Use Of Complete Decongestive Therapy And A Task-Oriented Approach In Treating Secondary Lymphedema And Improving Ambulation In A Patient Following A Stroke: A Case Report

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Use of Complete Decongestive Therapy and a task-oriented approach in treating secondary lymphedema and improving ambulation in a patient following a stroke: A Case Report

Snezhana Rudakova

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

The author acknowledges Brian Swanson, PT, DSc, OCS, FAAOMPT for assistance with case report conceptualization and Michelle Slike, PT, DPT for supervision and assistance with procedural interventions.
Abstract:

**Background and Purpose:** Ninety percent of stroke survivors have some functional disability with mobility and paralysis of the extremities being a major impairment. A paralysis of the extremities can result in an ineffective muscle pumping action, which can lead to the development of lymphedema; further increasing difficulty with ambulation post stroke. The purpose of this case is to report the use of complete decongestive therapy for the treatment of lymphedema as part of a comprehensive treatment program consisting of a task-oriented approach to improve walking ability in a stroke survivor.

**Case Description:** The patient was a 53 year old female six months s/p stroke who developed right lower extremity lymphedema. She presented with deficits secondary to CVA with right sided hemiparesis including decreased range of motion and decreased strength in the right lower extremity, as well as increased tone and spasticity throughout the right upper extremity and lower extremity. Her decreased strength, impaired balance, and increased limb heaviness contributed to her difficulty with ambulation and ADL’s.

**Outcomes:** She experienced a 1.0 cm-5.0 cm reduction in various areas of circumference measurements of the right lower extremity with no signs or symptoms of infection. Her gait mechanics and gait speed improved in conjunction with a decrease in disability of 39% (Tinetti).

**Discussion:** Despite her chronicity post-stroke, use of a task-oriented approach consisting of both strength and intensive mobility training improved the patient’s ambulation and increased her independence with ADL’s. Complete decongestive therapy was effective in reducing the swelling of the right lower extremity, further contributing to improvement with ambulation.

Abstract Word Count: 259

Manuscript Word Count: 4,271
**Background and Purpose:**

Every year, there are approximately 795,000 people in the United States who experience a new or recurrent stroke. While almost two-thirds of survivors have initial mobility deficits, more than 30% of the survivors cannot walk independently six months following a stroke. Of those who are able to walk independently, only a small proportion can walk with sufficient speed and endurance to be able to function within the community. Ninety percent of stroke survivors have some functional disability with mobility being a major impairment. Intensive mobility training which incorporates functional strengthening, balance and aerobic exercises, and practice on a variety of walking tasks improves gait ability both in sub-acute and chronic stroke.

Following a CVA, it is common to have a paralysis of the extremities which can lead to a decreased and ineffective muscle pumping action, thus resulting in lymph stasis. Lymphatic fluid stasis is associated with the accumulation of interstitial fluid in the subcutaneous tissue and skin. Lymphedema is the tissue fluid accumulation that arises due to impaired lymphatic drainage. Lymphedema can result from an intrinsic fault in the lymphatic vessels (primary lymphedema) or damage caused to the lymphatic vessels or nodes (secondary lymphedema). Secondary lymphedema is the most prevalent form of lymphedema and is typically caused by obstruction or disruption of the lymphatics due to surgery, radiation, trauma, or infection (typically filariasis). Lymphedema leads to swelling, decreased mobility, and increased risk of infection. The management of lymphedema by physical therapists consists of complete decongestive therapy (CDT) which includes a combination of skin care, compression, lymphedema remedial exercises, and manual lymphatic drainage.

Lymphedema often goes unnoticed and undiagnosed in patients following a CVA as it is more commonly associated with removal of lymph nodes or radiation, and in cancer related
lymphedema. If left untreated, lymphedema can lead to further health issues and hospitalizations.

This case report describes a patient who developed lymphedema in the right lower extremity following a CVA. The purpose of this case report is to explore the benefits of complete decongestive therapy as part of lymphedema treatment and its role in lymphatic drainage, as well as contribution to improving walking ability as part of a comprehensive treatment program including task specific training and intensive mobility training.

**Patient History and Systems Review:**

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

The patient was 53 year old female who was referred for outpatient physical therapy six months following a CVA resulting in hemiparesis on the right, as well as lymphedema in the right lower extremity. The patient was referred to physical therapy for improving balance, increasing strength in the right lower extremity, and improving ambulation in order to maximize the patient’s functional ability and independence with activities of daily living. Additionally, the patient was referred for lymphedema treatment of the right lower extremity.

The patient presented with deficits secondary to CVA with flaccid hemiplegia of the right upper extremity and hemiparesis of the right lower extremity. She presented with no active movement of the right upper extremity but with some function of the right lower extremity. Additionally, she presented with lymphedema of her right lower extremity. She utilized a solid AFO as well as a quad cane when ambulating around her home, but used a motorized scooter in
public places. She was mostly independent with ADL’s but was limited secondary to poor balance and difficulty with ambulation. Her husband assisted with cooking, cleaning, and other activities as needed.

She had no history of surgeries, but had a history of hypertension, controlled with medication. Additionally, the patient had restless leg syndrome in the right lower extremity controlled with medication. She also presented with type II diabetes, controlled by diet, and denied any smoking and alcohol use.

She was not employed outside of the home and reported no regular hobbies. She lived with her retired husband in a one story home which had three stairs leading up to the home with a railing on both sides.

**Medications and Indications:** Refer to Table 1

**Systems Review:** For results of a full systems review, refer to Table 2

**Patient’s Goals:**

The patient’s goals for physical therapy were to improve balance, increase strength in her right lower extremity, and improve ambulation in order to remain independent and decrease the burden of care for her husband.

**Clinical Impression #1:**

The patient presented with deficits secondary to CVA which consisted of impaired coordination, sensation, strength, and cardiovascular fitness. Secondary to lymphedema, the patient presented with increased limb size and heaviness. These impairments affected the patient’s ability to perform functional tasks such as transfers, ambulation, and activities of daily living. In order to confirm the diagnoses of CVA and lymphedema in the right lower extremity and to rule out any differential diagnoses, the plan for examination consisted of performing
manual muscle testing on the patient’s lower extremities bilaterally, as well as performing bilateral goniometric measurements of the hip, knee, and ankle. Due to the patient’s diagnosis of a CVA, the patient’s coordination, reflexes, and spasticity were planned. Circumference measurements were planned for the right lower extremity to document the amount of swelling due to lymphedema. As a functional outcome measure, the Tinetti Performance Oriented Mobility Test was planned to be performed in order to assess gait mechanics, strength, and balance.

**Examination:**

As part of the examination procedure, the patient’s lower extremity gross strength and range of motion was assessed bilaterally. Manual muscle testing was performed and graded as described by Kendall and McCreary. Inter-examiner reliability is found to be in a range between 82% and 97% and between 96% and 98% for test-retest reliability. The patient’s range of motion was within functional limits in all hip, knee, and ankle motions on the left. On the right, the patient lacked 20 degrees of active knee extension and 10 degrees of active ankle dorsiflexion. All other hip, knee, and ankle motions were within functional limits on the right. Active range of motion (AROM) and passive range of motion (PROM) of the lower extremities were measured using a goniometer as described by Norkin and White. To assess the patient’s neuromuscular system, reflex and coordination tests were performed (Table 3). Coordination tests consisting of finger to nose and heel to shin were performed as described by O’Sullivan. The patient’s skin temperature and color was within normal limits in bilateral lower extremities. There were no scars or wounds present, and toe nails were in good condition. In the right lower extremity, the patient was positive for stemmer sign and presented with 2+ pitting edema below the knee on the right lower extremity. No pitting edema was present in the left
lower extremity. Additionally, circumference measurements of the right lower extremity were taken with a tape measure as described by Norkin and White\textsuperscript{9} (Table 4).

The patient scored a 10/28 on the Tinetti Balance Assessment which placed her at a high fall risk and 64% disability. The Tinetti Performance Oriented Mobility Test exhibits sound reliability with interrater reliability coefficients ranging from 0.80 to 0.95 and test-retest reliability reported as 0.72 to 0.86. The MDC is estimated at 6 points, indicating that a patient must have a greater than 6-point change to be reflective of a true change in balance ability.\textsuperscript{11}

During gait, the patient used a quad cane and minimal assistance during ambulation and presented with a step to gait pattern, decreased foot clearance, no heel strike, decreased hip and knee flexion during swing, and wide base of support on the right. Her gait speed was 1.2 ft. /sec for a distance of 60 feet.

**Clinical Impression #2:**

During evaluation, she presented with significant weakness and increased tone throughout the right lower extremity causing mobility concerns as well as increased fall risk and difficulty with ambulation. The patient also presented with lymphedema in the right lower extremity which exacerbated impairments with strength in the leg causing even further mobility concerns due to heaviness.

Upon assessment of gait, foot drop was noted on the right as the patient was unable to clear the ground with the right foot. Compensatory pattern included lateral trunk lean to the left with decreased hip flexion and knee flexion during swing on the right. Additionally, she demonstrated a wide BOS due to impaired balance and a step to gait pattern due to decreased limb stance on the right.
Her score of 10/28 on the Tinetti Balance Assessment Tool placed the patient at a high fall risk with a 64% disability. Therefore, it was determined that the patient would benefit from skilled therapy services to work on gait, strength, functional transfers, and balance to reduce fall risk and improve functional mobility.

The paralysis in her right lower extremity resulting from her CVA has led to an ineffective muscle pumping action leading to a build-up of fluid. Due to right hemiparesis and increased limb heaviness she is put at an increased fall risk and increased impairment with ambulation. It was necessary to utilize a multifaceted approach as the impairments resulting from her lymphedema were also impacting the patient’s recovery process from stroke.

**Physical Therapy Diagnosis:**

The patient’s presentation of right sided hemiplegia of the upper extremity and hemiparesis of the right lower extremity, along with impaired mobility and balance were consistent with ICD-9 code 434.91 for CVA; Practice Pattern 5D: Impaired Motor Function and Sensory Integrity Associated with Nonprogressive Disorders of the Central Nervous System—Acquired in Adolescence or Adulthood. Additionally, the patient’s presentation of pitting edema, increased fluid, and increased circumference measurements of the right lower extremity was consistent with ICD-9 code 457.1 for secondary lymphedema; Practice Pattern 6H: Impaired Circulation and Anthropometric Dimensions Associated With Lymphatic System Disorders.

**Prognosis:**

The patient presented with deficits secondary to a CVA resulting in right sided hemiplegia of the upper extremity and hemiparesis of the right lower extremity. She was considered to be a good candidate for CDT: Complete Decongestive Therapy consisting of skin care, compression, lymphedema remedial exercise, and manual lymphatic drainage which assists
with reduction of swelling. This in combination with working on strengthening, balance, and gait
training will assist in maximizing patient’s functional potential and improving her ability to
remain independent. She was expected to respond well to therapy as she was motivated to
improve and had an excellent support system with her husband. However, since it was greater
than six months following her CVA, which is after the significant recovery phase, it was
important that we were aware that her improvements may be slow in progression. Additionally,
we were limited to 23 visits as that was determined by her insurance. Given this situation, we
made it a priority to be efficient with each visit in order to properly address concerns with
lymphedema in conjunction with functional mobility, balance, weakness, and ambulation
cconcerns.

Referral:
The patient was referred to occupational therapy for treatment of impairments of her right
upper extremity. Additionally, the patient was referred to a certified orthotist to receive a custom
spiral AFO to assist with ambulation and a custom fitted compression sock for her right lower
extremity for long term management of lymphedema.

Additional Testing:
Although no pitting edema was present in the left lower extremity, circumference
measurements should have been taken of the left lower extremity to compare the right lower
extremity (affected limb) to the left (unaffected limb). Since no measurements of the left lower
extremity were taken, the patient’s improvements in girth measurements of the right lower
extremity will be compared to the measurements taken at initial evaluation.
Interventions:

Complete decongestive therapy consisting of compression bandages, skin care, lymphedema remedial exercises, and manual lymphatic drainage was performed in order to assist with lymphatic drainage of the right lower extremity. Additionally, task specific training consisting of intensive mobility training and treadmill training will be performed in order to target the patient’s deficits secondary to CVA in order to improve the patient’s ambulation and functional mobility.

Functional Goals:

The patient will experience a decrease in circumference measurements of the right lower extremity in order to reduce limb heaviness and improve mobility of the right lower extremity. Additionally, she will improve her strength in the right lower extremity in order to assist with ADL’s and functional mobility such as independently ascending and descending 3-4 stairs to enter her home. By improving her gait mechanics and improving her score on the Tinetti Balance Assessment, she will demonstrate a decreased fall risk, improvement in balance, and a decrease in disability.

Interventions:

Coordination, Communication, Documentation:

Orthotic fit and train: In conjunction with a certified orthotist, the patient was fit for a custom below the knee compression garment for the right lower extremity. It was a Juzo Dynamic (Juzo® Compression Store, Inc 1595 E. Garrison Blvd. Suite C Gastonia, NC 28054) circular knit stocking with a silicone border and closed toe, with a compression grade of 20-30 mmHg. Additionally, the patient was fit for a graphite, spiral AFO to relieve the pressure on the sides of patient’s feet. The spiral design will allow room for potential swelling and to keep the AFO from
digging into the patient’s right leg and foot. The graphite material will provide assistance for toe
doff during the swing phase. Overall, this helped promote better body mechanics by decreasing
hip hike compensatory trunk lean, while promoting knee flexion.

**Patient/caregiver education:**

The patient and her husband were educated on lymphedema prevention strategies
including the use of custom fitted compression socks, and the importance of elevating the feet
when sitting. Additionally, the patient was educated on the role of complete decongestive
therapy (CDT) in reducing swelling, and how to identify signs of infection such as redness,
warmth, and swelling. Prior to beginning CDT, the patient and her husband were educated on
keeping the edematous limb clean, dry, and moisturized with a lotion of a neutral pH.

When first beginning outpatient physical therapy, the patient was given a home exercise
program consisting of strengthening hip adduction, hip abduction, hamstrings, and quadriceps.
These exercises were to be performed daily with ten repetitions per exercise. Towards the end of
the patient’s allotted visits (23), the patient was given an updated home exercise program
consisting of standing hip abduction, standing hip extension, sit to stands, alternate stair
stepping, standing hip flexion, and mini squats. These exercises were to be performed daily, 2 x
10 per exercise.

**Procedural Interventions:**

At nearly every treatment session, the patient spent about 10 minutes warming up on the NuStep
(NuStep Recumbent Cross Trainer Model: T5XR NuStep, Inc. Ann Arbor, Michigan USA).
Following the NuStep, the patient would then participate in either therapeutic exercise, complete
decongestive therapy, or gait training. At the start of the patient’s plan of care, therapeutic
exercise consisted of performing quad sets, glute sets, short arc quads, long arc quads, hip
abduction and adduction in sitting, ankle plantarflexion and dorsiflexion. The patient then
progressed to stair stepping exercises, standing hip abduction and adduction, standing hip
extension, repetitive sit to stands, and mini squats.

Transfer training: The patient practiced transferring from a chair with arm rests to a mat/bed with
a hard surface. The patient required minimal assistance x1 with verbal and manual cues to
courage weight shift onto the right lower extremity.

Bed mobility: The patient practiced performing supine to sit and sit to supine with verbal and
manual cues from the physical therapist to encourage the patient to utilize her right lower
extremity instead of compensating with the left.

Kinesiotape: The purpose of the kinesiotape (Kinesio® Tex Classic) was to assist with lymphatic
drainage. The kinesiotape was applied using the spider technique on the patient's right knee as
well as below the knee on the right. Below the knee, the base of the kinesiotape was applied on
the lymphatic ducts with the tails extending across the anterior, lateral, and slightly posterior part
of lower leg on the right.

Gait training:

Stepping activities and gait training focused on improving weight shift, foot clearance,
step length, push off phase of gait, and ability for the patient to put weight on her right lower
extremity to improve swing with the left leg. This was performed both with and without the use
of a LiteGait (LGI 360E, PO Box 3141, Tempe AZ, 85280); minimal to moderate assistance x 1
was needed for proper weight shift and additional moderate assistance to steer the LiteGait.

Another variation of gait training was with the use of an agility ladder during which the patient
was given verbal cues to step into each square of the ladder to promote a proper step through gait
pattern on the right. With each step, the patient was given verbal cues to heel strike in order to promote proper gait mechanics. Manual cues were provided to assist the patient with increasing the weight shift to the right side to promote a better swing through of the left leg. The patient used a quad cane with minimal assistance x 1 during weight shifting, and contact guard assist with use of the ground ladder.

**Complete Decongestive Therapy:**

- **Skin Care:** (See education section above)
  - Compression bandages: Application of compression bandages below the knee on the right lower extremity consisting of tricofix (BrightLife Direct, Inc. 6925-D Willow St NW, Washington, DC 20012), foam wrapping, and short stretch bandages (6, 8, and 10 cm wide), with eucerin cream having been applied before the tricofix. The tricofix was applied like a sock to the right lower extremity, extending from the base of the toes to the popliteal fossa. The foam wrapping was applied next in a spiral manner, again from the base of the toes to the popliteal fossa. The size 6 short stretch bandage was applied just to the foot and anchored around the ankle. The size 8 bandage was applied like a roman sandal to the foot and ankle, followed by the size 10 bandage which was applied slightly above the ankle all the way to the popliteal fossa in a spiral manner. A short stretch bandage has minimal stretch and is used to maintain the volume reduction from manual lymphatic drainage and exercise.¹²
  - Manual lymphatic drainage (MLD): MLD was performed to the following structures in a sequential and rhythmic manner, deep cervical lymph nodes, axillary lymph nodes on the right, inguinal axillary (IA) anastomosis, inguinal lymph node on the right, and pathways throughout the right lower extremity. Stationary circles and soft effleurage was performed to gently direct the fluid towards the unaffected lymph nodes.
Lymphedema remedial exercises consisting of toe flexion and extension, ankle pumps, ankle circles, and heel slides (knee flexion).

Outcomes:

The patient experienced a decrease in fluid from the initial evaluation to the 10th visit, which was during the process of complete decongestive therapy. However, she experienced an increase in fluid between the 10th and 15th visit which is when she was transitioned into wearing the tg soft compression garment (Lohmann & Rauscher, Doral, Florida) instead of the compression bandages due to discoloration of the right lower extremity. The decrease in fluid seen from the 15th visit to the 20th visit was when the therapist used kinesiotape (Kinesio® Tex Classic) in conjunction with the tg soft compression garment, (Table 5).

The patient demonstrated a slight improvement in right hip abduction and right knee extension, increased in both from a 4-/5 to 4/5, but otherwise remained the same between the initial evaluation and the 10th visit. The therapist did not test the strength at the 20th visit. Additionally, the patient demonstrated an improvement in balance and gait mechanics, as well as a decrease in disability and fall risk, (Table 6).

Discussion:

The patient presented with deficits secondary to CVA consisting of right sided hemiparesis, decreased range of motion and decreased strength in the right lower extremity as well as increased tone and spasticity throughout the right upper extremity and lower extremity. Her decreased strength, impaired balance, and increased limb heaviness contributed to her difficulty with ambulation and ADL’s. Secondary to lymphedema, the patient presented with increased limb size and heaviness. These impairments affected the patient’s ability to perform functional tasks such as transfers, ambulation, and activities of daily living. Due to the patient
having two diagnoses, the sessions had to be strategically divided between performing complete
decompressive therapy to address the patient’s lymphedema and use of a task oriented approach to
address the patient’s deficits secondary to stroke. Depending on the patient’s status from session
to session, some of the sessions were primarily focused on addressing her lymphedema, while
other sessions were primarily focused on utilizing a task oriented approach.

The impairments that result from stroke such as muscle weakness, impaired coordination,
impaired balance, spasticity, and impaired endurance can lead to persistent difficulties with
walking. Gait retraining through different types of exercise is currently the most common and
effective approach to improving walking ability. Intensive mobility training has been
particularly noted to improve walking ability in patients following stroke as it consists of
functional strengthening, balance exercises, and variation of walking tasks. We recognized that
the patient demonstrated an improvement in gait mechanics when there was variation in the
focus of the gait training. For example, the patient performed better when we switched up the
verbal and manual cues to focus on heel strike, or exaggerating hip flexion, or focusing on
weight shifting. Additionally, we recognized that the patient demonstrated an improvement in
gait mechanics when we combined strengthening activities with gait training. For example, the
patient benefitted from first attempting to perform a set or several sets of standing marches prior
to ambulating with a focus on exaggerating marching or hip flexion with each step.

Due to the chronicity of the patient’s stroke, it was necessary to set realistic expectations
regarding the patient’s progress. The primary goal was to improve the patient’s ambulation and
increase her functional strength in order to assist with performance of ADL’s and quality of life.
Despite her chronicity, use of a task-oriented approach consisting of graded strengthening,
aerobic exercise, and a variety of challenging walking tasks improved the patient’s balance, ambulation, gait mechanics, and endurance.

In order to improve the patient’s lymphedema in the right lower extremity, complete decongestive therapy was chosen as the intervention. Complete decongestive therapy is currently the most effective treatment for lymphedema and consists of compression, manual lymphatic drainage, skin care, and lymphedema remedial exercises. Manual lymphatic drainage (MLD) serves to stimulate the lymphatic system to pump extra fluid out of the particular extremity and it is most effective when combined with application of compression bandages to keep the fluid from returning to the area. MLD can be used to redirect lymph across the plexus of initial lymphatics towards healthy lymph nodes. The initial lymphatics respond to the rhythmic movement of the skin under the therapist’s hands, opening to allow fluid to enter the system. Skin care is important to avoid sunburns or cuts which can lead to infection and result in further inflammation and build-up of fluid. The lymphedema remedial exercises are most effective when performed with compression bandages and they assist with lymphatic drainage by contracting the muscles against the bandages and pumping the extra fluid out of the extremity. Combining the four parts of complete decongestive therapy serves to provide the most beneficial results.

Although lymphedema treatment for the right lower extremity began with complete decongestive therapy, due to the patient’s impaired sensation in the right lower extremity and the patient’s husband applying the compression bandages too tightly, she ended up with some discoloration in her right foot. This was noted after 15 visits. In order to improve the coloration of the right foot, and to still continue addressing the patient’s lymphedema, the physical therapist made the decision to switch to using a tg soft compression garment. The patient and her husband were educated on the fact that the compression grade of the tg soft compression garment was not
as effective as the compression bandages, but it would still assist with lymphatic drainage. To accommodate the decreased compression grade of the tg soft compression garment, the patient and her husband were instructed to elevate the right lower extremity when in sitting in order to prevent an increase in swelling. After several days of using the tg soft compression garment, the patient demonstrated an increase in fluid in the right knee but was still unable to use compression bandages due to discoloration in the right foot. To assist with lymphatic drainage, application of kinesiotape was used in conjunction with the tg soft compression garment. The kinesiotape was applied to the right knee using the spider technique with the heads placed at the lymphatic ducts and the tails extending across the anterior and lateral parts of the right knee where the fluid was most prominent.12

Following complete decongestive therapy, the patient demonstrated a reduction in circumference measurements of the right lower extremity. As mentioned above, the patient did experience a slight setback when switching over to the tg soft compression garment, but once again demonstrated improvement following the application of the kinesiotape. Although the patient did demonstrate a reduction of fluid in the right lower extremity following complete decongestive therapy, it would have been beneficial to compare the right lower extremity (affected) to the left lower extremity (unaffected) in order to see the true difference. However, the left lower extremity was never measured by the therapist, which is a significant limitation. It would have also been beneficial to have more visits as the patient experienced a setback when having to switch over to the tg soft compression. Further research is needed to explore the impact of lymphedema in patients following a stroke.
References:


Tables:

Table 1

<table>
<thead>
<tr>
<th>Medications</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>Pain in her right knee</td>
</tr>
<tr>
<td>HCTZ</td>
<td>HTN and lymphedema in right lower extremity</td>
</tr>
<tr>
<td>Ropinirole</td>
<td>Restless leg syndrome in right lower extremity</td>
</tr>
<tr>
<td>Coumadin</td>
<td>Anticoagulant: preventing blood clots</td>
</tr>
<tr>
<td>Baclofen</td>
<td>Spasticity in right lower extremity</td>
</tr>
<tr>
<td>Magnesium Oxide</td>
<td>Source of magnesium</td>
</tr>
<tr>
<td>Trazodone</td>
<td>Antidepressant</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>Pain in her right knee</td>
</tr>
<tr>
<td>Citalopram</td>
<td>Antidepressant</td>
</tr>
<tr>
<td>Potassium chloride powder</td>
<td>Electrolyte replenisher</td>
</tr>
</tbody>
</table>

Table 2

Systems Review

<table>
<thead>
<tr>
<th>Cardiovascular/Pulmonary</th>
<th>Normal heart rate, normal pulse and rhythm. Lymphedema in the right lower extremity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal</td>
<td>Impaired strength and range of motion on right side. Refer to tests and measures for specific results.</td>
</tr>
<tr>
<td>Neuromuscular</td>
<td>Increased tone and spasticity throughout right upper extremity and lower extremity. The following were impaired: Gait, balance, reflexes, coordination. Refer to tests and measures for specific results.</td>
</tr>
<tr>
<td>Integumentary</td>
<td>Skin temperature and color is within normal limits. No scars or wounds present. Toe nails are in good condition. Positive for stemmer sign. Patient presents with 2+ pitting edema below the knee on the right lower extremity.</td>
</tr>
<tr>
<td>Communication</td>
<td>Patient is verbal.</td>
</tr>
<tr>
<td>Affect, Cognition, Language, Learning Style</td>
<td>Patient is alert and oriented x3. Patient presents with pseudobulbar affect.</td>
</tr>
</tbody>
</table>

Tests and Measures: Table 3

<table>
<thead>
<tr>
<th></th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Strength Testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip Flexion</td>
<td>2/-5</td>
<td>5/5</td>
</tr>
<tr>
<td>Hip Abduction</td>
<td>3+/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Hip Adduction</td>
<td>3+/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Knee Flexion</td>
<td>3+/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Knee Extension</td>
<td>3+/5</td>
<td>5/5</td>
</tr>
</tbody>
</table>
Ankle Plantar flexion  | 1/5  | 5/5  
Ankle Dorsiflexion | 1/5  | 5/5  

**Reflexes**
- Patella (Nerve Root L2, L3, L4)  | 3+  | 2+  
- Achilles Tendon (Nerve Root S1, S2)  | 3+  | 2+  

**Babinski**  | Positive | Negative  
**Ankle Clonus**  | Positive with 2 beats | Negative  

**Coordination**
- Finger to Nose  | Unable to complete finger to nose on right due to lack of active movement | WNL  
- Heel to Shin  | Unable to complete heel to shin on right due to lack of active movement | WNL  

### Circumference Measurements of the right lower extremity: Table 4

<table>
<thead>
<tr>
<th></th>
<th>Initial Evaluation</th>
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</thead>
<tbody>
<tr>
<td>Metatarsals</td>
<td>24.0 cm</td>
</tr>
<tr>
<td>Figure 8</td>
<td>61.0 cm</td>
</tr>
<tr>
<td>Malleoli</td>
<td>31.0 cm</td>
</tr>
<tr>
<td>20 cm up from the ankle</td>
<td>39.5 cm</td>
</tr>
<tr>
<td>30 cm up from the ankle</td>
<td>46.5</td>
</tr>
<tr>
<td>Popliteal Fossa</td>
<td>46.5 cm</td>
</tr>
</tbody>
</table>

### Circumference Measurements of the right lower extremity: Table 5

<table>
<thead>
<tr>
<th></th>
<th>Initial Evaluation</th>
<th>10th visit</th>
<th>15th visit</th>
<th>20th visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metatarsals</td>
<td>24.0 cm</td>
<td>23.0 cm</td>
<td>22.4 cm</td>
<td>23.0 cm</td>
</tr>
<tr>
<td>Figure 8</td>
<td>61.0 cm</td>
<td>55.0 cm</td>
<td>58.5 cm</td>
<td>58.3 cm</td>
</tr>
<tr>
<td>Malleoli</td>
<td>31.0 cm</td>
<td>28.0 cm</td>
<td>31.6 cm</td>
<td>29.0 cm</td>
</tr>
<tr>
<td>20 cm up from the ankle</td>
<td>39.5 cm</td>
<td>32.6 cm</td>
<td>34.1 cm</td>
<td>(Not measured)</td>
</tr>
<tr>
<td>30 cm up from the ankle</td>
<td>46.5</td>
<td>43.2 cm</td>
<td>38.5 cm</td>
<td>41.7 cm</td>
</tr>
<tr>
<td>Popliteal Fossa</td>
<td>46.5 cm</td>
<td>44.6 cm</td>
<td>42.5 cm</td>
<td>(Not measured)</td>
</tr>
</tbody>
</table>
**Tinetti Balance Assessment: Table 6**

<table>
<thead>
<tr>
<th></th>
<th>Initial Evaluation</th>
<th>10th Visit</th>
<th>20th Visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance Score</td>
<td>7</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Gait Score</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>% Disability</td>
<td>64%</td>
<td>43%</td>
<td>25%</td>
</tr>
<tr>
<td>Fall Risk</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
</tbody>
</table>