12-14-2016

Physical Therapy Management Of A Patient With Chronic Brainstem Stroke Syndrome To Improve Functional Mobility: A Case Report

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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 Michael Fillyaw, PT, MS for support and conceptualization of this case report and Michelle Avery, PT, DPT and Ashley Peabody, PT, DPT for supervision and assistance with the patient's plan of care.

Abstract

Background and Purpose: Brainstem strokes are much less common and have a higher mortality rate than cortical strokes. Brainstem strokes can lead to several physical impairments, including gaze palsies, quadriplegia, ataxia, or cranial nerve deficits, leading to decreased balance and safety as well as decreased independence with functional activities. The purpose of this case report is to provide an overview of the physical therapy care plan created for a patient with chronic brainstem strokes.

Case Description: The patient is a middle-aged man who had two brainstem strokes over two years ago. He initially received physical, occupational, and speech therapies, then learned he had kidney cancer. After removal of his kidney, he remained unable to walk for two years. The patient chose to return to physical therapy services with the goal of improving his mobility. Examination revealed deficits in lower extremity functional strength, right sided upper and lower extremity sensation and proprioception, standing balance, transfers and ambulation, as well as visual impairments, ataxia, and right-sided hemiparesis. Therapeutic interventions including aquatic therapy, use of a bodyweight support system, and specific task practice were provided to address his deficits, with an emphasis on improving his functional mobility.

Outcomes: The patient improved his activity tolerance, balance, bed mobility, transfers, and gait. However, because of his stroke-related impairments, he was unable to ambulate without assistance or supervision.

Discussion: The patient made gains with physical therapy. Further research and case reports are needed regarding rehabilitation and physical therapy management for patients with brainstem strokes in order to determine more effective methods for improving functional mobility for this population.

Manuscript word count: 3256

BACKGROUND and PURPOSE

Strokes are a leading cause of disability, and the fifth leading cause of death in the U.S. Each year over 800,000 people in the United States have a first or recurrent stroke.[1] Brainstem strokes are much less common than cortical strokes; they also have much higher mortality rates as the brainstem controls many vital body functions, including the respiratory and cardiovascular centers. Brainstem strokes frequently have an abrupt onset and result in coma. Motor deficits can include quadriplegia, visual deficits including diplopia, dysphagia, dysarthria, vertigo, and ataxia as well as damage to cranial nerve nuclei.[2]

There are fewer accounts of brainstem stroke rehabilitation than cortical stroke rehabilitation due to poor prognosis and high mortality rate associated with brainstem stroke. Furthermore, there is not much data regarding the plasticity of brainstem circuitry. A better understanding of neural reorganization of the brainstem may be valuable in determining beneficial treatment techniques for patients with brainstem stroke.[2]

Several techniques for improving mobility in patients with chronic stroke have been documented. Miller, Quinn, and Gawlik Seddon[3] reported the effects of body weight support (BWS) treadmill and overground ambulation training for two patients with chronic disability following stroke. Following treatment, the participants demonstrated increased gait speed as measured by the 10 Meter Walk Test (10 MWT), as well as increased step length. One of the women also significantly improved her Berg Balance Scale (BBS) score, indicating improved balance.[3]

Vidoni, Tull, and Kluding[4] explored the effects of BWS training with use of a treadmill, as well as overground gait training with manual assistance and overground gait training with

variable task practice (using variable surfaces and paths, stepping over obstacles, etc.) for a 61-year-old man who had chronic quadriparesis resulting from five brainstem strokes sustained over five years. The authors did not observe a difference in effectiveness among strategies in making functional gains with ambulation for this patient, but concluded that improvement in ambulation is possible in a patient more than five years after multiple strokes.[4]

Jung, Ozaki, Lai, and Vrongistinos[5] compared cardiorespiratory responses in patients with hemiparesis post-stroke between overground treadmill walking (OTW) and aquatic treadmill walking (ATW). Results of the testing showed that most cardiorespiratory responses were lower in both healthy adults and adults post-stroke for ATW in comparison with OTW, suggesting ATW may improve energy conservation for people post-stroke, as they should be able to practice gait training for longer periods of time than they could with an overground treadmill.[5]

Aquatic therapy programs have also been suggested to improve the balance of patients post-stroke, as noted by Noh, Lim, Shin, and Paik.[6] In their evaluation of an aquatic therapy program compared to a land-based program for balance training, people in the aquatic program showed improved BBS scores as compared to initial scores and in comparison to the land-based group.[6]

A systematic review completed by Beyaert, Vasa, and Frykberg[7] discussed pathophysiology and rehabilitation of gait for patients post-stroke. They report that the brainstem is crucial in gait initiation and patterning, with the pons and medulla assisting to control support, balance, and rhythmic activity. The authors summarized various rehabilitation techniques for addressing gait in patients post-stroke, including motor skill training utilizing the "use it and improve it" technique. They report that this particular technique has been shown to promote restorative neural plasticity which enhances motor function. Applying this technique via

repetitive task gait training has shown to create short-term improvements in gait for patients post-stroke; however, long-term effects have not proven these improvements are maintained.[7]

Beyaert, Vasa, and Frykberg[7] also reported on non-specific gait training that was expected to transfer to improved effects on gait. They found sit to stand training from either a stable or unstable surface has been shown to have a positive effect on step length for both affected and unaffected limbs, and has also increased distance walked as measured by the 6 Minute Walk Test. The authors make a case for improving body symmetry prior to addressing gait in order to retrain the motor system in patients post-stroke. They state that creating exercises and tasks which require the affected limbs to safely and automatically provide support and balance will provide proprioceptive input which reiterates the body's postural automatic processes, essentially leading to improved gait patterns.[7]

The purpose of this case study is to describe the physical therapy management of a patient with chronic brainstem stroke with the goal of increasing his functional mobility in both inpatient and outpatient settings.

CASE DESCRIPTION

Patient History and Systems Review

The patient was a 61-year-old male with a history of two brainstem infarctions (pontine with locked-in syndrome, and a left medullary infarct several months later), resulting in right sided hemiparesis. Shortly after his second stroke, he was diagnosed with kidney cancer, resulting in removal of a kidney. This patient's medical history also included microscopic hematuria, tinnitus, anxiety, internuclear ophthalmoplegia, abdominal aortic aneurysm, drug-induced erythroderma, history of aspiration pneumonia requiring mechanical ventilation for respiratory failure, and history of smoking two packs per week until his first stroke. A general

systems review was completed; details can be found in Table 1.

Prior to his strokes, the patient served as a truck driver and heavy equipment operator in the Marines, then worked as a mechanical estimator for plumbing and heating systems for large commercial projects as a civilian. Following his strokes and kidney cancer, the patient lived at home with his wife in a one story house with ramps in front and back to enter. He utilized a home health aide for assistance with bathing and his wife helped him with dressing and food preparation. Every other weekend a recreational therapist came to his home to take him fishing or complete other leisure activities. This patient had a personal manual wheelchair, power wheelchair, and a front wheeled walker at home.

The patient began outpatient physical therapy after a long history of receiving therapy services elsewhere that were unable to help him achieve his primary goal of walking. He also hoped to improve independence with transfers and bed mobility without the use of a bed rail. Outpatient therapy was briefly interrupted as the patient was hospitalized for aspiration pneumonia for eight days. He was then admitted to the skilled nursing unit (SNU) to continue therapy services. His medication list can be found in Table 2.

The patient signed an informed consent allowing the use of medical information for this report.

Clinical Impression 1

Based upon the location of the patient's brain infarctions, it was expected he would have motor and sensory deficits including decreased lower extremity (LE) functional strength, visual deficits, decreased activity tolerance, standing balance deficits, and right upper extremity (UE) and LE sensation and proprioception deficits. These impairments led to functional limitations in gait, bed mobility, transfers, and self-care. In turn, he was restricted from travelling with his

wife, cooking dinner, or taking part in recreational activities without assistance. Given the patient's medical status, there was no need for differential diagnoses.

This patient was a good candidate for a case report as there are very few accounts of rehabilitation for patients post-brainstem stroke, particularly two years post-stroke. He also was a good candidate because of his motivation and willingness to participate in physical therapy.

Examination – Tests and Measures

The primary focus of the physical therapy examination was functional mobility, including transfers, bed mobility, and pre-ambulation. Findings were based upon visual observation of patient demonstration. Upon admission, examination assessment of gross strength, range of motion, balance, coordination, sensation, and motor control were completed, revealing decreased lower extremity functional strength, visual deficits, low activity tolerance, standing balance deficits, right sided upper and lower extremity sensation and proprioception deficits, and gait abnormalities. Further examination of functional limitations included: bed mobility and transfers (sit to stand, stand to sit, and surface to surface), posture, and pain. The patient needed close supervision and verbal cues for positioning and techniques for rolling and supine to sit in bed, with increased time and effort. He demonstrated sit to stand with minimum assistance using both arms to pull up on parallel bars, and also when using one arm to push up from the chair and the other pulling from the parallel bar, though this increased his anxiety and fear. While standing, the patient was able to weight shift when holding onto the bar, but required verbal cues as he lacked proprioceptive awareness of his posture. Further assessment of gait was completed using the ZeroG[*] bodyweight support (BWS) system. This system consists of a harness mounted to an overhead track which unloads a consistent percentage of weight off the patient and allows them

[*] ZeroG Aretech LLC: 21730 Red Rum Drive Suite 112, Ashburn, VA 20147

to move freely to practice gait or transfers while preventing falls. For the evaluation, support was set to take up 20% of his total bodyweight while the patient ambulated 10 feet with minimum assistance at his right leg and trunk to prevent posterior leaning. He demonstrated difficulty initiating stepping with his right LE and maintaining neutral trunk alignment, with increased cueing for weight shifting.

Other objective measures assessed included proprioception and sensation,[8] LE strength (interrater reliability of 0.66-1.00, validity not established),[9] balance, and the Postural Assessment Scale for Stroke (PASS).[10] The PASS was developed to grade 12 performances of functional tasks including maintaining postures or changing positions for patients with stroke. Items are scored on a scale of zero to four, with a total possible score of 36. The PASS has shown excellent interrater reliability (ICC = 0.97) and concurrent validity with the Berg Balance Scale (p = 0.92-0.95). See Table 3 for results of the initial physical therapy examination.

Clinical Impression 2

Based on examination data, the initial diagnosis of brain stem stroke syndrome (ICD-10 code G46.3) was confirmed and the patient was deemed appropriate for skilled physical therapy. His decreased functional strength, diminished proprioception and sensation led to standing balance impairments and inability to ambulate; therefore, a physical therapy treatment diagnosis of difficulty in walking, not elsewhere classified (ICD-10 code R26.2) was chosen. This patient continued to be appropriate for this case as he demonstrated motivation and good carryover with learning.

Barriers to recovery included his complicated diagnosis, as well as the sensory impairments, paresis, and poor motor control associated with the diagnosis. However, with his strength, motivation, and support system, he was expected to make functional gains with

physical therapy. As Hebert, Lindsay, and McIntyre, et al[11] report, most recovery for stroke patients occurs within the first three months of onset, though continued functional gains can occur months or years later. They state any patient with stroke who exhibits a change in functional status should be given a chance at further rehabilitation, providing they are medically stable and have the stamina and attention required of rehabilitative services. As such, this patient fits the criteria and has shown to be capable of making progress with therapy.

While residing in the SNU, the patient also received services from occupational therapy (OT) to address ADLs and upper extremity impairments. Coordination and communication with OT and the attending nurses and physician was included in the plan of care. As an inpatient, physical therapy weekly progress notes were completed; as an outpatient, progress notes were completed upon every 12th visit, or within 30 days. At those times original examination data was reassessed and the goals and plan of care were updated to reflect the patient's progress and potential for further gains. The patient expressed a strong interest in ambulation training as he reported not walking since his kidney was removed two years ago, and this was taken into consideration when developing a plan of care. Planned interventions included patient and caregiver education regarding impairments, activity limitations, interventions, and safety considerations, therapeutic exercises to strengthen the LEs to prepare for ambulation, balance training, gait training with and without Zero-G bodyweight support system, and aquatic therapy. As the patient was seen in an outpatient capacity first, then as an inpatient following a decline in health, two sets of initial short-term goals were created; the patient's long term goals remained the same when his status changed from outpatient to inpatient because they remained appropriate to the patient. All goals were created with input and agreement from the patient (Table 4).

Intervention

Coordination, Communication, Documentation

Documentation was completed daily for inpatient treatments, with descriptions of interventions and the patient's response, as well as details regarding presence of pain or supplemental use of oxygen. Progress notes were completed weekly and updates were reported at weekly interdisciplinary team meetings where care was coordinated and discharge planning took place. Team members included the patient and his wife, staff from physical therapy (PT), OT, pharmacy, nursing, and dietary, as well as the attending physician. Documentation for outpatient treatments was completed every visit, including details regarding interventions and patient response. A progress note was scheduled for his 12th visit, though he was admitted as an inpatient before then.

Patient-Related Instruction

The patient was educated on safe transfer techniques, including hand placement, anterior weight-shifting prior to standing, and applying the head-hips relationship[11] to scooting or transferring. He and his wife were educated on standing transfers with supervision, fall risk, and the importance of continuing with home health PT upon discharge from the SNU. The patient was also educated on postural awareness, with even weight-distribution between his LEs and avoiding knee hyperextension.[12]

Procedural Interventions

Physical therapy interventions included therapeutic exercise, therapeutic activities, neuromuscular re-education, gait training, and aquatic therapy (Table 5). Therapeutic exercise included stretching to address range of motion (ROM) impairments, as well as LE strengthening and pre-ambulation exercises (via seated long arc quads, hamstring curls, hip abduction and adduction, stepping, seated marching, and static standing) to increase his endurance with mobility, transfers, and activities of daily living (ADLs).[10,12] Therapeutic activities included bed

mobility, transfer training, and patient/family education; these interventions were intended to decrease burden of care and increase the patient's independence.[13] Neuromuscular re-education included balance and postural training to improve proprioceptive awareness of his trunk and LEs to improve his mobility and safety awareness.[12,14] Gait training was completed with and without the use of the Zero-G BWS system* to work on weight-shifting, foot placement, and task-specific ambulation practice.[14] Aquatic therapy was utilized to improve balance and attempt pre-gait training in a lower-impact environment.[10] Aquatic therapy was discontinued after three attempts as the patient exhibited increased anxiety and had made good progress with land-based interventions.

Interventions were progressed to assist the patient in reaching his maximum potential with mobility and daily tasks. He experienced some regression with the onset of pneumonia, causing him to suspend his outpatient treatments and continue as a skilled resident. Early in his inpatient EOC, the primary focus of intervention was increasing independence with transfers, increasing standing tolerance to promote weight-bearing through his LEs and for use with ADLs, and pre-gait training. Within one week, he progressed to completing transfers with more independence, further increasing his standing tolerance, and beginning gait training. By the third week of inpatient visits, the patient was ambulating with less assistance and working toward improving his standing balance and proprioceptive awareness, making significant functional gains with PT.

As an outpatient, he was initially scheduled for 24 PT treatments within two months, with each session set at one hour in length. He participated in three visits after his initial evaluation,

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then was admitted to the hospital with pneumonia and was unable to attend therapy until medically stable. Once he was discharged from the hospital and admitted as a skilled resident, the patient was scheduled daily for 60-75 minutes of PT, and actively participated with treatment throughout his 19-day stay.

Outcomes

Despite a decline in health that interrupted his rehabilitation, the patient made improvements in his bed mobility, balance, functional transfers, and ambulation (Table 3). He met all of his short-term goals for both outpatient and inpatient therapy. He met three of five long-term goals, and partially met one long-term goal. The patient was able to demonstrate bed mobility with modified independence, sit to stand and surface to surface transfers with contact guard assist to close supervision depending on his level of fatigue. He also was able to ambulate short distances without the use of a bodyweight support machine, though with contact guard for safety reasons, due to his lack of proprioception and sensation. Due to anxiety with aquatic therapy, the patient was unable to meet his goal of ambulating at least 15 minutes on the aquatic treadmill. He also was unable to demonstrate a surface to surface transfer with his walker and close supervision consistently, as he continued to require contact guard at times to ensure his safety secondary to continued impaired balance and proprioception (Table 4). The patient increased his PASS score from 14/36 to 27/36, which indicated an improvement in bed mobility and transfers as well as balance in both sitting and standing postures. There is no minimally clinically important difference established for the PASS, though the minimal detectable change is 3.2 points for patients with chronic stroke.[15] As this patient raised his score by 13 points, his improvement in function was quite noticeable. The patient expressed his pleasure with being able to move more easily in bed and to be able to walk more than he had in the last two years.

Discussion

This case study described the physical therapy management of a patient with chronic brainstem stroke with the emphasis on increasing his functional mobility in both inpatient and outpatient settings. He made good progress throughout his three outpatient appointments and 19 days of inpatient physical therapy. It was felt that stressing bed mobility, sit to stand and surface to surface transfers was appropriate given the patient's chronic condition. The patient showed marked improvement in these areas (Table 3). Factors that may have positively influenced the patient's outcome included his motivation, the physical therapy interventions used, his physical strength, his ability to learn, and the support of his wife. Factors that may have negatively influenced his outcomes included his anxiety, and the onset of pneumonia.

Little is written about the rehabilitation of patients with brainstem strokes, particularly for those greater than two years past onset. Therefore, research pertaining to patients with chronic strokes of any type was included in the literature review in order to develop a treatment plan and prognosis for this patient. Evidence suggests that improvement in gait could be made with use of bodyweight support ambulation training for patients with chronic stroke.[3,4] Bodyweight support ambulation training was applied to this case patient and he demonstrated good control with short periods of ambulation with it; however, it was noted that the patient's primary problem was lack of proprioception, and it was decided to put the emphasis of treatment on this.

Beyaert, Vasa, and Frykberg's[7] systematic review found repetitive task training was effective in improving functional tasks. They also reported improved ambulation after non-gait related practice, including sit to stand transfer practice. These techniques were applied to the case patient with good outcomes.

Individuals who have brainstem strokes are limited by the functional deficits associated with this condition, including proprioceptive deficits, visual impairments, vertigo, and

quadriplegia. These deficits can have a significant impact on functional movements, which limits individuals with participating in life events, decreasing their quality of life. It is still possible to make functional improvements through rehabilitation, regardless of time since onset of stroke. Further research into motor learning for patients with stroke, and in particular for patients with brainstem strokes, may be beneficial to determine better intervention techniques.

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TABLES and FIGURES

Table 1. Systems Review

Cardiovascular/Pulmonary	2 Liters supplemental Oxygen required; decreased endurance; dizziness upon positional changes BP 144/78; HR 85 bpm; RR 18 breaths per minute; SpO_2 91%
Musculoskeletal	B LE functional strength impaired
Neuromuscular	Motor control: impaired; R UE and LE Gross & fine motor coordination: impaired; R UE and LE Vision: requires glasses and wears tape over L lens to address diplopia Balance: decreased balance in standing Coordination: R sided ataxia Sensation: diminished sensation and proprioception R UE and LE
Integumentary	Unimpaired
Communication	Intact
Affect, Cognition, Language, Learning Style	A&O to person, place, time; emotionally labile Learning style: prefers verbal descriptions and demonstration
BP = blood pressure; HR = heart rate; RR = respiratory rate; B = bilateral; R = right; L = left; UE = upper extremity; LE = lower extremity; A&O = alert and oriented	

383 Table 2. Medications Upon Admission

Medication	Indication
Amoxicillin/Potassium Clavulanate	Pneumonia
Ceftriaxone	Pneumonia
Levofloxacin	Pneumonia
Ipratropium-Albuterol Inhaler	Pneumonia
Polysaccharide Iron Complex	Anemia
Folic Acid	Anemia
Lorazepam	Anxiety
Aspirin	Cerebrovascular Disease
Calcium	General Health
Vitamin C	General Health

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387 Table 3. Tests and Measures

Tests & Measures	**Initial Examination**	**Final Examination**
Sensation – discriminative touch	R LE absent sensation R UE absent sensation L LE normal L UE normal	R LE absent sensation R UE absent sensation L LE normal L UE normal
Proprioception	R LE absent proprioception R UE absent proprioception L LE normal L UE normal	R LE absent proprioception R UE absent proprioception L LE normal L UE normal
PASS	Total Score: 14/36 Maintaining Posture subset: 5/15 Changing Posture subset: 9/21	Total Score: 27/36 Maintaining Posture subset: 11/15 Changing Posture subset: 16/21
Strength	R LE grossly 4+/5 L LE grossly 5/5	R LE grossly 4+/5 L LE grossly 5/5
Balance	Sitting Static: good Sitting Dynamic: good – Standing Static: pt required assistance to maintain standing at this time Standing Dynamic: unable to assess secondary to poor standing static balance	Sitting Static: good + Sitting Dynamic: good Standing Static: fair + with FWW Standing Dynamic: fair – with FWW
Gait	Zero-G with BWS 20%, amb 10 feet with min A R LE and trunk to prevent posterior lean; difficulty initiating R LE step, unable to maintain neutral trunk alignment due to posterior lean and lack of proprioception; vcs for weight-shifting	Amb up to 25' x 1, 37' x 1 with FWW and CGA of 1 with vcs for weight-shifting. Demonstrates fair control managing "soft knees" and awareness of weight-shifting during ambulation
Bed Mobility	Cl S and vcs for rolling and supine to sit, with increased time and effort	Mod I for rolling and supine to sit
Transfers	Sit to stand with min A and B UE pulling from parallel bars Sit to stand with min A using one arm to push from chair and one arm to pull from	Sit to stand with CGA to Cl S depending on level of fatigue using B UE to push up from bed or chair Stand step transfer with FWW and CGA

	parallel bars	to Cl S depending on level of fatigue
R = Right; L = Left; B = bilateral; LE = Lower extremity; UE = Upper extremity; PASS = Postural Assessment Scale for Stroke Patients; BWS = bodyweight support; amb = ambulate; min A = minimum assistance; Mod I = modified independent; vcs = verbal cues; FWW = front wheeled walker; CGA = contact guard assist; Cl S = close supervision		

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389 Table 4. Goals

Outpatient Short-term goals (12 visits)	Inpatient Short-term goals (1 week)	Long-term goals (24 visits or 1 month)
1. Demonstrate sit to stand with one UE support on w/c and one on walker with minimum assistance consistently for decreased burden of care. 2. Demonstrate surface to surface transfer with FWW and less than or equal to 25% BWS and CGA for decreased burden of care. 3. Demonstrate ambulation greater than or equal to 10' x 2 with FWW and BWS less than or equal to 30% and CGA for increased access to environment. 4. Demonstrate surface to surface transfer with slideboard and CGA for decreased burden of care.	1. Roll in bed and transition from supine to/from sit with SBA to decrease burden of care. 2. Transition from sit to stand with CGA to FWW to increase access to his environment. 3. Transfer with FWW and CGA of one to decrease burden of care.	1. Demonstrate amb > or equal to 25' x 2 with FWW and CGA for increased access to environment. 2. Demonstrate sit to stand from w/c with B UE support on w/c and Cl S for decreased burden of care. 3. Demonstrate surface to surface transfer with FWW and Cl S for decreased burden of care. 4. Demonstrate bed mobility with Cl S without use of bed rail for decreased burden of care. 5. Demonstrate tolerance for amb on treadmill in aquatic setting > or equal to 15 minutes with B UE support for increased activity tolerance.
UE = upper extremity; w/c = wheelchair; BWS = body weight support; CGA = contact guard assistance; FWW = front wheeled walker; SBA = stand-by assist; amb = ambulation; B = bilateral; Cl S = close supervision		
Short-term goals are listed for both inpatient and outpatient capacities due to patient's change in medical status. Long-term goals were carried over as they remained appropriate to the patient.		

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391 Table 5. Interventions

		Outpatient	Inpatient Week 1	Inpatient Week 2	Inpatient Week 3
Therapeutic Exercise	ROM		HS and gastroc/soleus stretching	HS and gastroc/soleus stretching	
	Strengthening		Seated LE ex with 2# and green theraband (15 reps)	Seated LE ex with 2# and green theraband (20 reps)	
	Pre-Ambulation Activity		Seated stepper 5 mins Static standing	Static stand to promote LE endurance	
Therapeutic Activity	Bed Mobility		Supine<>sit with use of EOB to pull and min A	Supine<>sit with mod I using EOB	
	Transfers	Sit<>stand • at PB • with 30% BWS • with no support	Sit<>stand • mod A to FWW Bed<>w/c • mod A squat pivot • mod A with slideboard • mod A stand step transfer with FWW	Sit<>stand • min A to FWW • CGA to FWW Bed<>w/c • min-mod A stand step transfer with FWW • slideboard with min A for placement, CGA for transfer	Sit<>stand • CGA to FWW • Cl S to FWW Bed<>w/c • min A stand step transfer with FWW • CGA stand step transfer with FWW
	Patient Education		• Educated on head-hips principle • Importance of bed mobility	Pursed lip breathing techniques	Safe transfer techniques – only completing standing transfers when help is available

			without use of bed rail for less restrictions/broader applications • Importance of Oxygen saturations		
Gait Training	Gait Training	Amb 8’ x1 with min A and FWW	Pre-gait • Stepping forward and back in place with FWW	Amb 8’ x 1 and 10’ x 1 with min A and FWW, vcs for weight-shifting	Amb 10’ x 1 and 24’ x 1 CGA and FWW, vcs for weight-shifting Amb 33’ x 1 and 14’ x 1 with FWW and CGA Amb 25’ x 1 and 37’ x 1 with FWW and CGA
	BWS Training	20% BWS • Amb 10’ x 1 with min A with standard walker		0% BWS • Amb 8’ x 1 with min A of 2 with standard walker	

Neuromuscular Re-education	Balance, Posture, Proprioception	Optimal posture
		• Static standing with and without UE support
		• Ant/post weight shift
		  ○ Standing
		  ○ Sitting
		• Weight shifting L and R with UE support
		Proprioception training
		• Mini squats
		Balance
		• Seated ant/post weight shift
		• Seated toe taps
			Proprioception
			• Pre-liftoff with emphasis on equal WB bil
			Sitting reaching outside BOS for ant weight shift
				Standing weight-shifting and lifting B LE one at a time to address righting response in hips and knees
				
				Proprioception
				• Standing with side-stepping
				• Ant/post pelvic shifts
				Seated ant weight shift with physioball
				
				Attempted quadruped position; unable to attain secondary to lack of sensation in R UE and LE
					Standing weight-shifting lifting B UE one at a time for postural control
					
					Static standing at FWW reaching outside BOS with one UE at a time

	BWS Training			10% BWS • Sit<>stand with CGA and no AD Static standing with min-mod A to find midline	

Aquatic Therapy	Aquatic Therapy	Standing weight shifting • Ant/post • Right/left Sit<>stand from chair Pre-liftoff from chair Seated LE bicycles Seated trunk rotation		Standing weight shifting • Ant/post • Right/left Sit<>stand from chair Pre-liftoff from chair Seated trunk rotation Retrograde walking 5' x 1	Static standing • With B UE support • Without UE support Standing weight shifting Amb 6' with B UE support Sitting reaching outside BOS with vcs to keep R LE on floor Sitting on wonder board* to facilitate postural control
BWS = body weight support; ROM = range of motion; PB = parallel bars; Amb = ambulate; min A = minimum assistance; mod A = moderate assistance; vcs = verbal cues; ant = anterior; post = posterior; UE = upper extremity; LE = lower extremity; L = left; R = right; FWW = front wheeled walker; HS = hamstring; gastroc = gastrocnemius; ex = exercise; EOB = edge of bed; w/c = wheelchair; WB = weight-bearing; Bil = bilateral; BOS = base of support; mod I = modified independent; CGA = contact guard assist; AD = assistive device; reps = repetitions					

* Theraquatics Wonder Board: 704 N. Perry Street, Montgomery, AL 36104-2442

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Postural Assessment Scale for Stroke Patients (PASS) Scoring Form

Maintaining a Posture

Give the subject instructions for each item as written below. When scoring the item, record the lowest response category that applies for each item.

1. Sitting Without Support

Examiner: Have the subject sit on a bench/mat without back support and with feet flat on the floor.

____(3) Can sit for 5 minutes without support
____(2) Can sit for more than 10 seconds without support
____(1) Can sit with slight support (for example, by 1 hand)
____(0) Cannot sit

2. Standing With Support

Examiner: Have the subject stand, providing support as needed. Evaluate only the ability to stand with or without support. Do not consider the quality of the stance.

____(3) Can stand with support of only 1 hand
____(2) Can stand with moderate support of 1 person
____(1) Can stand with strong support of 2 people
____(0) Cannot stand, even with support

3. Standing Without Support

Examiner: Have the subject stand without support. Evaluate only the ability to stand with or without support. Do not consider the quality of the stance.

____(3) Can stand without support for more than 1 minute and simultaneously perform arm movements at about shoulder level
____(2) Can stand without support for 1 minute or stands slightly asymmetrically
____(1) Can stand without support for 10 seconds or leans heavily on 1 leg
____(0) Cannot stand without support

4. Standing on Nonparetic Leg

Examiner: Have the subject stand on the nonparetic leg. Evaluate only the ability to bear weight entirely on the nonparetic leg. Do not consider how the subject accomplishes the task.

____(3) Can stand on nonparetic leg for more than 10 seconds
____(2) Can stand on nonparetic leg for more than 5 seconds
____(1) Can stand on nonparetic leg for a few seconds
____(0) Cannot stand on nonparetic leg

*Reproducible Master Scoring Form accompanying VHI's **"Administering Functional Assessment Tests"** DVD #3.*

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5. Standing on Paretic Leg

Examiner: Have the subject stand on the paretic leg. Evaluate only the ability to bear weight entirely on the paretic leg. Do not consider how the subject accomplishes the task.

____(3) Can stand on paretic leg for more than 10 seconds
____(2) Can stand on paretic leg for more than 5 seconds
____(1) Can stand on paretic leg for a few seconds
____(0) Cannot stand on paretic leg

Maintaining Posture SUBTOTAL _____

Changing a Posture

6. Supine to Paretic Side Lateral

Examiner: Begin with the subject in supine on a treatment mat. Instruct the subject to roll to the paretic side (lateral movement). Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

____(3) Can perform without help
____(2) Can perform with little help
____(1) Can perform with much help
____(0) Cannot perform

7. Supine to Nonparetic Side Lateral

Examiner: Begin with the subject in supine on a treatment mat. Instruct the subject to roll to the nonparetic side (lateral movement). Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

____(3) Can perform without help
____(2) Can perform with little help
____(1) Can perform with much help
____(0) Cannot perform

8. Supine to Sitting Up on the Edge of the Mat

Examiner: Begin with the subject in supine on a treatment mat. Instruct the subject to come to sitting on the edge of the mat. Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

____(3) Can perform without help
____(2) Can perform with little help
____(1) Can perform with much help
____(0) Cannot perform

*Reproducible Master Scoring Form accompanying VHI's "**Administering Functional Assessment Tests**" DVD #3.*

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