12-4-2015

Clinical Reasoning And Intervention Selection For A Patient With Lower Extremity Weakness Following Acute Alcoholic Polyneuropathy: A Case Report

Sarah Uzel
University of New England

Clinical Reasoning and Intervention Selection for a Patient with Lower Extremity Weakness Following Acute Alcoholic Polyneuropathy: A Case Report

Sarah Uzel

Sarah Uzel, BS, is a DPT student at the University of New England, 716 Stevens Ave Portland, ME 04103

Address all correspondence to Sarah Uzel at: suzel@une.edu

The patient signed an informed consent allowing the use of medical information for this report and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act.

The author acknowledges Kirsten Buchanan PhD, PT, ATC for assistance with case report conceptualization. The author recognizes Janelle Harrington, MPT and Greer Colby, MPT for supervision and assistance with photography.

Background and Purpose: Acute alcoholic polyneuropathy (AAP) can present with a variety of symptoms including paresthesia and paralysis. There is little literature relating to physical therapy management and interventions for a patient with AAP. It is unclear what constitutes the best medical management and physical therapy practices for these patients. The purpose of this case report was to describe the clinical reasoning behind interventions selected for a patient with AAP in the acute setting.

Case Description: The patient was a 33 year old male, who was diagnosed with AAP after two days in acute care. Intervention during the first two days included passive range of motion, active assisted exercises, and functional mobility one times a day for 45 minutes. After diagnosis, an aggressive practice of strengthening and transfer training occurred for the remaining three days in acute care.

Outcomes: The patient demonstrated minor increases in bilateral dorsiflexion and hip flexor strength from 0/5 to 1/5 and 3/5 to 4/5 respectively. The patient made the greatest gains in transfer training using a slide board to transfer to a wheelchair and propelling himself 200 feet. By the end of five days, the patient was able to transfer with supervision to inpatient rehabilitation in a manual wheelchair.

Discussion: AAP can occur over the course of weeks and can become immobilizing. This case report of a 33 year old male revealed minimal improvements over five days with an aggressive practice of strengthening, functional mobility, and transfer training. It is unclear whether medical management or physical therapy was responsible for these improvements. Future research is needed to determine whether physical therapy or medical management were responsible for returns in muscle strength and sensation.

Manuscript word count: 3,398

Background and Purpose

Alcoholic polyneuropathy is a sensorimotor peripheral polyneuropathy that usually affects individuals over 40 years-old with a history of chronic alcoholism.[1] Most cases of alcoholic polyneuropathy occur chronically over several months. However, acute cases may develop over the course of weeks. Alcoholic polyneuropathy is sometimes accompanied by diabetic polyneuropathy or nutritional deficiencies, most commonly thiamine deficiency.[2] There is no one clearly understood pathobiology for injury to the nerves.[3] However, there are several proposed mechanisms for the action of ethanol on the peripheral nerves, the most common being the direct neurotoxic effect of ethanol on the axons. Symptoms of alcoholic polyneuropathy include numbness, paresthesia, loss of vibratory sensation, loss of kinesthesia and proprioception, and motor weakness presenting initially in the distal lower extremities.[4] Most cases are managed medically with nutritional replacements and pain medications, and symptoms usually diminish over a few weeks with only residual impairments remaining.[3] Documented physical therapy interventions for alcoholic polyneuropathy are scant, focusing on treating the patient's impairments in gait and preserving range of motion when available.[1] This scarcity may be due to the variable presentations of the condition and the numerous differential diagnoses. There is sparse literature surrounding physical therapy treatment and interventions for a patient with acute alcoholic polyneuropathy. Therefore, the aim of this case report was to describe the clinical reasoning behind the selection of physical therapy interventions used on a patient with acute alcoholic polyneuropathy in the acute inpatient setting.

History

The patient, a 33 year-old English speaking Caucasian male, was admitted to the emergency room with complaints of lower extremity weakness. The patient's weakness had an

insidious onset approximately four weeks prior, and had progressed to where he could no longer ambulate. Before the onset of weakness, the patient was independent in all activities of daily living (ADLs) and ambulated without an assistive device and without difficulty. Ambulation had been the patient's primary method of transportation. The patient reported no significant factors affecting his health, other than that prior to admission, he drank three liters of alcohol per week. Ten days before admission, he decided to abstain from alcohol and stated being successful with his abstinence. He described no past medical or surgical history, and reported not taking any medications. His family status was unknown; his sister was present at the time of evaluation, but neither mentioned parents. Family history for this patient included diabetes, dyslipidemia, and breast cancer. He lived in an apartment on the second floor with two roommates. He was unemployed, and was not participating in any physical fitness program. The patient's goals were to figure out what caused the onset of weakness and return to his prior level of function, focusing on ambulation. He was willing to work with physical therapy staff to move towards these goals and signed a consent form to participate in this case study.

Systems Review

A systems review covering the domains of cardiovascular and pulmonary, musculoskeletal, neuromuscular, integumentary, communication, and cognitive systems was completed at initial examination. The information obtained from this review can be found in Table 1. The cardiovascular, pulmonary, and integumentary systems were unremarkable. The patient communicated well in English and was oriented times four. In the musculoskeletal domain, the patient presented with decreased gross strength in the distal lower extremities and was symmetric bilaterally. Neurologically, the patient complained of numbness and tingling in the distal lower extremities and had symmetrically decreased sensation to light touch in those

areas. Thus the primary areas of impairment for the patient were the neurological and musculoskeletal domains, which were investigated more fully in the examination.

Clinical Impression #1

From the patient's history, his chief complaint was impaired strength in his lower extremities that limited his ability to ambulate and participate in activities of daily living. The primary suspected diagnosis was of Guillian-Barre Syndrome (GBS) due to the acute nature of the symptoms. However, there were many potential differential diagnoses. These diagnoses included, but were not limited to: chronic inflammatory demyelinating polyneuropathy (CIDP), amyotrophic lateral sclerosis (ALS), Lyme disease, chronic alcohol abuse, cancer, multiple sclerosis, hyperthyroidism, Human Immunodeficiency Virus (HIV) and spinal cord damage. No additional information was needed from the patient, however additional testing and imaging from the hospital was needed and had already been ordered. This patient was a good candidate for this case report due to his unusual presentation of acute weakness, intact cognition, ability to follow commands, and his willingness to participate in physical therapy activities. For the examination, strength, balance, mobility, sitting tolerance, standing tolerance, sensation, gait, pain, and coordination were assessed to ascertain a complete picture of the patient's presentation.

Examination

The patient was initially admitted to the emergency room where a routine examination of vitals was performed. After, the patient was deemed to not be in acute distress and was admitted to the Definitive Care Unit (DCU). While admitted, the patient underwent many tests from various specialists. On day one blood tests revealed the patient did not have HIV, but did have electrolyte imbalances, particularly decreased folate, thiamine, and magnesium levels. The patient was started on intravenous doses of those electrolytes and was tested for their efficacy

daily. On day two, the patient underwent a lumbar puncture which revealed normal cerebrospinal fluid protein levels. He also had magnetic resonance imaging (MRI) of his lumbar spine which showed "some mild degenerative changes" per the neurologist, but no association to his symptoms. An ultrasound of his liver on day three revealed mild cirrhosis with no major damage. A final diagnosis of acute alcoholic polyneuropathy was reached based on his reported history and the absence of any other acute damage to his systems or electrolyte levels. Results of the physical therapy examination can be found in Table 2.

Clinical Impression #2

The physical therapy examination data supported the initial impression of impaired strength in the lower extremities that prevented the patient from ambulating and carrying out activities of daily living. The data was in line with the final clinical diagnosis of acute alcoholic polyneuropathy. The patient also presented with impaired sensation to light touch in the distal lower extremities which contributed to a lack of safety in the community and home with loss of balance during daily activities. The patient's physical therapy diagnosis fell under the adapted practice pattern 5G: Impaired Motor Function and Sensory Integrity Associated with Acute or Chronic Polyneuropathies from the American Physical Therapy Association's *Guide to Physical Therapy Practice*.[5] His medical diagnosis, based on ICD9 codes, was 357.5 for alcoholic polyneuropathy. Based on the literature, the patient's prognosis was fair due to the atypical acute onset of alcoholic polyneuropathy.[1] The patient had already progressed through detoxification on his own at home, and seemed motivated to remain abstinent from alcohol. He was also very motivated to participate in all physical therapy interventions. This patient continued to be appropriate for the case due to his unusual presentation and symptoms of alcohol abuse and its relations to physical therapy evaluation and treatment.

In the acute setting, the medical team is an important aspect of patient care. Occupational therapy, a dietician, nursing staff, and a neurological specialist were included with physical therapy in the patient team. The members of the team conducted additional testing during the course of the patient's treatment as per their treatment plans.

The next plan of action for physical therapy was to proceed with interventions targeting retaining mobility and strength. These interventions were planned to be as functional as possible given the acute environment. The plan for intervention followed the patient in the acute care setting, in which the goals of the plan were functional mobility and preservation of strength to the level in which the patient presented at the time of service. The patient plan was to progress in mobility and stabilize enough to be discharged from the hospital to an inpatient rehabilitation center. The long term (1 week) goals established for the patient at evaluation were for safe functional mobility, independence with bed mobility, independence with transfers, for the patient to independently ambulate greater than 30.5 meters (100 feet) with an assistive device, and to ascend and descend 14 steps with minimum assistance while using both rails. The patient's short term (4 day) goals were for functional balance with minimum assistance with dynamic standing for 2 minutes using a front wheeled walker, minimum assistance with transfers using a front wheeled walker, and minimum assistance ambulating 15 meters (50 feet) using a front wheeled walker. Strength and functional measures were to be repeated at the time of discharge.

Interventions

Patient interaction was documented after every treatment using MEDITECH* software utilized by the hospital. This software was made for streamlined communication with the care

* MEDITECH Circle
Westwood, MA 02090

team as the entire team had access to the patient's electronic chart. The physicians read the therapy notes to determine placement of the patient. Occupational therapy was involved in the patient's care for a short period of time and used the software and breaks in the therapy office to communicate about the patient's status. It was hospital policy for the physical therapists to communicate with nursing before going to see the patient, and any change in patient condition or functional status was communicated to nursing after the treatment. The nurse in charge of intake for inpatient rehabilitation was in contact with the physical therapist to determine the patient's tolerance for therapy.

Patient instruction and education were very important in this case. The plan of care included instructions to educate the patient on the evolving status of his diagnosis and future prognosis. The plan of care also included instructions for education on movement strategies, transfers, equipment use, and an exercise program to be carried out while the patient was admitted to the hospital.

A variety of interventions were provided based on the patient's goals and functional needs. These interventions fell under the American Physical Therapy Association's procedural intervention categories of patient instruction, functional training in activities of daily living (ADLs), motor function training, and therapeutic exercise. Patient instruction and education were given for all of the procedural interventions. To increase independence in ADLs the patient was instructed in the use of assistive devices for transfers, the use of a manual wheelchair, and safety techniques while performing these tasks. For motor function training the patient was instructed in exercises for transfers, pre-gait, gait with partial body weight support, and wheelchair propulsion. For therapeutic exercise the patient was given active plantarflexion, active-assisted

dorsiflexion with a towel, heel slides, quad sets, bridging, hip adduction and abduction, and short arc quads.

On the first day the patient was admitted to the hospital, a physical therapy evaluation was ordered. As the original diagnosis was for bilateral lower extremity weakness with unknown cause, the interventions planned were conservative in nature. Functional mobility, gross strength, and range of motion were assessed in supine and in sitting. The patient was able to move from supine to sit with supervision using his upper extremities to move his lower extremities. The patient's main wish was to attempt standing, and as rehabilitation staff was present, an attempt to stand with two person assist to a front wheel walker was made. The attempt was unsuccessful with the patient unable to control his legs, and the patient was lowered back to the bed. Further attempts at standing were deemed unsafe at this time and the patient returned to supine. The patient was educated in using a towel to assist with dorsiflexion, 2 sets of 30 seconds each, to prevent the loss of range of motion due to decreased muscle activation. Therapeutic exercises were also performed using 1 set of 10 repetitions of quad sets and heel slides. The patient asked if stretching exercises were permissible to perform, and as keeping range of motion and decreasing muscle stiffness is a goal of exercise for Amyotrophic Lateral Sclerosis in order to maintain functional mobility and decrease pain, the patient was given encouragement to perform any stretches he felt he needed.[6]

On the second day of admission to the hospital, diagnoses of human immunodeficiency virus, Guillain-Barre syndrome, Amyotrophic Lateral Sclerosis, and spinal cord involvement were discarded due to medical imaging and testing. The patient reported compliance with exercises given the previous day. The patient also reported no fatigue or soreness from exercises done the day before, and the combination of these two factors resulted in the decision to increase

the amount of strength training the patient was given in order to promote an increase in functional mobility.[7] In supine, the patient performed 1 set of 10 repetitions of heel slides, quad sets, and hip abduction and adduction. The patient then moved to sitting at the edge of the bed and performed 1 set of 10 repetitions of short arc quads and seated marching. To promote movement towards safe gait, a pre-gait exercise was performed in sitting by having the patient lean forward to shift weight through the lower extremities five times while guarded by the physical therapist. The exercises in bed were then reviewed with the patient and given verbally for the patient to perform up to 2 sets of 10 repetitions to a maximum of 3 times a day as tolerated. The patient verbally stated his understanding of the exercises and the precaution to stop performing them if any adverse effects were noted.

Although some differential diagnoses were ruled out, the patient's symptoms remained unchanged on the third day. The patient was persistent with the request to try standing and gait, and fortunately the appropriate staff and equipment was available at this time for the use of mechanical lift for body weight support of standing. This activity, although early in the timeframe of the patient's therapy, was deemed important for the practice of gait and for the psychological well-being of the patient.[8-9] Bed mobility was reassessed and the patient was able to move from supine to sitting at the edge of the bed with supervised assistance. From this point, the patient was positioned into the Encore®[†] mechanical lift that would provide standing assistance and an explanation of the process for standing was given. The Encore® was used without the foot plate so that the patient could stand on the floor. See Figures 1 and 2 for reference. With the patient standing on the floor there was potential to practice pre-gait and gait

[†] Encore ArjoHuntleigh, Model #KKA5020, 1-800-323-1245
50 North Gary Ave, Unit A
Roselle, IL 60172

if the patient could tolerate standing. Using the Encore® and two people to assist, the patient was moved to standing and remained standing using the machine and his upper extremities for support. Pre-gait training was initiated with weight shifts laterally, and then weight shifts anteriorly and posteriorly. As the patient tolerated this well, the patient then ambulated 21.3 meters (70 feet) with maximum assistance given by two people and the lift. The patient was also followed with a wheelchair for safety. During gait the patient presented with a hip hike and rolling gait in order to have his feet clear the floor due to bilateral foot drop. After ambulating 21.3 meters (70 feet), the patient was transferred to the wheelchair using the Encore®. The patient then propelled the chair 21.3 meters (70 feet) back to his room using his upper extremities with some difficulty due to decreased finger and hand dexterity, numbness, and decreased hand strength. For safety, the Encore® was used to transfer the patient from the wheelchair to the bed.

On day four, the patient had regained some strength in the lower extremities as noted through manual muscle testing by the neurologist, and had reduced pain and numbness. The hospitalist noted that the diagnosis was suspected alcoholic polyneuropathy due to an ultrasound showing an enlarged spleen and some liver changes. The decision was made to focus on interventions for strengthening the lower extremities. Increasing muscle strength can improve speed of strength generation in people with peripheral neuropathy, which is important for transfers and ambulation.[10] Therapeutic exercises were performed in supine and included 1 set of 10 repetitions of quad sets, hip abduction and adduction, heel slides, and ankle pumps. The patient then moved to sitting at the edge of the bed and performed exercises of 1 set of 10 repetitions of short arc quads and seated marching. The patient returned to supine and needed verbal cueing to scoot up in the bed, at this point the decision was made to add bridging

exercises to increase functional bed mobility. A pillow between the knees was used to provide feedback to the patient to prevent the hips from falling into external rotation. The patient performed five bridges successfully, and needed education and cueing for breathing during exercise to prevent dizziness and lightheadedness. Additional staff were not available to assist with ambulation on this day.

On day five, the patient reported decreased numbness and tingling in all extremities. The patient was admitted to inpatient rehabilitation and discharge orders from the hospital were written. The decision was made to educate the patient on transfers from the bed to a wheelchair using a slide board since the patient was still not able to ambulate. The patient did not suffer from fatigue when using the upper extremities and was able to tolerate the multiple weight shifts required to use this transfer method.[6] The patient transferred with one person giving minimum to moderate assistance and verbal cues. After the patient was seated in the wheelchair, he used his upper extremities to propel the wheelchair 61 meters (200 feet) for functional aerobic training. The patient was then discharged to inpatient rehabilitation.

Outcomes

The patient showed some improvement over the course of five days, the summary of which can be found in Table 2. His range of motion actively and passively remained the same, as did his ability to mobilize in bed and sensitivity to crude touch. Most of the patient's muscle groups retained their strength, however there was an increase from 0/5 to 1/5 in dorsiflexion strength and an increase from 3/5 to 4/5 in hip flexor strength. The patient went from having a Functional Independence Measure (FIM) score of 1 for transfers, meaning that he required a total assist to transfer, to a FIM score of 5, meaning that he was able to transfer with supervision using an assistive device. Upon admission the patient was unable to transfer, and upon discharge the

patient transferred from bed to wheelchair using a slideboard with supervision. At the initial evaluation the patient was unable to ambulate, and at discharge the patient was able to propel a wheelchair using his upper extremities for 61 meters (200 feet) with supervision. When the patient was initially assessed for pain using the visual analog scale (VAS), the patient reported 0/10 pain. Upon discharge, the patient reported 2/10 pain. Lastly, upon initial evaluation the patient was unable to stand with two person maximum assist and a walker; on day 3 he was able to stand and take some steps with two person maximum assist and mechanical assistance.

Discussion

This patient presented to the emergency room with a unique case of acute alcoholic polyneuropathy. Over the five days that the patient was treated and seen in the acute care setting, the patient regained some strength in dorsiflexion and hip flexion, which may have stemmed from physical therapy interventions, medical management, or both. According to Confer et al, intensive physical therapy rehabilitation can decrease the length of ICU and hospital stays in patients with critical illness polyneuropathy and leads to better functional outcomes upon hospital discharge.[11] Medical management for chronic alcoholic polyneuropathy often includes management of thiamine deficiencies, vitamins B2, B6, and B12, folate deficiencies, and management of pain symptoms with antidepressants.[3] This patient received gabapentin for pain control and folate supplements during his treatment period. The report of increased pain by the last day of treatment may be attributed to the return of sensation. The increase in transfer ability was most likely due to education and practice, however improved strength may have been a contributing factor. The combination of medical management and physical therapy intervention made it difficult to differentiate which had the most impact on the patient's improvement.

Alcoholic polyneuropathy in both chronic and acute forms has unclear etiology and many complicating factors. There is not a lot of research pertaining to the short or long term outcomes in either a medical model or a physical therapy intervention for patients with alcoholic polyneuropathy. It is unclear whether this patient's progress was due to medical management or physical therapy intervention. Further research needs to be done on the efficacy of physical therapy interventions and the optimal duration, frequency, and intensity for interventions.

References

1. Laker, SR. Alcoholic neuropathy. Medscape website: http://emedicine.medscape.com/article/315159-overview. Published April 21, 2015. Accessed September 8, 2015.

2. Ropper AH, Samuels MA, Klein JP. Chapter 46. Diseases of the Peripheral Nerves. *Adams & Victor's Principles of Neurology*. 10th ed. New York, NY: McGraw-Hill; 2014: chap 46. http://accessmedicine.mhmedical.com.une.idm.oclc.org/content.aspx?bookid=690&Sectionid=50910898. Accessed July 14, 2015.

3. Chopra K, Tiwari V. Alcoholic neuropathy: possible mechanisms and future treatment possibilities. *Br J Clin Pharmacol*. 2011; 73(3): 348-362. DOI:10.1111/j.1365-2125.2011.04111.

4. Purves D, Augustine GJ, Fitzpatrick D. *Neuroscience*. 2nd ed. Sunderland, MA: Sinauer Associates; 2001. http://www.ncbi.nlm.nih.gov/books/NBK11019/. Accessed July 14, 2015.

5. Adapted Practice Patterns. American Physical Therapy Association Web Site. http://www.apta.org/Guide/PracticePatterns/. Accessed July 11, 2015.

6. Lewis M, Rushanan S. The role of physical therapy and occupational therapy in the treatment of Amyotrophic Lateral Sclerosis. *NeuroRehabilitation*. 2007; 22: 451-461.

7. Khan F, Amatya B. Rehabilitation interventions in patients with acute demyelinating inflammatory polyneuropathy: a systematic review. *Eur J Phys Rehabil Med*. 2012; 48: 507-522.

8. Gale J. Physiotherapy intervention in two people with HIV or AIDS-related peripheral neuropathy. *Physiother Res Int*. 2003; 8(4): 200-209.

9. Tuckey J, Greenwood R. Rehabilitation after severe Guillain-Barre syndrome: the use of partial body weight support. *Physiother Res Int*. 2004; 9(2): 96-103.

10. Handsaker JC, Brown SJ, Bowling FL, Maganaris CN, Boulton AM, Reeves ND. Resistance exercise training increases lower limb speed of strength generation during stair ascent and descent in people with diabetic peripheral neuropathy. *Diabet Med*. 2015. http://qa3nq3jm4u.search.serialssolutions.com.une.idm.oclc.org/?V=1.0&sid=PubMed:LinkOut&pmid=26108438. Accessed July 27, 2015.

11. Confer J, Wolcott J, Hayes R. Critical illness polyneuropathy. *American Journal of Health-System Pharmacy.* 2012; 69(14): 1199-1205.

12. O'Sullivan SB, Schmitz TJ, Fulk GD. *Physical Rehabilitation*. 6th ed. Philadelphia, PA: F.A. Davis; 2014.

13. Functional Independence Measure. Rehab Measures Database Website. http://www.rehabmeasures.org/Lists/RehabMeasures/PrintView.aspx?ID=889. Published January 18, 2013. Accessed July 2, 2015.

14. Functional Reach Test and Modified Functional Reach Test. Rehab Measures Database Website. http://www.rehabmeasures.org/Lists/RehabMeasures/PrintView.aspx?ID=950. Published April 12, 2013. Accessed July 2, 2015.

15. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain. *American College of Rheumatology*. 2011; 63(11): 240-252.

Tables

Table 1: Systems Review

Cardiovascular/Pulmonary	Reviews of cardiovascular and pulmonary systems were unremarkable. In supine, blood pressure read 134/82, heart rate 99 beats per minute, and oxygen saturation 100%. The patient reported no dizziness or breathlessness upon change in position from supine to sitting.
Musculoskeletal	Height: 188 cm (6'2") Weight: 122.9 kg (270.9 lbs) In the upper extremities, active range of motion and gross strength were within functional limits.[12] Grip strength was slightly impaired bilaterally, with the right hand being stronger than the left. The patient was right handed. The patient was observed having difficulty writing and holding a pen in his right hand. In the lower extremities, active range of motion was impaired due to weakness as passive range of motion was within normal limits. The patient presented with decreased gross strength in the distal lower extremities. The patient was bilaterally symmetric.
Neuromuscular	Upper extremity coordination and Rapid Alternating Movements (RAMS)[12] were normal and symmetrical bilaterally. Lower extremity coordination was not assessed due to muscle weakness. The patient complained of numbness and tingling in the fingertips and in both lower extremities. Sensation was present in both lower extremities, but was decreased distally.
Integumentary	Review of visible skin was unremarkable. Skin was dry, moderate in temperature, intact, and constant in color.
Communication	The patient communicated in complete and complex sentences spoken English.
Affect, Cognition, Language, Learning Style	The patient demonstrated a lively affect and was oriented times four. He spoke in complete and complex sentences. The patient learned best through explanation, experience, discussion, and visual handouts.

Table 2: Initial Evaluation and Discharge Results for Tests and Measures

Tests & Measures	Initial Evaluation Results	Discharge Results	Reliability and Validity
Range of Motion	Bilateral upper extremity (UE) active range of motion within functional limits (WFL) Bilateral lower extremity (LE) active range of motion limited by muscle weakness, passive range of motion WFL	No change from initial evaluation.	Active and passive range of motion tested per O'Sullivan et al[12]
Gross Muscle Strength	Bilateral UE gross strength WFL Bilateral UE grip strength impaired, L>R Bilateral LE gross strength as follows: Toe extension: 1/5 Toe flexion: 2/5 Plantarflexion: 5/5 Dorsiflexion: 0/5 Knee extension: 4/5 Knee flexion: 4/5 Hip flexion: 3/5	Bilateral UE gross strength WFL Bilateral UE grip strength impaired, L>R Bilateral LE gross strength as follows: Toe extension: 1/5 Toe flexion: 2/5 Plantarflexion: 5/5 Dorsiflexion: 1/5 Knee extension: 4/5 Knee flexion: 4/5 Hip flexion: 4/5	Intratester reliability of manual muscle testing has been found to be good between trained therapists. Intertester reliability varies.[12]
FIM: Bed Mobility	5= Supervised	5=Supervised	Test-retest reliability 80-98% Inter-rater reliability 95%[13]
FIM: Transfers	1= Total Assist	4= Minimal Assist	
Gait	Not assessed at this time due to inability to stand.	Wheelchair Locomotion FIM of 5= Supervised	
Sitting Balance: Modified Functional Reach	25 inches	Not Assessed	Test-retest reliability 84-95% Intra/Inter-rater reliability 87-99%[14]
Standing	Patient unable to stand with two person dependent assist to a front wheeled walker.	Patient required maximum two person assist, as well as mechanical assistance to achieve and maintain standing.	None available

Sensation	Crude touch intact for lower extremities but diminished.	No change from initial evaluation.	Crude touch performed per O'Sullivan et al[12]
Coordination	UE: rapid alternating movements normal, finger to finger normal LE: not assessed due to weakness	Not Assessed	Coordination tested per O'Sullivan et al[12]
Pain: Visual Analog Scale	0/10	2/10	Test-retest reliability 71-94%[15]

359

Table 3: Intervention Outline

	Day 1	Day 2	Day 3	Day 4	Day 5
Session Length	62 min	46 min	45 min	48 min	45 min
Therapeutic Exercises	Patient education using a towel for assisted dorsiflexion. Therapeutic exercise in long sit: 1 set of 10 repetitions of quad sets and heel slides.	Therapeutic exercise in supine: 1 set of 10 repetitions of quad sets, heel slides, and hip abd/adduction.	Supine functional mobility reassessed: patient completely independent.	Therapeutic exercise in supine: 2 sets of 10 repetitions of quad sets, heel slides, and hip abd/adduction.	Patient transferred to Inpatient Rehabilitation for further therapy.
Functional Mobility	Functional mobility assessed in evaluation	Therapeutic exercise in sitting: 1 set of 10 repetitions of short arc quads and marching.	Patient transfer from Encore® to wheelchair and used bilateral upper extremities to propel chair 70 ft back to room.	Therapeutic exercise in sitting: 2 sets of 10 repetitions of short arc quads and marching.	Transfer training from bed to wheelchair using a slide board.
Gait Activities	Attempt at sit to stand maximum two assist to front wheel walker	Pre-gait activity: 1 set of 5 repetitions of sitting with forward lean and weight shift to lower extremities.	Encore® used for partial body-weight support training with maximum two assist, ambulated 70 ft.	Therapeutic exercise in supine: 1 set of 3 repetitions of bridging with a pillow between the knees to prevent external rotation.	Patient propelled wheelchair 200 ft using bilateral upper extremities.

Figures

Figure 1: A Demonstration of the Encore[‡] for Sit to Stand without the Footplate

[‡] Encore ArjoHuntleigh, Model #KKA5020, 1-800-323-1245
50 North Gary Ave, Unit A
Roselle, IL 60172

Figure 2: A Demonstration of the Encore Used for Standing without the Footplate