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Psychologically informed strategies to improve expectations for post-operative return to function in a patient following cervical total disc replacement: a case report.

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Background and Purpose: Patient expectation is associated with clinical outcomes. Patient expectations can be modified by healthcare providers. The purpose of this study is to describe the implementation of psychologically informed practice strategies targeting expectation in a patient with low expectations for return to functional activities following cervical total disc replacement. **Case Description:** The patient was a 44-year-old male pharmacist referred to physical therapy 10 weeks after C4/C5 cervical total disc replacement (TDR). Prior to surgery the patient had a 4-year history of neck pain and impaired balance following an injury while working out at the gym. The patient presented with pain (3/10 on the numeric rating scale), functional limitations (38% on the neck disability index), impaired balance, posture, and upper extremity strength. Patient goals for therapy were to return to working out fully in the gym; however, he expected only a 50% improvement in his ability to function. The patient was treated for 13 visits over an 8-week episode. Treatment included standard interventions used by physical therapists to address the noted impairments. Additionally, the patient's expectations for treatment outcomes were addressed through graded exposure to activities for which he had identified low expectations, education regarding the likelihood of successful outcomes based on a review of a randomized controlled trial of patients with similar surgery, and re-enforcement of post-surgical x-rays demonstrating appropriate healing. **Outcomes:** The patient's expectations improved over the course of treatment to expecting 100% improvement in his ability to function. Improved expectations were associated with clinically meaningful improvements in both pain (0/10) and the neck disability index (20%) as well as meeting his goal of returning to working out at the gym. **Conclusion and Clinical Relevance:** Expectations are a modifiable psychological construct with a known association to clinical outcomes. We describe a patient in whom expectations were measured and specifically targeted as part of an overall physical therapy approach. Such an approach was associated with both improved expectations for recovery as well as clinically meaningful improvements in clinical outcomes suggesting a possible mediating effect of expectations on clinical outcomes perhaps worthy of further study.

Key Words: *patient expectations, physical therapy, Patient-Centered Outcomes*

INTRODUCTION

Neck pain is a common condition that presents a significant burden to United States employers according to a study of 276,364 employees from the Human Capital Management Services Research Database. Specifically, employees with a 6 month history of neck pain and neuropathic components have 182% higher average total annual health-related costs than healthy controls.[1] In patients with a single-level disc herniation, 32% continued to have pain after post-operative management requiring further utilization of healthcare. Based on the management costs of these patients, the authors estimate an additional cost of $493,383 per every 100 patients with single-level lumbar discectomy is required to manage low back pain after surgery.[2] A systematic review assessing current methods for conservative management of cervical radiculopathy found that no single method seems superior based on pain and disability outcomes at follow-up. The authors

state the pooled effect sizes for treatments of pain and disability (reported as Weighted Mean Difference) were small and not clinically meaningful.[3] Overall, the fact that many conservative interventions demonstrate similar efficacy suggests shared mechanisms underlying conservative interventions for cervical radiculopathy. Identifying modifiable patient factors to enhance the effect sizes of conservative treatment may improve clinical outcomes in management of neck pain in post-operative and non-operative populations.

Current literature supports patient expectation as a factor that has the capacity to influence clinical outcomes. In a population of adults receiving medical management for acute low back pain, expectation for recovery was associated with improved levels of function.[4] It has also been shown that high expectations for treatment were associated with lower disability and pain scores, as well as perceived effectiveness ratings.[5] Conversely, low expectations have been shown to increase the likelihood of poor outcome at 6 weeks (odds ratio = 3.24) in patients managed by physical therapists for neck pain.[6] Importantly, patient expectations tend to remain stable over time in the absence of purposeful interventions to modify them. One study observed no changes in expectation for treatment over an episode of outpatient therapy in patients presenting with musculoskeletal pain despite improved functional outcomes.[7] In a sample of patients reporting to primary care for low back pain, 80% demonstrated stable expectations for recovery over 3 months, regardless of their baseline level of expectation. However, the authors noted that patients in the "high expectations" cluster tended to have better outcomes at follow up.[8] Collectively, these studies suggest that physical therapists may need to directly intervene in order to improve patient expectations that are overly negative or unrealistic.

Several studies have demonstrated healthcare providers' ability to modify patient expectations. A cross-sectional study of neck/back and shoulder pain patients found a 1 hour consultation with a physical medicine and rehabilitation physician was sufficient to change expectations in 32% of patients on the Shoulder Outcome Expectancies (PSOE) questionnaire. Of these patients, 24% of patients reported increased expectations, and 9% reported decreased expectations.[9] A study assessing 12 month recovery expectations in patients scheduled for knee replacement surgery found that the addition of 15 minute educational modules to the standard pre-operative class, significantly lowered average expectations compared to the control group receiving only the standard class. Authors suggest the lowered expectations are due to patients adjusting to more realistic expectations regarding their post-operative recovery process.[10] Riley et al found that positive clinician communication can enhance patient's expectations for success of an intervention within minutes. In this study, patients were educated regarding thoracic manipulation for management of shoulder pain, with expectations for success recorded immediately before and after the instructional set. The group receiving the positive instructional set had significant increase in positive expectation for success compared to those who were given a neutral message.[11]

Although literature has established patient expectation as a modifiable factor in clinical outcomes, currently no studies describe implementation of strategies to directly modify patient treatment expectations by a physical therapist over the course of treatment. Therefore, the purpose of this study is to describe the implementation of psychologically informed practice techniques to improve expectations in a patient following cervical total disc replacement.

CASE DESCRIPTION

History

The patient was a 44 year-old healthy, married, right-handed male. The patient worked a sedentary job as a pharmacist. The patient was referred to physical therapy by his neurosurgeon approximately 10 weeks after a cervical total disc replacement (TDR) at level C4/C5 using Mobi-C disc, with a medical diagnosis of cervical disc disorder with radiculopathy in the mid-cervical region. The pre-operative MRI reported impression of moderate posterior disc bulge at C4/C5 with mild spinal cord impingement with possible tiny focal syrinx at mid C4 level, or focus of edema/myelomalacia. The patient presented with

upper extremity precautions of "no lifting, pushing, pulling more than 10lbs."

The symptoms began greater than 4 years ago while performing a sit-up at the gym. The patient stated he was "in denial" and did not seek treatment despite pain and feeling unbalanced when he walked. Approximately one year after the injury, patient sought treatment from an orthopedic physician due to worsening neck pain, and was informed he needed a surgery, but declined due to fear of surgery and poor confidence in the necessity of the surgery. Patient sought second opinion from neurosurgery approximately 4 years following the initial injury due to persisting symptoms. MRI results prompted neurosurgeon to strongly recommend surgical intervention. Patient received cervical TDR and was referred to physical therapy approximately 10 weeks after his surgery due to continued left lower extremity weakness, impaired balance described as "feeling drunk" while walking, and neck pain with prolonged positioning that disturbed his sleep and work.

The patient presented for his physical therapy evaluation with primary complaints of neck pain and stiffness, and impaired balance. He described shooting pain in the left upper and lower extremities, and dull neck soreness. Pain was worsened with cold weather, standing or sitting for prolonged periods, and mild activity. Pain was alleviated with rest, heat, and medications as needed. The patient reported inability to sleep without medications (diazepam, Flexeril, over the counter NSAIDs). An 11-item Numeric Pain Rating Scale (NPRS) was used to assess the patient's pain level with 0 = "no pain at all" and 10 = "worst pain you can imagine." The NPRS has excellent correlation with the Visual Analog Scale (VAS) of pain intensity (r=0.86)[13] and minimally clinically important difference (MCID) of 1 point in patients with chronic musculoskeletal pain.[14] The patient reported 0/10 current pain, 0/10 best pain, and 3/10 worst pain in the past 24 hours. Pain is reported in this case study as the average score of current, best, and worst pain ratings from the NPRS (Table 1). The Neck Disability Index (NDI) was administered as a measure of baseline disability; NDI = 38% disability. The NDI is a 10 item questionnaire. Each item is scored from 0 to 5 with the total score doubled to provide a percentage rating. Higher scores are indicative of higher perceived disability. The NDI has been shown to have no significant floor or ceiling effects, adequate test-retest reliability (ICC 5 0.97), standard error of measurement (SEM) of 2.9, and the minimal detectable change (MDC) of 3.1, as well as excellent construct validity for a diverse population with neck pain.[15]

Functionally, the patient stated he is fearful of "ruining his surgery" and reported being hesitant to perform any exercises or quick movements. Patient also reported he took 5 weeks off from work due to pain and stiffness with prolonged positioning at his desk and as a precaution to make sure he did not overexert himself. When asked to state his goals for therapy, he responded that he did not expect to return to gym activity, and that he would be "satisfied with being able to walk for exercise again, without discomfort or feeling off-balance." The patient further stated that he was getting "old" and did not expect to return to gym activity.

Of note, the patient reported history of motorcycle accident > 20 years ago in which he fractured the right wrist requiring open-reduction and internal fixation. Patient stated that the accident made him more prone to neck injury. Patient also reported his right hand weakness since the accident. The patient has since utilized his right hand for fine motor tasks and his left hand for tasks requiring increased grip strength.

Examination

Patient was observed sitting in waiting room with hands on his neck, and walked stiffly with minimal arm swing and trunk movement. When asked, the patient denied pain or feelings of instability in his neck, stating he holds his neck out of habit. The patient demonstrated significant rounded shoulder and forward head posture in standing and sitting with depressed left scapular complex. Stiffness in thoracic paraspinals and rhomboids, and increased tone and tenderness in bilateral upper trapezius was noted during palpation of these structures. Single leg balance was assessed in eyes open condition first (SL EO) followed by single leg balance with eyes closed (SL EC). SL EO was 17 seconds on the left and 28 seconds on the right. SL EC was 4

seconds on the left, and 8 seconds on the right. Therapists were unable to obtain cervical ROM due to patient discomfort and guarding at evaluation. Shoulder AROM in flexion and abduction were assessed using goniometer in standing at 120 degrees bilaterally in each plane, and are summarized in Table 1. Both grip strength and lateral pinch (key pinch) were measured in pounds of force using hydraulic dynamometers in seated with arm adducted and elbow at 90 degrees, hand grip set to middle (3rd) position, in neutral supination/pronation. Two trials were taken at each measurement, and highest score was recorded (Table 1). Light touch sensation intact to all four extremities. Deep tendon reflexes were normal at achilles, patellar, triceps, and brachioradialis tendons.

Outcome Measures

Patient Expectation: The Patient-centered outcomes questionnaire (PCOQ) was used to assess baseline (visit 1), midpoint (visit 7) and final (visit 13) patient expectations. The PCOQ was developed to assess the patient perspective of treatment goals for a chronic pain population.[16] This self-report questionnaire contains four domains: 1) pain, 2) fatigue, 3) emotional distress, and 4) interference with daily activities. Each domain is measured across five levels: 1) usual level, 2) desired level, 3) level expected after treatment, 4) level of treatment outcomes which would be considered successful, and 5) of importance for improvement in that domain.[17] Domains are measured using separate 101 point NPRS with 0 indicating none and 100 indicating the worst imaginable for usual, desired, successful, and expected levels, and 0 = not at all important and 100 = most important, for the importance of improvement level. Psychometric properties of PCOQ were assessed in people with chronic spinal pain and found to have good concurrent validity with pain and disability measures, acceptable test-retest reliability for usual levels in all domains (ICC = 0.84 to 0.90, $P < 0.001$), and significant correlation between usual levels of pain and the visual analog scale (VAS) of pain intensity ($r = 0.52$, $P < 0.001$).[18,19] The PCOQ subscale assessing the level of improvement expected after treatment was used to measure the patient's expectations for changes in pain and interference with daily activity in response to treatment. At baseline, the patient expectations included 100% improvement in his pain and only 37.5% improvement in his levels of interference with activities of daily living (ADLs).

Table 1. Musculoskeletal and subjective report measures.

Measure	Visit 1	Visit 7	Visit 13
NDI	38%	26%*	20%*^
NPRS (average)	1θ	0	0
Grip (left : Right)	70 : 55	100 : 75	105 : 82
Pinch (left : Right)	19 : 12	30 : 25	30 : 25
Single Leg Balance			
SL EO: (left : Right)	17 : 28	30 : 30 (maxed test)	30 : 30 (maxed test)
SL EC: (left : Right)	4 : 8	10 : 13	15 : 12
Shoulder AROM			
Flexion	120 bilateral	145 bilateral	175 bilateral
Abduction	120 bilateral	142 bilateral	170 bilateral
Subjective patient statement on expected functional recovery with therapy	Only expects improved neck pain and balance for comfortable/safe return to ADLs and walking	Believes healing will just take time, and he may eventually return to prior activities: "in about 1 year."	Has achieved majority of goals for return to ADLs, balance, and strength. Believes steady progress in higher level activities will continue after discharge.

*indicates changes from baseline measurement are greater than MCD

^ indicates changes from midpoint measurement are greater than MCD

θ indicates changes from baseline measurement are equal to or greater than MCID

Evaluation

Diagnosis

The patient's diagnosis for the medical record included impaired balance, cervical pain, and decreased UE AROM status post cervical TDR secondary to C4/C5 herniation with myelopathy. The patient presented with generalized deconditioning after surgery, cervical stiffness, increased muscle tone and guarding, and impaired single leg balance (left worse than right). Throughout the evaluation, the patient made statements that demonstrated doubt regarding his ability to return to gym exercises after therapy. Additionally, the baseline PCOQ scores revealed a clear discrepancy between patient's expected and desired levels of function in the domain of interference with ADLs. The patient's expectations for therapy were determined to be unrealistically low based on the patient's self-reported disability, general health, muscle tone, and movement quality.

Prognosis

The patient was considered a good candidate for physical therapy. A five year follow up study comparing single level TDR and anterior cervical discectomy and fusion (ACDF) showed TDR has no difference in adverse events, no significant difference in NDI scores between groups, and reported TDR had significantly lower rates of adjacent segment degeneration at the level above surgery than ACDF.[20] Subsequently, the presenting diagnosis suggested good to excellent clinical outcomes. However, our prediction for his prognosis was guarded due to the patient's apparent low expectations for improvements in function. Therefore, addressing low expectations using principles in psychologically informed practice was considered an important component of the plan of care in order to maximize clinical outcomes for this patient.

INTERVENTION

Musculoskeletal interventions

The patient was seen for 13 visits over an 8 week span. Sessions varied between 40 to 60 minutes in length. Interventions included standard interventions for cervical radiculopathy and chronic neck pain used by physical therapists with expectation modification strategies incorporated throughout the 8 week treatment period. Interventions included balance training, postural education, core stability, upper extremity strength and active range of motion, upper back and shoulder strengthening, manual proprioceptive neuromuscular facilitation (PNF) for scapular motor control, and soft tissue mobilization of upper and middle trapezius and levator scapula. Due to upper extremity precautions, early sessions and home exercise program (HEP) emphasized cardiovascular exercise, grip strengthening, postural re-education to correct forward head, rounded shoulders, and elevated scapula, PNF, sternocleidomastoid and pectoralis major and minor flexibility, and balance. At visit 11, the patient was given a comprehensive list of home exercises to establish a comfortable gym routine prior to discharge. Visit 12 and 13 emphasized diagonal patterns for simulation of functional activities in the home, such as yardwork, and overhead cleaning activities.

Psychologically Informed Techniques and Expectation Modification

Selected techniques described in the literature under the umbrella of psychologically informed physical therapist practice were implemented throughout the 8 week episode (see Table 2). Specifically, patient education, graded exposure, and optimistic discussion of prognosis were used with the intent to enhance the patient's expectations for return to functional activities and regular exercise after therapy. Between baseline and midpoint, psychologically informed techniques were incorporated as appropriate in response to specific patient statements or behaviors. For example, when the patient stated he wanted to return to walking for exercise but was scared of "ruining his surgery," it was brought to the patient's attention that he was already walking, and was assured that a goal of brisk walking for exercise was a safe and realistic goal. When the patient specifically asked if it would be safe to walk up and down stairs for exercise, his concerns were addressed with graded exposure using a 4-step staircase. Additionally, the patient was asked to recall all instances in which he had successfully used stairs since surgery, to reiterate his existing capacity to safely

use stairs. This method of recalling prior successes is outlined by Iles et al as a key strategy utilized in a comprehensive health coaching program to encourage confidence through motivational interviewing.[21] Graded exposure was also implemented specifically to enhance expectations for return to prior level of activity by utilization of familiar gym equipment when possible during therapeutic exercises in preparation for return to prior gym routine based on evidence that graded exposure had significant improvement in performance of daily activities.[22]

On visit 7, after his 3 month follow-up with the neurosurgeon, the patient presented with his x-ray and surgical notes for therapists to review, stating he felt "relieved that my hardware is in place and healing appropriately." Midpoint outcome measures were taken during this session. Midpoint PCOQ scores demonstrated only a slight improvement in the discrepancy between the patient's expected and desired levels of function in ADLs despite the positive feedback from his surgeon. Therefore, an educational intervention was developed specifically to enhance expectation for long term functional outcomes based on literature supporting healthcare providers' ability to enhance patient belief in efficacy of a treatment[11] and make expectations more reasonable.[10] The educational intervention included presentation of a Level 1 evidence study that examined the 5 year outcomes of cervical TDR using the patient's exact implant device and surgical procedure, compared to anterior cervical discectomy and fusion (ACDF). Positive outcomes of study, including significant improvement in the NDI and pain scores at the 6 month mark in the TDR group compared to the group with ACDF,[20] were highlighted and shown to patient. It was then discussed that the patient is approximately 50% to that 6 month mark, and therefore, he should not be discouraged that he has not met his desired levels of function yet, and can be confident in further improvement over the next three months.

Despite patient reports of relief after physician follow-up and acknowledgement of potential for full recovery after educational interventions, the patient continued to demonstrate reluctance and non-compliance in completion of gym HEP despite instruction in specific upper extremity exercises that were determined safe to complete independently. To address this, the patient was assisted in establishing gym routine using his printed HEP, with greater emphasis on the importance of his independence in gym exercise for the patient's long-term recovery. The patient was educated on safe progression of these exercises and attempted each exercise with undivided therapist supervision to increase the patient's confidence regarding his ability to perform the exercises with correct posture and form.

OUTCOMES

Grip strength, shoulder AROM, and single leg balance were recorded on visit 1, 7, and 13 (Table 1). These outcomes improved from baseline to discharge. Patient reported disability was associated with the patient's musculoskeletal improvements as well as patient expectation. Specifically, the NDI decreased 12% from visit 1 to visit 7, and 6% between visit 7 and visit 13, which is greater than both the SEM (2.9)[15] and MDC (3.1)[15] in each reassessment period. At discharge, the patient reported having only mild neck stiffness with prolonged positioning at work, and ability to return to normal household chores. By visit 4, the patient reported compliance in a cardiovascular home program with no difficulties or concerns. By visit 11, the patient reported weekly completion of upper extremity exercises at the gym. On the initial PCOQ, expected and desired levels were the same for the domain of pain. At midpoint (visit 7), the patient achieved his expected and desired levels of 0% in the domain of pain. The patient's expectation in the domain of interference with ADLs was 50% lower than his desired levels at baseline, and 35% lower at midpoint. At the discharge however, the patient's usual, expected, and desired levels of interference with ADLs, had all improved to 0%. The MCID and MDC have not been established for PCOQ. Therefore, changes in PCOQ will be discussed based on perceived patient satisfaction according to the subjective response to the survey (Table 1). The domains of pain and interference with ADLs are emphasized for the purpose of this report. Usual, expected, and desired PCOQ scores in the pain and interference with ADLs domains are represented

graphically in Figure 1 and 2 respectively. On the initial PCOQ, expected and desired levels were the same for the domain of pain. At midpoint (visit 7), the patient achieved his expected and desired levels of 0% in the domain of pain. The patient's expectation in the domain of interference with ADLs was 50% lower than his desired levels at baseline, and 35% lower at midpoint. At the discharge however, the patient's usual, expected, and desired levels of interference with ADLs, had all improved to 0%. The MCID and MDC have not been established for PCOQ. Therefore, changes in PCOQ will be discussed based on perceived patient satisfaction according to the subjective response to the survey (Table 2). The domains of pain and interference with ADLs are emphasized for the purpose of this report. Usual, expected, and desired PCOQ scores in the pain and interference with ADLs domains are represented graphically in Figure 1 and 2 respectively.

Table 2. Low expectation statements and correlating strategy used to improve expectation, by treatment session.

Visit Number	Patient Statement	Strategy Applied
Visit 1	Doubts regarding safety of brisk walking for exercise.	- Informed patient he is already walking well. - Discussed walking is good for spine health;[23] and is a safe, and common spine surgery post-op protocol
Visit 1—3	Low expectation for return to premorbid activities including prior gym exercise	- Discussed successful outcomes of patients with similar condition - Graded exposure: used familiar gym equipment**
Visit 2, 3	Doubts regarding capacity for low impact cardiovascular exercise (stairs, elliptical).	- Recalled successful usage of stairs since surgery - Graded exposure: 4-step staircase
Visit 7	Relief after follow-up with surgeon	- Educated that he is progressing "extremely well" in therapy, and bone healing time (~ 6 weeks) was likely complete prior to initiation of therapy
Visit 7—9	Low expectations for return to upper extremity gym exercise per PCOQ at midpoint, and reluctance to complete HEP	- Informed that his expectations seem unrealistically low, and therapists expect excellent prognosis - Educational intervention[20] to support expectation/likelihood for continued improvement**
Visit 10—13	Continued low expectation for return to upper extremity gym exercises, and reluctance to complete HEP in gym	- Encouragement and positive feedback during performance of HEP with supervision - Printed HEP with detailed instruction for completion of UE resistance exercises at gym

**Intervention specifically to enhance patient expectation for long term return to function

CONCLUSION AND CLINICAL RELEVANCE

In this case report psychologically informed practice strategies with a focus on enhancing patient expectations, were applied in an outpatient clinical setting by an entry-level practitioner without increased patient-contact time, equipment, or training. The patient's expectation for pain demonstrated only minor fluctuations overtime, which was likely the result of a floor effect due to the patient's low levels pain throughout the treatment episode. Patient expectations regarding improvement in function were initially low and progressed over time following psychologically informed strategies implemented with the goal to improve patient expectations. Furthermore, changes in expectations were associated with

meaningful improvements in clinical outcome measures.

Some studies have reported that patient expectations for therapy do not change over the course of physical therapy treatment.[7, 8] However, these studies in which expectations tended to remain stable over time were observational, and did not implement interventions intended to modify expectations. Studies designed to directly manipulate expectation have observed this to be a modifiable factor. For example, Mancuso et al demonstrated that patient expectations for long term outcomes prior to total knee replacement could be modified with an educational class.[10] Similarly, Riley et al showed an instructional set designed to modify patient expectations was able to enhance patient expectations for success of manual therapy treatment for pain relief.[11] Our findings are similar in that we describe changes in expectation associated with specific interventions directed at expectation. Our findings add to this body of literature by describing the process of expectation modification over a course of physical therapy.

Patient expectation for therapy is associated with clinical outcomes.[4,5,6] This case report reflected previous literature in that improved expectations for therapy corresponded to interventions intended to enhance expectation, and were associated with clinically meaningful improvements in function. These findings add to the growing body of literature supporting the significance of patient expectations in healthcare.

It is impossible to determine the accuracy of the application of psychologically informed techniques, or their efficacy in improving patient expectations due to limitations inherent in the study design of a case report, such as sample size, lack of control group and randomization, which precludes findings from establishing causation. Another limitation of the study was low frequency of outcome measure assessment. Due to decreased frequency of PCOQ assessment, chronological order of outcome changes are not detectable. Additionally, as non-specific effects are increasingly demonstrated as important factors of clinical outcomes, early management of cognitive-behavioral factors is important for optimal clinical outcomes. In retrospect, this patient would likely have benefitted from earlier implementation of the educational intervention to address his low expectations for return to function.

Future research should include a randomized controlled trial to investigate relationship between therapist applied strategies specifically geared toward improving low patient expectations and the relationship between expectation change and clinical outcomes. This investigation should be performed in a manner that is clearly described and practical for therapists with a full outpatient caseload so that physical therapists may have clearly defined methods to address and manage low expectations in their patients. Additional suggestion for future research should determine which factors predispose patients to have a beneficial response to expectation modifications.

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