

## **Comparison of Value per Operative Time between Primary and Revision Adult Spinal Deformity Surgery: A Propensity Score-Matched Analysis**

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**INTRODUCTION:** Adult spinal deformity (ASD) surgery is technically demanding and is often burdened by complications and high revision rates. This common need for additional surgery can increase the overall cost of care for ASD. Relative value unit (RVU) is the basis for the Medicare reimbursement formula and is used to determine physician payments nationally. RVUs consider the physician's work, the expenses of the physician's practice, and professional liability insurance. However, in arthroplasty literature, several studies have reported lower RVU compensation for revision procedures compared to primary despite the higher difficulty associated with revision surgeries. While previous studies have evaluated cost effectiveness of ASD surgeries, RVUs per minute has not been previously compared between primary and revision ASD surgery. The aim of the current study is to compare the RVUs per minute for primary versus revision adult spinal deformity surgery.

**METHODS:** This study utilizes data obtained from the ACS-NSQIP database. Patients  $\geq 18$  years old who underwent spinal deformity surgery between 2011 and 2019 were identified and included based on Current Procedural Terminology codes 22800, 22802, and 22804. Patients undergoing anterior-only and concurrent anterior-posterior fusions were excluded to ensure that a homogenous patient cohort undergoing posterior-only fusions were compared. Patients with missing demographic or surgical complication data were also removed to prevent biases in the results. Propensity score matching analysis was performed with a match tolerance of 0.01 according to demographic characteristics, comorbidities, and preoperative laboratory values. Patients were paired using nearest neighbor approach and without replacement. Matched groups were compared via Fisher's exact test and independent t-test for categorical and continuous variables, respectively.

**RESULTS:** A total of 326 revision surgery patients were matched with 152 primary surgery patients via propensity score matching. Age, sex, race, and ethnicity were statistically similar between groups after matching. Revision rate was significantly higher among patients with diabetes mellitus and ASA class 3 or greater. Within the revision group, 152 patients (46.6%) included osteotomy codes, and 61 cases (18.7%) used interbody devices. In the primary group, 58 patients (38.2%) had osteotomy codes, while 23 (15.1%) cases used interbody devices. Mean RVUs per minute was significantly higher for the revision surgery group compared to the primary surgery group (0.331 vs. 0.250,  $p < 0.001$ ). However, the primary surgery group was found to have significantly worse 30-day outcomes, including readmission, reoperation, and morbidity. In addition, rates of pulmonary embolism, ventilator need  $> 48$  hours, myocardial infarction, deep venous thrombosis, and sepsis were significantly higher in the primary surgery group.

**DISCUSSION AND CONCLUSION:** Revision ASD surgery was associated with significantly higher RVUs per minute compared to primary surgery. However, primary surgery was associated with higher 30-day readmission, reoperation, morbidity, and individual complication rates. Thus, RVUs for primary and revision ASD may have to be readjusted to reflect the physician's overall work and expenses.