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Factors Influencing Final Outcomes in Patients with Shoulder Pain: A Retrospective Review

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ABSTRACT:

Study Design:

Retrospective cohort.

Introduction:

Rehabilitation interventions are commonly prescribed for patients with shoulder pain, but it is unclear what factors may help clinicians' prognosis for final outcomes.

Purpose of the Study:

To determine what factors are the best predictors of improved patient-reported outcomes at discharge in patients with shoulder pain.

Methods:

Retrospective chart review of 128 patients presenting with shoulder pain to an outpatient physical therapy clinic. Chart review captured data regarding patient demographics, treatment interventions, patient history, and patient-reported outcome scores. The primary dependent variable was the overall change score of the QuickDASH (initial – discharge). Thirty-eight predictor variables were entered into a forward stepwise multivariate linear regression model to determine which variables and to what degree contributed to the dependent variable.

Results:

The linear regression model identified five predictor variables that yielded an $R = .74$ and adjusted $R^2 = .538$ ($P < .001$). The five predictor variables identified in order of

explained variance are QuickDASH change at the 5th visit, a total number of visits, initial QuickDASH score, scapular retraction exercise, and age.

Discussion: Early change scores, equal to minimal detectable change scores on patient-reported outcomes appear to be strong indicators that patients with shoulder pain are on a positive trajectory to benefit from rehabilitation.

Conclusion:

Using patient-reported outcomes throughout care, not just at the start and end of care, will provide therapist feedback regarding patient's progress and indicate treatment effectiveness.

Keywords: Patient-reported outcome, QuickDASH, physical therapy, prognosis

Levels of Evidence: Level: 4

1.0 Introduction:

Shoulder pain is a common and debilitating diagnosis in health care with a 1-year prevalence reaching up to 47% in the adult population.[1] It is second, only to low back pain in prevalence of musculoskeletal conditions for those seeking care.[2] Shoulder pain is often associated with unfavorable outcomes with roughly 40-50% of all new episodes of shoulder pain patients presenting to a primary care setting, who still report symptoms 6 to 12 months later.[3-5]

Research to determine which interventions and factors contribute to positive outcomes with rehabilitation intervention is growing but is inconsistent. A systematic search of the literature identified 16 studies that focused on the prognosis of shoulder disorders; only six, were designated as “high quality”.[6] Strong evidence exists that high pain intensity and middle age (45-54) are associated with poor outcomes. There is moderate evidence that prognostic factors for shoulder pain such as long duration of complaints, and high disability score at baseline predict a poor outcome in primary care.[6-8] Many prognostic factors were considered in these 16 studies such as sex, mechanism of injury, psychological factors, work demands, anatomical factors and impairments of motion and strength. [6] However the vast majority of the prognostic factors were identified only at baseline.

There is compelling evidence in the literature indicating exercise and patient education decreases pain and improves function at short-term and long-term follow-up for patients with impingement syndrome.[9, 10] Additional interventions such as

mobilization, modalities, and stretching interventions are commonly used to treat shoulder impingement syndrome with limited evidence to support their use.[11] Clinicians are often faced with questions relating to identifying prognostic factors that will determine a patient's positive outcome. Treatment approaches may vary based on the presence or absence of a number of prognostic factors. There are a many factors related to history, co-morbidities, psychological state, physical impairments, work demands, physical examination findings and patient self-report perceptions of function that can contribute to a patient's outcome. It is not known how much each of these items is weighted in contributing to a patient's prognosis.

The role of early response to rehabilitation has demonstrated limited evidence in predicting long-term outcomes. Researchers investigated the effects of early self-reported changes in levels of disability and pain levels in patients with acute back pain seeking chiropractic care.[12] Axen et al.,[12] found that improvement in pain and disability after visit 2 increased the odds of a positive treatment outcome by an 2.9 odds ratio compared to patients with no improvement. This response was further investigated in 2422 patients presenting with multiple musculoskeletal conditions to chiropractors in the United Kingdom over an 8 year period.[13] The best predictor of a positive outcome at the tenth visit in those patients with persistent musculoskeletal pain was self-reported improvement by the fifth visit. These authors suggested that early changes may be more important as predictors in musculoskeletal conditions than variables measured at baseline.[13]

It is hoped that the acquired knowledge of the prognostic factors that contribute to the successful outcomes of patients with shoulder pain will help provide more

informed clinical decision-making among health care practitioners. The gained information can be provided to patients regarding their plan of care and opportunity for a successful outcome. Based on the previous research we sought to be as inclusive as possible in retrospectively examining the charts plus our own clinical observations led us to incorporate the early treatment interventions and change scores of patient-self reports as prognostic factors accounting for the large number of factors used in this study. The objective of this study was to determine what factors are associated with a positive outcome in patients with shoulder pain presenting to a physical therapy clinic in a general orthopedic practice population. Specifically, we sought to identify which early interventions, historical presentation, and demographic variables are most associated with contributing to a positive outcome in patients presenting with shoulder pain.

2.0 Methods

We conducted a retrospective study involving patients presenting to a single outpatient physical therapy clinic with shoulder pain between the years 2008-2010. The outpatient clinic was located in the southern region of the United States representing a typical general outpatient orthopedic clinic seeking care for shoulder pain. This clinic had instituted patient-reported outcome data collection as a standard operating procedure in the fall of 2006. This clinic used the QuickDASH to track disability scores for upper extremity injuries. Subject data was obtained by performing systematic chart reviews of patients with shoulder pain. Data was subsequently entered into an SPSS version 22 (IBM, Armonk, NY) for statistical analysis. The retrospective chart review was approved by the university's institution review board, IRB# 10-0765-X1B before initiation of this study.

The QuickDASH is a shortened version of the original disability of the arm, shoulder and hand (DASH) questionnaire.[14] The QuickDASH is an 11 item disability scale ranging from 0 reflecting no disability to 100 indicating severe disability and has been found to be highly correlated with the full DASH.[14] The QuickDASH has demonstrated excellent reliability in patients with shoulder pain (ICC = 0.90) with minimal detectable change (MDC) = 11.2 and minimally clinically important differences (MCID) =8 in patients with shoulder pain.[15]

2.1 Subjects

Two hundred eighty-nine patient charts were reviewed. Potential subjects were excluded from analysis if any of the following were present: a history of shoulder surgery (n=12), neurological involvement (n=26), shoulder instability (n=6), severe loss of motion, suggesting adhesive capsulitis (n=57) or a positive lag sign, suggesting rotator cuff tear (n=1) and if the QuickDASH score at visit 5 was not recorded (n=8). One hundred seventy-nine patient charts were available to extract data. Neurological involvement was identified by an abnormal dermatome, myotome or deep tendon reflex test.[16] A positive apprehension sign, anterior or posterior drawer test was considered indicative of shoulder instability.[17] Severe loss of motion was found to be present if the patient lacked greater than 50% of the normal physiologic range of motion.[18] Finally, lag signs included a positive drop arm test, lift off test or external rotation lag sign.[17]

The terminology of shoulder pain was used in this study as this was a retrospective review and all patients were not screened with a standard evaluation for a particular pathology. We made an effort to exclude patients reporting history or physical

examination findings consistent with instability, adhesive capsulitis, neurological involvement, and rotator cuff tears, presuming the remaining patients are likely to have rotator cuff impingement, the most common diagnosis in patients with shoulder pain.[19, 20] There is a strong bias that most of these patients had some level of rotator cuff inflammation or impingement which is challenging to classify.[21] We were unable to confirm this diagnosis, therefore the terminology of shoulder pain was retained for this study.

2.2 Chart Review Procedures

Patient charts were systematically reviewed extracting information regarding exclusion criterion (5 variables), treatment received in first 5 visits (20 variables), treatment frequency (2 variables) demographical information (4 variables), comorbidities (4 variables), historical data (4 variables), physical examination (2 variables) and QuickDASH scores at three time points (initial, visit 5, and discharge). The dependent variable is the Overall QuickDASH change score which was calculated from the change between the initial and discharge QuickDASH scores. The QuickDASH change score at the 5^{th} visit was calculated as the difference between the initial and visit 5 QuickDASH scores. Nine continuous predictor variable were extracted: age, height, weight, duration of symptoms, pain levels, treatment frequency, the total number of treatments, initial QuickDASH score, change at 5^{th} visit QuickDASH score. Descriptive analysis of continuous data is presented with mean and 95% confidence intervals in Table 1.

Nine binomial variables were extracted as present or absent and coded as 1 or 0, respectively. The chart was reviewed for the presence of four comorbidities; history of

cancer, use of tobacco, use of alcohol, history of diabetes. These were the primary comorbidities filled out on the standard medical history form completed by patients at intake. Additionally, four historical variables, previous injury in the shoulder and work-related injury were coded on the excel spreadsheet. The last two binomial variables coded were mechanism of injury atraumatic = 1, and traumatic = 0 and sex was coded as 1 for males and 0 for females. The final variable from physical examination was the presence of limited elevation which was coded as present if the chart record indicated shoulder elevation less than 140° on the involved shoulder. This value was used based on previous research identifying 156 ± 12° as typical flexion available in patients with shoulder pain.[22] The value of 140 was decided upon based on measurement error ranging from 3-7° around 144°.[22] The frequency count of all these potential predictor variables are presented in Table 1.

2.3 Treatment Variable Descriptions

The therapist providing treatment recorded the specific modality, if applied, for each treatment and pertinent details of that application including number of minutes applied, specific anatomical site of application and numerical settings on the machine where applicable which is the standard practice for this clinic and is useful for subsequent treatments. The twenty treatment predictor variables were treated as continuous data ranging from 0 to 5 depending on the number of treatments received during the first five visits for the purposes of this project. For example, if a patient received an ultrasound three times during first five treatments they would be coded as three in the ultrasound variable. A zero would be coded in a treatment variable if nowhere in the notes was there an indication that a patient received a particular

intervention. The mean, 95% confidence interval, and frequency counts for each treatment category are presented in Table 1. This study only recorded data from the first five visits as our primary interest was how early interventions and early QuickDASH change scores would affect final outcomes. Previous research had demonstrated dramatic changes early during intervention, which was consistent with our clinical observations.[23]

Treatment counts were used in this study as this was a retrospective study. The specific parameters of each treatment were not documented and varied between therapists based on individual therapist clinical decisions for their patient. We chose to use treatment counts to document what occurs in a typical rehabilitation intervention for shoulder pain. Ideally, having a standard treatment protocol for all patients would have strengthened the study but this would not represent what is typically occurring in outpatient physical therapy clinic with multiple therapists treating patients. Five treatment modalities were recorded to indicate if a patient either did or did not receive the intervention as part of their treatment for each of the five visits. The modality had to be directed to the shoulder to be counted. Manual therapy interventions were categorized into three variables. Spine mobilizations were treatment interventions directed at cervical and thoracic joints regardless of the intensity of the mobilization. Glenohumeral mobilization was manual therapy treatment to gain range of motion in any direction of the shoulder regardless of the intensity. Soft-tissue mobilization was a massage or myofascial release techniques directed at surrounding shoulder and scapular musculature. Various exercises were prescribed so instead of specifying each exercise we categorized exercises into eleven components based on mode and

direction. The mode was either passive range of motion (PROM), active assistive range of motion (AAROM), or resistive range of motion (RROM). The three primary directions identified were flexion regardless of the plane of elevation, internal and external rotation irrespective of the amount of arm abduction. Strengthening exercises at this clinic focused on scapular exercises, so two additional categories of RROM were added for scapular protraction and retraction: exercises representing scapular punches and pinches using various resistive loads. Education regarding postural correction for forward head or shoulders was counted as a postural exercise intervention.

When examining the data entered into the excel spreadsheet 51 subjects had at least one missing predictor variable, therefore, these subject were removed, leaving 128 subjects available for the forward stepwise regression model.

<<Insert Table 1>>

2.4 Data Analysis

A multivariate linear regression analysis was conducted to determine which of the 38 predictor variables were most prognostic in estimating final outcome on the QuickDASH score. The outcome or dependent variable (Y) was the overall QuickDASH change score. The predictor variables were entered into a forward stepwise linear regression using SPSS version 22 (IBM, Corporation, Armonk NY). A forward stepwise method places the predictor variable with the highest correlated to the outcome variable into the equation first. A p-value of ≤ .05 was required for a predictor variable to enter the equation at each step requiring that the addition of other predictor variables had to contribute to estimating the outcome variable significantly. Additionally, at each step a

p-value ≥ 0.1 was used to remove a predictor variable that exceeded this value at each step in developing the regression model. The adjusted R^2 value was determined at each step to evaluate the explained variance by the predictor variables. The variable inflation factor was monitored at each step to assure predictor variables entered were not highly correlated and identify potential multicollinearity between predictor variables added to the equation.

3.0 Results

The multivariate linear regression analysis revealed a model with an adjusted R^2 = .538 (P < .001) accounting for 5 variables entered into the equation. (Table 2) The five variables in order were QuickDASH change score at 5 visits, Total visits, Initial QuickDASH score, RROM Scapular retraction, and Age. The resulting regression equation was able to account for approximately half of the variance of the change in perceived level of disability measured by the QuickDASH in patients with shoulder pain with a standard error of the estimate equal to 10.5 points. The resulting equation:

Y (Overall QuickDASH change score) = .62(QuickDASH change score at 5^{th} visit) + .73(Total visits) + .238(Initial QuickDASH score) + 1.22(RROM scapular retraction) - .165(Age) - 4.69.

<<Insert Table 2>>

4.0 Discussion

The objective of this study was to determine what factors are associated with a positive outcome in patients with shoulder pain presenting to a physical therapy clinic in

a general orthopedic practice population. With the recent emphasis on value-based health care[24, 25] and estimating final outcomes through the use of G-codes[26] clinicians need to establish and refine reasonable predictors for patient outcomes. The current study predicts short-term outcomes, as indicated by patient self-reported outcomes using the QuickDASH change scores and provides clinicians a potential tool to estimate outcome change scores in patients with shoulder pain.

4.1 Comparison to Previous Studies

Previous studies have investigated short-term outcome predictors for patients with shoulder pain. A systematic review of shoulder disorders found strong evidence that high pain intensity predicts poor outcomes in primary care populations. It also revealed moderate evidence for long duration of complaints and high disability score at baseline.[6] Similar findings were obtained in another systematic review, which found only two prognostic factors associated with outcome in two or more studies, duration of pain and baseline function.[27] All of these measures were included in this study however our results differed. Baseline pain level was not predictive of an overall change of the QuickDASH score, and higher initial QuickDASH scores were associated with greater change scores. It is logical and commonly reported that higher scores are predictive of greater change as there is more opportunity for change.[28] Based on previous studies we expected the duration of symptoms and pain levels to be predictive of change scores.[6, 27] These results were not observed in this study. The previous systematic reviews were primarily in prospective cohort studies and the current study is a retrospective cohort limiting the impact of this study's findings related to these two variables. In reviewing our data duration of symptoms ranged from very acute at .2 months to very chronic - 161

months. However, duration of symptoms was skewed toward the acute end of the continuum as 61% of all 128 subjects identified their duration of symptoms as less than or equal to 4 months. This relatively tight distribution was observed for baseline pain measures as 64% of all subjects rated their pain between 4 and 7 on a numeric pain rating scale. The lack of variability for each of these predictor variables likely contributes to their absence in the final regression model.

Previous studies investigating short-term outcomes of physical therapy lasting 3 months in duration found older age to predict greater disability at discharge.[29, 30] The use of age as a predictor is consistent with the results from the current study. We identified age as a negative predictor, indicating the greater the age, the poorer our outcome. However, this is a non-modifiable predictor variable and was a significant but weak predictor of final outcome as it was the last variable included in the regression model. Clinicians need to remember that in a regression model, it is the combination of variables that create the model, rather than a single variable and the relative importance is indicated by explained variance which in this case only contributed 1.5% of the explained variance.

The current study supports previous research that identified incorporating active interventions as prognostic of positive outcomes in patients with shoulder pain.[9, 10] It is interesting to note that no other intervention was strongly correlated with a positive outcome other than resistive scapular retraction exercises.[29] A substantial number of the patients included in this study exhibited signs and symptoms of impingement syndrome, though we did not specifically limit this study to patients with symptoms of impingement alone. Because we excluded patients with significant motion restrictions

and clinical findings consistent with shoulder instability, the majority of the remaining patients demonstrated rotator cuff involvement. Exercises focusing on scapular retraction provide benefit by increasing subacromial space[31, 32] and thereby reducing shoulder pain and dysfunction.[23, 33, 34] Experienced therapists note that scapular exercise is a fundamental element in their treatment of patients with shoulder pain likely to have sub-acromial impingement.[35]

Another factor that was a positive predictor of overall change in QuickDASH score in the current study was the total number of therapy visits. Though the aim of any treatment protocol is to achieve established goals in as timely a manner as possible, this information suggests there is important value in ultimate patient outcome by persisting with a treatment regimen, even if progress occurs at a slow pace. Given this evidence, therapists should be encouraged to persist in pursuing treatment goals and continue to evaluate specific features of treatment interventions, especially working to see that patient's "buy in" to the value of disciplined compliance with the prescribed exercise regimen.[35] In making this recommendation, it is recognized that beyond some, as yet, unidentified upper threshold of visit number, the positive predictive characteristic indicated by our research probably fades in value. We did not seek to establish that upper limit of visits as that was not the focus of the current study.

The results of the current study provide treating clinicians with useful information to track patient progress and modify treatment interventions based on that progress. The variable in our study most closely associated with predicting a successful patient response was the QuickDASH change score at the 5th therapy visit. This variable by itself was capable of explaining 40% of the variance of the overall change in the

QuickDash score at discharge. Tate et al.,[23] demonstrated graphically in their report that patients with shoulder impingement who exhibited significant improvement had at 2 weeks improved by approximately 15 points. Their sample was only 10 patients, but our findings agree and support their conclusions and a similar trend of early improvement in patient-reported outcomes. This is consistent with the current study as the average improvement of all patients in our study was 11 points improvement with a 95% confidence interval ranging from 9-13 points. This meets and exceeds the minimally clinically important difference of 8 points identified as meaningful improvement in patients with shoulder pain.[15] The use of patient-reported outcomes throughout the course of care, and not just at the beginning and end of treatment, is valuable as indicated by the results of the current study. This is important as it allows therapists the opportunity to adjust therapeutic intervention in an effort to prevent protracted pain and disability when patients do not self-report clinically meaningful functional progress. Failure to note substantial progress during the first five therapy visits should alert clinicians to examine the range of interventions for any given patient.[13]

4.2 Clinical Implications

The linear regression equation created from this dataset provides clinicians with a tool to estimate QuickDASH change score at discharge. This equation indicates that all variables are positive predictors of the overall QuickDASH change score except for age. The age variable has a negative sign indicating that for every year older the overall QuickDASH change score is decreased by .16 units. Any value can be applied to estimate the overall change in QuickDASH score. For the following example, the mean values for each predictive variable from Table 1 were used.

QuickDASH change score at 5th visit =11

Total visits = 12

Initial QuickDASH score = 40

RROM scapular retraction = 4

Age = 50

Constant = -4.69

Equation (.62(11) + .73(12) + .238(40) + 1.22(4) - .165(50) - 4.69) = 17

Applying the regression equation presented in the results section with mean values yields an estimated change score equal to 17 points. In applying this equation, the standard error of estimate, which equals 10.5 also has to be taken into consideration. The standard error of estimate for a regression equation functions similar to a standard deviation of the mean, which would indicate that change score could vary from 6.5 to 27.5 points. The wide range of scores is explained by the fact that the equation only explains approximately 50% of the variance of the overall QuickDASH change score and indicates that other factors not considered may contribute to the final outcome. This equation is not a perfect estimator of final change score but provides clinicians with the major predictor variables to consider and a useful tool to estimate prognosis.

Through examining the data from a different perspective, clinicians should focus on achieving an eleven point change or greater in the first five visits. The data was further evaluated to determine how likely a change of 11 points at visit 5 predicts a

QuickDASH change score of 17 or greater at discharge. Fifty-five out of the 128 patients had an overall QuickDASH change score greater than 17. Forty-one out of 55 or 74.5% of those patients had a change of 11 or more points on the QuickDASH at visit 5. This left 73 patients with an overall QuickDASH change score under 17 points. Fifty-three out of 73 or 72.6% of those patients had a QuickDASH change score under 11 points at visit 5. This change value has been found to be the minimal detectable change score with the QuickDASH in patients with shoulder pain.[15] This demonstrates that early use of patient-reported outcomes provide clinicians with the patient's perspective of how they are recovering from their shoulder injury and is essential in patient-centered evidence-based rehabilitation.[36-39]

4.3 Limitations

A number of limitations exist in the present study. This is a retrospective study which has a common limitation of missing data. This study is no different. A lack of objective data in the chart reviews relating to inclusion criteria limited our ability to diagnose patients with a specific condition such as subacromial impingement syndrome. It is very challenging, and much debate is ongoing in the literature regarding how to categorize these patients.[21, 40] We attempted to include potential patients by using reasonably strict exclusion criterion to limit our patient population, since advanced imaging was not available for all patients during this retrospective review of physical therapy notes. As a retrospective study all patients information is derived from either self-report or from therapist reported findings. There are details that could have contributed to the explaining final outcomes that were not able to be obtained or coded in a manner to allow adequate investigation such as continuous measures of motion

and strength measures in a standard manner. Future studies may be designed to create a more stringent inclusion criteria related to diagnosing sub-acromial impingement and using a prospective, rather than a retrospective design.

Another significant limitation refers to the generalizability of the results. The study was conducted in a single outpatient facility in the south region of the United States with only four treating therapists. It is unknown whether the results of our study will apply to other patient populations in different clinical settings. Future research should seek to replicate the present study in various regions of the country with a different cohort of patients to improve the generalizability of these results. Additionally, the specific intervention parameters were not well defined in this study. For example, it is not clear what aspects of the joint capsule were targeted with glenohumeral mobilization. More accurate treatment descriptions in a prospective, more controlled study may assist future therapists in determining specific treatment plans for their patients. Finally, the number of patients included in this study (n=128) was relatively low considering the number of variables considered in the regression model and may have led to less reliable results. Future research would benefit from including a larger number of patients in a similar study.

4.4 Conclusion

The goal of this study was to identify the best predictors of patient-reported outcome change scores at discharge in patients with shoulder pain. We identified four positive predictive factors with the greatest predictor being QuichDASH change score at visit 5 using a retrospective design. The other three positive predictive factors were the

number of patient visits, initial QuickDASH score, and incorporation of scapular retraction resistive exercises. The only negative predictor was the age of the patient, which is not modifiable. A change score of 11 points, equivalent to the minimal detectable change score for the QuickDASH, early in rehabilitation is a positive indication that patients with shoulder pain are on a positive trajectory to achieving a good outcome with rehabilitation.

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Table 1. Description of data extracted from 128 patients' charts. Continuous data presented with means, standard deviation and 95% confidence intervals of the means. Binomial data is presented as frequency counts.

Data Category	Variable	Mean	Standard Deviation	95% CI Lower Boundary	95% CI Upper Boundary	Present	Absent
Dependent Variable	Overall Change QuickDASH score	16.72	15.54	14.03	19.42		
Comorbidities	Cancer					6	122
Comorbidities	Alcohol					94	34
Comorbidities	Tobacco					18	110
Comorbidities	Diabetes					15	113
Dash Score	Initial QuickDash score	39.81	16.55	36.95	42.68		
Dash Score	QuickDash change score at 5th visit	11.10	12.91	8.87	13.34		
Demographics	Age	52.83	12.23	50.71	54.95		
Demographics	Sex					74 females	54 males
Demographics	Height (cm)	170.51	10.59	168.68	172.34		
Demographics	Weight (kg)	83.79	21.68	80.04	87.55		
History	Mechanism					90 atraumatic	38 traumatic
History	Duration of symptoms (months)	7.61	17.02	4.66	10.56		
History	Work related					18	110
History	Previous injury					39	89
Physical Exam	Limited shoulder elevation					79	49
Physical Exam	Pain (NPRS)	5.60	2.09	5.24	5.96		
Treatment	IFC	0.59	1.61	0.31	0.87	16	112
Treatment	TENS	1.97	2.40	1.55	2.39	55	73
Treatment	Muscle stimulation	1.45	2.24	1.06	1.84	39	89

Treatment	Iontophoresis	3.31	2.28	2.92	3.71	89	39
Treatment	Ultrasound	3.76	2.12	3.39	4.12	100	28
Treatment	Spine Mobilization	0.63	1.57	0.36	0.90	20	108
Treatment	Glenohumeral mobilization	3.73	1.73	3.43	4.03	111	17
Treatment	Soft tissue mobilization	0.72	1.66	0.43	1.01	22	106
Treatment	PROM flexion	0.64	1.57	0.37	0.91	21	107
Treatment	PROM external rotation	2.57	2.25	2.18	2.96	80	48
Treatment	PROM internal rotation	1.25	2.00	0.90	1.60	40	88
Treatment	AAROM flexion	2.45	2.29	2.05	2.84	73	55
Treatment	AAROM external rotation	0.38	1.23	0.17	0.60	13	115
Treatment	AAROM internal rotation	0.10	0.67	-0.02	0.22	3	125
Treatment	RROM internal rotation	2.41	2.26	2.02	2.81	75	53
Treatment	RROM external rotation	2.73	2.18	2.35	3.10	87	41
Treatment	RROM scapular protraction	1.00	1.76	0.69	1.31	38	90
Treatment	RROM scapular retraction	4.13	1.70	3.83	4.42	112	16
Treatment	RROM flexion	1.01	1.85	0.69	1.33	34	94
Treatment	Posture exercises	1.50	2.18	1.12	1.88	43	85
Treatment frequency	Total visits	12.18	5.83	11.17	13.19		
Treatment frequency	Visits per week	2.08	0.60	1.97	2.18		

CI = Confidence Interval

NPRS = numerical pain rating scale

Present = number of people in the sample that received the treatment or had the condition

Absent = number of people in the sample that did not receive the treatment or did not have the condition

Rx = Treatment category

IFC = Interferential current

TENS = Transcutaneous electrical nerve stimulation

PROM = Passive range of motion

AAROM = Active assistive range of motion

RROM = Resistive range of motion

Table 2. Regression analysis results with predictor variables present in order of entry into the forward stepwise regression model

Variable	R value	Adjusted R^2	Beta	Beta CI_{95} Lower Boundary	Beta CI_{95} Upper Boundary	Significance	VIF
QuickDash change score at 5^{th} visit	.636	.400	.620	.459	.780	.000	1.24
Total visits	.690	.468	.730	.402	1.058	.000	1.062
Initial QuickDash score	.723	.510	.238	.108	.361	.000	1.266
RROM scapular retraction	.735	.525	1.22	.100	2.345	.033	1.061
Age	.746	.538	-.165	-.318	-.013	.034	1.01

R = regression correlation values

VIF = Variable inflation factor

CI = Confidence Interval