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Use Of A Task-Oriented Approach In The Physical Therapy Management Of A Patient Following A Posterior Inferior Cerebellar Artery Stroke: A Case Report

Erika Derks
University of New England

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E Derks, BA, is a Doctor of Physical Therapy student at the University of New England, 716 Stevens Ave. Portland, ME 04103

Address all correspondence to Erika Derks at: ederks@une.edu

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

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Abstract

Background and Purpose: Stroke is the leading cause of long term disability in the United States. Despite the prevalence of stroke, there is minimal research on physical therapy interventions for patients with cerebellar stroke. The purpose of this case report is to describe a multidimensional intervention program for a patient following a cerebellar stroke, emphasizing a task-oriented approach and motor learning principles.

Case Description: The patient was a 78-year-old female who had a right posterior inferior cerebellar artery stroke. She received daily physical therapy for four and a half weeks in the acute rehabilitation setting. The examination revealed deficits in coordination, balance, motor function, and mobility. Procedural interventions included functional training with an emphasis on the task-oriented approach. The patient's progress was documented through the Berg Balance Scale, Functional Independence Measure, and required level of assistance.

Outcomes: The patient showed improvements in all categories by the end of the treatment period. From admission to discharge, the patient improved her Functional Independence Measure score by 28 points (MCID = 22 points), and her Berg Balance Scale score by eight points (MDC=6 points). However, due to residual deficits of a subsequent stroke, the interdisciplinary team recommended discharge to a skilled nursing facility for continued rehabilitation.

Discussion: Physical therapists within the acute rehabilitation setting commonly utilize the task-oriented approach for patients with cerebral stroke. A similar intervention approach for this patient with cerebellar stroke appears to have been beneficial. The patient had improved functional mobility at the time of discharge, despite having a second stroke. Continued research on determining the effectiveness of this approach is warranted.

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Background and Purpose

According to the Centers of Disease Control and Prevention, stroke, or cerebrovascular accident (CVA), is the leading cause of long-term severe disability in the United States and the fourth leading cause of death in adults.[1] Of the 600,000 strokes that occur annually in the United States, only 3.4% are cerebellar strokes.[1] Due to the compartmentalization of the cerebellum, not only are cerebellar strokes less prevalent, but the symptoms and presentation are distinctly different than cerebral artery strokes. Previous studies have shown the functional compartmentalization of the human cerebellum, which provides clarity regarding areas and functions that may be affected in a person post-stroke.[2] For example, the posterior inferior cerebellar artery (PICA) supplies the inferior portion of the cerebellum and portions of the dentate nucleus.[2,3] Therefore, infarction of the PICA often leads to gait and postural instability, nystagmus and vertigo.[3] The cerebellum controls limb, postural, and hand-eye coordination, and is also involved in non-motor function, such as cognition and attention, all of which are essential to everyday life and independence.

Although there is a low occurrence rate of cerebellar strokes, their impact can cause severe acute neurological morbidity. Among patients with PICA infarcts 50% had deficits at the time of acute hospital discharge, and the mortality rate was 17%.[4] Despite the significant neurological deficits present post-PICA stroke, minimal data exists on the topic. Furthermore, very little research has been done on the physical therapy (PT) management of patients with an acute PICA stroke.

Research is well documented on PT management and interventions for patients post CVA. In fact, the task-oriented approach (TOA) has been demonstrated to be an effective

treatment for this patient population. According to Rensik et al.,[5] task-oriented rehabilitation proved to be more effective than traditional therapies post CVA and led to improvements in functional outcomes and overall health-related quality of life. Unfortunately, limited research specifically addresses the use of a TOA in those with cerebellar stroke. The purpose of this case report is to provide an overview of PT management in the acute inpatient rehabilitation setting for a patient following a PICA stroke, with the use of a TOA.

Patient History and Systems Review

Prior to the patient's initial examination, the patient signed an informed consent to allow for the use of medical information and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act.

The patient was a 78-year-old female who reported being a generally healthy individual prior to her right PICA stroke. She was married to a very supportive husband and had three adult children, one of whom passed away. She was retired, but was still very involved with her local church and community. She reported singing in the choir and writing letters to people who were sick or home bound as volunteer work. Prior to this incident, she reported being independent with all age appropriate activities of daily living (ADLs). She lived with her husband in a private two-story home, with their bedroom and bathroom located on the second floor.

The patient presented with multiple co-morbidities, well controlled and maintained prior to her stroke, and medications, as shown in Appendix 1. She had a family history that was remarkable for cancer and coronary artery disease, as well as a personal history of T2 adenocarcinoma of the lower rectum. She denied any tobacco or alcohol use. The patient reported being fairly active at home and in the community prior to admission, and denied any history of falls, however she occasionally used a single point cane for mobility. Her past surgical

history included: gastric bypass surgery, appendectomy, breast surgery (lumpectomy in the 1960's), bilateral knee arthroscopies, carpal tunnel release, cholecystectomy, hernia repair, and abdominoperineal resection with placement of a colostomy bag.

The systems review revealed she had impairments of the cardiovascular, musculoskeletal, integumentary, and neuromuscular systems, as well as communication and cognition deficits (refer to Table 1). Her chief complaints were double vision and "unsteadiness" at initial examination. The patient and family goals included: being able to walk without assistance, return to her prior level of function, and return home safely.

Clinical Impression #1

The patient's primary problem included decreased coordination, sensation, balance and cognition, secondary to her medical diagnosis of an acute CVA in the PICA territory. This led to multiple activity limitations including an inability to ambulate, transfer, and complete ADLs. These limitations prevented her from returning home to her prior level of function. Her participation was restricted by an inability to attend community functions and serve as a volunteer. There were no potential differential diagnoses at the time of initial evaluation. The patient's deficits were consistent with the medical diagnosis and as expected. Additional information was gathered to quantify and qualify the impairments noted in the systems review. Tests and measures planned included: manual muscle testing (MMT), observation of functional mobility and gait, coordination, sensation, proprioception, reflexes, spasticity, and balance testing. The patient was a good candidate for this case report due to the uniqueness of her presentation and pathology.

Examination

Tests and measures were done at admission and discharge to objectively portray the patient's progress. Please refer to Table 2 for results and psychometric properties of the tests and

measures utilized.[6-12] The Berg Balance Scale (BBS), a 14-item objective measure, was used to assess the patient's static balance and fall risk.[6] Muscle strength was assessed using MMT.[7] The Functional Independence Measure (FIM) was used to assess the patient's function and the amount of assistance required to carry out ADLs.[8] The Modified Ashworth Scale graded her spasticity on a scale from zero to four.[9]

The other neurological tests performed included: deep tendon reflexes, coordination, proprioception, and sensation.[10] For coordination testing, the patient performed the heel to knee test.[11] Discriminative touch, with the patient's eyes closed, was done for sensation and tactile localization. By asking the patient to say or duplicate what position in which her extremity was placed, while her eyes were closed, conscious proprioception was tested.[10] Lastly, a functional and gait analysis was performed by observing the patient during functional activities for deficits, abnormalities, and defects.[12]

Clinical Impression #2

The examination data confirmed impairments consistent with a cerebellar artery stroke and further supported the initial clinical impression. The plan was to proceed with a multidimensional PT approach, with an emphasis on task-oriented rehabilitation. The patient continued to be appropriate for the case report, and her willingness to participate in PT and motivation to improve was still evident.

The patient exhibited lower extremity weakness, decreased sensation, impaired balance and coordination, and functional mobility deficits as a result of her cerebellar artery stroke. Her decreased sensation predominately on her left side, combined with her coordination deficits on her right side, greatly interfered with her function. She experienced severe balance deficits

which made gait extremely difficult and increased her fall risk. She scored a 5 out of 56 on the BBS, which further confirmed these deficits and put her into a high fall risk category (<45 indicates a risk for falls).[6] These limitations all contributed to a decreased functional independence and inability to keep up with her peers. Her FIM score was 44 out of 126 (FIM mean score = 2.44), which meant she required maximal assistance with functional activities. When assessing her basic mobility skills, she required moderate assistance from two persons to perform bed mobility and transfers due to her unsteadiness and inability to coordinate movements. She also required maximum verbal cues for safety and attention. Her cognition decreased her overall independence and her ability to perform self-care. She required moderate assistance times two persons for ambulation with a rolling walker for a distance of eight feet. She presented with an ataxic gait pattern, which consisted of scissoring lower extremities, poor foot placement, and heavy reliance on the walker. Ultimately, these deficits inhibited her from returning home safely and participating in her prior activities, such as attending church and volunteering.

Due to the patient's medical condition and impaired motor function, the ICD-9-CM codes 436 "acute cerebrovascular disease" and 781.2 "abnormality of gait" were chosen.[13]

Given the patient's expected recovery and prior level of function, she had good potential to make functional gains and decrease the secondary impairments from her stroke. As Dashe[14] notes, the most dramatic recovery following a stroke occurs in the first three to six months. She had yet to reach this time frame and would hopefully improve with continued rehabilitation; nonetheless, she was unlikely to be fully independent when discharged to home. Kase et al[4] described patients with cerebellar infraction in the territories of the PICA. Of those patients, 50% had neurological deficits at the time of acute hospital discharge.[4] Therefore, a full recovery

was not expected by the end of her acute stay and she would likely require 24-hour supervision for safety, and assistance with mobility to navigate her home. With the help of family support, her positive disposition and compliance to PT, the ease in her transition home would be increased. She was motivated and understood that improving these deficits would positively affect her recovery and ability to participate in normal daily activities. No referrals were necessary, as she was already receiving services from occupational therapy, speech therapy, social work, and a physician in the rehabilitation unit.

The plan for intervention was to develop a multidimensional PT program with an emphasis on task-oriented rehabilitation. In addition, motor learning principles, therapeutic activity, and strengthening exercises would be applied. Follow-up evaluation and interdisciplinary team meetings were done weekly to discuss progress and discharge planning. An open timeline was kept and continual assessment was done to adjust patient care as needed. The plan was to see her until acute rehabilitation goals (refer to Table 3) had been met and she was safe to return home.

Interventions

Coordination for the patient's case was done with nursing, occupational therapy, and speech language pathology. Throughout her care, the patient's upper extremity deficits and ADLs were addressed by occupational therapy. Similarly, speech and cognition were addressed by speech language pathology. Communication was done consistently with the patient's physician, nurse, dietician, social worker, case manager, and family. The patient's progress, plan of care (POC), and discharge planning was discussed at weekly interdisciplinary team meetings. Each treatment session was documented using an electronical medical system, and any changes in the POC were noted and explained at the time of change.

Patient related instruction included education on the recovery process, what to expect during therapy sessions, and her POC. Education on typical deficits in patients with cerebellar stroke and the importance of intensive PT was given. She was instructed on the proper use of a front wheeled walker, and the fitting of her ankle foot orthotic (AFO) and knee brace. She was encouraged to do frequent skin checks due to the AFO, for the prevention of skin break down. The patient's husband and family were also educated on her progress, safety of devices, and POC.

Over the course of four and a half weeks, the patient received 60 treatment sessions in the acute rehabilitation setting. She was seen six days a week for at least 60 minutes daily. The time was split between one morning and one afternoon session. She was also seen on Sunday, the seventh day of the week, for one 30 minute session. The patient was very compliant with PT and participated in all PT sessions initiated.

Procedural interventions were done using a multidimensional PT approach, with an emphasis on task-oriented rehabilitation. Task-oriented rehabilitation was used for re-training of bed mobility, transfers, gait, and wheelchair mobility. Minimal data existed on specific treatments for patients with cerebellar stroke, but evidence has shown improvements in patients with acute ischemic strokes by using this approach. Task-oriented rehabilitation has been found to achieve better functional gains than non-repetitive training. According to Takeuchi and Izumi,[15] task-specific training after stroke can effectively recover a wide array of motor behaviors involving upper limbs, lower limbs, sit-to-stand movements, and gait. In addition, Friedman[16] reported that earlier gait recovery is associated with future gait independence in patients post-stroke. Therefore, gait training was initiated early in the POC with the use of a TOA (refer to Table 4).

Other interventions in the multidimensional PT approach included: neuromuscular re-education, therapeutic exercise, and motor learning. Neuromuscular re-education interventions addressed balance deficits that limited her ability to perform functional activities. These interventions were heavily emphasized, as balance is an impairment that has a strong relation with walking and functional activities post-stroke.[17] Therapeutic exercise was done by lower extremity strengthening activities which helped increase the patient's activity tolerance and muscle control during movement. Lastly, motor learning principles were applied throughout PT interventions. According to Bayona et al.,[18] task-specific therapy in addition to motor learning is considered to have the best results in creating functional reorganization of cortical motor maps. In order to help create the reorganization of motor planning, these principles were applied. Furthermore, the patient was given education, demonstration, and feedback to increase performance and safety. Visual and tactile cues were given during ambulation to direct foot placement, control the rolling walker and improve her overall gait pattern. The patient was better able to control her scissoring gait pattern and direct her foot placement when parallel lines of blue tape where applied to the floor (see Figure 1).

Over time, interventions were progressed (refer to Table 4). The amount of assistance was decreased, the use of compensatory mechanisms was limited, and less feedback was given. Lower extremity strengthening exercises were progressed by increasing repetitions, implementing cuff weights, and adding resistance with Thera-band.* Balance exercises were progressed by moving from static to dynamic, decreasing upper extremity support, and transitioning activities to unstable surfaces (foam pad). Ambulation distances and repetitions of

*1245 Home Avenue Akron, OH 44310

transfers were also increased during the initial treatments. During the second week, she was given a right knee brace, as she had chronic right knee pain and it was limiting her ability to stand. She was also given a right ankle foot orthotic (AFO) to assist with gait training at the beginning of week three. The patient was making minimal progress at that time, and lacked coordination of her right lower extremity. In a study of children with cerebral palsy and lower limb coordination deficits, an AFO significantly improved postural control and lower limb kinematics during gait.[19] Although the patient population was significantly different, the presentation of ataxia and uncoordinated gait patterns was similar. Thus, the implementation of the AFO was initiated.

By the end of week three, it was noted that the patient was extremely distracted and her progress had plateaued. Subsequently, the patient was diagnosed with a second stroke and her rehabilitations goals had to be adjusted. The second stroke further limited her functional mobility and increased her cognitive deficits. Interventions were adjusted to focus on activities that would make her the most functionally independent by the time of discharge. Therefore, for the remainder of the treatment sessions, ambulation was deemphasized and more focus was given to wheelchair mobility and transfers.

Outcomes

Despite setbacks and a second stroke during the patient's episode of care, she showed significant improvements from admission to discharge. The patient improved her Functional Independence Measure (FIM) score by 28 points (MCID = 22 points), and her Berg Balance Scale (BBS) score by eight points (MDC = 6 points). According to her total FIM score, at discharge she required minimal assistance with functional activities, whereas she required maximal assistance at admission (refer to Table 3). Her BBS at discharge was a 13 out of 56,

still putting her in a high fall risk category, but showing a minimal detectable change in her overall balance. The patient was more independent by time of discharge; she performed wheelchair mobility with supervision and supine to sit transfers modified independently. During the episode of care, she showed the greatest improvement (greatest difference in assistance required) in wheelchair mobility, sit to stand transfers, and ambulation (refer to Figure 2). Despite this, she had not fulfilled all goals (refer to Table 3), required 24-hour supervision, and needed assistance for a majority of functional activities. She was unable to return home, perform daily activities, and continue her community involvement. Due to these limitations, the interdisciplinary team recommended discharge to a skilled nursing facility for continued rehabilitation.

Discussion

This case demonstrated the intended purpose by providing an overview of the PT management of a patient post-PICA stroke. Although minimal research existed on effective interventions for patients' post-cerebellar artery stroke, an emphasis was given to the TOA. The TOA is said to be an effective intervention for patients with acute ischemic strokes and led to improvements in functional outcomes and overall health-related quality of life.[5] When the TOA was applied to this patient with a cerebellar artery stroke, comparable results were yielded in the first two weeks of care. She showed initial improvements in balance, gait, transfers, and self-care. Over the first two weeks, she required less assistance and was showing signs of improvement. Her ambulation distance and overall endurance improved, as well as an increased independence through wheelchair mobility. Factors that may have positively influenced her outcomes included: an emphasis on the TOA, compliance with PT, motivation to improve, multidisciplinary care, and great family support.

Despite this, research has shown that among patients with PICA infarcts, 50% had deficits at the time of acute hospital discharge and the mortality rate was 17%.[4] Hypotheses were made on her potential recovery, but further research is needed to more accurately predict the prognosis of patients with cerebellar artery stroke. The patient's outcomes were negatively impacted by a subsequent stroke suffered during the third week of her recovery. Goals and interventions were adjusted as it became apparent that she would have residual deficits by the time of acute hospital discharge. The second stroke negatively affected her prognosis and resulted in setbacks to expected recovery.

Since there is limited data for patients with cerebellar artery stroke, it may be viable to publish additional case reports on patients with this condition. The research investigation of various treatment methods, such as the TOA, may also be beneficial. In addition, the use of treatment methods that were not expanded upon in this case could be explored. For example, the Nu-Step[†] may be beneficial if used on a regular schedule. In addition, the use of a body weight support system may allow for more substantial improvements in the patient's gait.

Although experiencing setbacks, the patient still improved in functional mobility at the time of discharge when compared to initial evaluation. Continued research on determining the effectiveness of this approach may support the use of these methods for future patients with similar conditions.

[†] NuStep, Inc. Ann Arbor, Michigan USA

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Table 1. Systems Review upon Admission

Cardiovascular/Pulmonary	
Impaired	Vital signs were not taken at the time of initial evaluation. There was edema present bilaterally in her lower extremities.
Musculoskeletal	
Impaired	Patient observed as obese, but gross symmetry not impaired. Her gross range of motion was within functional limits for lower extremities. Gross strength slightly diminished in all major muscles groups of lower extremities. Occupational therapist assessed upper extremities.
Neuromuscular	
Impaired	Gross coordinated movements, transfers, gait and motor function were impaired. Decreased sensation was noted in her left upper and lower extremities. No nystagmus present, but positive for double vision. Static sitting and standing balance were impaired. Deep tendon reflexes were diminished bilaterally (B/L) and muscle tone was normal.
Integumentary	
Impaired	Integumentary was intact. A scar was noted from previous resection of carcinoma. There was a colostomy bag on the left abdominal wall. Multiple bruises were also noted on her upper and lower extremities.
Communication	
Impaired	Dysarthria and inability to follow simple commands.
Affect, Cognition, Language, Learning Style	
Impaired	Orientation was intact. Cognition, memory, and attention were impaired. Patient's learning preference was not known at this time. Patient was bilingual, with French being her first language.

371 **Table 2. Test and Measures at Admission and Discharge**

Tests & Measures	Initial Examination Results		Discharge Results		Psychometric Properties
Cardiovascular/Pulmonary					
Edema	Bilateral LE edema = 1+		Normal, no edema noted		Unknown reliability and validity
Musculoskeletal					
Anthropometric Measurements	Height = 155 cm Weight = 88.4 kg BMI = 37		NT		
Manual Muscle Testing	**R LE**	**L LE**	**R LE**	**L LE**	Test-retest reliability (96% - 98%)[7] Inter-examiner reliability (82% - 97%)[7]
Hip Flexion	4/5	3+/5	4+/5	4+/5	
Hip Abduction	4/5	4/5	5/5	4/5	
Hip Adduction	4/5	4/5	5/5	4/5	
Knee Extension	4/5	4-/5	5/5	4+/5	
Knee Flexion	4/5	4-/5	5/5	4/5	
Ankle Dorsiflexion	4/5	4/5	5/5	5/5	
Ankle Plantarflexion	4/5	4/5	5/5	5/5	
Neuromuscular					
Coordination: Heel to Shin	R= slow and inaccurate, dysmetria	L = slow but accurate	R = slow and inaccurate, dysmetria	L = normal	Unknown reliability and validity
Sensation: Discriminative Touch	RUE and RLE = normal	LUE and LLE = diminished sensation	RUE and RLE = normal	LUE and LLE = normal (reports it "feeling different")	Unknown reliability and validity
Proprioception	RLE = normal	LLE = normal	RLE = normal	LLE = normal	Unknown reliability and validity
Berg Balance Test	5/56 = high fall risk		13/56 = high fall risk		Test-retest reliability (ICC = 0.98)[6] MDC in patients with stroke = 6 points[6]
Functional Balance Grades					Unknown reliability and validity
Static Sitting Balance	Fair, leans to the R		Good		

Dynamic Sitting Balance	NT due to safety	Good	
Static Standing Balance	Poor	Fair	
Dynamic Standing Balance	NT due to safety	Poor+	
Deep Tendon Reflexes	Patellar reflex = 1+ (diminished B/L) Achilles tendon reflex = 1+ (diminished B/L)	Patellar reflex = R 1 + (diminished); L 0 (absent) Achilles tendon reflex = 1+ (diminished B/L)	Unknown reliability and validity
Spasticity: Modified Ashworth Scale	Knee B/L = 0 Ankle B/L = 0	NT, not indicated	Intra-rater reliability at the knee (0.77 – 0.94)[9] At the ankle (0.59 – 0.64)[9]
Bed Mobility, Transfers, Ambulation			
Functional Mobility Assessment			Unknown reliability and validity
Supine to Sit	Mod A x 2	Mod I (using bed rail and raising HOB)	
Sit to Supine	Mod A x 2	Min A x 1	
Sit to Stand	Mod A x 2 (max VCs for safety and to push up from chair)	CGA x 1	
Stand to Sit	Min A x 2 (max VCs to reach back)	CGA x 1 (min VCs to reach back)	
Bed to/from chair transfer	Mod A x 2 with RW (max VCs to use RW)	CGA – min A x 1 with SPT (min VCs)	
Wheelchair mobility	Mod A (max VCs to avoid objects and use extremities to push)	Supervision	
Gait Analysis			Unknown reliability and validity
Ambulation level	Mod A x 2 with RW for 8’ Max VCs	Min A x 2 with RW for 70’ Max VCs	
Gait quality	Ataxic gait, scissoring pattern, unsteady and uncontrolled foot placement, trouble initiating gait, heavy reliance on walker	Ataxic gait, decreased scissoring and more accurate foot placement, recognizes and attempts to correct gait	
Activities of Daily Living			
Functional Independence Measure (FIM)			Test-retest reliability of total score (ICC = 0.98)[8]

Motor Subtotal Score	23 (1.77 FIM level)	47 (3.61 FIM level)	Test-retest reliability of motor score (ICC = 0.90) [8] Test-retest reliability of cognitive score (ICC = 0.80) [8] Validity with Barthel Index (r = 0.92 at admission, 0.94 at discharge) [8] MCID = 22 points total FIM score[8]
Cognitive Subtotal Score	21 (4.2 FIM level)	25 (5 FIM level)	
Total FIM Score	44 (18 lowest – 126 highest)	72 (18 lowest – 126 highest)	
Total FIM Level	2.44 (Maximal Assist)	4 (Minimum Assist)	
Communication			
	Dysarthria Word finding difficulties Difficulty following basic commands and holding conversation	Minimal dysarthria and word finding difficulties Able to follow basic commands and hold conversation	
Cognition			
Orientation	A & O x 3	A & O x 3	
Safety	Requires max verbal cues for safety during transfers and ambulation	Requires max VCs for safety during ambulation, min VCs for SPT	

372 R = Right, L = Left, LE = lower extremity, B/L = bilateral, Pt = patient, NT = not tested, mod A = moderate assistance, HOB = head of bed, min A = minimal
373 assistance, max = maximum, VCs = verbal cues, CGA = contact guard assistance, SPT = squat pivot transfer, ‘ = feet, FIM = Functional Independence Measure,
374 A & O x 3 = alert and oriented to person, place, time

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Table 3. Goals for Physical Therapy

Short-Term Goals (within 2 weeks of SOC)	Discharge Goals (within 4 weeks of SOC)
Bed mobility with min A x 1, using railings and independently raising head of bed with bed controls **(GOAL MET)**	Mod I with all bed mobility, in order to return home and properly use hospital bed at home **(GOAL MET)**
Perform bed to chair transfer with RW, min A x 1 **(GOAL MET)**	Independently transfer from multiple level surfaces with use of RW and demonstrate good safety awareness 100% of the time in order to return home safely
Amb with RW x 25 feet CGA and moderate verbal cueing	Independently amb with RW x 150 feet and no seated rest breaks in order to allow for household ambulation
Wheelchair negotiation with supervision on acute rehabilitation floor and demonstrate good safety awareness > 90% of the time **(GOAL MET)**	Independently negotiate wheelchair in a variety of settings (carpet, inclines, declines) and demonstrate good safety awareness 100% of the time to allow for community access
Perform 10 step ups in parallel bars with upper extremity support and CGA	Independently ascend/descend a flight of stairs (12 steps) with use of railing for return home and ability to live in second floor bedroom
Patient will perform 2 x 10 of lower extremity exercises with no physical assistance **(GOAL MET)**	Independent with home exercise program

SOC = start of care, Min A x 1 = minimal assistance times one person, RW = rolling walker, amb = ambulate, CGA = contact guard assistance, Mod I = modified independent, > = greater than

380 **Table 4. Interventions**

Interventions	Week 1	Week 2	Week 3	Week 4	Week 5
Sitting balance	Static (without UE support) and dynamic (reaching, perturbations)		Dynamic reaching out of BOS (1 x 20 reaches)		
Standing balance: Performed in // bars	Standing weight shifts (1 x10 with UE support) Marching (2 x 10 with UE support) Cone taps with LE's (1 min with UE support) Static standing balance (EO, EC, without UE support, on foam with UE support) Dynamic standing (reaching outside BOS, trunk rotations with one hand UE support)	Static balance (3 x 20 secs without UE support) Cone taps with LE's (2 mins with UE support) Standing balance with ball toss (2 x 20 tosses)	Standing on foam pad (3x 10 secs) Marching on foam pad (2 x 10) Cone taps with LE's (1.5 mins)	Marching (1 x 20) Standing balance EO, EC (3 each x 30 secs without UE support) Cone taps (1 min) Static standing with cognitive task - puzzle (5 mins) Tandem stance (3 x 30 secs without UE support) Dynamic reaching Berg Balance Scale re-administered	Standing cone taps Coordinated placement of LE to spots on floor (2 x 1 min)
Seated LE Exercises	2 x 10 B/L, RTB, no weights	2 x 10 B/L, BTB, 2# weights	1 x 15 B/L, BlaTB, 5# weights	2 x 15 B/L, BlaTB, 5# weights	2 x 20 B/L, BlaTB, 5# weights
Standing LE Exercises		1 x 5 in // bars (hip ABD, hip extension, mini squats)			1 x 10 in // bars (marches, hip ABD, hip flexion, hamstring curls)
Nu-Step			Level 2 for 15 mins		
Gait training	Focused on short distances (Up to 100' with RW x 2) Gait with max VC's and tactile cues for foot placement, control of RW, and decreased step length Gait in // bars with mirror for visual cues Gait with visual cues*	Focused on longer distances with more reps (Up to 140' with RW x 4) Max VC's for wider BOS, decreased step length, and focus on task Gait in // bars with mirror Stepping towards a target in // bars Lateral stepping in // bars (bar length x 4)	Short distances due to second stroke (Up to 75' with RW) Sidestepping in // bars (4 x 7') Forward and backwards walking in // bars (4 x 7') AFO implemented on R LE	Less of a focus, as discharge planning had changed (Up to 70' with RW)	Less of a focus, as discharge planning has changed (Up to 70' with RW)

		Gait with visual cues* Amb with partition (foam pad) btw LE to decrease scissoring			
Transfers	Sit ↔ stand transfers (1 x 3 and PRN) Bed ↔ chair transfers (PRN)	Sit ↔ stand transfers in // bars (1 x 3) Bed ↔ chair transfer using stand pivot transfer (1 x 3 and PRN)	Sit ↔ stand transfers in // bars (1 x 5) Bed ↔ chair transfer: using squat pivot transfer Toilet transfer Chair ↔ chair transfers (1 x 5)	Sit ↔ stand transfers (1 x8) Bed ↔ chair transfers** (1 x 3) Chair ↔ chair transfers** (1 x 5) Toilet transfers**	Sit ↔ stand (1 x 10) Bed ↔ chair* (1 x 3) Chair ↔ chair** (different height chairs; 1 x 5) Toilet transfer**
Bed mobility	Supine ↔ sit Scooting	Supine ↔ sit Scooting	Supine ↔ sit Scooting	Supine ↔ sit Scooting	PRN, but not specifically because Mod I
Wheelchair mobility	Flat, smooth surfaces Straight hallways Short distances Up to 50’	Flat, smooth surfaces Straight hallway and room negotiation Up to 150’ (75’ with LE only)	Weaving around obstacles Room negotiation Up to 200’	Negotiation of turns, backwards, around obstacles, picking up objects off floor, ramps, different surfaces (outside, carpeting, tile, stone) Up to 260'	Negotiation of turns, backwards, around obstacles, picking up objects off floor, ramps, different surfaces (outside, carpeting, tile, stone) Up to 300’

RTB = red theraband, // = parallel bars, LE = Lower extremity, ABD = abduction, RW = rolling walker, UE = upper extremities, W/C = wheelchair; ' = feet, BOS = base of support, B/L = bilateral, BOS = base of support, # = pound, SW = standard walker, amb = ambulation, BTB = blue theraband, BlaTB = black theraband, min(s) = minute(s), secs = seconds, EO = eyes open, EC = eyes closed, PRN = as needed/when necessary, reps = repetitions, btw = between, Mod I = modified independent

LE exercises included = hip flexion, hip abduction, hip adduction, knee flexion, ankle pumps, gluteal sets, quadriceps sets, hamstring curls

* = blue tape on floor to aid with foot placement (refer in Figure 2), ** = squat pivot transfer

A.  **B.** 

Figure 1. Visual Cues during Ambulation

A. The patient is shown mid-ambulation with no visual cues. She demonstrated an ataxic gait pattern, including scissoring of her lower extremities. B. The patient shown ambulating with visual cues. Parallel lines of blue tape were applied to the floor and the patient was encouraged to place her feet on the lines during ambulation. This improved her foot placement and decreased the scissoring of her lower extremities.

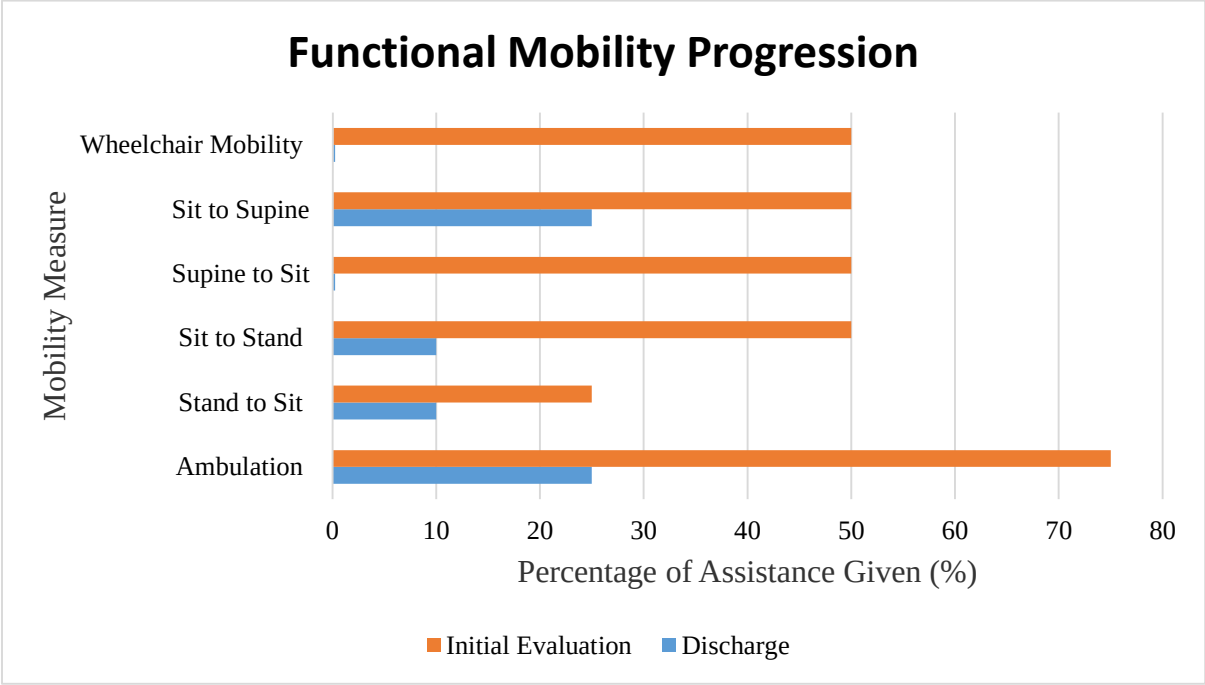

Figure 2. Functional Mobility Progression

In comparison to the initial evaluation, the patient required less assistance in all categories of functional mobility by discharge. The largest improvement (greatest difference in assistance required) was in ambulation, wheelchair mobility, and supine to sit. For wheelchair mobility and supine to sit, patient required no assistance at time of discharge.

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Past Medical History	Medications
T2 adenocarcinoma of the low rectum	
Abdominoperineal resection, placement of colostomy bag	GoLYTELY
Irritable bowel syndrome	Lactulose, Senna plus Docusate
Gastroesophageal reflux disease	Protonix
Fibromyalgia	Prednisone
Polymyalgia rheumatic	Prednisone
Colon polyps	
Diabetes mellitus type 2 insulin dependent	Lantus
Osteoarthritis	
Hypertension	Lisinopril, Lasix
Dyslipidemia	Lipitor, Plavix
Anemia of chronic blood loss with iron deficiency anemia	Iron sulfate
Possible diabetic neuropathy	Gabapentin
Restless leg syndrome	Ropinirole
Depression	Sertraline, Trazodone

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