Cost Benefit of Preoperative Mental Health Optimization for Adult Spinal Deformity Surgery

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INTRODUCTION: Psychological distress is often associated with worsening surgical outcomes and a more complicated postoperative course. Given the complexity of corrective surgery for adult spinal deformity (ASD), it is important to investigate the associations between pre-surgical psychological state, intervention, and overall costs. We hypothesize that preoperative optimization of psychiatric conditions will improve surgical outcomes.

METHODS: We retrospectively reviewed patients over 18 years of age with symptomatic cervical deformity who underwent elective surgery involving five or fewer levels and had a Neck Disability Index (NDI) score greater than 20%. Patients were administered four validated self-report instruments: the Distress and Risk Assessment Method (DRAM), the Fear-Avoidance Beliefs Questionnaire (FABQ), the Pain Catastrophizing Scale (PCS), and the Outcome Expectation Question (OEQ). Patients were then randomized using matched pairs into two groups: the Sham group, which received six sham treatments followed by surgery, and the CBT group, which received cognitive-behavioral therapy (CBT) from a licensed professional prior to surgery. Thresholds were established as follows: DRAM > 17, FABQ > 49/66, and PCS > 30/52. Subjects who did not meet these cutoffs were assigned to the control group. Those exceeding the thresholds were randomized into either the Sham or CBT group in a 1:1 ratio. Patients who exceeded the psychological distress criteria were assigned to the DRAM observation-only group. Cost data were valued using the CMS.gov DRG system. Quality-adjusted life years (QALYs) were calculated using NDI scores converted to EQ-5D scores with a published conversion, applying a 3% discount for life expectancy. Total utility gained was calculated by multiplying the change in utility by life expectancy. ANOVA and multivariate logistic regression were used to determine predictive factors for cost and outcomes across the cohort groups.

RESULTS:

A total of 47 patients were included in the study (mean age: 53.6 years, 49% female, mean BMI: 29.4 kg/m²). At baseline, the average Pain Catastrophizing Scale (PCS) score was 27.4, the Fear-Avoidance Beliefs Questionnaire (FABQ) score was 40, the EQ-5D score was 9.3, and the Neck Disability Index (NDI) score was 25.6. The cohort was divided into four groups: 17 patients in the Cognitive Behavioral Therapy (CBT) group, 11 in the Sham treatment group, 10 in the Control group, and 9 in the Distress and Risk Assessment Method (DRAM) observation group. The average surgical costs were as follows: CBT group: $4,722; Sham group: $4,720; Control group: $4,267; and DRAM group: $6,052 ($p = 0.685$). The total utility gained was highest in the DRAM group (0.467), compared to the Sham group (0.3712), CBT group (0.3510), and Control group (0.2349) ($p = 0.029$). Control patients without any intervention exhibited lower cost-effectiveness ($11,274) compared to other groups (CBT: $7,043; Sham: $7,224; DRAM: $6,024). Patients in the CBT group demonstrated trends towards higher rates of improvement in several measures: PCS (56% vs. other groups: 41%, $p = 0.338$), FABQ (50% vs. 28%, $p = 0.133$), NDI (69% vs. 45%, $p = 0.124$), EQ-5D (50% vs. 31%, $p = 0.209$), Visual Analog Scale (VAS) (63% vs. 38%, $p = 0.114$), Neck Rating Scale (NRS) for neck pain (56% vs. 38%, $p = 0.236$), and NRS for back pain (63% vs. 38%, $p = 0.114$). Multivariate analysis revealed that higher baseline NDI scores were associated with significantly greater odds of increased costs (OR: 1.22, [1.02, 1.86], $p = 0.027$).

DISCUSSION AND CONCLUSION:

Discussion: The study highlights the significant impact of preoperative mental health optimization on surgical outcomes and cost-effectiveness in patients undergoing adult spinal deformity (ASD) surgery. Psychological distress, measured using validated self-report instruments (DRAM, FABQ, PCS, and OEQ), was shown to correlate with worsened surgical outcomes and increased postoperative costs. The intervention groups (CBT, Sham, Control, and DRAM) were compared to assess the benefits of addressing psychological distress prior to surgery. Patients in the CBT group, who received treatment by licensed professionals, showed trends towards better outcomes in various measures, including PCS, FABQ, NDI, EQ5D, VAS, and NRS scores. Although these improvements were not statistically significant, the trends indicate potential benefits of preoperative mental health optimization. Furthermore, the DRAM group, despite having the highest surgical costs, demonstrated the greatest utility gained, suggesting that addressing psychological distress can lead to significant improvements in quality of life. The study's multivariate analysis revealed that higher baseline NDI scores were predictive of increased surgical costs, underscoring the importance of preoperative mental health optimization. Patients with untreated psychological distress (Control group) had lower cost-effectiveness compared to those who received some form of mental health intervention. This finding emphasizes the potential economic benefits of incorporating mental health optimization into preoperative care for ASD patients.

Conclusion: The study concludes that preoperative mental health optimization is crucial for improving surgical outcomes and cost-effectiveness in adult spinal deformity surgery. Increasing rates of mental health-related disability were

associated with diminished outcomes and higher surgical costs. By addressing psychological distress prior to surgery, healthcare providers can enhance overall patient outcomes and reduce the healthcare burden. The findings advocate for the integration of mental health assessments and interventions in the preoperative period to optimize the well-being of patients undergoing complex spinal surgeries.