Age, BMI, and Osteoarthritis are Predictors of Higher Total Costs in Spine Fusion Surgery at 2 Years

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Disclosures

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Background

• Spine surgery can entail complex, expensive procedures.
• Despite this, the rates of spine surgery have steadily risen.
• Currently, it is unknown which baseline (BL) factors are predictive of higher total costs in spine fusion surgery.

Objective

Identify baseline factors that are predictive of higher total costs in spine surgery.
Materials & Methods

• **Design:** Retrospective review of a single center spine surgery database.

• **Inclusion Criteria:**
  - Surgical patients ≥18 y/o
  - Underwent spine fusion procedures

• Operative patients were divided into **cervical, thoracic, and lumbar groups** based on their upper instrumented vertebral (UIV) level.

• **Cost Analysis:**
  - Total costs for surgery at 2Y were calculated using the PearlDiver database, which reflects both private insurance and Medicare reimbursement claims for ICD-9 codes.
  - Complications and comorbidities (CC) and major complications and comorbidities (MCC) were assessed according to CMS.gov manual definitions.

• **Statistical Analysis:**
  - **Propensity score matching** for surgical invasiveness was performed between each UIV group.
  - **Descriptive analyses** assessed mean age, BMI, and sex distributions.
  - A **Conditional Variable Importance Table** used non-replacement sampling set of 20,000 Conditional Inference trees to identify the top demographic, radiographic, and past medical history factors associated with higher cost surgery for the invasiveness matched cohort.
  - **Linear and logistic regression** assessed the relationship between significant predictors and the odds of having a higher cost surgery.
Results: Overview

After the PSM for Invasiveness

- 318 invasiveness matched patients
  - 106 Cervical
  - 106 Thoracic
  - 106 Lumbar
- **Average age:** 58.2 ± 15.9 year
- 46% Female
- **Mean BMI:** 28.7 ± 6.4 kg/m2

Surgical Approach

- 14% anterior approach
- 58% posterior approach
- 28% combined approach

Clinical Outcomes

- **Mean Levels Fused:** 4.5 ± 3.2 levels
- **Mean op time:** 291.8 ± 132.5 minutes
- **Mean EBL:** 590.3 ± 793.4 cc
- **Mean LOS:** 5.4 ± 6.4 days.
Results: Cost Overview

At 2 year, the costs of surgery between all groups ranged from $17,342.67 to $107,051.89
Results: Predictors of Higher Total Costs

• Among baseline demographic predictors:
  – Increasing BMI (1.04 [1.00-1.09], p=0.076)
  – In age (1.03 [1.00-1.06], p=0.028) were predictive of higher total surgery costs.

• For radiographic predictors
  – Increasing TS-CL (1.07 [1.02-1.13], p=0.012)
  – Increasing SVA (1.00 [0.99-1.01], p=0.031) were predictive of higher total costs.

• For comorbidity predictors:
  – Hip osteoarthritis (2.47 [0.91-6.7], p=0.075)
  – Knee osteoarthritis (4.14 [1.29-13.3], p=0.017)
  – Diabetes mellitus (3.12 [1.56-6.26], p=0.001)
Conclusions

• As the rates of spine surgery increase, the discussion on the economic impact of care is essential.

• Among invasiveness matched cervical, thoracic, and lumbar fusion patients, increasing age, BMI, global sagittal deformity, and past medical history of osteoarthritis were predictive of higher surgery costs.
Limitations

• Although patients were followed prospectively, this study is subject to the potential biases of a retrospective study.

• Total costs for surgery at 2Y were calculated using the PearlDiver database, which reflects both private insurance and Medicare reimbursement claims for ICD-9 codes but is subject to local variability.

• The advantages of this study are the 2 year follow up and the uniformity in practice and the accuracy of data collection in a single institution. However, costs and length of stay may vary significantly among centers, therefore it may not be generalizable to all centers.