Improvements in Outcomes and Cost after Adult Spinal Deformity Corrective Surgery between 2008 and 2019


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INTRODUCTION: As surgical methods and technology advance, so should improvements in patient outcomes and cost effectiveness.

METHODS:

Adult Spinal Deformity (ASD) patients with baseline (BL) and up to 2-year (2Y) HRQL data between the years of 2008-2019 were included. Incomplete yearly data from 2008 and 2019 were combined with 2009 and 2018, respectively. ANCOVA established estimated marginal means for outcome measures (complication rates, reoperations, HRQLs, total cost, utility gained, QALYs, cost efficiency [cost per QALY]) by year of initial surgery adjusting for covariates including age, gender, decompression or osteotomy, surgical approach, invasiveness, and BL deformity (Pelvic Tilt, Pelvic Incidence, Lumbar Lordosis). Trend-line slope indicated yearly changes. Cost was calculated using a large national insurance database and assessed for Complications/Major Complications and Comorbidities according to CMS.gov definitions. These costs represented national averages of Medicare pay-scales for services within a 30-day window including length of stay and death differentiated by complication/comorbidity, revision, and surgical approach. Internal cost data was based on individual patient DRG codes, limiting revisions to those within 2Y of the initial surgery.

RESULTS: There were 1,236 patients (2009: 117 patients, 2010: 97, 2011: 75, 2012: 45, 2013: 106, 2014: 127, 2015: 115, 2016: 204, 2017: 202, 2018: 148) included with no significant differences in baseline ODI by year. There was an overall decrease in rates of any complication (0.78 vs. 0.61), any reoperation (0.25 vs. 0.10), and minor complication (0.54 vs. 0.37) between 2009 and 2018 (all p<0.05). Minor complications decreased by 2.48% per year (R²=0.5179), with a 1.84% yearly decrease in any complication (R²=0.8322), 1.33% decrease in any reoperation (R²=0.2211), and 0.82% decrease in major complication (R²=0.1435). BL to 2Y difference in SF-36 PCS had the greatest improvement (0.2526 increase per year, R²=0.3985) and ODI BL to 2Y difference improved by 0.3687 per year (R²=0.3683). National average 2Y cost decreased at a yearly rate of $3,194 (R²=0.6602), 2Y Utility Gained had a yearly increase of 0.0041 (R²=0.57), 2Y QALYs Gained increased yearly by 0.008 (R²=0.57), and 2Y Cost per QALY decreased yearly by $39,953 (R²=0.6778). Adjusting for inflation since 2009, internal DRG data verified the trend of national average costs, as overall costs (including revisions within 2Y) have decreased at a rate of $793 each year (R²=0.0483). This resulted in a decrease in cost per QALY at 2Y of $19,903 per year (R²=0.3181).

DISCUSSION AND CONCLUSION: Between 2008 and 2019, rates of complications have decreased concurrently with improvements in patient-reported outcomes, resulting in improved cost effectiveness according to national Medicare average and individual patient cost data.