

**PHYSICAL THERAPY FOR IMPROVING FALL RISK WITH POST-LAMINECTOMY  
SYNDROME AFTER HOSPITALIZATION: A CASE REPORT**

**By**

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## **Abstract**

**Background and Purpose:** Post-laminectomy syndrome is not well known, and there are not many case reports on this topic relating to fall risk. Additionally, patients with sarcopenia and generalized weakness after hospitalization are at high risk for increased frailty and increased risk of falling. These patients benefit from physical therapy to combat sarcopenia, reduce chronic back pain, and decrease the risk of falling to improve their functional mobility and quality of life.

**Case Description:** The patient is a 77-year-old male presenting with complaints of generalized muscle weakness, constant low back pain, numbness and tingling down the left leg, and poor balance and stamina with walking. PT interventions focused on lower extremity strengthening, cardiovascular endurance, core stability, and balance.

**Outcomes:** The patient was initially prescribed physical therapy twice a week for eight weeks in addition to a home exercise program. Muscle weakness and stamina improved after 8 visits. The patient was assessed with the Focus on Therapeutic Outcomes (FOTO), Manual Muscle Testing (MMT), Timed Up and Go (TUG), Five Time Sit-to-Stand (5 STS), and Numeric Pain Rating Scale (NPRS). Upon increasing activity tolerance and stamina, the patient tolerated more gait training and standing activities with breaks.

**Discussion:** Physical therapy interventions were helpful for this patient and were supported by research to reduce fall risk and increase either strength or core stability. The patient improved MMT scores by at least one-half for all hip measurements except for left hip flexion. The patient improved TUG time, 5 STS time, and decreased NPRS. The patient's improvement in TUG time and 5 STS time indicates a decrease in the severity of the patient's fall risk.

**Key Words:** post-laminectomy syndrome; generalized weakness; fall risk; physical therapy;  
exercise

## **Introduction**

The CDC reports that approximately 28% of adults aged 65 years or older fall each year, costing approximately \$50 billion yearly in medical costs associated with falls and \$754 million on fatal falls<sup>1</sup>. Identifying the severity of fall risks in patients can be challenging as the risk of falling is multi-factorial, including but not limited to sarcopenia, generalized weakness, and low balance self-efficacy<sup>2</sup>. Older adults are more likely to fall with persistent low back pain<sup>3</sup>. Post-laminectomy syndrome (PLS) is a cause of chronic back pain after a failed back surgery that contributes to a life of disability and decreased quality of life<sup>4</sup>. Sarcopenia involves the loss of muscle mass and function, which leads to generalized muscle weakness and, ultimately, frailty<sup>5</sup>. Post-hospitalization patients are at high risk for increased frailty and increased risk of falling due to deconditioning associated with inactivity.

These patients benefit from physical therapy to combat sarcopenia, reduce chronic back pain, and decrease the risk of falling in order to improve their functional mobility and quality of life. The multi-factorial aspect of fall risk makes it essential to identify accurate assessments and appropriate interventions to reduce the potential for future falls<sup>2</sup>. Post-laminectomy syndrome is not well known, and there are not many case reports on this topic as it relates to patients also having a high fall risk. This patient also had many co-morbidities and contributing factors beyond general weakness and poor balance.

## **Case Description**

The patient was a 77-year-old male referred to physical therapy for generalized muscle weakness and constant low back pain with associated numbness and tingling down his left leg since his back surgery in 1974. The patient reports his strength “never recovered” post 4-day hospital stay for a UTI a month prior. The patient complains of his legs feeling heavy and glued to the floor, poor balance, fear of falling, and poor stamina with activity especially walking. The patient had a significant medical history of multiple back surgeries, chronic back pain, chronic anemia, arthritis, pacemaker, high blood pressure, currently taking blood thinners, incontinence, and a recent hospitalization for a urinary tract infection. The patient endorsed using a rollator pre- and post-hospitalization for ambulation with a greater reliance on this assistive device post-hospitalization. The patient was screened and cleared of red flags pertaining to medical history and denied fever, night sweats, unexplained weight loss or gain, recent trauma, and sleep disturbance. The patient received home health physical therapy twice a week for two weeks following discharge from the hospital before presenting to outpatient physical therapy. The patient was referred for physical therapy twice a week for eight weeks by the referring physician in outpatient physical therapy.

## **Examination**

The patient was referred to physical therapy with the diagnosis of generalized muscle weakness and was examined by a third-year physical therapy student accompanied by a licensed physical therapist. The patient's subjective report on aggravating factors included standing and walking, and easing factors included rest and sitting sometimes being better for low back pain. The patient was assessed with FOTO, MMT, TUG, 5 STS, and NPRS. The FOTO is an online self-reported outcome assessment measuring the physical functional status or ability regardless of their diagnosis and scored 40<sup>6</sup>. MMTs are assessing the patient's strength, and the lower extremity muscle strength is summarized in Table 1<sup>7</sup>. TUG is assessing the patient's gait speed which relates to indicating if the patient is at risk for falling, and the patient scored 26.60 seconds with modifications of starting and ending the test from a personal rollator<sup>8</sup>. 5 STS assesses their functional mobility and relates to the fall risk level, and the patient scored 24.69 seconds with the use of hands<sup>9</sup>. NPRS assesses a patient's current perception of pain, and the patient reported 7/10 pain<sup>10</sup>.

The patient's gait was assessed through observation and presented with an ataxic step-to gait, decreased heel strike bilaterally, decreased stance time on the left lower extremity, increased hip hike on left lower extremity, increased bilateral sway, decreased left hip flexion and knee flexion, in addition to decreased cadence. The patient demonstrated difficulty with ambulating, and fatigue was noted with 20 feet of ambulation assisted with the patient's rollator. Range of motion was not assessed due to the lack of remaining time for the examination and evaluation.

The results of the muscle strength assessment suggested that the patient presents with weakness in bilateral lower extremities with the left side demonstrating more deficits compared to the right

lower extremity. This strength deficit resulted in difficulty and decreased functional ability to perform all activities of daily living (ADLs), including standing for prolonged periods of time and walking. The patient's TUG and 5 STS score and subjective report of fear of falling indicates the patient is at a higher risk of falling.

After examination, the patient's physical therapy diagnosis was determined to be generalized muscle weakness, age-related disability, and chronic low back pain. The patient was recommended to attend physical therapy treatment three times a week for eight weeks, but due to the patient's personal factors of being a caregiver, attending therapy twice a week was more maintainable for eight weeks. The patient's prognosis was determined to be fair due to the chronicity of the patient's impairments and the complexity of the patient's medical history.

## **Intervention**

The primary goal of physical therapy interventions for this patient was to improve lower extremity strength, core stability, cardiovascular endurance, and balance in order to improve the patient's functional activity tolerance and decrease fall risk. The patient was given a home exercise program consisting of therapeutic exercises outlined in Table 2 on the first visit after the evaluation.

Improving the core muscular strength can improve dynamic balance by stabilizing the trunk by improving the strength and endurance of the trunk's deep stabilizers, rotators, and flexors<sup>11</sup>.

Interventions focusing on core muscular strength were abdominal bracing, seated trunk rotations, and seated bicycle kicks.

Many studies have highlighted the importance of strengthening the hip abductor and hip adductor musculature to assist in mediolateral stability, which helps improve overall stability and leads to reducing the risk for falls<sup>12</sup>. Interventions focused on strengthening the hip abductors and adductors were seated hip abduction, seated hip adduction, and lateral step-ups.

American College of Sports Medicine states that participating in resistance training can slow the loss of muscle mass, bone mass, and strength, which is not seen with aerobic exercises alone<sup>13</sup>.

In many studies, it was also proven that lower body strengthening has been shown to significantly improve balance of older adults and should be implemented to help prevent falls in this population<sup>13</sup>. Exercises focused on resistance training and lower body strengthening included STS, seated marches, bridges, and seated alternating heel and toe raises. Additionally, due to



decrements in joint ROM in the aging population, improving flexibility and mobility can help increase physical independence<sup>13</sup>. Flexibility and mobility were the focus of the double knee to chest (DTKC), active hip external rotation, and seated hamstring stretch.

Resistance training combined with aerobic exercise has been proven to improve factors associated with an increase in fall risk and improves postural control, balance, and walking performance<sup>14</sup>. After five visits, the patient added 10 minutes of aerobic exercise on the SciFit recumbent bike, and after six visits walking in the parallel bars was added.

Progressions were made after the patient had performed the same exercise more than once, with less difficulty and fewer rest breaks. Progressions were made through increasing repetitions, increasing sets, and increasing weight. The progressions of the exercises are outlined in Table 3. All interventions administered were researched and proven to reduce the risk of falling and increase either lower extremity strength, core stability, or improve balance.

## **Outcomes**

The patient was initially prescribed physical therapy twice a week for eight weeks in addition to a home exercise program. The outcomes of the patient's reassessment compared to his initial evaluation are outlined in Table 4.

The patient canceled two treatment sessions due to his wife having medical complications and visit 9 was preemptively ended due to incontinence. Otherwise, the patient was very compliant with treatment sessions and tolerated interventions well, with breaks given as necessary due to muscle fatigue and shortness of breath due to deconditioning. The patient was asked how he was feeling after each set of exercises and monitored by the student physical therapist for shortness of breath and other potential adverse symptoms. The patient was very vocal about his rate of exertion and was cognizant when breaks were necessary during treatment sessions.

## **Discussion**

Physical therapy interventions were helpful for this patient with generalized weakness following a hospital stay and failed back surgery. Muscle weakness improved after 8 visits, as shown in Table 1. Knee flexion and extension were not reassessed; therefore, no improvements were shown in the patient's MMT scores. Upon increasing strength and stamina, the patient tolerated more gait training and standing activities with breaks.

The patient's FOTO score did not improve upon reassessment, and the likely explanation for this decrease in the score is the patient's complaint of an increase in the numbness and heaviness of his left leg after visit 8. The patient was prompted to talk to his doctor about this and had scheduled an appointment to be evaluated after the reassessment had taken place.

A limitation of this care report would be that the patient's low back pain limited his ability to participate in a lot of balance interventions. The patient also had poor control of his left lower extremity and poor trunk endurance; often the patient would start slipping out of his rollator, which he preferred to sit on for seated exercises. Given the chronicity of the patient's symptoms, knowing more about the details of the patient's prior back surgeries and potentially the surgical notes could have given insight into whether there was any nerve involvement contributing to the patient's long-standing numbness and tingling and incontinence. This patient had many biopsychosocial factors that potentially could be affecting his progress with physical therapy, including being a caretaker for his wife and coping with his wife's terminal medical condition, in addition to limited social support. A strength of the approach to this diagnosis was that even though our primary focus was increasing lower extremity strength, increasing stamina, and decreasing the risk of falling, we were still able to decrease his low back pain.

In summary, the patient's improvement in TUG time and 5 STS time indicates a decrease in the severity of the patient's fall risk<sup>8,9</sup>. Despite the complex medical history, the patient had improvement in back pain in addition to improved muscle strength and a progressive reduction in risk of falling with PT twice a week for six weeks, with the potential for further progress. Research with more patients with post-laminectomy syndrome is needed to identify which exercises are the most effective in reducing their pain and reducing their risk of falling.

## References

1. Older Adult Fall Prevention. Centers for Disease Control and Prevention.  
<https://www.cdc.gov/falls/data/falls-by-state.html>. Published July 9, 2020. Accessed September 1, 2022.
2. Lusardi MM, Fritz S, Middleton A, et al. Determining Risk of Falls in Community Dwelling Older Adults: A Systematic Review and Meta-analysis Using Posttest Probability. *J Geriatr Phys Ther*. 2017;40(1):1-36. doi:10.1519/JPT.0000000000000099
3. Bell T, Pope C, Fazeli P, Crowe M, Ball K. The Association of Persistent Low Back Pain With Older Adult Falls and Collisions: A Longitudinal Analysis. *J Appl Gerontol*. 2021;40(11):1455-1464. doi:10.1177/0733464820966517
4. Garcia JB, Rodrigues DP, Leite DR, do Nascimento Câmara S, da Silva Martins K, de Moraes ÉB. Clinical evaluation of the post-laminectomy syndrome in public hospitals in the city of São Luís, Brazil. *BMC Res Notes*. 2015;8:451. Published 2015 Sep 17. doi:10.1186/s13104-015-1400-9
5. Anton SD, Hida A, Mankowski R, et al. Nutrition and Exercise in Sarcopenia. *Curr Protein Pept Sci*. 2018;19(7):649-667. doi:10.2174/1389203717666161227144349
6. FOTO Patient Outcomes. 2022. *FOTO - Patient Outcomes | Frequently Asked Questions*. <https://fotoinc.com/frequently-asked-questions>. Accessed August 4, 2022.
7. Cuthbert SC, Goodheart GJ Jr. On the reliability and validity of manual muscle testing: a literature review. *Chiropr Osteopat*. 2007;15:4. Published 2007 Mar 6. doi:10.1186/1746-1340-15-4

8. Nightingale CJ, Mitchell SN, Butterfield SA. Validation of the Timed Up and Go Test for Assessing Balance Variables in Adults Aged 65 and Older. *J Aging Phys Act.* 2019;27(2):230-233. doi:10.1123/japa.2018-0049
9. Duarte Wisnesky U, Olson J, Paul P, Dahlke S, Slaughter SE, de Figueiredo Lopes V. Sit-to-stand activity to improve mobility in older people: A scoping review. *Int J Older People Nurs.* 2020;15(3):e12319. doi:10.1111/opn.12319
10. Karcioglu O, Topacoglu H, Dikme O, Dikme O. A systematic review of the pain scales in adults: Which to use?. *Am J Emerg Med.* 2018;36(4):707-714. doi:10.1016/j.ajem.2018.01.008
11. Kahle N, Tevald MA. Core muscle strengthening's improvement of balance performance in community-dwelling older adults: a pilot study. *J Aging Phys Act.* 2014;22(1):65-73. doi:10.1123/japa.2012-0132
12. Daun F, Kibele A. Different strength declines in leg primary movers versus stabilizers across age-Implications for the risk of falls in older adults?. *PLoS One.* 2019;14(3):e0213361. Published 2019 Mar 7. doi:10.1371/journal.pone.0213361
13. Chodzko-Zajko, Wojtek J. Ph.D., FACSM, (Co-Chair); Proctor, David N. Ph.D., FACSM, (Co-Chair); Fiatarone Singh, Maria A. M.D.; Minson, Christopher T. Ph.D., FACSM; Nigg, Claudio R. Ph.D.; Salem, George J. Ph.D., FACSM; Skinner, James S. Ph.D., FACSM. Exercise and Physical Activity for Older Adults. *Medicine & Science in Sports & Exercise*: July 2009 - Volume 41 - Issue 7 - p 1510-1530 doi: 10.1249/MSS.0b013e3181a0c95c
14. Sousa N, Mendes R, Silva A, Oliveira J. Combined exercise is more effective than aerobic exercise in the improvement of fall risk factors: a randomized controlled trial in

community-dwelling older men. *Clin Rehabil.* 2017;31(4):478-486.

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## Tables and Figures

| <b>Table 1: Lower Extremities Strength (MMT)</b> |                 |                     |                   |
|--|-----------------|---------------------|-------------------|
| <b>Lower Extremity</b>                           | <b>Initial</b>  | <b>Reassessment</b> | <b>Comments</b>   |
| <b>MMT</b>                                       | <b>06-15-22</b> | <b>07-29-22</b>     |                   |
| R Hip Abduction                                  | 4-              | 4+                  | Tested in sitting |
| L Hip Abduction                                  | 3+              | 4+                  | Tested in sitting |
| R Hip Adduction                                  | 4               | 4+                  | Tested in sitting |
| L Hip Adduction                                  | 4-              | 4+                  | Tested in sitting |
| R Hip Extension                                  | 4-              | 4                   | Tested in sitting |
| L Hip Extension                                  | 3+              | 4-                  | Tested in sitting |
| R Hip Flexion                                    | 3+              | 4                   | Tested in sitting |
| L Hip Flexion                                    | 3               | 3                   | Tested in sitting |
| R Knee Extension                                 | 4-              | NT                  | Tested in sitting |
| L Knee Extension                                 | 3+              | NT                  | Tested in sitting |
| R Knee Flexion                                   | 4               | NT                  | Tested in sitting |
| L Knee Flexion                                   | 4-              | NT                  | Tested in sitting |

NT = not tested

| <b>Table 2: Interventions</b> |                               |                                    |             |                      |
|-------------------------------|-------------------------------|------------------------------------|-------------|----------------------|
| <b>Visit</b>                  | <b>Timed Based Activities</b> | <b>Comment</b>                     | <b>Sets</b> | <b>Reps</b>          |
| 1                             | Seated marches                | Simulate reciprocal stepping       | 3           | 10 each leg          |
|                               | Bridges                       | Simulate scooting and bed mobility | 3           | 10                   |
|                               | SAQ                           | Quad activation                    | 3           | 10 each leg; 3" hold |
| 2                             | Seated marches                | Simulate reciprocal stepping       | 3           | 10 each leg          |
|                               | Bridges                       | Simulate scooting and bed mobility | 3           | 10; 1" hold          |
|                               | SAQ                           | Quad activation                    | 3           | 10 each leg; 3" hold |
|                               | <i>Seated hip abduction</i>   | Glute med activation               | 3           | 10                   |



|   |                                 |   |   |                      |
|---|---------------------------------|---|---|----------------------|
|   | <i>Seated hip adduction</i>     | Adductor control w/ rainbow ball  | 3 | 10                   |
|   | <i>STS</i>                      | Standing from sitting in rollator (try from lower surface next visit) functional mobility | 3 | 5                    |
|   | <i>DKTC</i>                     | w/ SB (stopped d/t sharp pain in left hip)  | 1 | 4'                   |
|   | <i>Seated hamstring stretch</i> | Intro to hip hinge  | 3 | 30" hold each leg    |
| 3 | Seated marches                  | Simulate reciprocal stepping  | 3 | 10 each leg          |
|   | Bridges                         | Simulate scooting and bed mobility  | 3 | 10; 3" hold          |
|   | SAQ                             | Quad activation   | 3 | 10 each leg; 3" hold |
|   | Seated hip abduction            | Glute med activation (RTB)  | 3 | 10                   |
|   | Seated hip adduction            | Adductor control w/ rainbow ball  | 3 | 10; 3" hold          |
|   | Seated hamstring stretch        | Intro to hip hinge  | 3 | 30" hold each leg    |
|   | <i>Step ups (no riser)</i>      | Community ambulation, BLE strengthening   | 1 | 4'                   |
| 4 | Seated marches                  | Simulate reciprocal stepping  | 3 | 10 each leg          |
|   | Seated hip abduction            | Glute med activation (RTB)  | 3 | 10                   |
|   | Seated hip adduction            | Adductor control w/ rainbow ball  | 3 | 10; 5" hold          |
|   | Seated hamstring stretch        | Intro to hip hinge  | 3 | 30" hold each leg    |

|   |                               |   |   |                      |
|---|-------------------------------|---|---|----------------------|
|   | LAQ                           | Quad activation; in chair                   | 3 | 10 each leg; 1" hold |
|   | <i>Seated heel/toe raises</i> | Heel strike and toe off in gait             | 1 | 4'                   |
|   | STS                           | Standing from sitting from chair at // bars | 3 | 5                    |
| 5 | Seated marches                | Simulate reciprocal stepping                | 3 | 12 each leg          |
|   | SAQ                           | Quad activation                             | 3 | 10 each leg; 5" hold |
|   | Seated hip abduction          | Glute med activation (RTB)                  | 3 | 10; 5" hold          |
|   | Seated hip adduction          | Adductor control w/ dodge ball              | 3 | 10; 5" hold          |
|   | Seated hamstring stretch      | Intro to hip hinge                          | 3 | 30" hold each leg    |
|   | DKTC                          | w/ peanut with heel dig for HS activation   | 1 | 4'                   |
|   | Seated heel/toe raises        | Heel strike and toe off in gait             | 1 | 4'                   |
|   | <i>Hip IR</i>                 | Seated, sliding board and towels under feet | 3 | 10 each leg          |
| 6 | <i>SciFit L1</i>              | Seat 8; promote reciprocal gait             | 1 | 10'                  |
|   | Seated marches                | Simulate reciprocal stepping                | 3 | 12 each leg          |
|   | <i>Abdominal bracing</i>      | w/ black dodgeball for TrA engagement       | 3 | 10; 3" hold          |
|   | Seated hip abduction          | Glute med activation (RTB)                  | 4 | 10; 5" hold          |
|   | Seated hip adduction          | Adductor control w/ dodge ball              | 3 | 10; 5" hold          |

|   |                              |   |   |                      |
|---|------------------------------|---|---|----------------------|
|   | <i>Seated trunk rotation</i> | w/ black dodge ball for TrA engagement      | 1 | 4'                   |
|   | <i>Seated bicycle kicks</i>  | 5 reps then alternate                       | 1 | 3'                   |
|   | Seated resisted marches      | RTB   | 3 | 10 each leg          |
| 7 | SciFit L1                    | Seat 8; promote reciprocal gait             | 1 | 10'                  |
|   | Seated marches               | Simulate reciprocal stepping                | 4 | 10 each leg          |
|   | Seated hip adduction         | Adductor control w/ dodge ball              | 4 | 10; 5" hold          |
|   | LAQ                          | Quad activation; in chair                   | 4 | 10 each leg; 1" hold |
|   | Step ups (no riser)          | Community ambulation, BLE strengthening     | 1 | 6'                   |
|   | STS                          | Standing from sitting from chair at // bars | 3 | 5                    |
|   | <i>Walking in // bars</i>    | w/ BUE support, fwd/bwrld                   | 1 | 4'                   |
| 8 | SciFit L1                    | Seat 8; promote reciprocal gait             | 1 | 10'                  |
|   | Seated hip abduction         | Glute med activation (RTB)                  | 4 | 10; 5" hold          |
|   | Seated hip adduction         | Adductor control (5" hold)                  | 4 | 10; 5" hold          |
|   | LAQ                          | Quad activation; in chair                   | 4 | 12 each leg; 1" hold |
|   | Seated trunk rotation        | w/ black dodge ball for TrA engagement      | 1 | 4'                   |
| 9 | Seated marches               | Simulate reciprocal stepping                | 4 | 10                   |

|   |                          |  |   |                      |
|---|--------------------------|--|---|----------------------|
|   | Seated hip abduction     | Glute med activation (RTB)                           | 4 | 10; 5" hold          |
|   | Seated hip adduction     | Adductor control w/ dodge ball                       | 4 | 10; 5" hold          |
|   | DKTC                     | w/ peanut with heel dig for HS activation            | 1 | 6'                   |
| 10                                      | SciFit L1                | Seat 8; promote reciprocal gait                      | 1 | 12'                  |
|   | Seated hamstring stretch | Intro to hip hinge                                   | 3 | 30" hold each leg    |
|   | LAQ                      | Quad activation; in chair                            |   | 12 each leg; 1" hold |
|   | Seated hip adduction     | Adductor control w/ dodge ball                       | 4 | 10; 5" hold          |
|   | Walking in // bars       | w/ BUE support, fwd/bwrd (added side stepping today) | 1 | 4' each              |
|   | STS                      | Standing from sitting from chair at // bars          | 3 | 7                    |
|   | Seated resisted marches  | RTB  | 3 | 10 each leg          |
| 11                                      | SciFit 8 L1              | Seat 8; promote reciprocal gait                      | 1 | 12'                  |
|   | Seated marches           | Simulate reciprocal stepping                         | 3 | 15 each leg          |
|   | Seated hip abduction     | Glute med activation (RTB)                           | 4 | 10; 5" hold          |
|   | STS                      | Standing from sitting from chair at // bars          | 3 | 5                    |
|   | Seated trunk rotation    | w/ black dodge ball for TrA engagement               | 1 | 4'                   |
| <i>Italics</i> = indicates new exercise |                          |  |   |                      |

| <b>Table 3: Exercise Progressions</b> |                                |                    |                                 |                     |                                 |
|---------------------------------------|--------------------------------|--------------------|---------------------------------|---------------------|---------------------------------|
| <b>Exercise</b>                       | <b>Initial</b>                 | <b>Reason</b>      | <b>Progression 1</b>            | <b>Reason</b>       | <b>Progression 2</b>            |
| Seated marches                        | 3 sets of 10 each leg          | Increase frequency | 3 sets of 12 each leg           | Increase resistance | 3 sets of 10 each leg w/ RTB    |
| Bridges                               | 3 sets of 10                   | Increase intensity | 3 sets of 10, 1" hold           | Increase intensity  | 3 sets of 10, 3" hold           |
| SAQ                                   | 3 sets of 10 each leg, 3" hold | Increase intensity | 3 sets of 10 each leg, 5" hold  | N/A                 | N/A                             |
| LAQ                                   | 3 sets of 10 each leg, 1" hold | Increase frequency | 4 sets of 10 each leg, 1" hold  | Increase frequency  | 4 sets of 12 each leg, 1" hold  |
| Seated hip abduction                  | 3 sets of 10                   | Increase intensity | 3 sets of 10, 5" hold           | Increase frequency  | 4 sets of 10, 5" hold           |
| Seated hip adduction                  | 3 sets of 10                   | Increase intensity | 3 sets of 10, 5" hold           | Increase frequency  | 4 sets of 10, 5" hold           |
| Step ups                              | 4' no riser (4" step)          | Increase duration  | 6" no riser (4" step)           | N/A                 | N/A                             |
| STS                                   | 3 sets of 5 from rollator      | Increase intensity | 3 sets of 5 from standard chair | Increase Frequency  | 3 sets of 7 from standard chair |
| SciFit                                | 10' Level 1                    | Increase duration  | 12' Level 1                     | N/A                 | N/A                             |

| <b>Table 4: Outcome Measures</b> |                 |                     |                 |
|----------------------------------|-----------------|---------------------|-----------------|
|                                  | <b>Initial</b>  | <b>Reassessment</b> | <b>Improved</b> |
|                                  | <b>06-15-22</b> | <b>07-29-22</b>     |                 |
| FOTO                             | 40              | 29                  | No              |
| TUG                              | 26.60 seconds   | 15.34 seconds       | Yes             |
| 5 STS                            | 24.69 seconds   | 16.24 seconds       | Yes             |
| NPRS                             | 7/10            | 5/10                | Yes             |