The Additional Economic Burden of Frailty in Adult Spinal Deformity Patients Undergoing Surgical Intervention

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INTRODUCTION:
With an increasing focus on value-based care and cost optimization, adult spinal deformity (ASD) surgery has come under the spotlight for its increased incidence over the last decade. While previous studies have assessed the direct costs associated with intervention there is paucity in the literature on the direct and indirect costs of ASD surgery with the additional economic burden of frailty. A limitation of the analysis is frailty also incorporates health-related quality of life (HRQL), which may be a confounding variable in the association. The purpose was to investigate the direct and indirect costs associated with ASD and frailty.

METHODS:
Surgical ASD patients (scoliosis≥20°, SVA≥5cm, PT≥25°, or TK≥60°) with available BL and 2Y radiographic data were included. Patient demographics and surgical details at BL and 2Y were analyzed. Patients were stratified according to Frailty states of: Severely Frail (SF), Frail (F), and Not Frail (NF). Utility data was calculated by converting ODI to SF-6D using published conversion methods. QALYs utilized a 3% discount rate to account for residual decline to life expectancy (78.7 years). Direct costs were calculated using a large insurance database. Indirect costs associated with loss of work was calculated based on response to SRS-22rQ9 and estimating loss of average weekly earnings based on the average weekly income from the US Bureau of Labor Statistics. After accounting for complications, LOS, revisions, and death, cost per QALY at 2Y and life expectancy were calculated for NF, F, and SF patients.

RESULTS:
A total of 592 ASD patients were included (59.8yrs±14.0, 80%F, BMI: 27.7 kg/m2 ±6.0, ASD-FI: 3.3±1.6, CCI: 1.8 ±1.7). Surgical details: average EBL was 1569.3 mL, op time 376.6 min, with 63% undergoing an osteotomy, and 54% undergoing a decompression. In terms of surgical approach, 13% had an anterior approach compared to 87% posterior. Overall, 4.7% of patients were categorized as severely frail (SF), 22.3% as frail (F), and 73.0% as not frail (NF). At baseline, 104 ASD were classified as unemployed experiencing an average weekly earnings loss of $971.38. After 1Y postoperatively, 62 patients remained unemployed experiencing an overall average loss of $50,508.64 yearly income. Propensity score matching for BL SVA, the average cost of ASD surgery at 2Y follow up for F/SF patients was greater compared to NF ($81,347 vs. $69,722). Furthermore, the cost per QALY was higher for F/SF patient at 2Y compared to NF ($436,473 vs. $430,437). If utility gained is sustained to life expectancy, the cost per QALY differences between F/SF and NF become comparable ($58,965 vs. $58,149).

DISCUSSION AND CONCLUSION:
Despite an initial greater cost of intervention, frail and severely frail patients are likely to show greater improvement postoperatively. Overall, the cost difference between not frail and frail patients offset as cost per QALY at life expectancy become similar.