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**REHABILITATIVE MANAGEMENT OF A 66-YEAR-OLD FEMALE WITH  
CHRONIC LOW BACK PAIN: A CASE REPORT**

By

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CAPSTONE PROJECT

Submitted in partial fulfillment of the requirements

For the Degree of Doctor of Physical Therapy

Governors State University  
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# Rehabilitative Management of a 66-Year-Old Female with Chronic Low Back Pain: A Case Report

Rachael Matthews, SPT

## ABSTRACT

**Background and Purpose:** There is a lack of research demonstrating standardization of treatment protocols for patients with chronic low back pain and lumbar spinal stenosis. The purpose of this case report was to examine the effectiveness of a physical therapy rehabilitation program for a 66-year-old female referred for lumbar radiculopathy and lumbar spinal stenosis.

**Case Description:** This case report contained interventions focused on lumbar extension exercises, upper and lower extremity and postural control exercises, aerobic training, and modalities, in order to achieve the patient's goals and to improve quality of life. To measure the outcomes the following tests and measures were chosen: the numerical pain rating scale (NPRS) to measure pain intensity, lumbar range of motion (ROM), lower extremity manual muscle tests, neurodynamic tests including the straight leg raise and slump test, and the Modified Oswestry Disability Index to assess activity limitations.

**Outcomes:** The patient achieved 6 of the 7 physical therapy goals and partially met 1 of the goals. Lumbar ROM improved in the directions that showed limitation at baseline from moderately limited to within normal limits (WNL). Lower extremity strength improved in all areas by half to a full grade. Numerical pain rating scale score decreased from 8/10 to 6/10. There was no change in the Modified Oswestry Disability Index score.

**Discussion:** The results of this case report support research showing that physical therapy helps improve ROM and strength in patients with chronic low back pain and lumbar spinal stenosis. Additional research could include studies looking at different types of interventions and compare them to each other to discover which produces superior outcomes.

## **INTRODUCTION**

Chronic low back pain is the second most common cause of disability in adults living in the United States.<sup>1</sup> The lifetime prevalence rate of low back pain ranges from 75-85%.<sup>2</sup> Leg pain is often associated with low back pain. It is present in up to 57% of the patients diagnosed with low back pain caused from either neural or non-neural structures.<sup>3</sup>

Low back pain has many causes, one being lumbar spinal stenosis. Lumbar spinal stenosis is a degenerative condition defined as the narrowing of the spinal canal or associated regions, including central, lateral recesses, foraminal and extraforaminal regions.<sup>4</sup> The narrowing is due to mechanical compression caused by bone and/or soft tissue of the spinal nerve roots.<sup>4</sup> The compression can result in weakness, reflex alterations, gait disturbances, bowel and/or bladder dysfunction, motor and sensory changes, radicular pain or atypical leg pain, and neurogenic claudication.<sup>4</sup> The prevalence of lumbar spinal stenosis is about 50% in those over the age of 60 and 80% in those over the age of 70 as well as being a source of decreased quality of life in those over the age of 50.<sup>5, 6</sup>

Physical therapy can help improve or restore mobility and reduce the symptoms of low back pain leading to the restoration of normal function. Research has suggested that patients receiving physical therapy for low back pain reduced their likelihood of receiving surgery within one year of treatment.<sup>5</sup> When it comes to treatment interventions for lumbar spinal

stenosis, the research states that initially treatment includes medication for pain control, exercise, steroid injections, and physical therapy, but suggested interventions lack specific protocols or standardization of physical therapy treatment.<sup>4, 8</sup>

The purpose of this case report was to examine the effectiveness of a physical therapy rehabilitation program for a 66-year-old female referred for lumbar radiculopathy and lumbar spinal stenosis. The treatment interventions used in this report focused on lumbar extension exercises, upper and lower extremity strengthening exercises, postural control exercises, aerobic training, and modalities, including interferential current, moist heat, and/or cold pack, in order to achieve the patient's short and long term goals and to improve quality of life.

## **CASE DESCRIPTION**

The patient was a 66-year-old Caucasian female referred to physical therapy with a medical diagnosis of lumbar spinal stenosis and lumbar radiculopathy. She had a history of chronic low back pain that had an insidious onset years prior. Her significant past medical history included osteoporosis, arthritis, and numbness and tingling into her right upper extremity. Before being referred to physical therapy she was prescribed medications to help control her pain. The medications included hydrocodone, cyclobenzaprine, lidocaine patches, and meloxicam. She stated that she had

an MRI done of her lumbar spine 3 weeks prior to the initial evaluation. She presented to physical therapy with an exacerbation of her low back pain symptoms that began one month prior to the initial evaluation. The pain locations included her low back with the left side being greater than the right side, left posterior thigh, left lateral leg, and left lateral foot. The patient described the pain at the time of initial evaluation as intermittent and rated it an 8 out of 10 on the Numerical Pain Rating Scale (NPRS). The patient's prior level of function before the exacerbation was limited due to her chronic low back pain. Aggravating factors at the time of initial evaluation included rolling from side to side, transferring from sit to stand, and prolonged sitting, while walking provided pain relief. The patient stated that her goal was to return to her prior level of function, allowing her to participate in activities she enjoyed which included volunteering as receptionist at a cancer center, walking 30 minutes daily, and attending services at her synagogue.

## **SYSTEMS REVIEW**

Before the physical examination began, the patient's blood pressure, as a part of the cardiopulmonary portion of the systems review, was taken by a physical therapy aide and found to be 116/70 mmHg. The patient had a co-morbidity of aortic valve regurgitation for which she was taking baby aspirin, possibly causing her blood pressure to be lower. The musculoskeletal portion of the systems review found impairments that included decreased

lumbar range of motion (ROM) and decreased lower extremity strength found from the screening of myotomes/postural strength.

**Myotomes of Lower Extremity:** This screen was done to test the patient's muscle power for possible neurological weakness.<sup>9</sup> The myotomes were measured seated for bilateral nerve roots L1-S2. These included hip flexion (L1-L2), knee extension (L3), ankle dorsiflexion (L4), great toe extension (L5), ankle plantar flexion (S1), and knee flexion (S2). The movements were performed as explained by Magee.<sup>9</sup>

### **CLINICAL IMPRESSION #1**

After obtaining the patient's history and performing a systems review, the primary impairments were identified. They included increased lower back and left lower extremity pain, decreased bilateral lumbar ROM, and overall decreased lower extremity strength. In order to provide a more accurate description of the patient's condition, more specific tests and measures were performed. By using the NPRS and obtaining a subjective pain description, an accurate pain account could be gathered, suggesting a possible source of the pain. Manual muscle testing was performed due to the weaknesses found during the myotomal testing of the lower extremities. Lumbar ROM was measured to assess the possible causes of the limitation. Neurodynamic testing was performed due to complaints of radiculopathy and the pain pattern in the lower extremities on the left side from the lower back to the

foot, suggesting possible neural tissue involvement. The Modified Oswestry Disability Scale was used to assess any functional limitations or disability caused by her condition due to her goal to return to her prior level of function. The results of her MRI were also obtained after the initial evaluation to provide more insight on what was occurring in her lumbar spine and are described in the clinical impression #2 of this case report.

## **TESTS AND MEASURES**

### **Numerical Pain Rating Scale (NPRS)**

This test was used to measure the patient's pain intensity. She was asked to rate her pain at that moment on a scale of 0 to 10, where 0 indicated no pain and 10 indicated the most intense pain imaginable causing the patient to seek care at an emergency room. This test was chosen in order to provide data regarding the patient's current pain level. It also requires no equipment and can be done in less than 3 minutes. Childs et al. reported that the NRPS was found to have a standard error of measurement of 1.02, a minimal detectable change (MDC) of 2 points, a minimal clinically important difference (MCID) of 1.5 points during the first week of physical therapy treatment and 2.2 points after 4 weeks of physical therapy treatment, and a large effect size (ES) at 1 week and 4 weeks (ES= 0.95-1.2) in patients receiving physical therapy for low back pain.<sup>10</sup> Farrer et al. reported that the NRPS was found to have a MCID of 1.7 points or a 27.9%



reduction.<sup>11</sup> Herr et al. reported that the NRPS was found to have an excellent internal consistency in those aged 65-94 with a Cronbach's alpha of 0.87.<sup>12</sup> During initial evaluation, the patient reported her NPRS score to be 8 out of 10.

### **Lumbar Range of Motion (ROM)**

Lumbar ROM was measured grossly for lumbar flexion, extension, right rotation and sidebending, and left rotation and sidebending. The movements were performed as explained by Reese and Bandy, but not recorded using an instrument, such as a goniometer or tape measure.<sup>13</sup> It was scored instead using subjective observation and given a rating. The rating could be one of the following: within normal limits (WNL), meaning no significant limitation, minimally limited (75% of range present), moderately limited (50% of range present), and severely limited (25% or less of range present). During initial evaluation, the patient demonstrated a rating of moderately limited for lumbar flexion that elicited pain. Bilateral lumbar rotation was WNL, but elicited pain. Also to note, the patient experienced a centralization of symptoms when performing lumbar extension.

### **Manual Muscle Testing**

Lower extremity manual muscle testing was performed bilaterally for hip flexion, knee extension, ankle dorsiflexion, great toe extension, ankle plantar flexion and knee flexion. The movements were performed as explained by Hislop and Montgomery.<sup>14</sup> Plantar flexion and knee flexion were

performed in a short seated position in order to allow for patient comfort. Scoring ranged from 0 to 5 including pluses and minuses, with 5 meaning normal, 4 meaning good, 3 meaning fair, 2 meaning poor, 1 meaning trace activity, and 0 meaning no activity.<sup>14</sup> During the initial evaluation, weaknesses were found bilaterally in all muscles tested; complete results are found in Table 1.

### **Neurodynamic Tests**

**Straight Leg Raise (SLR):** This test is used to determine lumbosacral neural tissue mechanosensitivity by putting a mechanical and possibly physiological strain on the sciatic nerve and the nerve roots.<sup>3</sup> In order to perform the test, the patient is lying in the supine position with head and pelvis flat.<sup>2</sup> The examiner slowly lifts one of the patient's feet off the table into hip flexion while maintaining knee extension.<sup>2</sup> The leg is progressively elevated until maximum hip flexion is reached or the patient experiences a reproduction of their symptoms.<sup>2</sup> The test is positive if there is a reproduction of the symptoms or if the examiner finds significant resistance.<sup>3</sup> Majlesi et al. reported that the test was found to have a sensitivity of 0.52 and a specificity of 0.89, suggesting that when looking at the results there were fewer false positive scores, allowing for confidence when ruling in the condition when finding a positive result.<sup>2</sup> Walsh and Hall reported that the test was found to have good reliability of 0.80 and a good inter-rater reliability interclass

correlation coefficient (ICC) of 0.82 and 0.77.<sup>3</sup> Gabbe et al. reported that the test was found to have an excellent inter-rater reliability with an ICC of 0.95, a SEM of 4, and good test-retest reliability with an ICC of 0.91 and 0.91 and a SEM of 2 and 4.<sup>15</sup> During initial evaluation, the patient demonstrated a positive finding on the left side and a negative finding on the right side.

**Slump Test:** This test is designed to put the sciatic nerve roots under increasing tension. The test is performed by the patient sitting on the side of the examination table with the back straight, looking straight ahead.<sup>2</sup> The patient is then instructed to “slump” over putting the thoracic and lumbar spines into flexion while continuing to look straight ahead.<sup>2</sup> The next portion of the test is to put the cervical spine into full flexion, then to extend the knee of one of the lower extremities, and ending with the examiner placing the patient’s foot of the extremity with the extended knee into ankle dorsiflexion.<sup>2</sup>

Throughout the test, the patient reports to the examiner what they are experiencing and if their radicular symptoms have been reproduced.<sup>2</sup>

The test is considered positive if there is a reproduction of symptoms suggesting sciatic nerve root tension.<sup>2</sup> Majlesi et al. reported that the test was found to have a sensitivity of 0.84 and a specificity of 0.83, suggesting good false negative and false positive rates.<sup>2</sup> Walsh and Hall reported that the test was found to have a fair reliability of 0.71

and a good inter-rater reliability with an ICC of 0.89 and 0.70.<sup>3</sup> Gabbe et al. reported that the test was found to have an excellent inter-rater reliability with an ICC of 0.92 and SEM of 3 and excellent test-retest reliability with an ICC of 0.95 and 0.80 and SEM of 3 and 5.<sup>15</sup> During initial evaluation, the patient demonstrated a positive finding in the left lower extremity and a negative finding in the right lower extremity.

### **Modified Oswestry Disability Index**

This outcome tool measures activity limitation in people with low back pain. It consists of 10 questions that address different aspects of function and can be completed on paper or on a computer.<sup>7, 16</sup> Each question is scored from 0 to 5.<sup>7</sup> The total score is expressed as a percentage with 0 meaning no disability, 0-20 minimal disability, 20-40 moderate disability, 40-60 severe disability, 60-80 housebound, and 80-100 bedbound/maximum disability.<sup>16, 17</sup> Cleland et al. reported that the test was found to have a good to excellent reliability with an ICC of 0.863, a MDC of 13.1, MCID of 5.0, and a SEM of 5.65.<sup>17</sup> Davidson and Keating reported that the measure was found to have good test-retest reliability with an ICC of 0.92, an SEM of 4.5, and a MDC of 10.5 in those who self-reported being "about the same" post treatment.<sup>7</sup> During initial evaluation, the patient scored a 42%, suggesting severe disability.

Table 1  
Lower Extremity Manual Muscle Testing

	Initial Evaluation	3 Weeks	Discharge (8 weeks)
Hip flexion	Right 4-/5; Left 3+/5	Bilateral 4/5	Bilateral 5-/5
Knee extension	Bilateral 4-/5	Right 4/5; Left 4-/5	Bilateral 5/5
Ankle dorsiflexion	Bilateral 4/5	Bilateral 4+/5	Bilateral 5/5
Great toe extension	Bilateral 4/5	Bilateral 4+/5	Bilateral 5/5
Ankle plantar flexion	Bilateral 4/5	Bilateral 4+/5	Bilateral 5/5
Knee flexion	Bilateral 4-/5	Bilateral 4/5	Bilateral 5-/5

Table 2  
Lumbar ROM

	Initial Evaluation	3 Weeks	Discharge (8 weeks)
Flexion	Moderately Limited*	Minimally Limited*	WNL*
Extension	WNL	WNL	WNL
Sidebend Right	WNL	WNL	WNL
Sidebend Left	WNL	WNL	WNL
Rotation Right	WNL*	WNL	WNL
Rotation Left	WNL*	WNL	WNL

\* Elicited Pain; WNL: within normal limits

## **CLINICAL IMPRESSION #2**

The initial evaluation was performed one month after an exacerbation of the patient's chronic low back pain symptoms. The patient was treated with prescription medications to control the pain before being referred to physical therapy. During the examination, there were key impairments found. The first impairment found was an increased pain level. According to the patient's NPRS score of 8 out of 10 at the time of initial evaluation, she had a high pain intensity level. The patient subjectively described her pain as intermittent starting in her bilateral lower back with the left side being more painful than the right side following a path down her left lower extremity into her foot. Myotome screening of the lower extremities found generalized bilateral lower extremity muscle weakness, suggesting a possible neurological cause, but also could have suggested general muscle weakness. Manual muscle testing was then completed and generalized bilateral weakness was found in all muscles tested, which included hip flexion, knee extension, ankle dorsiflexion, great toe extension, ankle plantar flexion, and knee flexion. Lumbar ROM testing revealed a moderate limitation, meaning 50% of the range was present, with lumbar flexion as well as pain with lumbar flexion and bilateral rotation. Neurodynamic testing found positive results in the left lower extremity for the SLR and the Slump tests, suggesting possible neural tissue involvement and/or sciatic nerve or nerve root tension. The Modified Oswestry Disability Index reported a score

of 42%, suggesting severe disability, which was not allowing the patient to perform actions, tasks, or activities required of her to fulfill her roles.<sup>18</sup>

These roles included self-care, household management/chores and volunteer work. The posture exam revealed that the patient had decreased lordosis of her lumbar spine (flat back), which could be a possible compensation for spinal stenosis allowing for an increase in the foraminal space. . Results of the patient's MRI completed 3 weeks prior to the initial evaluation were obtained. They stated that there was severe bilateral foraminal stenosis at L5/S1, due to loss of disc height and hypertrophy of the facet joints and mild central canal and foraminal stenosis at L4/L5, due to grade 1 anterior subluxation of L4 and L5 and disc bulge.

## **DIAGNOSIS AND PROGNOSIS**

The patient was referred to physical therapy with a medical diagnosis of lumbar radiculopathy and lumbar spinal stenosis. The key impairments discovered during the initial evaluation included abnormal posture, decreased strength, pain affecting function, decreased mobility, and decreased functional mobility, falling into the preferred practice pattern 4F (Impaired Joint Mobility, Muscle Performance, ROM, and Reflex Integrity Associated with Spinal Disorders). Due to the patient's condition, age, level of impairment, motivation to improve and prior level of function, the patient was given a prognosis of excellent. This prognosis is supported by research.

Kou et al. that those with radicular type of low back pain associated with lumbar spinal stenosis were good candidates for conservative treatment, such as physical therapy, due to a positive outcome.<sup>18</sup> Verkerk et al reported that there was a 30% improvement rate for those with the following characteristics, married or living with one other adult, younger age, higher disability at baseline, and no previous rehabilitation.<sup>20</sup> The patient did not fall in line with all of those factors, but she was of a younger age, had a higher disability at baseline, and had no previous rehabilitation. There is also contradicting evidence that suggests there is little evidence as to which prognostic factors are of value in the recovery of chronic nonspecific low back pain.<sup>21</sup> The subject of this case study was chosen based on her condition and symptoms. She was referred with a medical diagnosis of lumbar radiculopathy and lumbar spinal stenosis, but according to the MRI she received she also had a herniated disc and grade 1 spondylolisthesis. The symptoms she presented with did not fully agree with lumbar spinal stenosis. Lumbar spinal stenosis is characterized by back pain, burning pain in the buttock or legs, weakness in the legs, increased pain with walking, and decreased pain with leaning forward or sitting.<sup>6</sup> The subject of this case report did not describe her pain as burning, had increased pain with lumbar flexion and prolonged sitting, and decreased pain with walking. The patient also reported a centralization of her pain and symptoms with lumbar extension, suggesting the pain being partially due to the herniated disc.



## PLAN OF CARE

It was decided after the initial evaluation that the patient would be seen for physical therapy 2-3 times per week for 4 weeks. The treatments would include modalities as indicated, pain management, patient education, postural education, and therapeutic exercise, including ROM, stretching and strengthening, all in order to achieve short and long term goals listed in Table 3. These goals addressed the key impairments found including increased pain, decreased lumbar flexion ROM, and decreased general lower extremity strength.

Table 3  
Goals

Short Term Goals	Re-Assessment	Discharge
Patient will report pain at a 25-50% reduction with tolerating prolonged sitting.	In progress	Met
Patient will demonstrate increased lumbar flexion mobility by 25-50% improved ability to perform activities such as dressing/washing, sitting, transfers, lifting and occupational/recreational activities.	Met	Met
Patient will demonstrate increased lumbar myotome/postural strength to 5-/5 for performing transfers such as getting in/out of car/tub and/or rising from chair/toilet.	In progress	Met
Patient will demonstrate independence with current home exercise program.	Met	Met
Long Term Goals		
Patient will report pain at a 50-75% reduction with sleeping/turning in bed.	In progress	Met

Patient will demonstrate increase lumbar flexion mobility by 50-75% to improve ability to perform activities such as dressing/washing, sitting, transfers, and lifting.	In progress	Met
Patient will demonstrate increased lumbar myotome/postural strength to 5/5 for performing household ADLs such as vacuuming, making the bed, and cooking.	In progress	Partially Met

## **INTERVENTIONS**

The patient attended 20 physical therapy treatment sessions. Each session lasted between 45 to 55 minutes. Interventions focused on lumbar extension exercises, upper and lower extremity strengthening exercises, postural control exercises, aerobic training, and modalities, including interferential current, moist heat, and/or cold pack. Interventions were selected based on the patient's level of function and support in the research. Specific exercises and progressions are listed in Appendix A. The patient was also provided with a home exercise program (HEP) in addition to the treatment sessions to maintain gains achieved and to promote a return to prior level of function as quickly and effectively as possible. During the last treatment session, the patient was provided with a new HEP, which included strengthening exercises from the original HEP with added progression of increased repetitions as well as new exercises, in order to maintain the

improvements made in therapy. She was able to verbalize and demonstrate her understanding of before discharge.

## **OUTCOMES**

The patient's goals were developed based on the impairments found during the initial evaluation as well as what the patient wanted to achieve by the end of the therapy. The patient met 6 out of the 7 goals and partially met 1 out of the 7 goals; the data is represented in Table 3. The one goal was only partially met because not all strength gains were 5 out of 5, some were 5- out of 5. Also to note was the goal involving pain. It stated that the patient would report pain at a 50 to 75% reduction with sleeping/turning in bed, this was not true at discharge do to her pain level being reported as a 6 out of 10. The therapist who conducted the discharge took into consideration that at the session prior to discharge she rated her pain as a 3 out of 10, as well as the patient subjectively reporting that she was experiencing less pain with sleeping and turning in bed resulting in a decision to document that the patient met that goal.

### **Modified Oswestry Disability Index**

The patient's score at initial evaluation was 42%, suggesting severe disability. After 3 weeks, the patient reported a score of 48%. The score at discharge, after 8 weeks, was 42%. The patient overall did not demonstrate an improvement, still suggesting that she had a severe disability (Table 4).

Table 4  
Modified Oswestry Disability Index

Date	Score
Initial Evaluation	42%
3 Weeks	48%
Discharge (8 weeks)	42%

## **Lumbar ROM**

The patient demonstrated decreased lumbar flexion ROM, as well as an increase in pain with lumbar flexion and bilateral lumbar rotation. The lumbar flexion was measured as moderately limited suggesting that the patient had 50% of the range present. During the re-assessment at 3 weeks, the patient demonstrated an increase in lumbar flexion from moderately impaired to minimally impaired, suggesting the patient had 75% of the range present. No pain was experienced with bilateral lumbar rotation. After 8 weeks, the patient increased her lumbar flexion from minimally impaired to WNL, showing an overall improvement that may be the result of a decrease in pain level. The decrease in pain level could be the result of the improvement of the herniated disc present at L4-L5. The patient continued to experience no pain with bilateral lumbar rotation. Specific data is represented in Table 2.

## **Lower Extremity Manual Muscle Testing**

During initial evaluation, the patient had decreased bilateral lower extremity strength. After 3 weeks at re-assessment, the patient

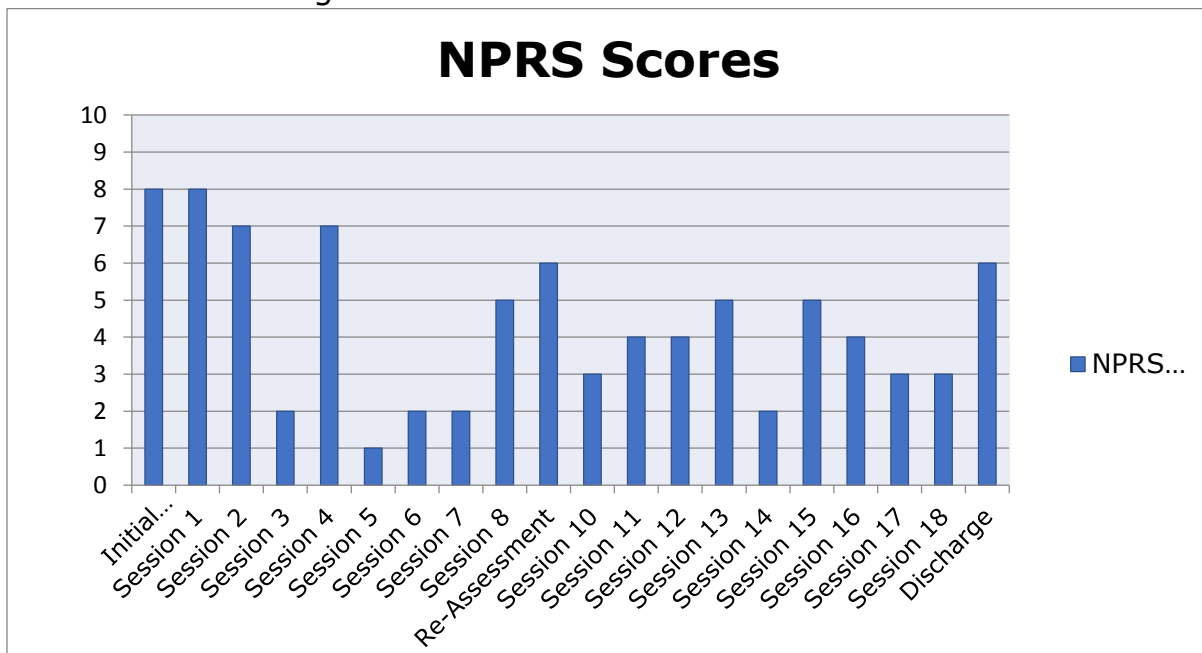
demonstrated an improvement at all levels of at least a half grade. The reason for this quick increase in strength is possibly due to a decrease in pain level. Again with the decrease in pain possibly being the result of an improvement of the herniated disc. The patient continued to show improvement at discharge after 8 weeks by improving by at least a half grade from re-assessment; specific data represented in Table 1.

### **Numerical Pain Rating Scale**

The patient was asked to rate her pain using the NPRS at every treatment session. Figure 1 shows the pain level progression from initial evaluation through discharge. After 3 weeks, the patient had a two point decrease in pain level from 8 out of 10 to 6 out of 10. According to the research, the MDC was found to be 2 points, suggesting that the patient had a significant decrease in pain level after 3 weeks of treatment.<sup>10</sup> After 8 weeks, the patient reported her pain level a 6 out of 10. Because the level stayed at 6 out of 10, there was no significant change from re-assessment at 3 weeks to discharge at 8 weeks. During weeks 2 through 5, there was a fluctuation of pain scores. There was no adverse event reported by the patient. The only change that occurred was the patient had received an epidural steroid injection into her lumbar spine between weeks 2 and 3. Prior to the injection, the patient was showing a decrease in pain, but post injection she experienced an increase. According to a retrospective study by Mashari et.al, it was found that 15% of patients who received an epidural

steroid injection for either lumbar spinal stenosis or lumbar disc herniation, reported worsening or no change in pain level, suggesting that the increase and fluctuation in pain possibly could have been due to the epidural steroid injection.<sup>22</sup> During treatment session two, the patient received intermittent pelvic traction, which increased the patient's NPRS score reflected in Figure 1.

Figure 1  
Numeric Pain Rating Scale



## DISCUSSION

The purpose of the study was to examine the effectiveness of a physical therapy rehabilitation program for a 66-year-old female referred for lumbar spinal stenosis and lumbar radiculopathy. The treatment interventions focused on lumbar extension exercises, upper and lower extremity strengthening exercises, postural control exercises, aerobic

training, and modalities, including interferential current, moist heat, and/or cold pack, in order to achieve the patient's short and long term goals and to improve quality of life. By the end of the treatment, the patient met 6 out of the 7 goals set at the initial evaluation, as well as partially meeting 1 out of the 7 goals. The one goal was only partially met because not all strength gains were 5 out of 5, some were 5- out of 5. Also to note was the goal involving pain. It stated that the patient would report pain at a 50 to 75% reduction with sleeping/turning in bed; this was not true at discharge due to her pain level being reported as a 6 out of 10. The therapist who conducted the discharge took into consideration that at the session prior to discharge she rated her pain as a 3 out of 10, as well as the patient subjectively reporting that she was experiencing less pain with sleeping and turning in bed resulting in a decision to document that the patient met that goal.

Although the patient met the majority of her goals, her score on the Modified Oswestry Disability Index stayed the same as it was at the initial evaluation.

This case report is significant because of the prevalence of chronic low back pain in adults in the United States. The research suggests that 60-90% of individuals will report low back pain during their lifetime.<sup>6</sup> Lumbar spinal stenosis is one many possible causes identified as a cause of low back pain.

It is reported to have a high prevalence in the aging population at approximately 10-25% of the US population, and is diagnosed in 22% of patients with chronic low back pain.<sup>6</sup> Conservative treatments are

recommended before surgery in the majority of cases.<sup>6</sup> The standard practice includes joint mobilizations, lumbosacral corset, flexibility, stabilization, aerobic conditioning and strengthening exercises in order to decrease pain and increase function.<sup>6</sup> Fritz et al. suggested that physical therapy could reduce the likelihood of patients receiving surgery within one year.<sup>5</sup> Although there is evidence supporting physical therapy as being an appropriate conservative treatment choice for patients with low back pain and lumbar spinal stenosis, there is a lack of standardization of the treatment protocol being used. Tomkins et al. concluded that after looking at the physical therapy treatment options for lumbar spinal stenosis, more research needs to be performed in order to develop a standardization of care for patient with low back pain and lumbar spinal stenosis.<sup>23</sup> The results of this case report can add to the gap of literature on the specific treatment interventions used to treat patients with low back pain and lumbar spinal stenosis. The interventions used were supported by research in order to treat chronic low back pain. Interferential current (IFC) was used to address the high level of pain she was experiencing. Fuentes et al. suggested that those with chronic low back pain who received IFC combined with therapeutic alliance, defined as working rapport/positive social connection, demonstrated a decrease in pain intensity by 77.4% and a decrease in muscle pain sensitivity by 51.5%.<sup>24</sup> Extension exercises were chosen due to the patient's centralization of symptoms with lumbar extension. These



exercises are supported by clinical practice guidelines set by the Orthopaedic Section of the American Physical Therapy Association (APTA) in 2012.<sup>25</sup> The guidelines state that centralization and directional preference have a grade A for patients with low back pain, suggesting strong evidence support by research at levels I-II, which are considered high quality diagnostic studies, prospective studies, or randomized control trails.<sup>24</sup> Lower extremity and upper extremity exercises were also chosen as an intervention in order to address the strength deficit. Traction was initially chosen due to the patient's radicular symptoms, but was discontinued after the patient reported an increase in pain. Traction was given a grade D by the Orthopaedic Section of the APTA, suggesting that there is conflicting research on its outcomes.<sup>25</sup> Postural control exercises were added to the intervention plan in order to increase the dynamic strength of the scapular muscles. It has also been found that postural control is impaired in individuals with chronic low back pain relative to control.<sup>26</sup> The exercises chosen were performed as explained by Kisner and Colby.<sup>27</sup> Treadmill walking was also added to the intervention plan to increase the patient's overall fitness as a form of pain management. The Orthopaedic Section of the APTA rates fitness and endurance activities as a grade A for pain management.<sup>25</sup> There is also some conflicting evidence found by Hendrick et.al. The results of that article state that walking has only moderate level evidence supporting positive outcomes and treadmill walking has poor evidence.<sup>28</sup> Even though there is some conflicting

evidence, the patient found pain relief from walking, so it was included in the intervention plan. During treatment session 9, the patient reported an increase in pain level. Due to this increase in pain, positional distraction was performed using a bolster applying overpressure to the spinous processes of L1-L5 as explained by Kisner and Colby, which is generally chosen to relieve pain in patients with lateral stenosis.<sup>29</sup>

Factors other than physical therapy interventions may have influenced this patient's outcome. Treatment began one month post exacerbation of her chronic low back pain symptoms, which may have factored into the outcomes. The patient had a decrease in activity due to increase of pain in her lower back, possibly causing a decrease in strength and ROM. The patient also received a lumbar epidural injection between weeks 2 and 3 of treatment. Prior to the epidural, the patient was making significant gains when it came to decreasing pain level, but after the injection, she experienced an increase in pain symptoms, possibly causing the fluctuation of scores on the NPRS during weeks 2 through 5; represented in Figure 1. The increase in pain included a peripheralization into her left lower extremity similar to the symptoms found at the initial evaluation. The cause of this increase in pain could have been due to the herniated disc. There was a change in interventions post injection. The focused returned to decreasing pain, as opposed to increasing strength and ROM, which included an increase in modalities used

There were limitations presented in this case report. This is a single case report so no generalizations or conclusions can be reported about the results found. The patient also received other treatments outside of physical therapy including an epidural steroid injection into her lumbar spine and pain medications, which could have affected the outcomes.

Suggestions for future research may include studies comparing different modes of treatment such as muscular strengthening exercises and aerobic exercises and comparing them to each other to see which produces superior outcomes.

## **REFERENCES**

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## APPENDIX A

Session	Modalities	Lumbar Extension Exercises <sup>24</sup>	Lower Extremity Strengthening <sup>24</sup>	Upper Extremity Strengthening <sup>24</sup>	Postural Control Exercises <sup>26</sup>	Aerobic Training <sup>24</sup> <sub>26</sub>	Traction/ Positional Distraction
1	IFC with moist heat x 15 minutes <sub>23</sub>						
2	Moist heat x 10 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating hip extensions x 20 reps	Calf stretching x 2 minutes Long arc quads 10# x 20 reps Hip abduction 40# x 20 reps Seated leg curls 10# x 20 reps	Overhead pull down 10# x 20 reps Rows 10# x 20 reps			Intermittent pelvic traction 60#/40# with moist heat 60 sec/20 sec x 15 minutes <sup>24</sup>
3	Moist heat x 10 minutes IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating hip extensions x 20 reps	Calf stretching x 2 minutes Long arc quads 10# x 20 reps Hip abduction 40# x 20 reps Seated leg curls 10# x 20 reps	Overhead pull down 10# x 20 reps Rows 10# x 20 reps Lat pull downs 20# x 20 reps			
4	Moist heat x 10 minutes IFC with moist	Prone on elbows x 2 minutes Prone press ups x 20	Calf stretching x 2 minutes Long arc quads 10# x 20 reps	Overhead pull down 10# x 20 reps Rows 10# x 20 reps			

	heat x 15 minutes	reps Prone alternating hip extensions x 20 reps	Hip abduction 45# x 20 reps  Seated leg curls 15# x 20 reps	Lat pull downs 20# x 20 reps			
5	Moist heat x 10 minutes IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating hip extensions x 20 reps	Calf stretching x 2 minutes  Long arc quads 10# x 20 reps  Hip abduction 45# x 20 reps  Seated leg curls 15# x 20 reps	Overhead pull down 10# x 20 reps  Rows 10# x 20 reps  Lat pull downs 20# x 20 reps			
6	Moist heat x 10 minutes IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating hip extensions x 20 reps	Calf stretching x 2 minutes  Long arc quads 10# x 20 reps  Hip abduction 55# x 20 reps  Seated leg curls 15# x 20 reps	Overhead pull down 10# x 20 reps  Rows 10# x 20 reps  Lat pull downs 25# x 20 reps	Total Back Table (Picture 1)  0# x 20 reps each in prone position Shoulder Extensions Scapular Retractions Horizontal abduction Flexion at 110° abduction		

					n		
7	Moist heat x 10 minutes IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating hip extensions x 20 reps	Calf stretching x 2 minutes Long arc quads 10# x 20 reps Hip abduction 55# x 20 reps Seated leg curls 15# x 20 reps	Overhead pull down 10# x 20 reps Rows 10# x 20 reps Lat pull downs 25# x 20 reps	Total Back Table 0# x 20 reps each in prone position Shoulder Extensions Scapular Retractions Horizontal abduction Flexion at 110° abduction		
8	IFC with cold pack x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating hip extensions x 20 reps	Calf stretching x 2 minutes Long arc quads 15# x 20 reps Hip abduction 55# x 20 reps Seat leg curls 20# x 20 reps	Overhead pull down 12.5# x 20 reps Rows 12.5# x 20 reps Lat pull downs 25# x 20 reps	Total Back Table 1# x 20 reps each in prone Shoulder Extensions Scapular Retractionns Horizontal abduction Flexion at 110°	Treadmill walking speed 2.0 x 5 minutes	



					abduction		
9	IFC with moist heat x 15 minutes		<p>Calf stretching x 2 minutes</p> <p>Long arc quads 15# x 20 reps</p> <p>Hip abduction 55# x 20 reps</p> <p>Seated leg curls 10# x 20 reps</p>			Treadmill walking speed 2.5 x 5 minutes	Right side-lying positional distraction using bolster applying overpressure to spinous processes L1-L5 <sup>27</sup>
10	<p>Moist heat x 10 minutes</p> <p>IFC with moist heat x 15 minutes</p>	<p>Prone on elbows x 2 minutes</p> <p>Prone press ups x 20 reps</p>	<p>Long arc quads 15# x 20 reps</p> <p>Hip abduction 55# x 20 reps</p>	<p>Overhead pull down 12.5# x 20 reps</p> <p>Rows 12.5# x 20 reps</p> <p>Lat pull downs 25# x 20 reps</p>			
11	<p>Moist heat x 10 minutes</p> <p>IFC with moist heat x 15 minutes</p>	<p>Prone on elbows x 2 minutes</p> <p>Prone press ups x 20 reps</p>	<p>Calf stretching x 2 minutes</p> <p>Long arc quads 15# x 20 reps</p> <p>Hip abduction 55# x 20 reps</p> <p>Seated leg curls 10# x 20 reps</p>	<p>Overhead pull down 12.5# x 20 reps</p> <p>Rows 12.5# x 20 reps</p> <p>Lat pull downs 25# x 20 reps</p>	<p>Total Back Table</p> <p>0# x 20 reps each in prone</p> <p>Shoulder Extensions</p> <p>Scapular Retractions</p> <p>Horizontal abduction</p> <p>Flexion</p>		

					at 110° abduction Pushups		
12	Moist heat x 10 minutes IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps	Calf stretching x 2 minutes Long arc quads 15# x 20 reps Hip abduction 55# x 20 reps Seated leg curls 10# x 20 reps	Overhead pull down 12.5# x 20 reps Rows 12.5# x 20 reps Lat pull downs 25# x 20 reps	Total Back Table 0# x 20 reps each in prone Shoulder Extensions Scapular Retractions Horizontal abduction Flexion at 110° abduction Pushups		
13	Moist heat x 10 minutes IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps	Calf stretching x 2 minutes Long arc quads 20# x 20 reps Hip abduction 55# x 20 reps Seated leg curls 10# x 20 reps	Overhead pull down 12.5# x 20 reps Rows 12.5# x 20 reps Lat pull downs 25# x 20 reps	Total Back Table 1# x 20 reps each in prone Shoulder Extensions Scapular Retractions Horizontal abduction		

					n Flexion at 110° abductio- n Pushups		
14	Moist heat x 10 minutes  IFC with moist heat x 15 minutes	Prone on elbows x 2 minutes  Prone press ups x 20 reps	Calf stretching x 2 minutes  Long arc quads 20# x 20 reps  Hip abduction 55# x 20 reps	Overhead pull down 12.5# x 20 reps  Rows 12.5# x 20 reps  Lat pull downs 25# x 20 reps	Total Back Table  1# x 20 reps each in prone Shoulder Extensio- ns Scapular Retractio -ns Horizont- al abductio- n Flexion at 110° abductio- n Pushups		
15	Moist heat x 10 minutes	Prone on elbows x 2 minutes  Prone press ups x 20 reps	Calf stretching x 3 minutes  Long arc quads 30# x 20 reps  Hip abduction 55# x 20 reps  Seated leg curls 15# x 20 reps	Overhead pull down 12.5# x 20 reps  Rows 12.5# x 20 reps Lat pull downs 30# x 20 reps	Total Back Table  2# x 20 reps each in prone Shoulder Extensio- ns Scapular Retractio -ns Horizont-	Treadm- -ill walking speed 1.0 x 8 minutes	

					al abductio- n Flexion at 110° abductio- n Pushups		
16	IFC with moist heat x 15 minutes		Calf stretching x 3 minutes  Long arc quads 30# x 20 reps  Hip abduction 55# x 20 reps	Overhead pull down 12.5# x 20 reps  Rows 12.5# x 20 reps  Lat pull downs 30# x 20 reps	Total Back Table  3# x 20 reps each in prone Shoulder Extensions Scapular Retractions Horizontal abduction Flexion at 110° abduction Pushups	Treadmill walking speed 1.0 x 8 minutes	
17	Moist heat x 10 minutes	Prone on elbows x 2 minutes  Prone press ups x 20 reps	Calf stretching x 3 minutes  Long arc quads 30# x 20 reps  Hip abduction 60# x 20 reps	Overhead pull down 15# x 20 reps  Rows 15# x 20 reps  Lat pull downs 30# x 20 reps	Total Back Table  3# x 20 reps each in prone Shoulder Extensions Scapular Retracti-	Treadmill walking speed 1.0 x 8 minutes	

					ons Horizontal abductio- n Flexion at 110° abductio- n Pushups		
18	Moist heat x 10 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps	Calf stretching x 3 minutes Long arc quads 30# x 20 reps Hip abduction 60# x 20 reps	Overhead pull down 15# x 20 reps Rows 15# x 20 reps Lat pull downs 30# x 20 reps	Total Back Table 3# x 20 reps each in prone Shoulder Extensio- ns Scapular Retracti- ons Horizont- al abductio- n Flexion at 110° abductio- n Pushups	Tread- mill walking speed 2.0 x 9 minutes	
19	Moist heat x 10 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating leg extensions	Calf stretching x 3 minutes Long arc quads 30# x 20 reps Hip abduction 60# x 20 reps	Overhead pull down 17.5# x 20 reps Rows 17.5# x 20 reps Lat pull downs 30# x 20 reps	Total Back Table 3# x 20 reps each in prone Shoulder Extensio- ns	Tread- mill walking speed 2.0 x 9 minutes	

		x 20 reps			Horizontal abduction Flexion at 110° abduction Pushups		
20	Moist heat x 10 minutes	Prone on elbows x 2 minutes Prone press ups x 20 reps Prone alternating leg extensions x 20 reps	Calf stretching x 3 minutes Long arc quads 30# x 20 reps Hip abduction 60# x 20 reps	Overhead pull down 17.5# x 20 reps Rows 17.5# x 20 reps Lat pull downs 30# x 20 reps	Total Back Table 3# x 20 reps each in prone Shoulder Extensions Scapular Retractions Horizontal abduction Flexion at 110° abduction Pushups	Treadmill walking speed 2.0 x 9 minutes	

Picture 1: Total Back Table



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