; MCID for patients with vestibular disorders = 2.3 seconds	Y
PARTICIPATION RESTRICTIONS				
Outcome Measure	Initial	Follow-up (DC)	Change	Goal Met? (Y/N)
Patient able to walk up/down 22 stairs with stand-by assistance, 2 rest breaks, using 1 rail.	Patient unable to climb up/down any stairs	Patient able to walk up/down 22 stairs with supervision level assistance, 2 rest breaks, using 1 rail.	Increased ability to overcome environmental barriers, so that he may go home and participate in his life role.	Y
Patient will be able to demonstrate gait speeds sufficient for community ambulation	Gait speed: 0.64 m/s	Gait speed: 0.76 m/s	+0.12 m/s, cut off score for community ambulatory = 0.8 m/s	N

MDC = Minimal detectible change, MCID = Minimally clinically important difference, DC = Discharge

Discharge Statement:

This patient was a 68-year old man who presented to the NSICU at a major hospital for progressive dysphagia and progressive respiratory distress. He was later determined to have SNMG. Upon initial evaluation the patient presented with the following impairments: decreased balance, strength, and endurance, and an inability to mobilize to the edge of bed and out of bed without assistance. The patient's primary goals were to achieve medical stability and return to his prior level of function, which included going home with assistance and the ability to climb the 22 stairs up to his front door. The patient was seen a total of 16 times during his 28-day stay in the hospital.

Physical therapy interventions included exercises targeting balance, strength and endurance impairments in a functional and progressively challenging manner. Educational interventions emphasized pursed lip breathing, the importance of maintaining mobility during hospital stay, a home exercise program, and caregiver training for properly monitoring, cuing and assisting the patient. Throughout the course of physical therapy treatment, the patient made meaningful improvements in balance, strength, gait, stair climbing and overall functional mobility. Once he achieved medical stability, the patient was able to return to his home with the assistance of his wife and a recommendation for home health physical therapy services.

DC G-Code with modifier: G8980CI *based on the T-POMA*

Chapter 7

DISCUSSION

This patient was able to meet nearly all goals and he made significant improvements across all impairment categories. Functionally this patient made huge gains. At initial evaluation he was too weak to mobilize in and out of bed without assistance, and at discharge he was able to safely mobilize to edge of bed, get out of bed, transfer without the use of an assistive device, ambulate functional distances with a front wheel walker, and traverse three flights of stairs with supervision level assistance and supplemental oxygen. The physical therapy interventions were tolerated very well by the patient and contributed to improvements in functional mobility and facilitated his discharge home.

Although the task-specificity of interventions was effective, additional outcome measures to assess the patient's status will be considered with similar patient presentations in the future. For example, the Berg Balance Scale would have been a useful measure to evaluate this patient's functional balance and mobility and is a better predictor of falls compared to the T-POMA. In the future I will use this measure to assess patients with a similar presentation to this one. Considering the fatiguing nature of this patient's disease, I wish that I had included the rating of perceived exertion (RPE) during goal-setting, in order to better assess the patient's levels of fatigue and exertion with activity. Although I was regularly monitoring the patient's level of exertion using vital signs including heart rate, blood pressure, respiratory rate

and oxygen saturation, I believe that setting goals around the RPE and vital signs would have been more beneficial for this patient.

The primary reason this patient was able to make such significant gains in balance, strength, and functional mobility may have been due to his commitment to engaging in regular physical therapy sessions and daily exercise on his own. There is a distinct lack of evidence relating to physical therapy interventions and MG, with the exception of training respiratory muscles. Better quality evidence would have informed my plan of care during the treatment of this patient, but I feel that I did the best I could with the information I had. I believe that this patient case illustrates the fact that physical therapy intervention can lead to improvements in balance, strength, endurance and functional mobility in patients with MG in the acute setting.

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