# Predicting Good Outcomes after Adult Spinal Deformity Surgery: Analysis of Preoperative Symptoms with Optimal Radiographic Alignment and Patient Outcomes

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INTRODUCTION:
Patients with less severe adult spinal deformity (ASD) undergo surgical correction and often achieve good clinical outcomes. However, it is not well understood how much presenting symptoms influence prediction of optimizable alignment and ideal clinical outcomes. This study works to identify combinations of symptoms as predictors of optimized radiographics and good outcomes.
METHODS: Operative ASD patients (scoliosis >20, SVA>5cm, PT>25, or TK>60) with available baseline (BL) and 2-year (2Y) HRQL data were included. Optimal radiographic outcome was defined by improvement in all three age-aligned SRS-Schwab modifiers, proportioned (P) in GAP, and an ODI score of less than 25 at 2 years. Patients stratified by radiographically optimal (defined as ROpt) vs. not optimized (NOpt). Optimized patients further tested against reported symptoms using SRS-22, SF36, and ODI standardized scoring systems taken at baseline visit: SRS Activity, SRS Pain, SRS Mental Health, SF36 Physical Functioning, SF36 Social Functioning, SF36 Body Pain, ODI Pain Intensity, ODI Walking, ODI Lifting, ODI Social Life, ODI Employment. Scores were grouped for analysis into 4 main domains: Pain, Physical, Social, and Mental Health. Good Outcome (GO) defined as meeting either: 1) SCB for ODI by 2Y (change greater than 18.8), or 2) ODI <15 and SRS-Total >4.5 by 2Y. Descriptive analysis identified cohort demographics, radiographic parameters, and surgical details. K-means cluster analysis tested each group against ROpt. Logistic regression was further determine predictive association between symptoms scores and optimal alignment. Further multivariate analysis was used to determine significance for complications and good outcomes.
RESULTS: A total of 469 ASD patients (59.9±14.7yrs, 27.3±5.3kg/m2, CCI: 1.63±1.6, FI: 3.12±1.65) were included and underwent surgery (11.5±4 levels fused, EBL: 1565±1406 mL, op time: 371±136 min, LOS: 8.5±4.6 days). Some 256 patients met optimal realignment goals (ROpt). No significant difference in age, BMI, CCI compared to NOpt (all p>.05). Cluster analysis revealed that compared to NOpt, patients achieving ROpt had significantly lower Physical and increased Social scores at baseline (both p<.001). With the Pain cluster, ROpt had significantly lower scores (p<.001). Decreasing Mental Health scores at baseline had better odds achieving ROpt by 2 years (OR .264 [.87,1.96], p=.21). Multivariate regression found that there was a decrease in baseline Mental Health Scores (OR -.74, [.48,1.59], p=.022) and an increase in Social scores (OR 1.82 [.88,1.22], p<.05) when predicting GO at 2 years, thus indicating important of preoperative patient optimization. Similarly, decrease in Pain scores at baseline had better odds of achieving GO and ROpt (OR:.367 [1.12,1.85],p=.004).
DISCUSSION AND CONCLUSION: Our study highlighted the relationship between initial symptoms, radiographic alignment, and good clinical outcome. Those with lower baseline Mental Health and Pain scores, with higher Social scores, correlating to optimized radiographics and subsequently good outcomes. Thus, patient presentation and socialization can play an important role in achieving good clinical outcome and radiographic alignment.