# Post-operative Physical Therapy Versus No Physical Therapy Following Anterior Cervical Discectomy and Fusion and Cervical Disc Replacement - Comparative Analysis of PROMIS Scores

Nathan August Lorentz[1], Matthew Galetta, Michelle Amanda Zabat, Tina Raman[2], Themistocles Stavros Protopsaltis[3], Charla R Fischer
[1]Department of Orthopedic Surgery, NYU Langone Health, [2]NYU Langone Orthopedic Hospital, [3]NYU Hosptial For Joint Disorders

INTRODUCTION: Postoperative physical therapy (PT) following anterior cervical discectomy and fusion (ACDF) surgery is often performed to improve a patient's functional ability and reduce neck pain. However, current literature evaluating the benefits of postoperative PT using patient reported outcomes (PROs) is limited and remains inconclusive. To date, no study has investigated the benefits of postoperative after ACDF using PROMIS (Patient-Reported Outcomes Measurement Information System) scores. The purpose of this study is to compare postoperative improvement between patients who did and did not undergo formal PT after ACDF using PROMIS scores.

METHODS:
A retrospective, observational study examined patients who underwent 1 or 2 level primary ACDF or CDR at an academic orthopedic hospital, who had PROMIS scores recorded at pre-operative, 2 week, 6 week, 3 month, 6 month, 1 year, and/or 2 year follow-ups. Patients were separated according to whether or not they attended formal post-operative PT. PROMIS scores recorded include intensity, interference, upper extremity function, physical function, mobility, mental health, and physical health. Patient demographics including age, sex, BMI, smoking status, and race were included and compared. Mann Whitney U test was conducted for continuous data, Fisher's exact test for categorical, and student's t test was used to compare improvement in postoperative PROMIS scores from baseline between PT and no PT patients.

RESULTS:
In total, 220 patients were identified. Demographic differences between PT and no PT groups include age (54.1 vs. 49.5, p=0.005), with the PT group being older on average, and BMI (28.1 vs. 29.8, p=0.028), with the no PT group having higher BMIs (Table 1). When comparing mean PROMIS scores between PT and no PT groups at 2 week, 6 week, 3 month, 6 month, 1 year, and 2 year post-operative follow ups, the only significant difference was seen in physical health score at 3 months post-op, with the no PT group having a higher score (43.9 vs. 39.1, p=0.008). Otherwise, all other scores at the various follow up intervals were not significantly different between groups (Table 2). Sufficient pre-operative baseline PROMIS scores were only available for physical health and mental health scores. Physical health scores were seen to improve from pre-operative baseline to 1 year follow up in both PT and no PT groups (PT: Improvement from baseline to 1 year post-op = 3.5, p=0.025; no PT: Improvement from baseline to 1 year post-op = 6.6, p=0.008). There were no significant differences between groups when comparing improvements in physical health scores between groups at 6 month and 1 year follow ups (Table 3).

DISCUSSION AND CONCLUSION:
In conclusion, there was no significance to support the benefits of post-operative physical therapy in regard to PROMIS scores. Physical health scores improved from pre-operative baseline to 1 year follow-up in both PT and no PT groups. No significant differences in PROMIS were observed between groups from pre-operative baseline scores to 6 month and 1 year follow ups.

| | PT | No PT | P-value |
|---|---|---|---|
| Number of Patients | 139 | 81 | |
| Age | 54.1 | 49.5 | 0.005 |
| Sex (male %) | 43 (53.1%) | 82(59.0%) | 0.394 |
| Current smoker | 12 | 15 | 0.38 |
| BMI | 28.1 | 29.8 | 0.028 |
| Race (White, African American, Asian, Other) | 94/17/9/19 | 58/9/5/9 | 0.931 |

| Intensity | PT | No PT | p-value |
|---|---|---|---|
| 6 months - mean (# of patients) | 47.9 (27) | 49.5 (21) | 0.58 |
| 1 year - mean (# of patients) | 48.3 (45) | 51.1 (28) | 0.19 |
| **Interference** | **PT** | **No PT** | **p-value** |
| 6 months - mean (# of patients) | 57.8 (30) | 59.4 (22) | 0.57 |
| 1 year - mean (# of patients) | 59.4 (48) | 62.0 (28) | 0.21 |
| **UE Function** | **PT** | **No PT** | **p-value** |
| 6 months - mean (# of patients) | 33.5 (10) | 38.4 (10) | 0.09 |
| 1 year - mean (# of patients) | 38.4 (18) | 35.4 (11) | 0.44 |
| **Physical Function** | **PT** | **No PT** | **p-value** |
| 6 months - mean (# of patients) | 45.3 (15) | 41.8 (10) | 0.37 |
| 1 year - mean (# of patients) | 40.4 (25) | 37.7 (15) | 0.44 |
| **Mobility** | **PT** | **No PT** | **p-value** |
| 6 months - mean (# of patients) | 41.5 (10) | 42.4 (9) | 0.84 |
| 1 year - mean (# of patients) | 43.8 (14) | 41.7 (7) | 0.5 |
| **Mental Health** | **PT** | **No PT** | **p-value** |
| Preop - mean (# of patients) | 44.6 (42) | 43.5 (19) | 0.71 |
| 2 weeks - mean (# of patients) | 45.2 (35) | 49.1 (24) | 0.13 |
| 6 weeks - mean (# of patients) | 46.7 (41) | 49.3 (34) | 0.24 |
| 3 months - mean (# of patients) | 43.9 (48) | 48.3 (33) | 0.3 |
| 6 months - mean (# of patients) | 46.1 (64) | 46.5 (51) | 0.83 |
| 1 year - mean (# of patients) | 46.9 (97) | 46.6 (52) | 0.86 |
| 2 years - mean (# of patients) | 45.4 (56) | 43.0 (31) | 0.31 |
| **Physical Health** | **PT** | **No PT** | **p-value** |
| Preop - mean (# of patients) | 38.2 (42) | 35.9 (19) | 0.19 |
| 2 weeks - mean (# of patients) | 39.7 (35) | 41.1 (24) | 0.46 |
| 6 weeks - mean (# of patients) | 40.5 (41) | 42.8 (34) | 0.16 |
| 3 months - mean (# of patients) | 39.1 (48) | 43.9 (33) | 0.008 |
| 6 months - mean (# of patients) | 40.8 (64) | 42.4 (50) | 0.31 |
| 1 year - mean (# of patients) | 41.7 (96) | 42.5 (51) | 0.61 |
| 2 years - mean (# of patients) | 40.0 (55) | 38.5 (30) | 0.46 |

| Improvement in mental health score | | | | Differences in Improvement |
|---|---|---|---|---|
| | PT | p value | No PT | p value | p value |
| 6 months - Preop | 1.5 | 0.48 | 3 | 0.24 | 0.8378 |
| 1 year - Preop | 2.3 | 0.29 | 3.1 | 0.22 | 0.7292 |
| **Improvement in physical health score** | | | | **Differences in Improvement** |
| | PT | p value | No PT | p value | p value |
| 6 months - Preop | 2.6 | 0.13 | 6.5 | 0.0006 | 0.2299 |
| 1 year - Preop | 3.5 | 0.025 | 6.6 | 0.0008 | 0.3595 |