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Physical Therapy Management for Chronic Neck and Intrascapular Pain with Upper Extremity Tingling and Headaches: A Case Report

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PHYSICAL THERAPY MANAGEMENT FOR CHRONIC NECK
AND INTRASCAPULAR PAIN WITH UPPER EXTREMITY
TINGLING AND HEADACHES- A CASE REPORT

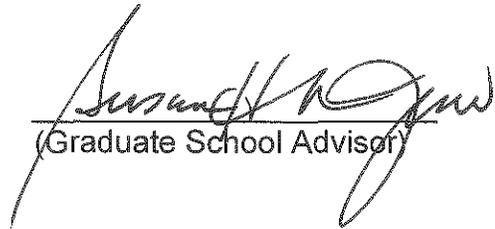
By

Tonya Kunze
Master of Physical Therapy
University of North Dakota, 2003

A Scholarly Project Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine and Health Sciences
University of North Dakota
in partial fulfillment of the requirements for the degree of
Doctor of Physical Therapy

Grand Forks, North Dakota
December, 2007

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


(Graduate School Advisor)


(Chairperson, Physical Therapy)

PERMISSION

Title Physical Therapy Management of Chronic Neck and
Intrascapular Pain with Upper Extremity Tingling and
Headaches

Department Physical Therapy

Degree Doctor of Physical Therapy

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ABSTRACT

In the US, it is estimated that there are 1 million new cases of whiplash type injuries annually. There is plenty of discussion regarding the treatment for these injuries but there is limited research using Med-X spinal strengthening machines to treat this type of chronic spinal pain associated with these whiplash type injuries. The patient chosen for this study sustained these type of chronic symptoms due to a motor vehicle accident 13 years prior and had struggled with these symptoms on and off since the accident. The purpose of this study was to determine whether a 56 y/o female that presented with chronic recurrent neck, upper back and intrascapular pain as well as headaches and left arm numbness over the past 13 years could recover using these specialized Med-X exercise equipment over the course of 12 weeks. The Med-X equipment is specialized exercise equipment designed to specifically target spinal muscles. At the completion of the 12 week program the patient had made excellent objective as well as subjective changes due to the strength gained through the use of the Med-X machines. The use of these machines to treat chronic spine pain could revolutionize the way physical therapists treat chronic spinal pain.

CHAPTER 1

INTRODUCTION

The patient is a 56 y/o female that presented to the clinic on May seventeenth, two thousand and five for recurrent neck, upper back and intrascapular pain as well as headaches and left arm numbness. The patient had sustained these injuries in 1993 due to being rear-ended in a motor vehicle accident (MVA). Prior to the patients MVA, she had mild migraines as well as neck pain that had been treated with short term chiropractic care. Immediately following her accident she was treated with chiropractic care but had reduced her visits to three to four times a year. In the month prior to her presentation to the clinic, the patient's pain had increased and she had started seeing her chiropractor two to three times a week without much relief in her symptoms. Based on the physician's initial evaluation the diagnosis from the physician was non specific cervical and thoracic spine pain, headache and deconditioning syndrome. The PT practice pattern was 4F Impaired joint mobility, motor function, muscle performance, range of motion, and reflex integrity associated with spinal disorders. Based on this diagnosis, it was recommended that the patient complete a 12 week active rehabilitation program that specifically targeted strengthening the spinal muscles.

This patient was married with 2 adult children no longer living at home. The patient had not worked since her MVA and was no longer employed outside of the home. The patient had also dealt with this pain for over 10 years with

multiple interventions prior to being seen at this facility so her prognosis was fair based on this as well as her high Oswestry score of 62. The Oswestry is a questionnaire that concerns impairments like pain, and abilities like personal care, lifting, reading, driving, and recreation.¹ For each section, subjects choose the statement that best describes their status. Total scores can range from 0 (highest level of function) to 50 (lowest level of function). Disabilities can then be ranked based on a percentage as follows.¹ 0% to 20% - minimal disability, 20% to 40% - moderate disability, 40% to 60% - severe disability, 60% to 80% - crippled, and 80% to 100% - bed bound (or exaggerating symptoms). Again the patient had a initial score of 62 which indicates a severe perceived disability.

In the last 10 years, the incidence of neck pain following a whiplash type injury has increased dramatically.² In the US it is estimated that there are 1 million new cases with this type of injury annually.² This was the type of injury sustained by this patient. There is a lot of discussion regarding the treatment of whiplash type injuries however, there is limited research regarding using Med-X machines to treat cervical pain. In fact when looking under PubMed, when looking for exercise to treat a whiplash type injury, only 54 articles were available compared to over 800 for general treatment of whiplash type injury. Only 4 of those articles discussed using Med-X machines to treat chronic spine pain with only 2 articles pertaining specifically to the cervical spine. One of the studies discussed 3 different treatment options for chronic neck pain. Patients were treated with either spinal manipulation alone, spinal manipulation along with low tech rehabilitative exercise using traditional upper body strengthening and then

the final group was assigned to the Med-X strengthening alone.³ The results of this study demonstrated an advantage of spinal manipulation combined with low-tech rehabilitative exercise and Med-X rehabilitative exercise versus spinal manipulation alone in the lasting reduction of pain symptoms over two years and are similar in magnitude to those observed after one-year follow-up. These results suggest that treatments including supervised rehabilitative exercise should be considered for chronic neck pain sufferers³ in that their symptoms were reduced for a longer period of time.

It has not been possible to determine a definite etiopathological pathway in causation of whiplash injury.² This is largely due to the fact that a whiplash injury is determined by several factors, namely, energy of the trauma, direction of force, biomechanics, preparedness for the injury, social awareness, psychosocial attributes, and medical aspects.² Based on this patient's PT diagnosis and according to the Guide to PT practice, the expected number of visits would be 8 to 24.⁴ Based on this, the patient was scheduled to complete a 12 week active rehabilitation program consisting of two visits per week. Due to the fact that the patient had an initial Oswestry score of 62 which rates as a high rate of perceived disability as well as utilizing multiple interventions prior to this intervention session her prognosis was fair. The patient's goal upon completion of the program was to achieve some level of functional improvement and it was felt that she could gain some level of functional improvement in the long term.

In the past this patient had utilized chiropractic care for her neck pain and headaches. According to a study done in Canada, patients that utilized their

general practitioner as well as chiropractic care immediately following a motor vehicle accident had a slower rate of recovery versus patients who only utilized their general practitioner sparingly following an accident.⁵ Essentially, the patients that did virtually nothing for their symptoms had a better recovery than those who continued to utilize the medical system, specifically chiropractic care. For some patients, the use of chiropractic care can completely eliminate their symptoms, for this patient however, her symptoms kept returning. Another study reviewed the literature regarding the treatment options for neck pain showed moderate evidence that dynamic and isometric resistance exercises were effective in the treatment of chronic neck conditions.⁶ Based on the results of this study, it was felt that an isometric resistance exercise program would be most effective for this patient.

CHAPTER II

CASE DESCRIPTION

Examination, Evaluation and Diagnosis

This patient presented to the clinic with her chief complaint being neck and upper back pain. She also complained of intermittent left arm numbness and headaches. The patient described difficulty with activities of daily living such as washing her hair, reading and sewing. She also complained that her neck frequently "went out" where she was unable to move her neck for up to 2 days. She found it helpful to stretch but it only helped reduce the severity of the symptoms and did not relieve them completely. The patient first experienced these symptoms following an MVA in 1993. Her symptoms had lessened over time but when she presented to the clinic on May seventeenth, two thousand and five, her symptoms had been increasing for the past month. The patient was rear ended in 1993 at a low rate of speed. Prior to the accident, her past medical history included migraine headaches and some mild neck pain.

This patient is a 56 year old female who is married and has 2 adult grown children that no longer live at home. She was able to care for herself and her home but she did describe difficulty with washing her hair, reading and sewing. Her husband raced cars on the weekend and the patient helped in the pit checking tire temperatures and recording lap times. Due to her symptoms she had a difficult time reading tire temperatures and could not close the trailer door. Prior to the accident she worked as a cake decorator but she had not worked in this capacity since 2 weeks after the accident. She had a 10 year history of hypertension and in 2002 she had right knee replacement surgery. Some

concerns regarding this patient were that she had sought care for this condition for over 12 years and also had an initial Oswestry score of 62 which represents severe disability. She also had engaged in litigation immediately following the accident but she lost the case. Typically patients that are involved in litigation have poorer results from therapy.⁶

Prior to coming to the clinic, the patient had only sought care from her family doctor and chiropractor. She was given pain pills by her doctor and her chiropractor used ice, heat, ultrasound, and electrical stimulation in addition to the spinal adjustments. She had also been given stretching exercises by her chiropractor that entailed flexion, extension, rotation and side-bending of the neck. The specific type of spinal manipulations used by the chiropractor for this patient were unknown at the time of referral to physical therapy.

This patient had goals of being able to sew without neck pain, she wanted to be able to help her husband with his racing, read the tire temperatures and close the trailer door. She also wanted to function without being frightened that her neck would "go out".

This patient was currently taking Lisinopril, Protonia, Lipitor and Amitriptyline. The ACE inhibitors and the anti-depressant may combine to produce clinically significant hypotension which would be observed in the client during positional changes. Another side effect of HMG-CoA inhibitors (i.e. Lipitor) is rhabdomyolysis. This is a rare side effect but the signs and symptoms are musculoskeletal in nature resulting in complaints of generalized myalgia which does not respond to PT intervention.⁷ Had this patient not responded to the

treatments in the first 3 to 6 weeks, it would have been appropriate to refer her to her primary physician to assess if her symptoms were possibly due to the side effects of her medication.

During the initial evaluation this patient rated her pain as a 5/10 based on a 10 point scale with 0 being no pain and 10 being the pain regarding medical attention. Upon observation of her posture she had slightly rounded shoulders as well as slight forward head. There was no evidence of scoliosis. She had normal thoracic kyphosis and lumbar lordosis. The patient also noted tenderness upon palpation in the left paracervical and bilateral trapezius muscle. The patient had normal range of motion in both shoulders. Range of motion measurements for rotation of the cervical spine were performed by inclinometer and are shown in Table 1. Range of motion measurements for flexion and extension of the cervical spine were performed using a tape measure and are shown also in Table 1. In a study done in 2005, the use of the inclinometer was intra-rater reproducibility and the inter-rater reproducibility were good.⁸

Table 1. Initial Cervical range of motion

| | |
|----------------|---------------------------------------|
| Neck Flexion | Lacks 6 cm from flexing chin to chest |
| Neck Extension | 17 cm from chin to sternal notch |
| Side Bend | 30° both right and left |
| Rotation | 45° (right), 40° (left) |

The patients cervical myotomes were tested and all were strong bilaterally. There was a series of special tests performed as well. The neck compression test was performed and caused an increase in neck pain. Neck distraction was performed and caused a decrease in neck pain. A study performed in 2007 that compared

the sensitivity and specificity of tests in the diagnosis of a disc prolapse demonstrated that the distraction test was moderate in sensitivity and high in specificity.⁹ While performing the Spurling's maneuver, there was no change in arm symptoms. In a research study done in 2004 on the reliability of a soft disc prolapse using Spurling's test, the authors concluded that the test is moderately sensitive and can be used as a predictor of a soft cervical disc prolapse.¹⁰ This test can also be used to confirm a diagnosis of disc prolapse with radiculopathy. The interexaminer reliability of the neck distraction test has been identified as "good", with a specificity of 100% and a sensitivity of 40%.¹⁰ However, it is highly specific for radicular pain and for neurologic and radiologic signs of radiculopathy from cervical disc disease.¹¹ Due the fact that the patient's upper extremity symptoms did not change during the test, it would be appropriate to believe that the symptoms were not due to a disc prolapse. A brief review of systems was also performed with the heart rate, respiratory rate and blood pressure all being within normal limits for the patients age. The integument system and neuromuscular system were grossly reviewed with no significant deficits noted. The patient displayed an ability to communicate with proper orientation to time and place. The review was performed to assist in identifying any other possible problems that would require consultation or referral to another provider.⁴

Initial evaluation data revealed that the patient did not appear to have a cervical disc syndrome nor any shoulder tendonitis or bursitis. The patient did appear to have non-specific cervical spine pain, headache syndrome, tight muscles and deconditioning secondary to the inability to sustain muscle

endurance during functional activities such as sewing and reading. Since the patient had tried multiple passive therapies prior to this PT event, strengthening appeared to be the patient's best treatment option since she had not tried this type of approach prior to treat her chronic symptoms. This patient's symptoms were very chronic in nature. She had dealt with these issues off and on over the past 13 years. To this patient her perceived level of disability was severe even though she would come into the clinic and appear to be functioning well and be able to converse easily, smile and interact appropriately.

The patient's functional impairments included decreased strength and decreased mobility which led to functional limitations of an inability to look down for extended amounts of time as well as an inability to work overhead. She was also frightened to do too much physical activity due to the fact that in the past when she did, her neck would often "go-out". Based on this patient's initial evaluation and functional limitations the patient's PT Practice Pattern from the Guide to Physical Therapy Practice was 4F Impaired Joint Mobility, Motor Function, Muscle Performance, Range of Motion and Reflex Integrity associated with Spinal Disorders.⁴ The patient's ICD-9 Codes were 723.1 Non specific cervical spine pain, 724.1 Non specific thoracic spine pain, 784 Headaches and 728.2 Deconditioning syndrome.⁴

Prognosis and Plan of Care

The patients prognosis is good, in that over the course of 3 months, the patient will demonstrate optimal muscle strength, range of motion and the highest level of functioning in home, community and leisure activities.⁴ The

patient's short term goals that were to be met in 6 weeks included: 1) The patient will demonstrate an increase in cervical ROM, cervical strength and decrease in pain and frequency of headache's by 50%, 2) decrease frequency of left upper extremity tingling by 50% and tolerate repetitive cervical flexion for 30 min in order to sew. Long term goals that were to be met in 12 weeks included: 1) Normal cervical ROM, 2) double cervical strength in the Med-X machines, 3) 75% reduction in headache's and pain, 4) no occurrence of left upper extremity tingling and 5) tolerate repetitive flexion in order to tolerate sewing and reading. It was expected that this patient would be able to double her strength at discharge and increase her ROM to normal. I was reluctant to think that she would have a complete reduction in her pain since it was so chronic in nature, thus why I did not have complete resolution of pain as a goal. I felt based on all the facts gathered that she would be able to meet these goals.

Intervention

This patient was seen in physical therapy twice a week for 12 weeks for approximately 30 minute sessions. During each session the patient performed a warm-up for 5 minutes at 90 RPM's on a UBE seated to patient comfort . Following that the patient performed stretches for cervical flexion/extension/rotation/side bend and cervical retraction. She also stretched her mid back with the cat/camel stretch. After the patient had warmed up and was stretched out, she continued to exercise using the specialized Med-X exercise equipment for cervical extension and rotation as well as thoracic rotation. The Med-X machines are medical rehab exercise equipment that was

developed by Arthur Jones, the founder of Nautilus.¹¹ The Med-X cervical extension machine isolates the cervical spinal musculature by restraining the shoulders to prevent any additive strength from the trunk musculature.¹¹ The head is also weighed and counterbalanced to negate the effects of gravity.¹¹ It has been proven to be highly reliable for cervical extension strength testing and dynamic variable resistance training.¹¹ Isometric testing can be performed every 3° through the normal 126° range of motion in the machine.¹¹ Safety features for it include dual weight stacks with a stroke length of only 1.5 in. during a full-range dynamic contraction.¹¹ The cervical rotation machine isolates by restraining the shoulders and pads are adjusted and tightened around the face. The weights are lifted by pushing against those pads that surround the face.¹¹ The thoracic rotation machine restrains the lower extremity so that the patient may only use the upper thoracic and abdominal musculature.¹¹ Neither the cervical or thoracic rotation machines can perform strength testing.¹¹ Pictures of the following machines follow in Figures 1,2 and 3.

Figure 1. Cervical Extension

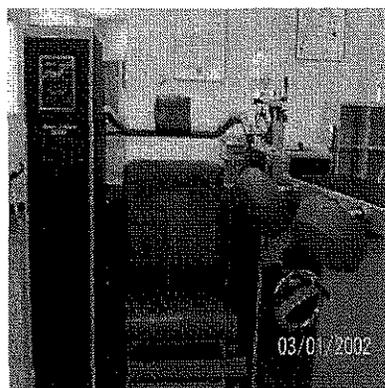


Figure 2. Cervical Rotation**Figure 3. Thoracic Rotation**

One time a week the patient performed a “Max” workout on each of the Med-X machines. A “Max” workout is defined as doing one set of 20 to 30 repetitions to a maximum fatigue level. The patient’s first “Max” workout on the cervical extension machine was 81 in/lbs. Each week the patients weights were increased 10% as long as she had been able to complete 20 reps the previous work out. If she did a “Max” in cervical rotation, she would then perform 60% of her last max work out in the cervical extension machine defined as a “Sub-max” workout. She performed a Max cervical extension and thoracic rotation work out on the same days. The patient’s attended physical therapy twice a week, so on

one visit the patient did a "Max" cervical extension and "Max" thoracic rotation workout and on the other she performed a "Max" cervical rotation and a "Sub-max" cervical extension work out. Each visit she also performed lat pull downs, rows and shrugs. On the auxiliary equipment she performed 2 sets of 15 repetitions of each exercise each session. 2 sets of 15 repetitions was chosen to increase her endurance and it was a fatiguing workout for those muscles. Her auxiliary equipment weights were increased when they were no longer challenging as reported by the patient.

The choice to treat this patient using an aggressive exercise program was based on the fact that the patient had already completed prior passive therapy with minor success. After 12 years of guarding her neck, it was felt that the patient had underlying weakness due to the fact that she could not tolerate functional activities that required her to spend an amount of time in repetitive flexion. It was also felt she needed to retrain her muscles to function again properly. the choice to use the Med-X machines was due to the fact that they have been shown to be safe and viable for the treatment of chronic cervical spine pain.¹² A study done in 1992 demonstrated that patients who used the Med-X cervical extension machine over an 8 week time frame, similar to the way my patient was treated, showed significant gains in average strength and ROM and they also reported a decrease in perceived pain.¹² This was the basis for the program established for this patient and the anticipated result of this intervention.

Another study utilizing the Med-X rehab equipment demonstrated the positive outcomes associated with the equipment. This study was done to

determine if patients that were recommended for spinal surgery could avoid it through an aggressive strengthening program using the Med-X machines.¹³ A group of 60 patients that were recommended for surgery were enrolled in the study.¹³ Of the 60 only 46 completed the program due to drop out. Forty four percent rated their outcome as excellent, 36% as good, 11% as fair and 8% as poor.¹³ The subjects' had strength gains that ranged anywhere from 62% to 134%.¹³ Now, at the time of treatment my patient did not require surgery but it does show how this type of therapy is effective.

The only home instruction the patient was given was to continue to perform her stretches everyday, once a day at home on her own. Towards the end of the program, the patient was instructed in a home exercise program. There was no need for referral to other disciplines due to the fact that in the first 3 weeks the patient was showing improvement. If she had not, a possible referral to a pain clinic may have been necessary since the patient had tried other therapies in the past. Every 3 weeks the patient's ROM as well as strength was assessed with the results being shown in Table 2. Also every 3 weeks her functional limitations were addressed to see if any improvements were made. At the 3 week mark of rehab the patient reported that her headache pain had resolved and that her neck no longer "went out". She also pulled down the trailer door with only a mild increase in pain. At 6 weeks the patient was able to sew for about a half an hour. At 9 weeks the patient read a book for an hour before taking a short break. At 12 weeks the patient had no difficulty with reading or sewing and was able to close the steel door on her husband's trailer without any

neck pain. She could also read tire temperatures without any increase in neck pain.

Outcomes at Discharge

At the completion of the 12 week program the patient had made excellent objective as well as subjective improvements in her functional abilities. The patient was able to sew, read and wash her hair without complaints of neck pain. The patient was also able to help her husband with his race team and read tire temperatures and close the trailer door without difficulty. At the beginning of the program the patient had only 39° of motion in the cervical extension machine with 126° being normal. She could only lift 54 in/lbs in the machine with the average strength of most women being between 180 in/lbs and 240 in/lbs depending on the patients size and weight. The following table, Table 2, shows the progression of the patients weight and range of motion in the program in the Med-X machines.

Table 2. Progression of Program

| | Initial weight (ROM) | 3 weeks | 6 weeks | 9 weeks | 12 weeks |
|--------------------|----------------------|------------------|-------------------|-------------------|--------------------|
| Cervical Extension | 54 in/lbs 39° | 99 in/lbs 63° | 135 in/lbs 78° | 186 in/lbs 93° | 240 in/lbs 102° |
| Thoracic Rotation | 12 ft/lbs 48° | 23 ft/lbs 60° | 32 ft/lbs 60° | 45 ft/lbs 72° | 61 ft/lbs 84° |
| Cervical Rotation | NA | 20 in/lbs 72° | 30 in/lbs 72° | 42 in/lbs 84° | 60 in/lbs 96° |

Besides the patient having improved her range of motion in the Med-X machines her cervical range of motion also increased as shown in Table 3.

Table 3. Cervical ROM at Initial and Final Evaluation

| | Initial | Discharge |
|----------------|----------------------------------|----------------------------------|
| Neck Flexion | Lacks 6 cm from chin to chest | Lacks 2 cm from chin to chest |
| Neck Extension | 17 cm from chin to sternal notch | 19 cm from chin to sternal notch |
| Side Bend | 30° both right and left | 50° both right and left |
| Rotation | 30° both right and left | 85° both right and left |

The patient no longer reported tenderness in the left paracervical and bilateral trapezius muscles and neck compression caused no pain. The patient also initially filled out a Oswestry Neck Disability index with her initial score being 62. At discharge the patient reported her score as 2, a vast improvement. She was also asked to give her overall satisfaction and she rated it on a scale of 1 to 5 with 5 being very satisfied, she rated it a 5 with two extra plus signs drawn in. She stated that out of all the things that she had done for her neck this was the one thing that helped the most. She stated she wished she could have come to our clinic immediately following the accident.

Overall the patient had an excellent response to therapy. All of her short term goals were met with the exception of increasing her cervical extension and side bending by 50%. She nearly met all of her long term goals also except for

flexion where she lacked the ability to flex her chin to her chest. She doubled her cervical extensor strength. Her headaches were reduced by 90%. Since the fourth week in the program she had not experienced any left arm tingling. She was also able to sew for up to 2 hours before needing to take a break. The patient did not display any functional limitations at discharge. Since her husband owned a race team she also helped out with that. She was able to look down and check tire temperatures without difficulty. She also could close the door to the car trailer without difficulty which she stated she would not have even attempted prior to coming through the therapy program. Her neck had not "gone out" since she started treatment and she did not feel fearful of physical activity anymore. She was able to do everything, if not more, than she had done prior to coming through the program. In a study done using exercise and advice together and advice alone for patients that had sustained whiplash type injuries with symptoms persisting past 3 months, the group that received exercise and advice was more effective for subjects with higher baseline pain and disability.¹⁴ This was especially true for this patient. She was encouraged to gradually increase her normal activities throughout the program and told that at first she would be sore but that it would improve over time.

CHAPTER III

DISCUSSION/REFLECTION

Overall, this patient's outcome following physical therapy intervention was excellent. On the first day I saw her, I would not have thought that she would improve as greatly as she did due to her high initial Oswestry score and the chronicity of her symptoms. She greatly exceeded my expectations. This patient's results were comparable to the 2 studies already mentioned. She had a reduction in her pain, increased strength, and an increase in her functional abilities. A similar case study was done with a 60 year old male patient that injured his neck while lifting a 20 lb object. He tried passive therapy with minimal success. He had a MRI that showed severe disc degeneration at C 6-7 and was offered surgery but declined. He returned to work with light duty restrictions and pain medication however still experiencing pain. Following therapy using the same guidelines as were used with treating my patient, the patient's strength increased 270% in 8 weeks. His ROM improved 62% and he was able to work without pain medications or work restrictions.¹⁵

Med-X Machines are a very specific form of rehab exercise equipment designed to specifically strengthen spinal musculature. Prior to working at my current position, I had never heard of or utilized the Med-X machines. Now they are a mainstay in my practice. It is the only intervention I do to treat spinal pain. For many patients it can help stop the "revolving door" of patients having chronic recurrent spinal pain. Patients with prior injuries often have reoccurrences of pain when they increase their activity, lift something wrong , or do something as

simple as bending forward. The simple idea of strengthening that we as therapists use in every other area of our practice can now be applied to spinal care. I feel that the use of this equipment can revolutionize spinal treatment by lowering the cost of recurrent care and lowering the need for spinal surgery. As previously stated in the study done by Nelson et al¹³, 60 patients were recommended for spinal surgery. Of the 48 that completed the program, a follow-up 12-30 months after completion of the program identified that those patients that completed the program, only 3 needed surgery.¹³ In a time where insurance companies want objective as well as subjective gains to occur in order to reimburse, it is valuable to have information such as strength gains and decreased disability scores to prove the therapy you have chosen is the correct choice. It is also more cost effective when the aforementioned therapy costs roughly \$3000 versus \$170,000 for a lumbar fusion.¹³ Med-X equipment does cost a fair amount to purchase, the equipment runs roughly \$35,000 so it needs to be utilized on multiple patients to offset the cost.¹¹

Future studies involving the Med-X equipment should have a control group to determine if someone that has not had standard physical therapy could improve as much as someone doing aggressive spinal strengthening. It would also be beneficial to follow up on the patients that have completed the program to see if they continue to be symptom free or if they have had a reoccurrence of symptoms. Roughly one month after the patient was discharged, she was contacted and reported she continues to do well regarding her symptoms, however no follow-up has been done since.

Overall, I feel the patient had a positive outcome and is a good example of how patients can dramatically improve with aggressive spinal strengthening which should become a mainstay of spinal therapy. The algorithm regarding the evaluation and treatment of this patient is shown in Appendix A.

Based on this patient's results, I feel there are a few things that I would change if I had the chance to treat her again. While taking the patient's history, I would ask her for more specific functional activities that she was unable to do. I would also ask how long she could tolerate those activities in order to make goals that were more functional and specific to her limitations versus her range of motion and strength. I would obtain the records from the chiropractor or ask the patient to describe her chiropractic treatments more specifically. I would not change anything with the patient's examination because I performed a very complete evaluation and the findings I had led me to the correct treatment progression. As for the plan of care, the one change I would make would be the patient's goals. I would try to make the goals more objective such as giving her headaches a rating. I would also try to make the goals more functional since insurance companies are starting to rely more on functional limitations. I would like to have found more recent evidence on the reliability and validity of the Med-X machines. I also would have liked to have seen more case studies similar to mine using the Med-X machines to treat similar cervical conditions. Lastly, I would have referred this patient to a counselor to discuss her feelings regarding how her life changed after the accident. Many clinicians that saw this patient told her that her symptoms would be chronic, which I feel negatively impacted her

recovery. This patient may never be quite the same, but I believe that one needs to take ownership over their own recovery which I believe our clinic tries to accomplish.

This patient had excellent results with this therapy program. The cost of her initial evaluation was \$150. Each subsequent rehab visit cost \$156 as well as four additional recheck visits with the physician at our clinic with the cost of each recheck visit costing \$79. The total cost of the therapy program for this patient was \$4337. Her insurance covered \$3687 with the out of pocket cost to the patient being \$500. If this patient didn't have insurance, I am not sure if she would have paid that much for the therapy she received. The patient did comment that out of all the therapies she had tried, this was the most helpful, so perhaps she would have spent that much.

I do feel, however, that the cost that the patient did spend was reasonable to the outcome that she had. Her Oswestry score was lowered from a 62 to a 2 and she was also able to help her husband with his business which was the family business. The only thing that would have possibly lowered the patient's therapy cost would have been to have her only complete 9 weeks of therapy. The patient's weights were at a reasonable weight and she had almost complete resolution of her symptoms but I feel that the patient would have wanted to continue to get as strong as she could in order to get as much resolution of her symptoms as possible.

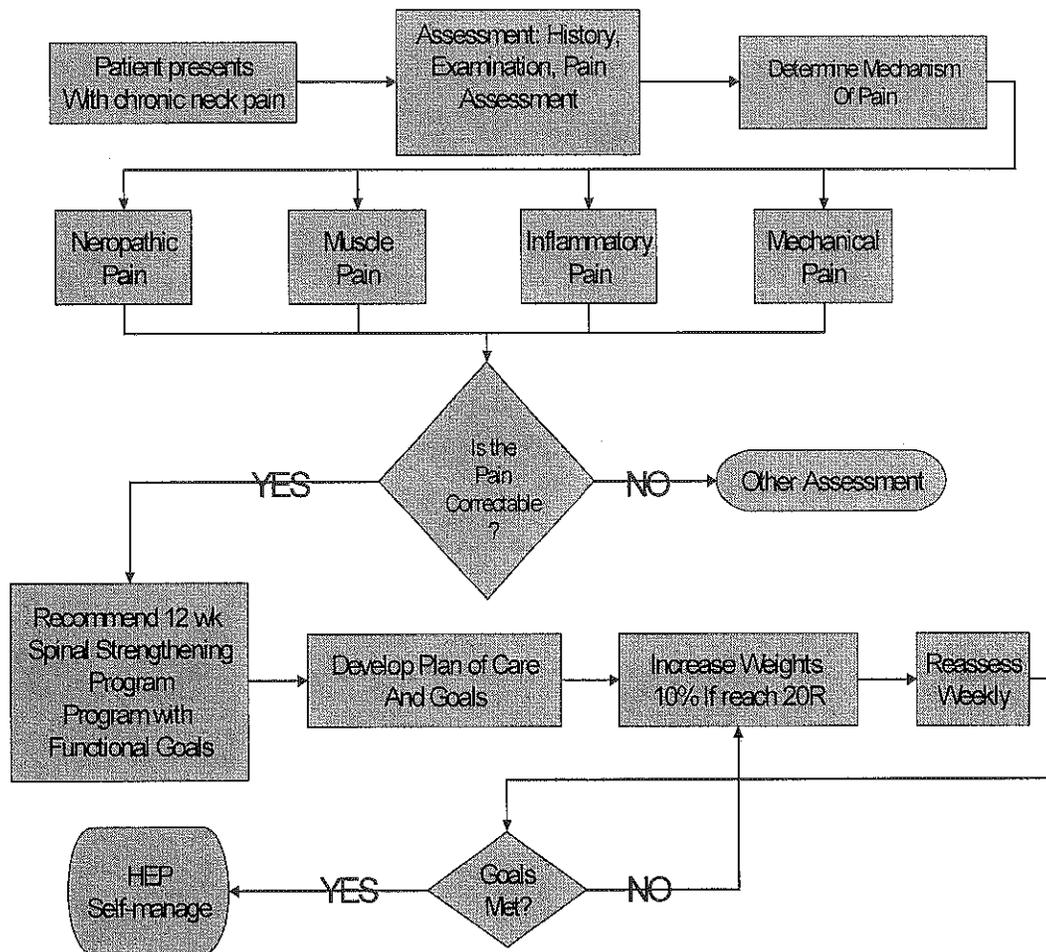
Overall this case study has helped develop my professional development. I saw this patient early on in my career at my current position. At

that time I had already developed some skepticism regarding patients that continued to focus on their symptoms for that long of a period of time. This patient taught me that patients can really be helped. I feel this type of therapy can help patients in this situation become more confident in their spines and are no longer afraid to try things because they know that they are strong. The patients realize that their spines can sustain them through more physically demanding activities. I truly enjoying this type of therapy and researching it gave me more perspective as to why we do what we do. It gave me more insight into how our clinic has developed the protocols that we use. It has also given me so much more interest into the Med-X corporation and the development of the machines. I greatly enjoyed this case study and it renewed my interest in my job as well as also keeping my positive attitude with my patients.

APPENDIX

Appendix A

Examination and Intervention Algorithm



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