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Middle Cerebral Artery Occlusion and the Effects of Physical Therapy in the Skilled Nursing Facility: A Case Study

Delany Faiman

MIDDLE CEREBRAL ARTERY OCCLUSION AND THE EFFECTS OF PHYSICAL THERAPY IN THE SKILLED NURSING FACILITY: A CASE STUDY

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Delaney Faiman
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Steven Haleem, PT, DPT 10/14/16

(Graduate School Advisor) Date

David Reed 10/20/2020

(Chairperson, Physical Therapy) Date

PERMISSION

Title MIDDLE CEREBRAL ARTERY OCCLUSION AND THE EFFECTS OF PHYSICAL THERAPY IN THE SKILLED NURSING FACILITY: A CASE STUDY

Department Physical Therapy

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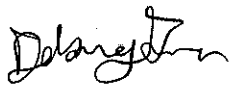
Signature 

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ABSTRACT

Background and Purpose: Stroke is the leading cause of disability and fifth leading cause of death among adults in the Unites States. This case study evaluates the effectiveness of inpatient physical therapy following a right middle cerebral artery occlusion and the outcomes throughout the weeks of treatment. **Case Description**: The patient was an 80-year-old male who received physical therapy within the hospital for six days before he was referred to a skilled nursing facility. The patient completed four total weeks of skilled physical therapy in the nursing home prior to discharge. **Intervention:** The therapy provided to the patient utilized high frequency of sessions consisting of repetitive task training. These activities were completed to increase the patients core strength, balance, left side awareness, and efficiency and safety during transfers and ambulation. **Outcomes:** Throughout the four weeks of physical therapy, the patient made significant improvements in his strength, balance, endurance, and left side awareness. He demonstrated increased independence in all functional activities including bed mobility, transfers, and ambulation. **Discussion:** This case demonstrates its intended purpose by describing how the patient achieved significant gains during his time in the skilled nursing facility. The patient responded well to treatment, however further investigation into the efficacy of interventions for stroke patients with similar demographics and medical history is necessary.

CHAPTER I

BACKGROUND AND PURPOSE

Stroke is the leading cause of disability and the fifth leading cause of death among adults in the United States with an estimated 15 million people worldwide experiencing a stroke each year.[1] A stroke is defined as the sudden loss of neurological function which occurs when there is an interruption of blood flow within a vessel that supplies the brain with blood. Furthermore, there are two types of strokes, defined as an ischemic or hemorrhagic stroke. Ischemic strokes result in a blockage of the vessel, while a hemorrhagic stroke is caused by a rupture of the vessel. When compared, hemorrhagic strokes account for the larger number of deaths with mortality rates of 37% and ischemic strokes at 14.7%. However, ischemic strokes are seven times more common than hemorrhagic and account for an estimated 80% of all strokes.[1,2]

For the purpose of this case study, we will focus on ischemic strokes, which lead to the death of brain tissue and focal neurological deficits.[3] If an acute ischemic stroke is suspected, the patient's history, the presence of major or minor risk factors, medications, family history, and any recent changes in patient function is thoroughly investigated by the health care team. A physical examination and the presenting symptoms will help locate the location of the lesion and involvement. Several tests and measures including the *National Institutes of Health Stroke Scale* (NIHSS), as well as several biomarkers can be used to help identify an acute cerebral ischemia. Beyond this, cerebrovascular imaging is the main tool used to establish the diagnosis of suspected ischemic stroke with advanced neuroimaging's ability to rapidly identify the occluded

artery. Cerebrovascular imaging includes Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Magnetic Resonance Angiography (MRA), Doppler Ultrasound, and Arteriography and Digital Subtraction Angiography to form a medical diagnosis. [4]

To improve neurologic outcomes in individuals following an acute ischemic stroke the overarching goal is to relieve the arterial occlusion and restore the cerebral blood flow as soon as possible. One of the methods performed to reduce injury and improve outcomes in an acute ischemic stroke is intravenous recombinant tissue plasminogen activator (IV rtPA) therapy.[3] However, this treatment demonstrates the best clinical outcomes in patients presenting within 4.5 hours of symptom onset. Intra-arterial therapy using stent retrievers has also demonstrated improvement in recanalization of proximal artery occlusions and clinical outcomes beyond both IV rtPA therapy and supportive care alone. The method undergone to treat an acute ischemic stroke is important because efforts made to hasten reperfusion can greatly affect long term outcomes.

A stroke is typically characterized by the vascular territory affected, which is commonly referred to as the stroke syndromes.[1] The most common type of stroke syndrome is a middle cerebral artery infarction, which accounts for an estimated 51% of stroke occurrences.[4] The middle cerebral artery is the second of two main branches of the internal carotid artery and supplies the entire lateral aspect of the cerebral hemisphere and subcortical structures. Occlusion of the proximal middle cerebral artery produces extensive neurological damage with significant cerebral edema (Figure 1). The most common characteristics associated with the onset of a middle cerebral artery occlusion include slurring of speech, tingling or numbness of the face, arm, and/or leg, and loss of movement of corresponding body parts. The motor consequences of

this syndrome may vary but typically include hemiparesis or hemiplegia of the limbs contralateral to the lesion.[4]

Figure 1. Initial CT scan demonstrating occlusion on right middle cerebral artery (arrow)[5]

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Though strokes are associated with a devastating loss of function and increased disability, there is typically a great deal of natural neurological recovery that occurs spontaneously following the onset of a stroke. At the time of stroke, 73-88% experience hemiparesis, 30-36% have aphasia, and 13% have dysphagia. While in contrast at 6 months' post-stroke only 37-48% have hemiparesis, 18-30% have aphasia, and 4% have dysphasia.[2] Natural recovery is demonstrated by up to 70% of patients with severe hand weakness at onset making a good recovery by 4 weeks.[2] Along with the natural recovery that takes place post stroke, another recovery is thought to occur as a result of neuroplasticity. This is defined as the ability of the central nervous system to reorganize and remodel itself after an injury. The external, or

experience-dependent plasticity is of great interest to rehabilitation professionals in the treatment of stroke survivors.

The most common and widely recognized impairment caused by stroke is motor impairment, a loss or limitation in function in muscle control, or limitation in mobility.[6] Due to this, there is a very wide range of available interventions post-stroke within stroke rehabilitation, typically involving physical therapy and occupational therapy. Even so, it is estimated that only slightly more than one-half of all stroke survivors in the United States receive a form of rehabilitation services.[2] Rehabilitation has an important role in increasing participation by promoting activity involvement and reducing body function structure deficits. The ultimate goal of therapy for lower extremity motor impairment is to improve the ability of patients to walk and recover movement. The literature demonstrates that patients who receive more physical therapy, either longer or more frequent sessions, may have greater improvements in recovery.[7] Along with this, organized multidisciplinary care and rehabilitation after a stroke enhance patient survival and independence, as well as reducing inpatient stay.[8]

There is a significant amount of research detailing the vast physical therapy interventions for patients with hemiplegia following a stroke, including, but not limited to, gait, balance, strength, endurance training, and mirror therapy. Yet, there is a lack of evidence supporting interventions for individuals with multiple complicated comorbidities.[1,9,10] The purpose of this case study is to describe the physical therapy management and progressive plan of care for an 80-year-old male patient following a middle cerebral artery occlusion with multiple comorbidities in the skilled nursing setting.

CHAPTER II

CASE DESCRIPTION

The patient was an 80-year-old male who suffered from a cerebral infarction due to unspecific occlusion or stenosis of his right middle cerebral artery on 8/18/2019. He was in the hospital at the time of stroke undergoing cardiac surgery. The patient completed a six-day inpatient stay in the hospital following the stroke. The physician referred the patient to physical therapy at the skilled nursing facility for evaluation and treatment of deficits occurring secondary to right cerebrovascular accident and cardiac surgery. The patient's past medical history included in the referral information and confirmed upon subjective interviewing included atherosclerotic heart disease and hyperlipidemia. Research demonstrates a high incidence of coronary artery disease in patients with nonfatal cerebral infarctions.[11] The intervention completed in the hospital post stroke was tPA. The patient participated in conservative treatment including physical therapy and occupational therapy twice a day for the seven days he was admitted in the hospital. Physical therapy included sitting edge of bed with assistance and minimal gait training.

The patient was admitted to the skilled nursing facility with complaints of limited mobility and strength of left upper and lower extremities. These deficits left the patient unable to perform daily tasks independently; ambulation and all transfers now required maximal assistance from caregivers. Due to this reason, the patient was currently using a wheelchair with assistance for transportation. The patient reported no pain, but complained of occasional tingling and

numbness occurring in left lateral forearm into the left hand. Prior to the stroke, the patient was living in a single level home independently with his spouse. He did not previously use an assistive device at baseline and maintained a fairly active lifestyle playing with his grandchildren and walking daily with his wife.

The initial examination of the patient was completed in the late afternoon after checking into the skilled nursing facility. Examination and evaluation of the patient was based on Ryerson's Neurological Assessment, which is a process of collecting information about disordered movement patterns, underlying impairments, activity restrictions, and societal participation for the purpose of intervention planning.[12] The patient demonstrated significant fatigue throughout the examination that affected measurements. Upon observation, the patient demonstrated rounded shoulders, forward head posture with right side leaning at trunk and cervical rotation to the right at rest. The patient was not properly positioned in wheel chair and was seated with right trunk rotation demonstrating limited body awareness. He also required heavy cueing to look to his left when spoken to. The patient demonstrated good recall with subjective interviewing, with a slight delay of response. A review of systems was not performed at initial evaluation due to time constraints.

Upon range of motion testing, the patient demonstrated decreased active range of motion compared bilaterally through left upper and lower extremity due to weakness and deficits in left sided awareness. Measurements of active range of motion were not taken due to patient inability to maintain any range of motion through left upper and lower extremity. Patient was moved through passive range of motion to within normal limits through all extremities with no pain and testing through left extremities compared bilaterally. Light touch screening was completed through all extremities with a difference noted by the patient through the left lateral forearm and

hand, along the T8 and C1 dermatome pattern. The patient demonstrated no range of motion, sensation, or strength deficits on right upper or lower extremity during testing.

The patient's ambulation and functional transfer status was also assessed and the patient demonstrated maximal assistance of one person required for bed mobility and sit-to-stand transfers and maximal assistance of two people required for ambulation with hemi-walker. The patient demonstrated a limited ambulation range of 20 feet with a hemi walker and wheel chair follow with maximal assistance of two. While performing ambulation the patient demonstrated a diminished left arm swing and reduced left foot clearance.

After observation and examination of the patient, he was determined to have strength and range of motion deficits through the left upper and lower extremities secondary to his stroke. Through subjective interviewing and observation, the patient was determined to have no pain at rest or with activity. The patient was also determined to have left sided neglect through observation of the patient's ambulation, seated positioning, and through further cognitive and visual examination that was later performed by occupational therapy at the skilled nursing facility. Due to the listed functional deficits, the patient was determined to be a candidate to receive physical therapy. The treatment diagnosis assigned to the patient was unspecified abnormalities of gait and mobility and full body weakness.

The goals for this patient included increasing left side awareness and increasing patient strength and balance in order to complete activities at prior level of function. These goals were determined to increase patient independence and to decrease the level of assistance needed by caregivers. Interventions that would address these goals would help prepare the patient and patient's family for a return to home and safety status. The patient was determined to have fair rehabilitation potential due to cardiovascular comorbidities, being 80-years of age, and having a

high level of activity prior to the stroke.

CHAPTER III

INTERVENTION

The patient was seen five days a week for 68-76 minute sessions for 4 weeks. Research demonstrates that seeing patients at an increased frequency may improve patient outcomes post stroke.[13] The patient interventions listed below are based off of research that has shown that trials of repetitive task training post-stroke, as well as early physical fitness training provide better patient outcomes.[4] Literature also demonstrates that too much bed rest should be avoided in the early phase after a stroke due to its association with poor functional outcomes.[14] The first week's interventions included activities that would increase patient core strength and balance, left side awareness, efficiency and safety awareness during transfers and ambulation. The patient interventions at the beginning of the week included 5 repetitions of sit-to-stands using bilateral upper extremity support to push up off of a standard chair. The patient required heavy verbal and tactile cueing to complete activity safely utilizing left extremities and locating left extremities before he completed the sit-to-stand activity. The heavy verbal cueing typically included "where is your left hand at" and "make sure your left foot is underneath you." Tactile cueing involved touching the patients left side to encourage awareness to this side of his body. The patient was able to demonstrate ambulation 4 repetitions x 10 feet with a hemi-walker used with right upper extremity and maximal assistance of one during activity. However, due to diminished left side awareness, he required heavy verbal and tactile cueing, as explained above, to improve reduced

left foot clearance, increase stride length, and to turn his head and neck to the left in order to ambulate in a straight line.

To increase left side awareness, the patient completed seated edge of bed activities including kicking a ball with his left lower extremity and balloon tapping with his left upper extremity for 2-3 minutes. Both activities at edge of bed were completed with good tolerance from the patient who needed minimal assistance of one due to diminished core strength. He continued to require heavy cueing during activities to encourage left side looking and awareness. During these activities a mirror was placed in front of the patient to encourage self correction of right leaning and looking posture. Literature demonstrates that mirror therapy may improve motor function and activities of daily living, as well as decrease pain perception in stroke patients.[15] He was able to self-correct his posture during activities, occasionally requiring tactile and verbal cueing to reset posture.

The patient tolerated the first week of interventions well. He had early fatigue with ambulation, balloon tapping, and ball kicking activities and needed frequent rest breaks. At this point in time the patient continued to required heavy cueing for all activities, maximal assistance with transfers and ambulation activities, and minimal assistance with seated activities.

During the second week of sessions, the patient continued activities requiring left side awareness, ambulation and transfer training, and balance training. It was determined that the patient would benefit from a front wheeled walker as an assistive device rather than a hemi-walker. This decision was made to increase left side activity during ambulation and to provide tactile cueing to the patients left hand. The patient was trained to use the front wheel walker but demonstrated inconsistency during ambulation by straying outside the width of the walker.

However, clinical judgment was made to continue with front wheel walker due to the its ability to engage the patients left side when compared to the hemi-walker.

The second week began to introduce endurance training with the patient using a Nustep bike on level 4 resistance for 10-20 minutes at the beginning of every session. The Nustep was utilized in the patient's interventions due to literature demonstrating that aerobic exercise in an important component of stroke rehabilitation due to its ability to improve aerobic capacity in stroke patients.[16] He required either a glove or active assistance from a caregiver to hold his left hand onto the arm of the bike during the activity. The second week continued ambulation activities with front wheel walker, but this week the patient weaved in and out between 5 different colored cones. As he weaved he was given cues to look at each cone on either the left of right side of him and state the color of the cone out loud. This was done 2 x 3 repetitions to increase left side awareness and looking during ambulation. The patient required moderate assistance of one for this activity with heavy verbal and tactile cueing for pivoting and weaving.

Other patient interventions included seated edge of bed left extremity balloon tapping and ball kicking for several minutes. The patient began to better tolerate these activities, requiring less frequent rest breaks. To increase balance, the patient completed various activities in the parallel bars with bilateral upper extremity support. Here he completed static tandem standing with a 2-inch foam pad placed under the front foot. The patient completed the activity for 3 repetitions around 1-2 minutes and required a mirror placed in front of him for visual cueing and postural correction. He required contact guard assistance for this activity and demonstrated good balance throughout activities though slowly increasing stance times.

During this second week the patient began to show better left side awareness during ambulation, requiring moderate assistance, however still requiring heavy cueing for all activities.

The patient also demonstrated increased energy levels and less frequent rest breaks needed during activities. The patient was able to complete sit-to-stand transfers with his front wheel walker throughout sessions with minimal assistance and no cueing as well.

During the third week of treatment, the patient continued Nustep biking on level 5 resistance at the start of every session, anywhere from ten to twenty minutes. The patient also continued to complete balance training, ambulation training, and standing endurance activities as previously described. At this point in time, every intervention that the patient completed was also a left side awareness activity. The patient was constantly cued to look to the left to identify objects and complete activities on the left side of his visual field. This week the patient demonstrated an increase in fatigue that caused the patient to need frequent rest breaks. Additional patient fatigue was most likely due to restlessness at night time causing a lack of sleep, as reported by nursing staff. The patient continued to have no pain at rest or with activities.

The third week continued with the patient beginning to complete a 4-cone drill where the patient would walk forwards, laterally, backwards, and laterally again, completing a square shape. He would complete this activity with his front wheel walker, moderate assistance of one, and heavy verbal and visual cueing in both clockwise and counterclockwise directions for 2 x 3 repetitions. This activity, along with 2 x 3 repetitions of 20 ft. of heel toe walking, backward walking, and cues to increase stride length with walking were completed with front wheel walker and minimal to moderate assistance. He continued the cone weaving activity completed last week as well. These activities were all completed to challenge the patients left side awareness, balance, and safety awareness.

The patient continued ambulation this week, increasing distance to 300 feet with his front wheel walker before a rest break was needed. At this point in time, he was able to walk straight

with contact guard assist, but if the patient needed to pivot, moderate assistance and heavy cueing was needed. He began to show improvements with ambulation, without cueing by demonstrating increased stride length on left lower extremity and decreased shuffling. He demonstrated ability to walk in a straight line without straying to the right side during ambulation and needed less cueing for staying inside the width of his front wheel walker. To increase standing endurance and incorporate activities completed in left visual field, the patient completed standing activities including shooting a ball into a basketball hoop and 2 pound weighted ball tossing and catching onto a trampoline. The patient completed both of these activities for 2 x 3-4 minutes and had to include his left upper extremity in the activity. The patient had his front wheel walker placed in front of him if needed for safety.

The fourth and final week of interventions continued many of the activities described in the third week of treatment. These included completing 20 minutes of Nustep biking on level 7 resistance, shooting balls into a small hoop, trampoline weighted ball catching and tossing, balloon tapping in standing and ambulation and balance training with cone weaving activity. This week a major goal for staff and the patient was to provide caregiver training to the patient's spouse. The patient's wife was taught verbal cueing and tactile guidance with a gait belt during ambulation activities in order for increased safety for future return to home. Within the fourth week of rehabilitation the patient required contact guard assistance for transfers and ambulation with a front wheel walker. He continued to require minimal to moderate assistance during pivoting activities and heavy cueing for left side awareness during all activities.

At the end of week four, a home evaluation was completed with staff, the patient, and patients spouse. The patient and caregiver were educated on changes within their home that would help improve safety, including removing rugs, decreasing bed height, and removing tables

in hallway. With demonstration of deficits still occurring during ambulation and transfers around the patient's home, the patient and patient's caregiver were educated that the patient was still not ready for return to home due to safety concerns. At the end of the fourth week of treatment, he was discharged from the inpatient facility due to a scheduled cardiac surgery. The patient was to complete a hospital stay after the surgery and the physical therapy team and skilled nursing facility did not have contact with the patient following this surgery.

CHAPTER IV

OUTCOMES

The overall outcomes for the patient were favorable considering the severity of the middle cerebral artery occlusion and cardiovascular comorbidities. Throughout the four weeks of physical therapy, the patient made significant improvements in strength, balance, endurance, and left side awareness. Within this time frame, objective and subjective measures were taken to gauge the effectiveness of activities performed each session. The objective measurements collected throughout the weeks included ambulation distance, ambulation and transfer level of assistance, timed-up and go (TUG) test, and fatigue based on rest breaks.

At initial evaluation, the patient could walk ten feet and required maximal assistance of two individuals (MAAx2) for ambulation and maximal assistance of one individual (MAAx1) for transfers. At discharge he could ambulate 400 feet with contact guard to moderate assistance (CGA-MOAx1) using a front-wheeled walker with a step through pattern. Although trials of canes and hemi-walkers were performed, it was determined that the patient exhibited the best safety with the use of a front-wheel walker. He was also able to perform transfers and bed mobility with supervision upon discharge.

Another notable improvement included a decrease in TUG testing from 45 seconds with maximal assist of one (MAAx1) with a front wheeled walker completed late in week one, to 26 seconds with contact guard assist of one (CGAx1) using a front-wheel walker upon discharge. The TUG test was utilized because it demonstrates ability to detect change in mobility over time in patient with stroke.[15] Throughout the four weeks of treatment, the patient continued to have no

pain and demonstrated an overall decrease in fatigue, requiring less frequent rest breaks during and after activities. This was demonstrated by an average of three seated rest breaks per ambulation period in week one to one average seated rest break during week four of treatment.

The patient also made considerable improvements in other activities and symptoms that were not routinely measured, including sensation, strength, endurance, and balance. The patient demonstrated decreased tingling through left lateral forearm and hand and increased strength and recruitment of his left upper extremity throughout the four weeks. At week one and two, the patient required the use of a strap to connect his left hand to the grips of the Nustep. By the end of week three, the patient could recruit his left hand and upper extremity to perform the gripping, pushing, and pulling required to participate in the Nustep machine. Other notable improvements included an average of seven minutes and a resistance level of six on the Nustep in week one before fatigue to twenty minutes at the end of week four.

The patient had a cardiac surgery scheduled, which required a discharge after the four weeks of treatment in the skilled nursing facility. It was assumed that he would return to the facility after discharge from the hospital following the surgery. The patient did not return, which is indicated by unachieved goals previously aimed for a return to home. The inpatient goal that was met by discharge included improving independence by decreasing assistance needed for sit to stand transfers and stand pivot transfers from maximal assistance of one (MAAx1) to moderate minimal assistance of one (MOAx1) with a front wheel walker 2 out of 3 attempts within 10 minutes in order to rely less on caregivers. Goals that were not met included improving independence by increasing ambulation to 100 feet with minimal assistance of one individual (MIAx1) with front wheeled walker to demonstrate increased ambulation distances and progression towards long term goals. This goal was not considered met due to the patient

demonstrating the need for different levels of assistance, anywhere from supervision to moderate assistance, throughout ambulation periods. These goals are laid out in Table 1 below.

Table 1: Inpatient Goals

Goals	Met/Not Met
Following skilled physical therapy, the patient will decrease assistance needed for sit-to stand transfers from MAAx1 to MOAx1 within 2-4 weeks.	Met
Following skilled physical therapy, the patient will decrease assistance needed for stand pivot transfers from MAAx1 to MOAx1 within 2-4 weeks.	Met
Following skilled physical therapy, the patient will increase ambulation distance from 10 feet with MAAx1 and FWW to 100ft with MIAx1 with FWW within 2-4 weeks.	Not Met

The patient demonstrated good tolerance to the physical therapy interventions and did not have any adverse or unanticipated events occur. He participated in all scheduled appointments and his tolerance to the interventions were assessed throughout the sessions by monitoring his fatigue and motivation to continue treatment. His willingness to participate in each therapy session was assessed prior to beginning each day through verbal affirmation from the patient and his wife. The patient's compliance was always excellent and he demonstrated great motivation to work towards prior level of function and returning home. Overall, the patient, his wife, and immediate family were all very satisfied with the care and treatment he received within the skilled nursing facility. They were pleased with his improvements each week and demonstrated this by saying the patient "looked ready to return home soon." Even though there were

significant improvements and the patient's family was motivated to have him return home it was the physical therapist's professional opinion that he should continue rehabilitation in the skilled nursing facility.

CHAPTER V

DISCUSSION

The purpose of this case report was to describe the physical therapy management of a patient following a right middle cerebral artery occlusion with multiple comorbidities. This case demonstrated its intended purpose by describing how the patient achieved significant gains in strength, endurance, and balance to improve his independence during his time in the skilled nursing facility. Although the patient did not return to the skilled nursing facility following his cardiac surgery, he made great improvements in his overall functional mobility. As research demonstrates, the patient decreased the level of caregiver assistance in his functional activities through long and frequent therapy sessions.[7] These results suggested that along with the natural recovery following a stroke, physical therapy may be beneficial to improve functional limitations in a stroke survivor.[2]

Not returning to the facility following his surgery is one of the major reasons that all of the patient's goals were not met at discharge. The patient also demonstrated poor safety throughout his sessions and during his inpatient stay. The nursing staff alerted physical therapy in week two that he would consistently attempt to get out of bed on his own instead of calling staff. This decision would ultimately end up with the patient falling on the floor risking injury. This lack of safety awareness demonstrated a need for a longer stay and increased education on safety prior to the patient returning home.

Factors that positively influenced the patient's outcomes included his motivation to return

home, prior independence before his stroke, and his family's support. In addition, the services the patient was provided by occupational and speech therapy must also be considered when assessing the patient's progress. Research demonstrates recovery rate improves with immediate high intensity physical therapy following a stroke.[18] The patient's physical therapy in the skilled nursing facility began seven days after his stroke and he was treated for four weeks, at least five days a week, with high intensity repetitive practice interventions.

The implications of this case report demonstrate that it can be a long road to recovery for stroke patients during physical therapy. A limitation of this report includes finite multidisciplinary plan of care explanation. Further research into the efficacy of interventions utilized for this patient, including mirror therapy, unilateral repetitive task training, and caregiver education should be further investigated for patients with similar demographics.

Reflective Practice

Initially seeing the patient, due to his fatigue and inability to properly follow directions, we were unable to complete any accurate strength or range of motion testing. It would have been useful to have used manual muscle testing on the patient's extremities in order to compare strength bilaterally, as well as changes in strength throughout treatment in the affected limb. The patient also was not assessed on standing balance. The Berg Balance scale would have been a good scale and functional test to perform with the patient once he was less fatigued and engaged in communication. Studies demonstrate that the Berg Balance Scale shows strong reliability, validity, and is a valid predictor of length of stay.[19]

A quality of life scale was also not given to the patient during his stay in the nursing facility. Literature demonstrates that depression is a frequent comorbidity of stroke.[20] Research determines an association between depression severity and functional impairment as well. Since this was the patients first stroke, it would have benefited the patient to evaluate his psychosocial factors. This can be done using a quality of life scale similar to the SS-QOL-12, which is a valid and reliable measure for assessing different aspects across the psychosocial and physical domains.[21] This could have benefited his overall outcomes if he received a referral to the correct services.

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