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A 70 Year Old Male with Left-Sided Flaccidity Following Right Hemorrhagic Cerebrovascular Accident: A Case Study

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A 70 YEAR OLD MALE WITH LEFT-SIDED FLACCIDITY FOLLOWING RIGHT HEMORRHAGIC CEREBROVASCULAR ACCIDENT: A CASE STUDY

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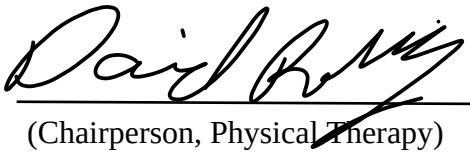

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ABSTRACT

Background and Purpose: Cerebrovascular accidents (CVAs) are a common medical issue addressed by physical therapists. This case study examines the effectiveness of one rehabilitation plan in an inpatient rehabilitation setting, and explores potential improvements in the method of intervention for patients following a CVA.

Case Description: This patient was a 70-year-old male admitted to an inpatient rehabilitation facility following a right CVA resulting in left-sided flaccidity of upper and lower extremities. He underwent therapy in this facility for five weeks.

Interventions: Conventional therapy interventions were used with this patient. The interventions consisted of a combination of strengthening, gait training, balance activities, wheelchair mobility, and patient education. The goal of physical therapy was to improve the patient's function and independence by the time of discharge.

Outcomes: The patient achieved significant gains in his mobility and transfer abilities, as well as his activity tolerance.

Discussion: While the patient and his family were satisfied with the improvements gained in therapy, additional intervention and examination options may have been beneficial. The use of a fatigue scale and virtual reality-based therapy are discussed as potential beneficial additions to the original rehabilitation process. These additions may have the potential to improve outcomes and overall therapy experience for clients in the future.

CHAPTER I

INTRODUCTION

According to the Columbia Department of Neurology, one of the earliest recorded incidences of a now prominent medical condition was witnessed in ancient Greece, by Hippocrates.[1] The condition was referred to as "apoplexy", and at the time was observed to be frequently characterized by varying degrees of paralysis.[1] Since then, modern medicine has revealed much more information regarding this condition and its etiology.[1] It is now often referred to in medical settings as a cerebrovascular accident (CVA), but the layperson knows it by another name – a stroke.[1] The World Health Organization defines a stroke as:

> *"rapidly developing clinical and/or signs of focal, and at times global, loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin."* [2]

According to Harvard Medical School, there are different types of cerebrovascular accidents that may occur.[3] A hemorrhagic stroke is caused by the occurrence of bleeding in the brain.[3] Specifically, an intracerebral hemorrhage occurs inside the brain tissue.[3] Hemorrhagic injuries can result from a past medical history of hypertension, a history of heavy alcohol consumption, and being in an elderly age range.[3] The other main and more frequently occurring type of stroke is an ischemic stroke.[3] The rate of hemorrhagic stroke occurrence as opposed to ischemic stroke is around 20% .[3] The causes of the two main types of stroke are represented graphically in Figure 1.[4]

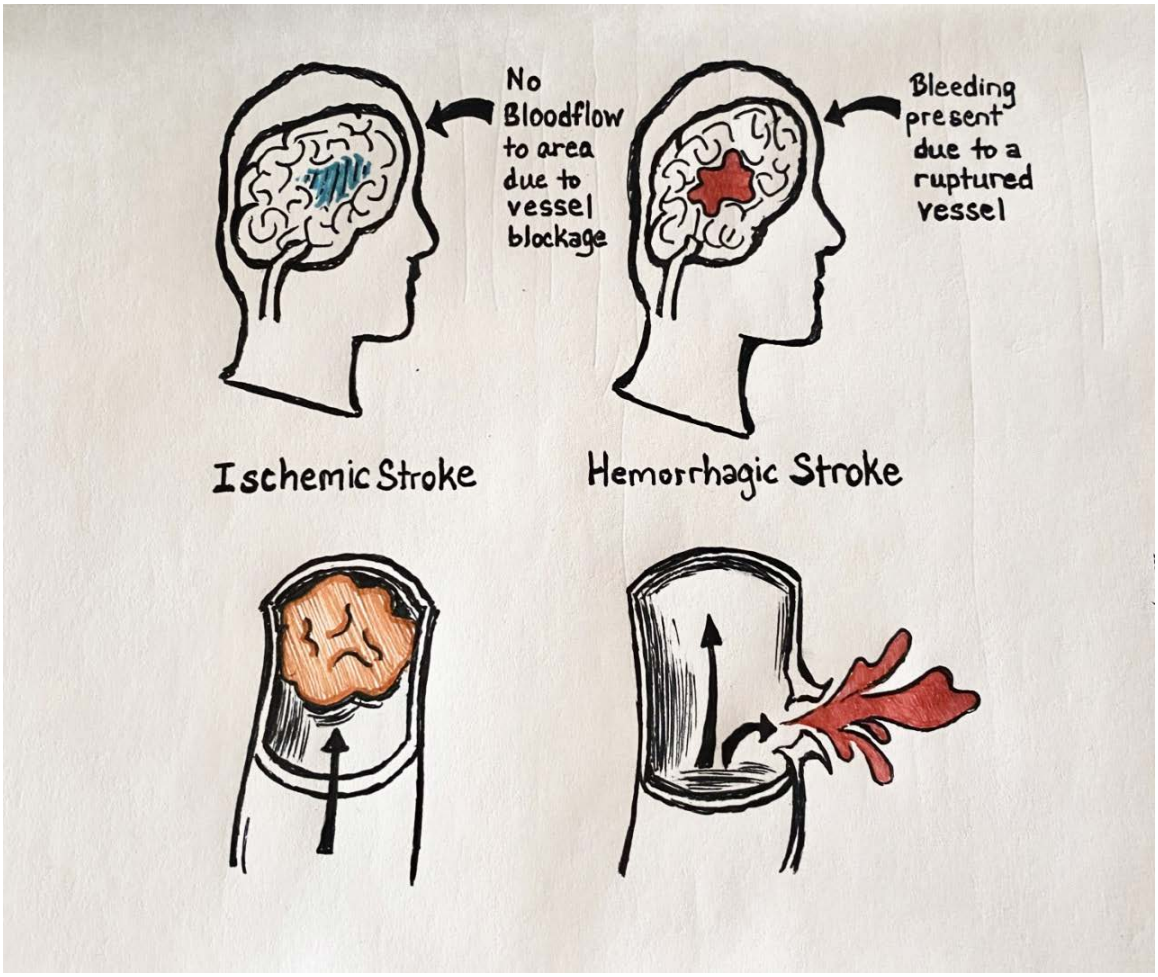


Figure 1. Ischemic and Hemorrhagic Stroke

The patient presentation of hemorrhagic and ischemic stroke vary. Symptoms of an intracranial hemorrhage often occur suddenly, while the patient is alert and awake. The patient may experience onset of muscle weakness, paralysis, loss of sensation, aphasia, abnormal respiratory rates, reduced ability or inability to walk, or even coma or death.[3] Sometimes, it is challenging to tell the difference between a hemorrhagic and ischemic stroke, as some of the symptoms can be the same. A patient may experience any combination of the following: nausea/vomiting, head pain, a wide variety of neurologic

signs and symptoms, seizures, and increases in diastolic blood pressure.[5] Following the onset of symptoms of a hemorrhagic stroke, the patient may observe an increase in symptom severity for about an hour.[3] Confirming the presence of an intracranial hemorrhage and surveying the extent of the damage to brain tissue/structures requires either a computed tomography (CT) scan or magnetic resonance imaging (MRI) to be performed.[3]

Outcomes following a hemorrhagic stroke are highly variable in nature.[3] A small percentage of patients may regain most of their function for up to a month-long period following their stroke.[3] For most other patients, recovery is a long and intensive process.[3] A percentage of patients do die due to stroke and stroke complications – Harvard Medical School states that an intracerebral hemorrhage kills anywhere between 30-60% of patients who experience one.[3] This often happens within the first 48 hours following the stroke.[3]

Prognostic tools may be able to help determine what degree of function the patient might be able to regain following their stroke.[5] According to Caceres and Goldstein, during the time immediately after a cerebrovascular accident, there are various prognostic tools that may be used to help decide the level of risk for patient death or complications, as well as the likelihood of the patient regaining function.[5] These include the Intracranial Hemorrhage Score (ICH Score) and the Functional Outcome Risk Stratification Score.[5] The ICH score ascertains the likelihood of stroke-associated death in the 30 days following the CVA while the Functional Outcome Risk Stratification Score discerns the patient's independent function 90 days after the stroke event.[5] For the

Functional Outcome Risk Stratification Score, a higher score indicates better odds of recovery of former function.[5]

According to Veerbeek et al., it was determined that nearly 795,000 of those living in the United States experience a stroke annually, making it a prominent medical issue in today's society.[2] Physical therapy plays a major role in the treatment and rehabilitation of patients after stroke.[2] A variety of interventions for may be used in the context of physical therapy – these include, but are not limited to, bed mobility/early mobilizing of the patient, balance exercises in all positions – seated, standing, quadruped, kneeling, practice transitioning from one position to another, gait training/ambulation exercises, application of orthoses/assistive devices, application of electrical stimulation or neuromuscular stimulation, and strengthening activities.[2] Another form of intervention during post-stroke rehabilitation includes virtual reality (VR) technology.[6] Virtual reality training is a newer form of therapy intervention, but has been showing promising results as a form of therapy that produces positive results without being overly expensive.[6] This study will further explore virtual reality as a physical therapy intervention later, in the discussion of alternative treatment options for this patient.

This case study details the examination and evaluation of a patient who was admitted in the subacute stage following a hemorrhagic stroke. It outlines his rehabilitation process in physical therapy, the interventions used, the outcomes, and explores alternative assessments and interventions within the scope of physical therapy available for application in future patients with similar pathologies. The purpose of this article is to discuss the critical and diverse role of physical therapy in rehabilitation

process of patients following stroke, and to explore potential improvements for the future of stroke rehabilitation.

CHAPTER II

CASE DESCRIPTION

A 70 year old male with a right-sided cerebrovascular accident (CVA) will be presented in this case study. The patient was admitted to an inpatient rehabilitation facility several weeks following a right CVA, which he experienced while at home. He was first admitted to the hospital, and then to a skilled nursing facility. When questioned about his lifestyle and routine prior to his stroke, the patient reported that he had been independent with all of his activities of daily living, and that he could independently navigate the four steps into his single level home. The patient did not formerly use any assistive device for ambulation or for activities of daily living prior to his CVA. He was formerly employed in agriculture, but had since retired. He previously enjoyed being able to walk around his yard at home, and was still actively driving prior to having his stroke. He was living with his wife at the time, and also had a son who was also frequently at the house.

Upon presenting to therapy, the patient's most apparent deficits were the total flaccidity in his left upper extremity and moderate to severe amounts of flaccidity in left lower extremity, with visible muscle atrophy in both of these. A wheelchair was the patient's primary mode of mobility at the time. His comorbidities included a history of essential hypertension and heavy alcohol use. There was no history of any other cerebrovascular accidents in his past, and his body mass index was within normal limits. The patient's chief complaints were the inability to walk and negotiate stairs

independently. He denied the presence of any pain, rating his pain at a 0/10 (0 being no pain at all, 10 being the worst pain imaginable). The patient would sometimes report an "achiness" in his left arm, which usually occurred after neglecting the dependent position of the extremity. The upper extremity aching was relieved by cueing the patient and placing the arm in a supported resting position or sling. When questioned about his goals for physical therapy, the patient responded that "getting back to my normal life and going home" were the things that were most important to him.

Following his brief stay in a skilled nursing facility, the patient was admitted to an inpatient rehabilitation facility with physician orders to evaluate and treat.

Examination

A portion of this patient's examination aligns with certain procedures and measures outlined in the section of writing pertaining to stroke examination and evaluation by O'Sullivan, Schmidt, and Fulk.[7] Checking his orientation to time, person, place, and event confirmed that the patient was oriented x 4. It is also notable that he did not possess any apparent cognitive or speech deficits. Upon observation and palpation, it was confirmed that there was atrophy of the patient's left upper and lower extremities. In addition to this, his left shoulder was slightly subluxed. An assessment of his dermatomes revealed that the patient lacked sensation throughout his left lower extremity.

Range of motion and gross manual muscle testing were derived from the methods described in *Cram Session in Goniometry and Manual Muscle Testing*.[8] His passive range of motion in bilateral lower extremities was within functional limits. It should be noted that "within functional limits" in this case means that the patient's results may not be considered average or "normal" for their age, but the patient has adapted in such a way

that they are still able to complete a task. The patient's active range of motion of the right lower extremity was within functional limits, but the patient exhibited functional deficits in the left lower extremity when asked to perform ranges of motion. These were not measured goniometrically, as a more functional approach was being implemented for this evaluation, as well as the fact that his range of motion below the knee was negligible. Eversion and inversion were not tested, as this was not protocol for a gross assessment of the patient's functional range of motion. Special tests were not used in this case, as it was decided they were not relevant and also not the typical protocol for stroke patients at this establishment. Additionally, the physical therapy diagnosis was able to be confirmed without their use. Manual muscle testing of the opposite lower extremity revealed that all actions of the right hip, leg, and foot were grossly 5/5. (See Table 1 for additional reference)

Table 1. Initial Manual Muscle Test Results for Lower Extremity Movements

	Left	**Right**
Hip adduction	4/5	5/5
Hip abduction	4-/5	5/5
Hip flexion	3+/5	5/5
Knee extension	3+/5	5/5
Knee flexion	3+/5	5/5
Dorsiflexion	Nil	5/5
Plantarflexion	1/5	5/5

The patient's level of ambulation and transfer ability was also assessed upon admission to physical therapy. When testing his level of function for walking, he was capable of ambulating 30 feet using a hemi-rail and one therapist providing moderate assist while another therapist followed with the wheelchair. During ambulation, scissoring of the patient's gait was evident. For safety, the therapist held the patient's gait belt with one hand and stabilized the left knee with the other hand, while scooting alongside the patient on a stool. For stand to sit transfers and lying to sitting transfers, the patient required minimal assist. For sit to stands, he required moderate assist. For stand and pivot transfers, the patient required only moderate assist when pivoting to his unaffected side, but total assist (moderate assist of two therapists) when pivoting to his affected side. (See Table 2 for reference)

Table 2. Initial Transfer Examination & Assist Levels Required

Type of Transfer	**Level of Assist**
Bed mobility	Standby
Lying to sitting	Minimal
Standing to sitting	Minimal
Sit to stand	Moderate
Stand and pivot (to right side)	Moderate
Stand and pivot (to left side)	Total (Mod. of 2 people)

PT Diagnosis and Goals

Following this examination and evaluation, the patient was diagnosed with left sided flaccidity, atrophy, and loss of function secondary to a stroke. After considering the

referral from the attending physician, reviewing the patient's medical history, and an examination that assessed his gross range of motion, strength, and functional limitations, this was the logical PT diagnosis. The physical therapy long term goals for this patient included: Complete bed mobility with a modified independent status, complete transfers with standby assist, complete 100 feet of ambulation with an assistive device and standby assist, negotiate 3 steps with moderate assist from one person, and be able to self-propel 240 feet in a wheelchair on a level surface as modified independent. Achieving these goals will help this patient attain his personal goal of "getting back to my normal life and going home". (See Table 3 for reference)

Table 3. Functional Goals for Physical Therapy

Functional Task	**Level of Assist**
Bed mobility	Modified independent
All transfers	Standby
Ambulate 100 ft w/ AD	Standby
Safely negotiate 3 stairs	Moderate x1
Wheelchair mobility 240 ft/level surface	Modified independent

CHAPTER III

INTERVENTION

This patient was seen 7 days/week for 1.25 -1.5 hours in inpatient physical therapy each day, typically broken up into a morning session and an afternoon session. His rehabilitation program consisted of a combination of gait training, wheelchair mobility, stairs training, strengthening, balance activities, and patient education. While historically these are traditional and functional interventions for someone rehabilitating from a stroke, potential additions to the original interventions will be proposed in the discussion chapter. One of the most important interventions which was regularly implemented with this patient was that of skin checks. Due to having little to no sensation in his left lower extremity below the knee, it was important to watch for any bruising, chafing, pressure spots, or irritation in order to prevent sores and infections from forming. Annually, sores and ulcers caused by irritation from continuous pressure result in 29,000 deaths in U.S. hospitals, and typically create around $10.2 billion in expenses.[9]

The first week, the patient worked on completing bed mobility. This involved rolling to the right and left sides and transitioning from sitting to supine while using a bed rail. His bed mobility required only standby assist for safety, making sure he did not accidentally roll onto his flaccid arm or leave it hanging in an odd position behind him. He worked on transitions from lying to sitting, from standing to sitting, and from sitting to standing (see Table 2 for initial values). He also practiced transferring by using the

stand-pivot method, which required moderate assist of one therapist if he wished to pivot to his right side, but required total assist (MOAx2) if he tried to pivot to his left side. The first week that he practiced ambulating, he needed to use the hemi-rail in the hallway, and his gait showed a tendency to scissor. In order to reduce the scissoring, the therapist held the patient's gait belt with one hand and stabilized the left knee with the other hand. The PT's position helped to place the patient's left lower extremity with the other hand, while scooting alongside the patient on a stool. Another therapist typically followed with the wheelchair. The patient also practiced wheelchair mobility, usually self-propelling with his right lower extremity for 120 feet with only standby assist the first week.

Strengthening exercises were also completed during this first week. Therabands were used regularly for this purpose. With the assist of the therapist, an elastic band was used with his right lower extremity to complete hamstring curls, hip adduction, and hip abduction. A 2.5 lb ankle weight was used for resistance in seated hip flexion and knee extension exercises. On the left lower extremity, the elastic band was used for hip abduction and adduction, and the patient was encouraged to try and perform the remaining actions while the therapist provided manual assistance, as the left lower extremity was not strong enough to resist a band or ankle weight at the time. Typically, 2 sets of 15 repetitions were completed for each of these exercises. Additionally, during the second week, the patient was seen by the prosthetics and orthotics department, and was fitted for a left knee-ankle-foot-orthosis (KAFO). This was applied by the end of week 2 in order to reduce hyperextension of the left knee during walking and minimize the effects of the patient's left foot drop. One study by Li, Francisco, and Zhou advocated the benefits of ankle-foot-orthoses.[10] In a study that examined both botulinum toxin and

application of AFOs for addressing the problem of tone and its detriment to a patient's walking ability, it was concluded that AFOs add support and stability to the affected LE and would be a worthwhile intervention.[10]

Much of week 3 was spent with the patient accustoming himself to the use of a hemi-walker and testing his abilities while wearing the KAFO. During these times, the patient continued to require verbal and manual cueing to encourage left hip extension and proper foot placement. The hemi-walker was also used while practicing stand-pivot transfers, however the patient did require moderate assist from a therapist during these attempts. One new intervention that was added during the third week of rehab was stair training. The method of stair training would change as the patient's strength and stability improved, but to start out, he used 2" and 4" blocks to practice "step-ups", using the parallel bars and two therapists to support and guide him. In addition to implementing powderboard activities where the patient would be in sidelying and practice controlled left knee flexion and hip extension on a low-friction surface, a hip abduction strengthening exercise was introduced to his exercise plan. During this exercise, the patient would lie on his right side on the therapy mat and, with verbal and manual cueing from the therapist, attempt to abduct his left leg from midline as much as possible, for several repetitions. These exercises did tend to cause him to fatigue easily, as the gluteus maximus/medius/minimus are a larger group of muscles and required more effort on his part.

During his fourth week, the patient continued to work on strengthening, wheelchair mobility, ambulation, and mat activities. Supine bridging exercises were added to his growing list of mat activities, in order to facilitate and strengthen his core

muscles and gluteus maximus, as weakness in these seemed to contribute to his decreased postural control and activity tolerance when ambulating. During these exercises, the therapist would stabilize the client's knees and then lift his hips up off of the mat and hold the position for 5 seconds. He was typically able to complete 10 repetitions. The patient was also able to graduate from the blocks in the parallel bars to a set of three adjustable steps with a railing in the therapy gym, in order to continue his stair training. He required minimal assist from the therapist and used the right-side rail while ascending the steps. He would then transition to a sitting position at the top of the steps and scoot down on his buttocks with minimal to moderate levels of assist from the therapist in order to descend the steps.

During the fifth week of rehabilitation, no new interventions were added, as the patient was discharged that week. Prior to his discharge, his wife and son did attend one of his sessions in order to receive caregiver training and help them prepare for his return home. His family received education on how to apply a gait belt, how to safely help the patient ambulate and negotiate stairs, how to correctly don/doff his KAFO, and how to perform routine skin checks. They also received education on how to help the patient complete both seated and lying home exercise programs, which contained exercises similar to what he had been completing consistently in physical therapy (see appendix for example of home exercise program).

CHAPTER IV

OUTCOMES

By the beginning of the fifth week in physical therapy, it had become evident that the patient's progress had plateaued to a point that insurance would not be able to justify covering his continued stay at the facility. That being said, it is likely he would still benefit from outpatient physical therapy. A study by Ballester et al. challenged the commonly accepted theory that most recovery of function occurs within the first 3-6 months after a stroke has occurred.[11] Their findings supported their hypothesis, and suggested that significant recovery can be experienced even longer than 12 months after a stroke has occurred.[11] Given those results, a substantial case could be made for recommending that the patient continue to receive physical therapy in an outpatient therapy setting.

Although manual muscle testing was completed at admission, it was not performed at discharge. This was partially due to the protocol at this facility not requiring it, but primarily because his therapy sessions had focused on the patient's functional gains rather than strength gains. Notably, his strength in and of itself did not show significant change. Additionally, the initial strength testing was conducted more so as a measure of the patient's current ability, in order to guide the formation of interventions and a plan of care. Similarly, since his range of motion was measured through a gross functional screen at admission, there were no goniometric measurements to show

progress. Rather, progress was shown by the completion of goals set on a weekly basis. That being said, his functionality and activity tolerance did improve significantly. Given that the patient had no significant pain upon arrival and that his pain levels showed no variation, except for some minor achiness in his left arm when he would forget about it and let it hang off his armrest, there was no progress or regression to be shown in that area. His long term physical therapy goals were reassessed upon discharge and are as follows: (See Table 4)

Table 4. Patient Goals and Status at Discharge

Goal	**Status at discharge**
Complete bed mobility w/ modified independent status	Goal not met (patient still required supervision for safety)
Complete transfers with standby assist	Goal not met (patient still required minimal assist from PT)
Complete 100 feet of ambulation with AD and standby assist	Goal not met (patient still required minimal assist from PT)
Negotiate 3 steps with moderate assist of one person	Goal met.
Self-propel 240 ft in w/c on level surface with modified independent status	Goal not met (patient's max distance was 150 ft with PT supervision for safety)

Although the patient succeeded in meeting most of his week-by-week goals for the first 3.5 weeks in therapy, there were four out of five of his long term goals which remained unmet by his discharge. Even so, he did exhibit substantial improvement. Results demonstrate he progressed from needing moderate assistance during transfers and sit to stand transitions to being able to stand with just minimal assistance and his hemi-walker for stability. He went from only being able to ambulate 30 feet with a hemi-rail

and multiple therapists assisting, to being able to ambulate 120 feet with his KAFO, hemi-walker, and minimal assist. His wheelchair mobility improved to the point that he could self-propel 120-150 feet with a therapist supervising for safety.

Probably the most significant outcome for this patient was being able to finally navigate the stairs. When he was admitted, he required the use of the parallel bars and a therapist on either side of him in order to step up onto 2" and 4" wooden blocks. By the time he was discharged, he was able to negotiate three standard height steps using a unilateral railing on the right side and minimal assist to ascend. He could then transition to a seated position at the top step and scoot on his buttocks with just minimal assist to descend. This was significant, as it ensured he had the ability to enter his own home with the assistance of a family member.

As previously mentioned, the patient was discharged at five weeks because his progress to that point began to plateau, and was not considered significant enough for insurance companies to justify a continued stay at an inpatient rehab facility. However, when comparing the patient's functional level at his initial examination to his functional level at discharge, it is evident that progress was made in the areas of ambulation, transfers/transitions, wheelchair mobility, and stair negotiation. If the patient chose to follow therapist recommendations and continue to be seen for physical therapy in an outpatient setting, it is not unreasonable to expect that more of his long term goals may yet have been achieved.

CHAPTER V

DISCUSSION & REFLECTION

This patient achieved significant improvements in his functional status during his time at inpatient rehabilitation. By discharge, he was able to return home. He was also a more appropriate candidate for outpatient physical therapy by this time, which was recommended to him by the therapist. Although not all of his long term goals were met, this was due to the fact that his progress had become less rapid – given the opportunity to continue regular therapy in an outpatient setting, it can be expected that he would achieve these goals.

One change to the patient's rehabilitation plan that could have influenced whether or not he met all of his goals by discharge was the nature of interventions used routinely with him. At the end of his third week, it was becoming evident that he was beginning to grow bored with the types of activities in therapy, and the therapy setting in general. One solution to this problem may have been the introduction of virtual reality training to his intervention plan. A systematic review by Corbetta, Imeri, and Gatti examined the effects of virtual reality training on the progress of 341 patients post-stroke in the areas of walking speed, balance, and mobility.[12] They examined studies in which either virtual reality rehabilitation took the place of some part of conventional therapy, was the sole intervention used, or was used to supplement traditional interventions.[12] Findings from the study reported partially or fully replacing traditional rehabilitation methods with VR

training were correlated with a significant increase in all three of these areas.[12] That being said, using VR as a supplement to conventional therapy was only correlated with significant improvement in mobility.[12]

Another study by Malik and Masood examined virtual reality training's impact on the sensorimotor capacity and overall mobility of a sample of patients following a CVA.[13] The patients participated in virtual reality activities that targeted both balance and gait, in addition to actually playing some games available on the device used to administer VR training.[13] The researchers concluded that both the mobility and sensorimotor capacity of the patients' legs experienced positive effects as a result of the virtual reality therapy.[13] They also conducted a pre-VR and post-VR training Timed Up and Go test, in which they noted an average reduction in TUG time of 12.28 seconds across the group of patients.[13]

As seen with this patient, the inability to independently ambulate is a key concern of many patients post-CVA.[14] One study by Yang et al. examined the impact of VR-supplemented treadmill training on gait and ability to community ambulate in patients post-CVA.[14] The VR group was compared to a group that experienced traditional treadmill gait rehabilitation, and all patients' walking pace was measured following treatment.[14] Additionally, they completed a Walking Ability Questionnaire and an Activities-specific Balance Confidence assessment.[14] When compared to traditional gait rehabilitation methods, they found that the VR group experienced enhanced improvements in their ability to complete community ambulation.[14]

The patient in this case study would likely have been a good candidate for VR training as an addition to his therapy times. He was fully oriented, his cognition was

intact, his age did not pose any interference, and he was a goal-driven individual. VR training is both a versatile and relatively inexpensive intervention to implement.[6] Research has shown the benefits of VR training on improving mobility and gait, which were some of this patient's most significant areas of deficit.[12] In addition, virtual reality-based activities may have provided more variety in the patient's intervention in order to keep him motivated and interested in his therapy sessions. If there was any chance that VR-based therapy could have postponed his plateau of progress, it would be a worthwhile intervention to have considered.

Another change that should have been implemented with this patient is the use of a fatigue scale, which can be used as a supplemental assessment for stroke patients. Fatigue is an easily overlooked but significantly troublesome after-effect experienced by patients following a CVA.[15] It can occur in anywhere between 38% and 77% of stroke survivors, and results in many negative impacts for the patient.[16] It can interfere with the patients' motivation as well as their overall rehabilitation process, not to mention the impact it has on their physical and emotional wellbeing.[15] A study by Drummond et al analyzed fatigue levels in patients following a CVA.[15] The study found that patients were more likely to experience fatigue 4-6 weeks following a CVA.[16] It also stated that decreased mobility levels and ability to complete ADLs were strongly correlated with increased amounts of fatigue.[15]

During treatments for this case study, the therapist would frequently note fatigue as a symptom that the patient experienced. However, there was not a protocol "fatigue scale" utilized by physical therapists at this site for patients with CVA. The inconspicuous nature of fatigue allows for it to be easily missed in the clinical setting.[17] A

Dutch research study on post-CVA fatigue found that 70% of participants experienced significant fatigue throughout a month-long post-stroke period.[17] Implementing a scale to measure patient fatigue levels would have been beneficial for the purposes of documentation and intervention modification with this patient. This is especially relevant since increased fatigue reports have been associated with more balance deficits and increased dependency on external help with ADLs.[17]

Traditionally, the two most common forms of gauging fatigue in patients following CVA are subjective patient reports and measuring their physical performance and ability.[17] The Fatigue Severity Scale (FSS), the Short Form 36, and the Fatigue Impact Scale are three self-assessment type scales that are commonly chosen for the measurement of fatigue in patients.[17] A review by Lerdal et al. examined thirty-three articles on fatigue and found that the previously mentioned FSS was the most common subjective fatigue measure of choice.[17] In a study by Valko and Bassetti, this scale was compared to a visual analog scale (VAS) used on patients who had multiple sclerosis, ischemic CVA, and sleeping disorders.[18] The study's results indicated that the patients' FSS ratings were comparable to those of their VAS ratings when describing their fatigue.[18] Another study by Chuang et al. examined the validity and reliability of another self-report style scale, a numerical rating scale coupled with the Fatigue Faces Rating Scale, in 106 patients who had previously experienced a stroke.[16] The study concluded that sensitivity and specificity were both deemed to be high in this particular hybrid scale.[16] Additionally, reliability and validity levels were adequate enough to be used to detect significant fatigue change in the clinical setting.[16]

A scale such as the one used in the study by Chuang et al. would have been extremely helpful for the purpose of documentation and data gathering, as notes were frequently made of how the patient was feeling that day, whether he was tired, motivated, or lacking in motivation. Additionally, a fatigue scale would have provided valuable data not only for the patient, but also for all patients with CVA in this facility, as it could provide a reference for fatigue level norms in therapy, and display concrete numerical guidelines for engaging in lighter versus more rigorous therapy activities. Given these facts, it should be a priority among healthcare providers and rehabilitation teams to be able to recognize fatigue in patients post-CVA, as it can impede their progress in rehab if it is not addressed and managed appropriately.[15]

In a future case with a patient presenting similarly to the one discussed in this case, several changes could be recommended – two of these being the implementation of virtual reality-based therapy and the use of a fatigue scale in therapy. Upon reflection, additional factors that should be considered are the use of a quality of life or functional assessment, as these aspects of rehabilitation are just as important for the sake of treating the whole patient. Additionally, though the forgone use of goniometry is understandable in this case, it should be completed in the future for the sake of thoroughness. Similarly, manual muscle testing upon discharge should also be completed in future cases, as this serves to provide concrete numerical data with which to show progress or lack thereof.

Despite not meeting all of his long-term goals, this patient made significant progress on a functional level during his time in therapy. He and his family were pleased with the outcomes, and recommendations were made for him to continue regular physical therapy in an outpatient setting. As with any medical intervention, conventional CVA

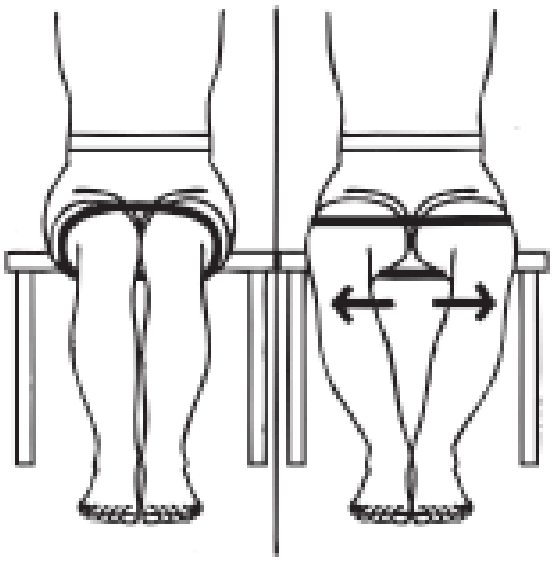
interventions and protocols may benefit from further changes and improvements, in order to deliver patient-centered care and provide the client with the best possible outcomes.

APPENDIX

Home exercise program containing exercises assigned to patient.

UND School of Medicine & Health Sciences
University of North Dakota

Seated Home Exercise Program for Patients Post-CVA



Hip Abduction Exercise with Band

Purpose: to strengthen hip abductors and assist with correct gait form

Position: seated on chair, feet on floor.

Step 1: Place band (or have someone help you place it) around legs, just above knees.

Step 2: As shown in diagram, pull knees apart, against resistance provided by band.

Step 3: Slowly bring knees back together.

Complete **2 sets** of **15 repetitions, 3-4 days/week**

Progression: If this exercise becomes less challenging, attempt to hold the abducted position for 3-5 seconds before bringing knees back together.

Hip Adduction Exercise with ball/rolled up towel

Purpose: to strengthen hip adductors

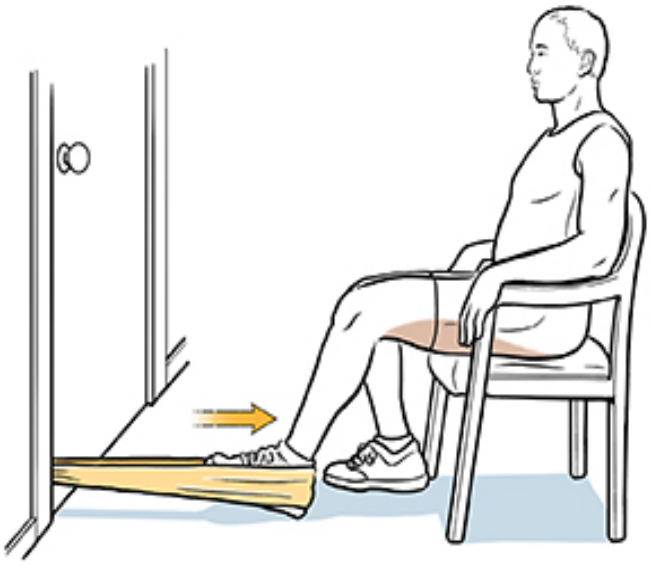
Position: Seated in chair with feet on floor, semi-inflated ball or large rolled towel between knees.

Step 1: Bring knees together, squeezing ball/towel roll.

Step 2: Slowly pull knees back apart.

Complete **2 sets** of **15 repetitions**, **3-4 days/week**

Progression: Each time you bring knees together, hold this position for 3-5 seconds before slowly returning to start position.



Hamstring Curls with Band

Purpose: To strengthen hamstrings in order to assist with gait and transfers

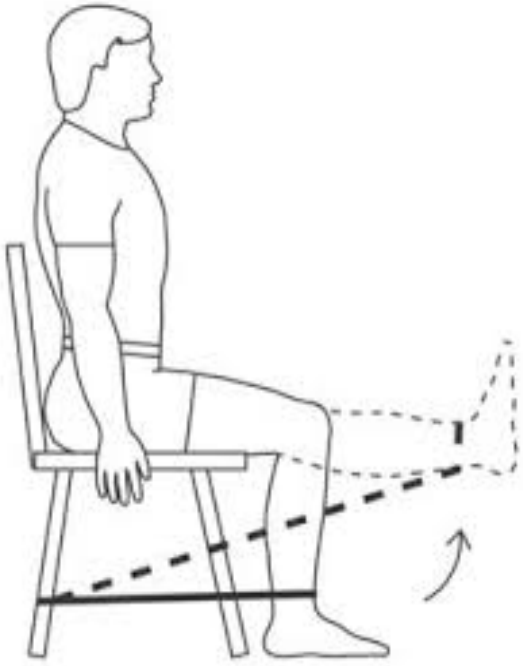
Position: Seated in a stable chair

Step 1: Loop band around heel and secure other end of band in door, as shown in diagram (Can have one other person assist with holding the band instead of using doorframe)

Step 2: Bracing with other foot, pull your heel back towards yourself, against the resistance of the band.

Complete **2 sets** of **15 repetitions** on both legs, **3-4 days/week.**

Knee Extensions with Band



Purpose: to strengthen quadriceps in order to increase ease of transfers and gait

Position: Seated, with one end of resistance band looped around the front of ankle, the other attached to stable chair leg or being held by another person (This exercise will likely require assistance from another person for setup/completion)

Step 1: Bracing with opposite foot, straighten your leg against the resistance of the band.

Step 2: Slowly bend knee back to starting position.

Complete **2 sets** of **15 repetitions** on both legs, **3-4 days/week,** with supervision of another person

Seated Ankle Pumps Exercise

Purpose: To promote circulation while sedentary for longer periods of time

Position: Seated with feet on floor (Can also be completed while supine/lying)

Directions: Move your toes up toward your nose and point them back downward again.

Complete **2 sets** of **20 repetitions** with both feet whenever you sit or lay down for long periods of time. (You can set reminder alarms on your phone, or complete these whenever there is a commercial break if you are watching television).

If you experience any pain or lasting discomfort in your legs/feet during/following these exercises, **contact your doctor and physical therapist** so that modifications can be made. If you have any questions, please contact your physical therapist at (701) 306 – 1234.

Hannah DeKrey, SPT

Physical therapist signature:_____ Hannah DeKrey, SPT _____

Image References for Home Exercise Program

https://hughesbarbell.files.wordpress.com/2017/05/hip-abduction.png?w=184&h=194

https://encrypted-tbn0.gstatic.com/images?q=tbn%3AANd9GcTMSH40C4lOIwPt0D8HypzgpEVylxoh87vsOw&usqp=CAU

https://api.kramesstaywell.com/Content/6066ca30-310a-4170-b001-a4ab013d61fd/ucr-images-v1/Images/man-sitting-on-chair-with-heel-in-resistance-band-doing-hamstring-curl-exe

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