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# A Case Report: Cerebrovascular Accident

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# A CASE REPORT: CEREBROVASCULAR ACCIDENT

by

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This Scholarly Project, submitted by Kayla Andreasen in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Graduate School Advisor)

(Chairperson, Physical Therapy)

PERMISSION

**Title** A Case Report: Cerebrovascular Accident

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Signature Kayla Andreasen

Date 9/30/15

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## ABSTRACT

**Background:** Cerebrovascular accidents (CVAs) are one of the leading disabilities in America resulting in mild to severe functional limitations. These functional limitations can be addressed in physical therapy (PT). **Purpose:** The purpose of this case report is to review background, treatments, physical therapy interventions and outcomes of a patient with a sub-acute stroke, treated in an inpatient setting. **Case Description:** The patient was a 70 year old male with a severe ischemic CVA following surgery to repair an abdominal aortic aneurysm. The patient was transferred to a nursing home to recover and returned to the hospital 5 months later with hypotension and residual weakness of lower left extremity. There he was treated by inpatient PT. **Interventions:** The patient was treated 2x/day for 5 days in 45 minute sessions. Treatment consisted of gait training, therapeutic exercise, and neuromuscular re-education. **Outcomes:** Over the short course of treatment, the patient significantly improved in functional mobility, transfers, ambulation, and bed mobility. He was accepted into the Acute Rehab Unit for an extended rehab stay where he was able to receive more intensive PT, and progress even further towards his goal of returning home. **Discussion:** The patient responded well to treatment, however additional interventions could be utilized in the future to aid in greater improvements.

# CHAPTER I

## BACKGROUND AND PURPOSE

One of the leading disabilities in America is a cerebrovascular accident (CVA), commonly known as a stroke, leaving 40% of stroke patients with moderate impairments and up to 30% with severe disabilities.[1] There are two primary types of CVAs: ischemic and hemorrhagic. An ischemic stroke occurs when the flow of oxygen-rich blood is obstructed from a region in the brain, resulting in brain tissue damage. This obstruction of blood flow is often caused by a blood clot or plaque.[2] Secondly, a hemorrhagic stroke occurs when an artery to the brain leaks or bursts open. The leaking blood causes increased pressure on the brain tissue, also resulting in tissue damage and death. A hemorrhagic stroke can result from high blood pressure, and/or aneurysms.[2] There is also a third event, a transient ischemic attack (TIA), which can be considered a type of stroke. TIAs are sometimes referred to as a "mini-stroke". A TIA is similar to an ischemic stroke in that it is caused by blockage of blood flow to the brain, yet unlike an ischemic stroke, this blockage only occurs for a short time, usually 1-2 hours. Thus, damage to the brain cells is not permanent.[2]

A variety of function of the body can be affected depending on what portion of the brain tissue has been damaged. *Figure 1* depicts the various bodily functions in which the brain is responsible for controlling.[3]

Figure 1: Functional Areas of the Brain

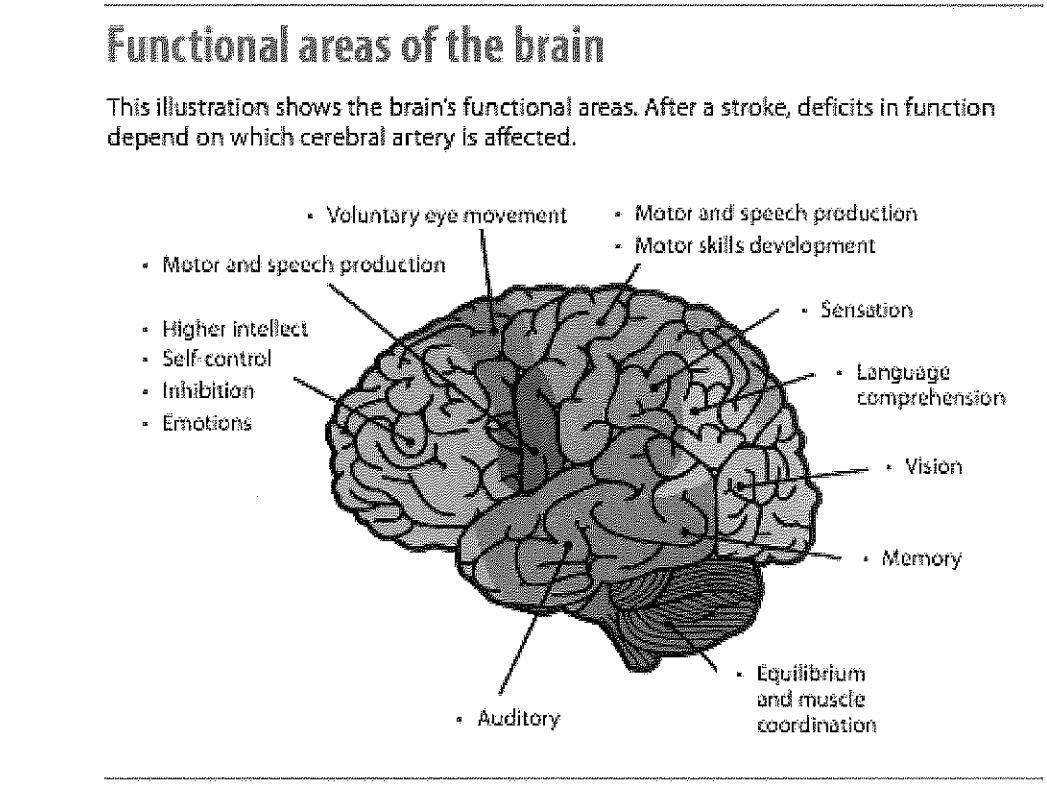



Image courtesy of: http://www.americannursetoday.com/identify-the-vessel-recognize-the-stroke/

There are 3 main vessels that carry blood to the brain, and therefore can be involved in a stroke. These vessels are the Anterior Cerebral Artery (ACA), Middle Cerebral Artery (MCA), and the Posterior Cerebral Artery (PCA).[3] Of these three vessels, the largest and most commonly involved is the MCA. The MCA supplies blood to a large portion of the brain as seen in *Figure 2*. It supplies the frontal, temporal and parietal lobes, as well as deep brain structures including the basal ganglia and internal capsule. Occlusions of this vessel most typically result in hemiplegia and sensory loss of the contralateral side of the body as well as visual deficits, aphasia and unilateral neglect.[3] Strokes involving the PCA and ACA are rare. Involvement of the PCA can result in visual deficits,

while involvement of the ACA can result in behavioral changes, contralateral weakness and sensory loss, and incontinence. Strokes involving the vertebral-basilar circulation can also occur and affect the cerebellum, brainstem, or both. Cerebellar strokes will commonly impair balance and coordination.[3]

Figure 2: Blood Supply to the Brain

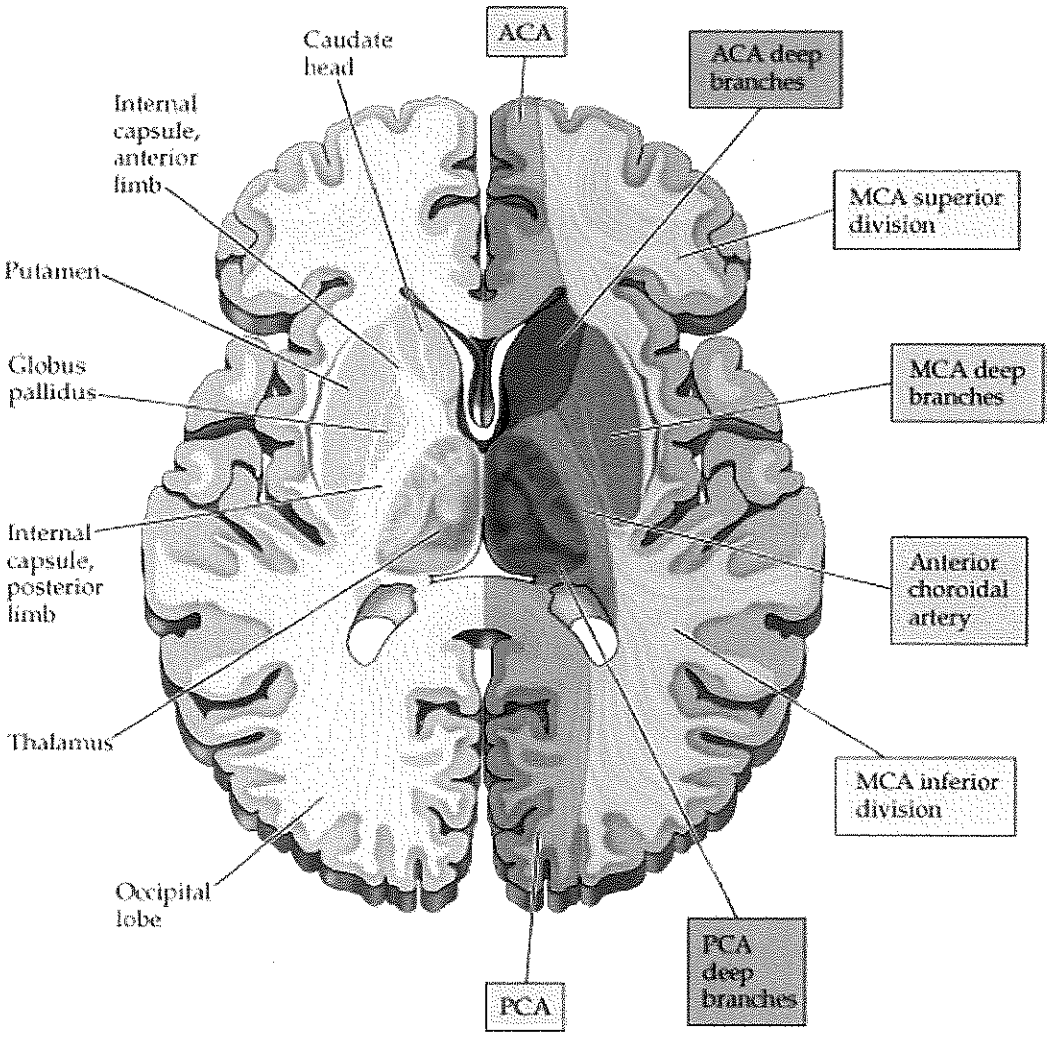



Image Courtesy of: http://www.americannursetoday.com/identify-the-vessel-recognize-the-stroke/

Causes and risk factors of a CVA include atherosclerosis, high cholesterol, high blood pressure, atrial fibrillation, blood disorders, smoking,

diabetes, coronary artery disease, aneurysms, heart failure, age, family history, ethnicity, lack of physical activity, unhealthy diet, obesity, stress, and alcohol/drug abuse. Any one of these factors can increase the risk of having a stroke, although it is possible to have a stroke without any risk factors.[2] Signs and symptoms of a CVA may include sudden weakness or paralysis particularly on one side of the body, difficulty speaking or communicating, blurred vision, loss of balance and coordination, severe headache, loss of consciousness, or confusion.[3] A stroke is considered an emergency requiring immediate medical attention. A CVA is diagnosed based on the signs and symptoms, medical history, physical exam and test results. Test results can include a computed tomography (CT) scan of the brain, magnetic resonance imaging (MRI), a computed tomography arteriogram (CTA), or carotid ultrasound or angiography. A doctor may also use an echocardiograph or an electrocardiogram (EKG) to check the heart to determine an underlying cause of the stroke.[3]

Complications and impairments resulting from a stroke may fully reside, or become permanent. These complications and impairments can include swallowing or eating problems, communication difficulties, both receptively and expressively, emotional changes, loss of bladder or bowel control, muscle and nerve problems, language, speech and memory problems. Treatment of CVA can include medication, surgery, lifestyle changes and rehabilitation.[2] Rehabilitation intervention programs started early after stroke onset can enhance the recovery process and decrease functional disability[1]. Increased function after

early rehabilitation leads to improved patient satisfaction and reduces costly long-term care expenses.[1]

This case study pertains to an individual in the sub-acute phase, 5 months post ischemic stroke. As most intensive therapies are started in the acute phase, the question arises: Will the intensive therapies still make significant improvements in patients' abilities when administered in the sub-acute phase? Tangeman et al[4] addressed the rehabilitation of patients with chronic stroke (at least 1 year post stroke), and concluded significant improvements in function measured by weight shifting, balance and ADL scores. They also assessed retainment of skills at a 3 month follow up. The results suggest physical therapy can be beneficial to sub-acute or chronic stroke patients, though this study's sample size was relatively small with a sample size of 40 participants.

Duncan et al[1] recommends a patient post-stroke should have a formally coordinated and organized therapy, that it should be intensive, and rehab should involve a variety of disciplines including PT, OT, MD, nursing, SLP, psychologist, patient and family/caregivers. If not available, the patient should be referred to a facility that can provide this type of therapy. Further studies agreed and concluded there were significantly greater gains in functional recovery with more intensive therapy.[5]

In addition, the literature recommends conventional physical therapy including gait training, neuromuscular re-education, and therapeutic exercise/activity immediately following acute onset of CVA.[6] Further articles

agree and support conventional therapy with supplementation of mirror therapy or electrotherapy stimulation in order to restore motor function.[7,8]

This case report will illustrate the examination, intervention, and outcomes of a patient with a CVA, who did not receive intensive physical therapy until 4-5 months after initial onset of stroke due to underlying medical issues and initial severity level of extremity involvement. The purpose of this case report is to review background, treatments, interventions, and outcomes of a patient with a sub-acute stroke, treated in an inpatient setting.

# CHAPTER II

## CASE DESCRIPTION

The patient presented to inpatient physical therapy in September, 2014 after PT received MD orders for evaluation for 'discharge planning' and 'weakness'. Review of history in the patient's chart concluded the patient had underwent surgery to repair an abdominal aortic aneurysm (AAA) in May, 2014 and awoke from surgery with symptoms of a CVA. Records indicated the patient was transferred to a nursing home where he resided until a hypotensive episode lead to hospitalization. The patient was then evaluated bedside by physical therapy. The patient was a 70 year old, Caucasian male standing 5 feet 4 inches tall and weighing 229 pounds. The information below depicts the results of the examination procedure and information gathered.

### Examination

***Current Condition/Chief Complaint:*** The patient was admitted to the hospital from the nursing home following complaints of dizziness and episodes of blacking out resulting from hypotension. Blood pressure medications were lowered and patient began to notice improvement of symptoms. He presented with residual weakness of his left lower extremity (LLE) and decreased functional independence resulting from his CVA.

***Medical/Surgical History:*** This patient had a number of active medical comorbidities including surgery to repair the AAA which resulted in the CVA and a chronic aortic dissection. The CVA presented initially, with dense left hemiplegia with involvement of upper and lower extremities, asphasia, and dysphagia. He had a past medical history that included obesity, hypokalemia, anemia, hypertension, hyperlipidemia, osteoarthritis, lower extremity edema, and a chronic aortic dissection status post ascending aortic dissection repair. A computerized tomography (CT) scan indicated stability with aortic dissection from descending aorta to common iliacs. Additional medical history included angioedema, hypothyroidism, and nocturnal hypoxia. Refer to *Table 1* for significant medical timeline.

Table 1. Significant Medical Timeline

| **Significant Medical Timeline** | | |
|---|---|---|
| **Timeline** | **Location** | **Progress/Action** |
| **May 2014** | **Hospital:** Surgery for AAA repair; awoke with symptoms of CVA (1 month hospital stay) | -Dense left sided hemiplegia of UE & LE<br>-Aphasia<br>-Dysphagia |
| **June 2014** | **Transfer to Nursing Home** | -Aphasia/dysphagia resolved<br>-Dysphasia resolved<br>-LUE function began to return<br>-Max/total assist transfers |
| **August 2014** | **Nursing Home** | -LUE function significantly improved<br>-Able to wiggle LLE toes<br>-Max assist transfers |
| **September 2014** | **Nursing Home** (2 days prior to hospitalization) | -Ambulated 10 ft with Mod. Assist x2 & FWW |
| **Present (September 2014)** | **Hospital:** hospitalized after feeling vaguely ill, warm and diaphoretic<br>Dx: Hypotension | - Medication adjusted; BP returned to normal limits<br>- MI ruled out<br>-Chronic aortic dissection deemed stable<br>**-Began IP PT** |

***Family History:*** All family history is unremarkable with the exception of his father being diagnoses with heart disease and his mother being diagnosed with asthma.

***Employment:*** He is a self-employed cattle farmer and was actively farming prior to his CVA last Spring.

***Social History:*** The patient was single, and had no children. A friend provided support with transportation and managed the patient's cattle farm and finances while he had been in the nursing home/hospital. The patient had two sisters living in California, but no family locally. He reported no history of drinking or smoking.

***Living Environment:*** Patient lived alone in a one story house, on his farm. He had a ramp to get into the house that was built by his friend following his CVA. The patient had not lived at home since his CVA; and had resided in a local nursing home.

***Assistive Devices:*** He had no assistive devices for mobility prior to CVA. After readmission to the hospital, he received his own wheelchair, front wheeled walker (FWW), and had ordered an ankle-foot orthosis (AFO) for his left lower extremity.

***General Health Status:*** During the initial evaluation, the patient was very motivated to regain independence. He denied pain, and overall he felt well. He easily became tearful and emotional at times, and had a history of depression following his CVA. He displayed some short-term memory loss and had confusion regarding sequence of recent events, yet was not a significant barrier

to communication. He reported sleeping well, with the exception of waking from 3 to 6 am each morning for frequent urination, which began occurring following his CVA. He was motivated for therapy and eager to return to his farm.

***Functional Status & Activity Level:*** Prior to the patient's stroke he was independent with all basic and advanced activities of daily living (ADLs) including dressing, personal cares, toileting, ambulation, and all transfers. He lived alone on his farm and managed all the finances independently. Following his stroke, prior to acute PT rehabilitation, the patient had been maximum assist of two to total assist with Hoyer lift in all transfers while residing at the nursing home. He utilized the bed pan for toileting and began to implement ambulation in his therapies, in which was a maximal assistance level of two. Upon evaluation, the patient required maximum assistance of one with bed mobility and transfers, and moderate assistance of two for ambulation using FWW for a total distance of ten feet.

***Relevant Medications:*** The patient was taking Coreg (Carvedilol), a beta blocker used to treat high blood pressure, and Imdur, used to treat high blood pressure. Imdur is not intended to be taken just prior to physical activity.[9] Both medications may contribute to lowering blood pressure too far, resulting in the dizziness, light-headed-ness and near fainting that this patient was experiencing prior to hospitalization.[9-10] Following review of medications, it was determined that blood pressure, heart rate, and oxygen saturations would be closely monitored throughout exercises.

***Review of Available Records:*** The surgical report and physicians notes were reviewed from the AAA surgery and resulting stroke in May in order to gather additional history. The additional reports indicated that an MRI identified scattered foci in both the cerebral and cerebellar hemisphere bilaterally, consistent with an ischemic CVA. Clinically, he initially displayed dense left hemiplegia, dysphagia, and aphasia. After some recovery, he was transferred to a nursing home on 6/09/2014 to receive therapies including PT, OT and speech. At the nursing home, his cognitive status improved, asphasia resolved, and he regained left upper extremity function and began to dispay a small amount of return of left lower extremity function.

***Systems Review***

***Cardiovascular/Pulmonary:*** Upon evaluation, HR: 74bpm, RR: 16rpm, and BP: 126/70mmHg. Minimal lower extremity edema noted.

***Integumentary:*** No skin lesions present.

***Musculoskeletal:*** Patient was obese, with a BMI of 39.34. The patient demonstrated a forward flexed posture with kyphosis and forward head. Strength, range of motion (ROM), and endurance values are depicted in tests and measures below.

***Gait:*** During ambulation the patient exhibited LLE internal rotation and foot drop on the left. He was unable to initiate a step with his LLE, and required assistance of two in order to ensure proper placement and advancement of LLE. He demonstrated decreased gait velocity, decreased step length bilaterally, and decreased weight shift to the left.

***Tests & Measures:*** Strength was grossly 5/5 for RUE, 4+/5 for LUE, 5/5 for RLE, 2+/5 hip and knee strength and 3/5 ankle strength on the LLE. His PROM was within functional limits throughout.[11] The patient displayed good balance in sitting in that he was able to remain seated without loss of balance for an unspecified amount of time. In standing he was able to balance with a FWW and standby assistance, however he leaned to the right during dynamic activities. The patient's endurance limited his ability to participate in extended gait trainings. His endurance was tested daily via HR, BP, O2 saturation levels, and distance ambulated. In addition, the patient's tolerance to LLE weight bearing during static standing was tested daily. Dynamic balance was assessed via the patient's ability to complete weight shifting cone transfers and dynamic reaching abilities. Dynamic balance was also assessed with observation of the extent of loss of balance with sit to stand transfers.

The patient completed the Geriatric Depression Scale (GDS) as a way to assess his quality of life. The GDS assesses depression and suicide ideation in elderly individuals. The full scale consists of 30 yes or no questions, though there are forms available with a shorter number of questions.[12] For this patient, a short form of 15 questions was utilized. An example of this form is included in *Appendix A.* A score of greater than 5 on a 15 question scale, may indicate depression.[12] This tool has a sensitivity of 69% and a specificity of 75%, both specific to patients with a stroke.[13] The patient scored a 6/15, indicating depression and suggesting a referral to psychology.

## Evaluation

The patient's evaluation was guided through use of the International Classification of Function (ICF). This is disablement model and how the patient fit into each of the categories is depicted below.

Figure 3: International Classification of Function (ICF) Model

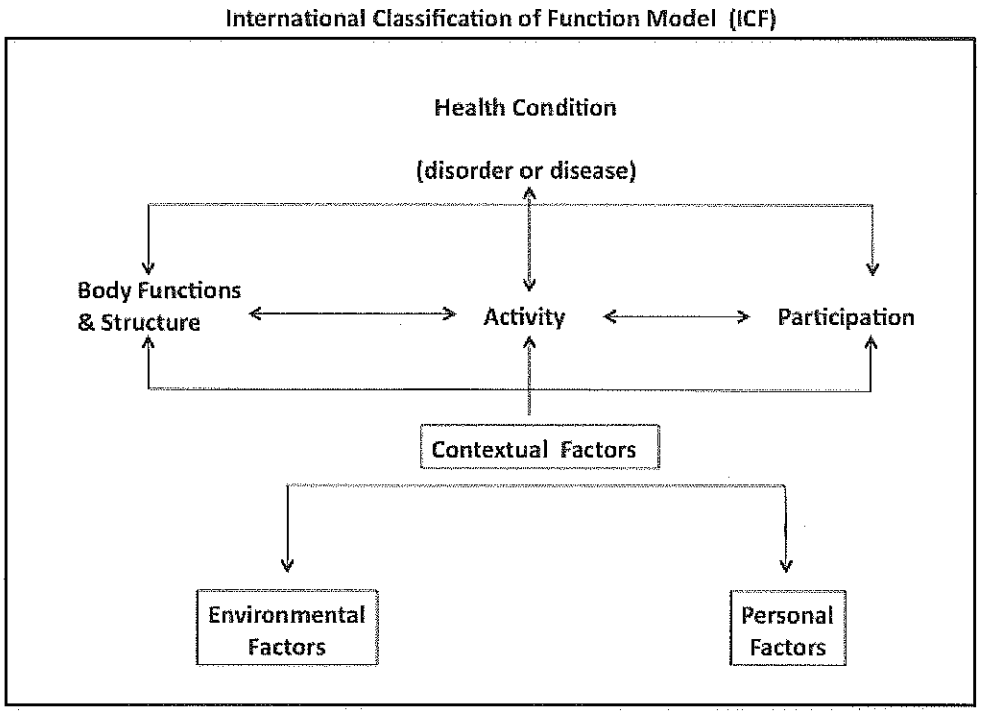



Image Courtesy of: http://www.physther.net/content/88/8/956/F1.expansion.html

***Health Condition:*** The patient was diagnosed with a CVA five months prior to this evaluation.

***Body Function & Structure:*** Residual symptoms and results of the cerebrovascular accident include decreased strength involving the LLE, decreased ROM of left dorsiflexion, and decreased balance. Due to low activity level while residing in the nursing home following his stroke, the patient developed significantly decreased endurance.

***Activity:*** Abilities and limitations demonstrated by the patient include maximum assist of one for bed mobility, maximum assist of one for all transfers including sit to/from stand, and pivot transfers. The patient was able to ambulate using a front wheeled walker with moderate assistance of two for a distance of 10 feet. Standing balance is impaired and the patient demonstrated decreased weight shifting to left throughout standing, transfers and ambulation.

***Participation:*** Patient participation involved the inability to return home alone to live independently due to safety concerns. He required assistance with self-cares, dressing and toileting. He was unable to move in hospital room independently for ADL's or leisure. He is able to participate in balance activities including cone transfers and standing weight shifting exercises.

***Environmental Factors:*** Positive environmental factors working in the patient's favor included supportive friends who had built wheelchair accessible ramp at the patient's home and managed his farm and finances. The patient's insurance coverage of Acute Rehab Unit stay in hospital and physician approval of patient for ARU were both positive environmental factors. Negative environmental factors included the lack of family support, living alone, and not being placed in an intensive rehabilitation program to regain function immediately after CVA.

***Personal Factors:*** Positive personal factors included high motivation to complete therapies in order to improve function. He made significant improvements in mobility in short time while at hospital. Negative personal factors included the patient's depression following his CVA and uncertainty of

prognosis of CVA. The patient also fatigued easily and had a lack of knowledge of condition, or how interventions may help.

***Interpretation of examination findings:*** The patient's hypotension, in which he was originally hospitalized, had resolved. He presented with residual symptoms and impairments of prior CVA. Documentation did not support that the patient had an extensive rehab stay to increase functional independence following his CVA. His current level of function and progress thus far suggested the patient would be an appropriate candidate for placement in the Acute Rehab Unit (ARU) of the hospital. This would provide him with an extended stay to undergo more intensive rehab than available at the nursing home. Therapy in ARU would consist of three hours/day, so that he could have greater and more rapid return of endurance, strength and neuromuscular function of left lower extremity. Until patient was accepted into ARU, he was continued to be treated by inpatient PT.

***Patient problems:*** The patient had decreased endurance due to inactivity following his CVA. The decreased endurance impacted the patient's ability to wheel himself down to the dinner table while at the nursing home. The decreased endurance also limited his ability to stand or walk for extended periods of time which inhibited his maximal potential for gain in physical therapy. He had residual weakness in LLE as a result of his CVA, which limited his independence in transfers and ambulation, rendering him inappropriate to return to his home at this time due to safety concerns. He also has decreased balance, which limited his ability to statically stand and to weight shift which ultimately increases his fall risk when performing activities such as reaching for a bowl to cook a meal.

***Prevention needs:*** Due to the patient being non-ambulatory at the time of hospitalization, prevention measures needed to be addressed. These included positional changes and turning to decrease risk of pressure sores, as well as education of inactivity and importance for movement to prevent deep vein thromboses. The patient was educated by the MD, nursing, and PT on the risk factors that may contribute to onset of a stroke, as well as ways to change his lifestyle to decrease the modifiable risk factors. These included, diet, sedentary lifestyle, cholesterol, blood pressure, and stress.[2]

***Health, wellness, and fitness needs:*** Functional mobility training and neuromuscular re-education were important components of the patient's rehabilitation in IP PT and needed to be implemented throughout the rest of his recovery in order to maintain gains and progress further.[14]

Diagnosis

***Preferred Practice Pattern:*** 5D: Impaired Motor Function and Sensory Integrity Associated with Nonprogressive Disorders of the Central Nervous System-Acquired in Adolescence or Adulthood.[15]

***Medical diagnosis (ICD-9 Codes):*** Ischemic CVA, 434.91[15]

Prognosis

***Prognosis:*** Rehab potential was good for the patient to undergo inpatient physical therapy to increase activity tolerance so that the patient may be considered for admission to the Acute Rehab Unit. Rehab potential was good with a projected discharge destination to return to his home after an extended stay in the Acute Rehab Unit. He was expected to require home services of PT,

OT, and nursing upon return to home, so that he could reach a level appropriate for independent activity in the community. Anticipated assistive devices included an AFO for left leg, a front wheeled walked, a wheelchair, a leg leash, and a reacher.

***Anticipated duration and frequency of intervention:*** While in inpatient PT, the patient received physical therapy 2x/day for 45 minute sessions. The patient was referred to be evaluated for acceptance into ARU. Anticipated duration of ARU stay was 6 weeks. While in ARU, the patient received a more intensive rehabilitation which consisted of 3 hours of therapy/day, 5 days per week with an additional shorter session on the weekend.

***Rehabilitation Goals:***

Short term goals for inpatient Physical Therapy, to be met in 1 week:

1. The patient will increase his endurance so that he can ambulate 25 ft with minimum assistance x2 with use of front wheeled walked in order to walk to bathroom without use of wheelchair.
2. The patient will increase strength in order to demonstrate minimum assistance x1 for bed mobility, so that he can sit at edge of bed for meals, and change positions to reduce risk of pressure sores.
3. The patient will increase static standing balance to 3 minutes so that he is able to stand at his bathroom sink in order to shave and brush his teeth.

Gathered from records:

Short term goals for Acute Rehab Unit to be met in 3 weeks:

1. The patient will increase strength and coordination in order to be standby assistance of 1 with bed mobility so that he can change positions in order to reduce risk of pressure sores.
2. The patient will increase strength in order to be standby assistance with sit to stand transfers so that he can get up from his chair at the dinner table, and off the toilet.
3. The patient will increase his endurance so that he is a minimal assistance of 1 when ambulating 75 feet with FWW so that he is able to ambulate between rooms in his house.
4. The patient will increase his endurance so that he may propel up and down a ramp with manual wheelchair, with standby assistance so that he can access entry to his home.

Gathered from records:

Long term goals for Acute Rehab Unit to be met in 6 weeks:

1. The patient will increase strength in order to be modified independent with bed mobility so that he can change positions in order to reduce risk of pressure sores, and safely return to living on his own.
2. The patient will increase his strength so that he is modified independent with use of a FWW for sit to stand transfers in order to get up from his chair at the dinner table and get off the toilet when he is alone at home.
3. The patient will be increase his endurance so that he is standby assistance when ambulating 150 feet with use of L AFO, and FWW for

household/community ambulating in order get to his bedroom in his home.

4. The patient will increase endurance in order to propel his wheelchair up and down a ramp with modified independence in order to access entry to his home.

Plan of Care

***Plan of Care:*** Physical therapy planned to treat patient while in the hospital for 45 minute sessions, 2x/day, 5 days/week. Focus treatment on neuromuscular re-education, therapeutic exercise and gait training. Recommended admission to Acute Rehab Unit of the hospital following MD approval, where patient would undergo intensive rehab and an extended stay, so that he could improve his functional independence and achieve his goal to return to his home.

***Discharge Criteria:*** Criteria for discharge of inpatient PT, included acceptance into ARU, attainment of goals appropriate for discharge to home, or plateau in progress.

# CHAPTER III

## INTERVENTION

Inpatient physical therapy treatment sessions consisted of 45 minute sessions 2x/day. The patient was seen for 5 days, making a total of 10 sessions. These sessions were divided into 15 minutes of neuromuscular re-education (NMR), 15 minutes of gait training, and 15 minutes of therapeutic exercise. All three of these intervention techniques have been shown to equally increase function in stoke patients.[14] NMR included balance and weight shifting activities to increase weight bearing and activity/proprioception of LLE. Research indicates symmetrical weight bearing aides in return of LE function and fall prevention in post-stroke individuals[16], therefore, neuromuscular activities included timed static standing balance, and weight-shifting with UE reaching tasks, and transfers across body in order to encourage weight-bearing on affected LLE. Gait training was provided with manual assistance and verbal cues to ensure proper placement and advancement of LLE in order to retrain the brain and muscles into a correct gait pattern, as well as increase aerobic endurance. Therapeutic exercise was provided to strengthen left hip, knee and ankle motions so that patient is able to better tolerate weight bearing on LLE with activities such as gait. This included PT manual resisted isometrics, AROM and AAROM as necessary for all hip, knee, and ankle motions. Research states that

facilitation can significantly improve voluntary movement by way of activation of muscle spindles and golgi tendon organs,[17] therefore, these exercises were conducted with patient supine and seated on a mat, with facilitation techniques in the form of tapping as necessary. See *Table 3* below for a list of therapeutic exercises completed.

Table 2: Therapeutic Exercises

| **Exercise** | **Resistance** | **Assistance** | **Sets X Reps.** |
|---|---|---|---|
| Hip Abduction | _____ | Manual & Facilitation | 2x10 |
| Hip Adduction | Manual Resist. | _____ | 2x10 |
| Straight Leg Raise | _____ | Manual | 2x10 |
| Int./Ext. Hip Rot. | _____ | Manual & Facilitation | 2x10 |
| Glute Set | Isometric | _____ | 2x10 |
| Hamstring Set | Isometric | _____ | 2x10 |
| Quad Set | Isometric | Facilitation | 2x10 |
| Short Arc Quad | _____ | Facilitation | 2x10 |
| Heel Slide | Manual Resist. | _____ | 2x10 |
| Ankle dorsiflex. | _____ | Manual & Facilitation | 2x10 |
| Ankle Plantarflex. | Manual Resist. | _____ | 2x10 |
| Dorsiflex. Stretch | _____ | _____ | 3x30sec. hold |

Treatment sessions always started and ended with gait training with PT assistance and use of FWW. Gait training was divided into two sessions due to the patient's decreased endurance and tolerance for ambulation. This allowed for

more activities to be completed with NMR and therapeutic exercise before the patient became overly exhausted. Due to gait training being the most strenuous for this patient, blood pressure, heart rate, and oxygen saturation were consistently monitored before, during, and after ambulation. Treatment sessions incorporated bed mobility with sit to/from supine motions in order for the patient to transition out of bed and position himself on the mat for therapeutic exercise. Transfers techniques were also incorporated within treatment sessions by incorporating sit to/from stand to better complete NMR activities and gait training, and allow easier transition from WC to mat. Throughout treatment sessions, assistance level of bed mobility, transfers, and ambulation distance were consistently recorded at each treatment session to measure functional progress and to ensure patient would reach a functional level appropriate for acceptance into ARU for an extended stay.

After acceptance of patient into ARU, and discharge of inpatient PT, the treatment sessions increased in duration to 3 hours/day to include PT, OT and speech. OT focused on dressing, self cares and toileting, while PT focused on WC mobility, ambulation, transfers, endurance and strength. At the ARU, the patient was provided a left AFO, secondary to foot drop during ambulation.

# CHAPTER IV

## OUTCOMES

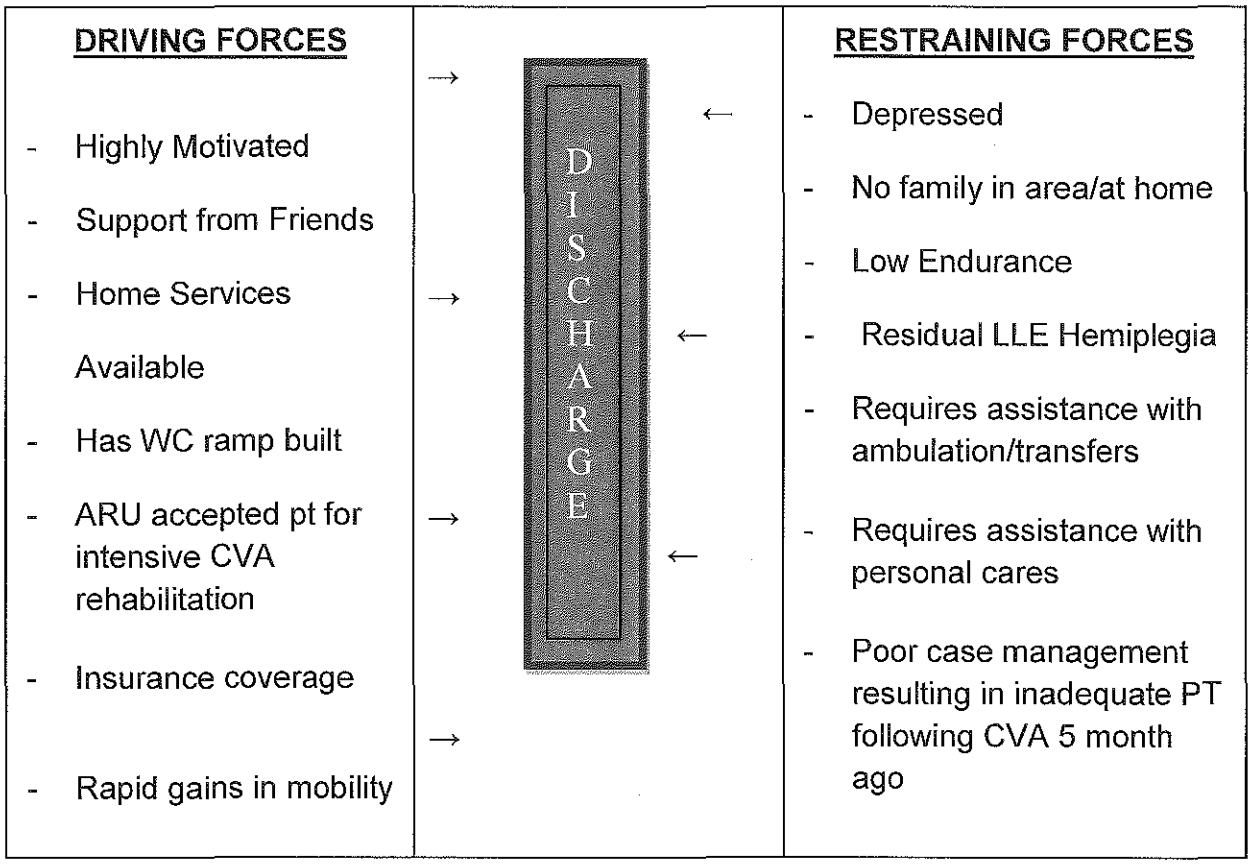
The patient had multiple underlying comorbidities discussed above, including the chronic dissecting abdominal aortic aneurysm and severity of CVA symptoms originally rendering him not appropriate to tolerate the 3 hours of therapy/day which ARU required. This may have led to the way his case was managed beforehand with delayed intensive therapies following his CVA. Throughout inpatient physical therapy, the patient continued to show accelerated progress and recovery of residual CVA symptoms over his 1 week long hospital stay. He was referred to the ARU due to his rapid increases in functional mobility, suggesting the patient would benefit from a more intensive rehabilitation program than available at the nursing home he had been residing following his CVA. He was evaluated and accepted into the Acute Rehabilitation Unit by the ARU MD, therefore discharged from inpatient physical therapy. ARU allowed the patient to have access to more intensive PT, OT, and speech therapies. A reassessment was completed following three weeks of being admitted to the ARU. The functional outcomes of inpatient PT and 3 weeks of ARU are depicted below in *Table 3*. Since the overall discharge goal of ARU was for the patient to return to his home, new goals were created to further improve independence with mobility before discharge.

Table 3: Functional Outcomes

| Functional Activity | Initial IP PT Eval. | 1 week IP PT | 3 Weeks ARU | 6 Weeks ARU |
|---|---|---|---|---|
| **Bed Mobility** | Max A. x1 | Min A. x1 | SBA | TBA |
| **Transfers** | Max A. x1 | Mod A. x1 | Sit<>stand: SBA<br>Pivot: Min A. x1 | TBA |
| **Ambulation** | Mod. A. x2<br>FWW<br>10 ft. | Mod A. x2<br>FWW<br>25 ft. | Min A. x1<br>FWW & AFO<br>75 ft. | TBA |

**Factors Affecting Outcomes:** There were various factors in which contributed to this patient's successes and hurdles every step of the way. The final desired outcome was discharge from ARU to return home. While it was unknown if the patient ever reached this potential, his vast strides in functional mobility can be seen over the course of his IP PT stay, and first 3 weeks of ARU. The patient was approved for a longer stay in ARU to further increase his independence. Unfortunately, further information on this patient was not available, so it was not possible to follow up with his continued progress. Based on his previous progress, it is likely that the patient did gain enough independence to return to his farm with home PT, OT, and nursing services as needed. *Figure 3* depicts driving and restraining forces, which contributed to the patient's discharge goal progression.

Figure 3: Driving & Restraining Forces




**Cost/Benefit Analysis:** The total number of physical therapy visits this patient had in IP PT was 10, as he received PT 2x/day for 5 days. The average cost per visit was $102.22. Below, *Table 4* depicts typical session with associated charges. The average total cost of care was $1022.19.[18] Total cost to the patient was $0.00 as the expenses were covered by the Inpatient Prospective Payment System (IPPS) under Medicare Part A. Each patient's case is classified into a diagnoses-related group (DRG). Each DRG has a payment weight assigned to it based on the average resources used to treat Medicare patients in that DRG.[19]

Table 4: Minnesota Payment Rates

**2015 Payment Rates for Minnesota**

| Code | Status | Treatment | Payment Rate |
|---|---|---|---|
| 97001 | A | PT Evaluation | $75.09 |
| 97110 | A | Therapeutic Exercises | $32.36 |
| 97112 | A | Neuromuscular Re Education | $33.71 |
| 97116 | A | Gait Training<br>*** Code 97504 should not be reported with code 97116* | $28.64 |

The patient was no longer able to operate his cattle farm, but was fortunate to have a close friend take over for him throughout his time in the hospitals, nursing homes, and ARU so that he could still make a profit from his farm. After inpatient PT, the patient was transferred to ARU, which also was covered under his insurance as he had not received extensive rehab initially following his stroke.

**Impact of Societal Resources:** Given the patient would have initially been transferred into a more intensive rehabilitation unit immediately following his stroke, he possibly could have accelerated his return of function, lowering the cost of rehabilitation and reduced the time period of nursing home placement. With the average cost of a nursing home in the United States being $205/day, these finances could accumulate quickly.[20]

**Patient Satisfaction:** The patient was very pleased with his progress and enjoyed his therapies, though they exhausted him. He was motivated to continue to progress in his functional ability so that he could return home to his farm.

# CHAPTER V

# DISCUSSION

Overall, the patient had a difficult start following his stroke. He was not placed in an appropriate intensive rehab facility possibly due to his low tolerance of activity (ARU requires tolerance of 3 hours/day) and co-morbidities (obesity, AAA, and chronic dissection) Intensive rehabilitation has been proven to create significant gains in function following a stroke,[21] so it is unfortunate the patient was unable to receive this immediately following his stroke. Though he did not initially qualify for the rehab, he was able to begin to regain function throughout his four month nursing home stay. Following hospital readmission, due to his bout of hypotension, he proceeded to improve his functional mobility while his chronic abdominal aortic dissection stabilized. Four months following his stroke, his improved mobility and stabilized abdominal aortic dissection helped qualify him for acceptance to the ARU. Had he not been readmitted to the hospital secondary to hypotension, he may not have been evaluated by PT. Without a PT evaluation the patient could have continued to reside in the nursing home receiving limited therapies. This could have resulted in continuation of his slowed functional progress and a greater financial cost long term. While in ARU, he continued to make rapid functional gains after receiving the appropriate

amount of intensive therapies, and was approved for an extended stay in order to reach his goal to return home.

## Reflective Practice

In retrospect of this patient's case, there are a few interventions and assessments that could have been added to treatment. Mirror therapy is a relatively new treatment in which a mirror is set up so that the patient sees the reflection of their non-paretic extremity performing exercises or movement. When the patient looks into the mirror, it appears as though their affected extremity is the one moving.[7] This essentially tricks the brain and aids it in re-wiring itself and creating a new neural pathway. As indicated by Sütbeyaz et al[7], the use of mirror therapy in addition to conservative treatment of strokes enhances lower extremity motor recovery and functioning in sub-acute stroke patients. Mirror therapy would have served as a beneficial addition to this patient's PT treatment had the facility had the appropriate resources.

In addition to mirror therapy, the use of electromygraphic (EMG) biofeedback could have been added to treatment of this patient. EMG biofeedback placed on the affected paretic muscles can help to facilitate contraction as it will show the patient when the slightest bit of contraction is occurring.[8] According to Moreland et al,[8] EMG biofeedback is superior to conventional therapy alone, for improving ankle dorsiflexion strength.

A more specific and quantitative functional outcome measure could have been utilized in documentation of the patient's functional progress and baseline. The functional assessment I would have utilized in retrospect would have been

the Fugl Meyer Assessment of Motor Recovery (Minimal Detectable change=5.2 points, Minimal Clinically Important Difference=10, Intraclass Correlation Coefficient Reliability=.96).[22] This tool identifies a quantitative value to stroke recovery in order to better gauge improvements. It is composed of 5 domains including motor function, sensory function, balance, joint ROM, and joint pain. Items are scored on a 3 point ordinal scale (0=cannot perform, 1=performs partially, 2=performs fully), with a maximum score of 226 pts. For efficiency, subscales can also be administered without using the full test.[23] An example of a LE Fugl-Meyer sub-scale that could have been utilized with this patient is included in *Appendix B.*

Though there could have been both changes and additions to treatment interventions and evaluation procedures, the patient's case was ultimately managed well. Through IP PT, he reached a functional level appropriate for acceptance into the ARU. This provided him with the intensive therapy he needed in order to ensure the greatest potential to return to his home.

## APPENDIX A: Geriatric Depression Scale: Short Form

Choose the best answer for how you have felt over the past week:

1. Are you basically satisfied with your life? YES / NO

2. Have you dropped many of your activities and interests? YES / NO

3. Do you feel that your life is empty? YES / NO

4. Do you often get bored? YES / NO

5. Are you in good spirits most of the time? YES / NO

6. Are you afraid that something bad is going to happen to you? YES / NO

7. Do you feel happy most of the time? YES / NO

8. Do you often feel helpless? YES / NO

9. Do you prefer to stay at home, rather than going out and doing new things? YES / NO

10. Do you feel you have more problems with memory than most? YES / NO

11. Do you think it is wonderful to be alive now? YES / NO

12. Do you feel pretty worthless the way you are now? YES / NO

13. Do you feel full of energy? YES / NO

14. Do you feel that your situation is hopeless? YES / NO

15. Do you think that most people are better off than you are? YES / NO

Answers in bold indicate depression. Score 1 point for each bolded answer.

A score > 5 points is suggestive of depression.
A score ≥ 10 points is almost always indicative of depression.
A score > 5 points should warrant a follow-up comprehensive assessment.

*This scale is in the public domain.*

## E. LOWER EXTREMITY

### I. Reflex activity, supine position

| | none | can be elicited |
|---|---|---|
| **Flexors**: knee flexors | 0 | 2 |
| **Extensors**: patellar, Achilles | 0 | 2 |
| Subtotal I (max 4) | | |

### II. Volitional movement within synergies, supine position

| | | | none | partial | full |
|---|---|---|---|---|---|
| **Flexor synergy:** Maximal hip flexion (abduction/external rotation), maximal flexion in knee and ankle joint (palpate distal tendons to ensure active knee flexion). | Hip | flexion | 0 | 1 | 2 |
| | Knee | flexion | 0 | 1 | 2 |
| | Ankle | dorsiflexion | 0 | 1 | 2 |
| **Extensor synergy:** From flexor synergy to the hip extension/adduction, knee extension and ankle plantar flexion. Resistance is applied to ensure active movement, evaluate both movement and strength. | Hip | extension | 0 | 1 | 2 |
| | | adduction | 0 | 1 | 2 |
| | Knee | extension | 0 | 1 | 2 |
| | Ankle | plantar flexion | 0 | 1 | 2 |
| Subtotal II (max 14) | | | | | |

### III. Volitional movement mixing synergies, sitting position, knee 10cm from the edge of the chair/bed

| | | none | partial | full |
|---|---|---|---|---|
| **Knee flexion** from actively or passively extended knee | no active motion | 0 | | |
| | no flexion beyond 90°, palpate tendons of hamstrings | | 1 | |
| | knee flexion beyond 90°, palpate tendons of hamstrings | | | 2 |
| **Ankle dorsiflexion** compare with unaffected side | no active motion | 0 | | |
| | limited dorsiflexion | | 1 | |
| | complete dorsiflexion | | | 2 |
| Subtotal III (max 4) | | | | |

### IV. Volitional movement with little or no synergy, standing position, hip at 0°

| | | none | partial | full |
|---|---|---|---|---|
| **Knee flexion to 90°** hip at 0°, balance support is allowed | no active motion / immediate and simultaneous hip flexion | 0 | | |
| | less than 90° knee flexion or hip flexion during movement | | 1 | |
| | at least 90° knee flexion without simultaneous hip flexion | | | 2 |
| **Ankle dorsiflexion** compare with unaffected side | no active motion | 0 | | |
| | limited dorsiflexion | | 1 | |
| | complete dorsiflexion | | | 2 |
| Subtotal IV (max 4) | | | | |

### V. Normal reflex activity supine position, evaluated only if full score of 4 points achieved on earlier part IV, compare with unaffected side

| | | | | |
|---|---|---|---|---|
| **Reflex activity** knee flexors, Achilles, patellar | 0 points on part IV or 2 of 3 reflexes markedly hyperactive | 0 | | |
| | 1 reflex markedly hyperactive or at least 2 reflexes lively | | 1 | |
| | maximum of 1 reflex lively, none hyperactive | | | 2 |
| Subtotal V (max 2) | | | | |

**Total E** (max 28)

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