

Risk Factors and Downstream Consequences of In-Hospital Opioid-Related Adverse Events Following Total Shoulder Arthroplasty: A National Cohort Study

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Introduction

Burden of Disease: Total shoulder arthroplasty (TSA) volume exceeds 100,000 annual procedures in the US. While pain management is critical, opioid-related adverse events (ORAEs) including respiratory depression, GI dysfunction, and delirium are significant complications.

Knowledge Gap: While opioid dosage is a known risk factor, the independent clinical and economic predictors of in-hospital ORAEs and their specific downstream consequences (length of stay, readmission, costs) remain poorly characterized in the TSA population.

Objective: To identify independent risk factors for in-hospital ORAEs (specifically anesthetic sensitivities) and quantify their association with adverse postoperative outcomes.

Methods

- Study Design:** Retrospective cohort study using the National Readmissions Database (NRD), 2020-2022.
- Population:** 129,811 patients undergoing primary TSA (Anatomic and Reverse).
- Identification:** ORAEs identified via specific ICD-10 codes for "adverse effect" of opioids/narcotics.
- Statistical Analysis:**
 - Risk Factors:** Multivariable logistic regression assessing patient, surgical, and socioeconomic predictors.
 - Outcomes Assessment:** Multivariable modeling for Length of Stay (LOS), total charges, discharge disposition, 30-day readmission, and in-hospital mortality.
 - Validation:** A secondary analysis using a 1:1 propensity-matched cohort (n=938 per group) to control for confounding.
- Software:** STATA Version 18 (a = 0.05).

- Anesthetic Sensitivity:**
 - The strongest predictor of an ORAE was a documented adverse reaction to local anesthetic (*aOR 7.88, p<0.001*).
- Patient Factors:**
 - Female Sex (*aOR 1.73, p<0.001*)
 - Substance Use Disorder (*aOR 1.44, p=0.03*)
 - Chronic Pain (*aOR 1.42, p<0.001*)
 - Anxiety (*aOR 1.22, p=0.03*)
 - Higher Charlson Comorbidity Index (*aOR 1.21 per point*)
- Socioeconomic & Surgical Factors:**
 - Highest Income Quartile vs. Lowest (*aOR 1.53, p<0.001*)
 - Reverse TSA vs. Anatomic (*aOR 1.22, p=0.021*)

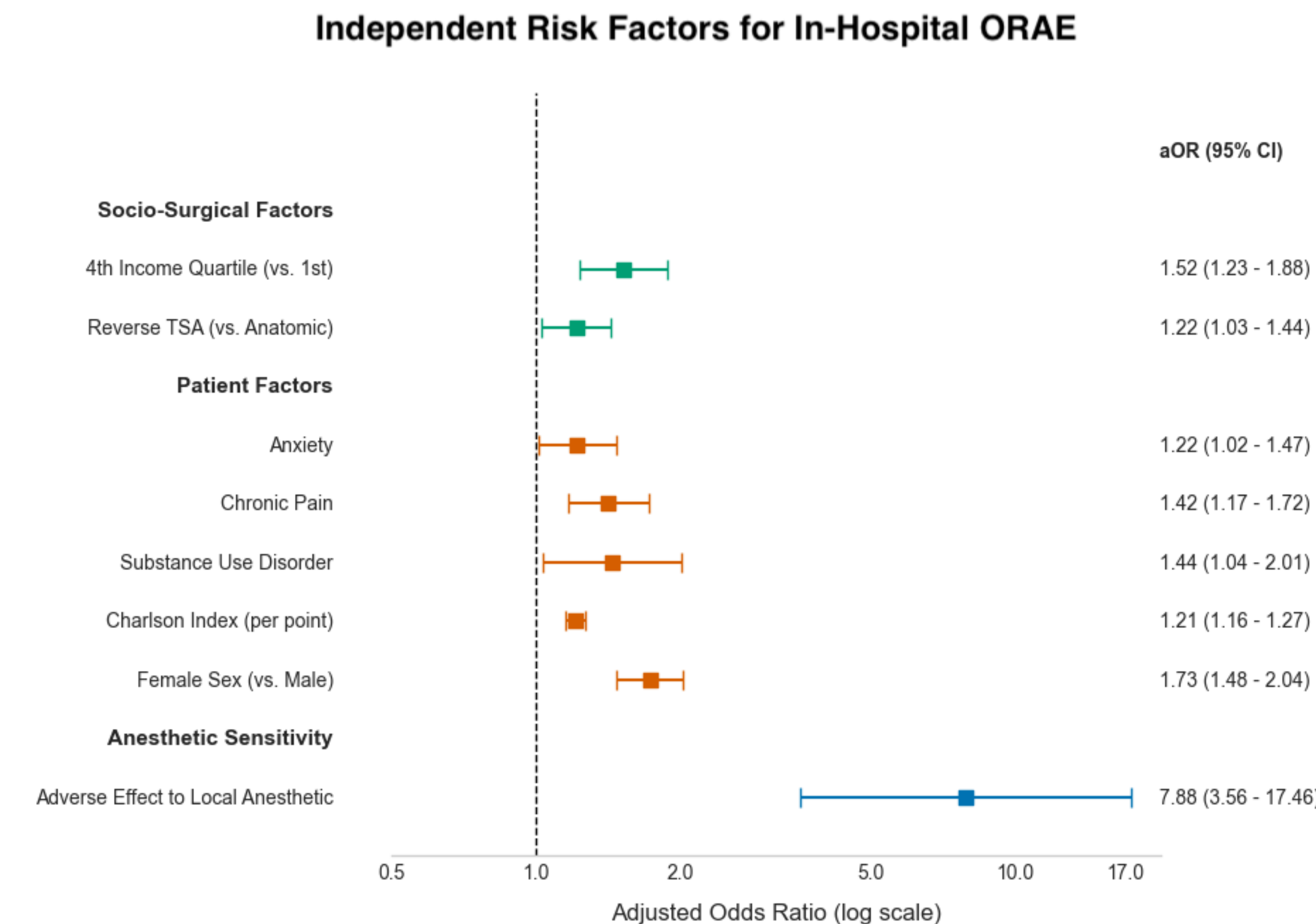


Figure 1: Independent risk factors for in-hospital ORAE with an adjusted survey-weighted multivariable analysis.

Results

Clinical and Economic Outcomes		
Outcome Measure	Adjusted Impact (Full Cohort)	Propensity-Matched Result
Length of Stay (LOS)	2.15x increase (p<0.001)	4.7 days vs 2.1 days (p<0.001)
Total Charges	1.30x increase (p<0.001)	\$119,897 vs \$88,558 (p<0.001)
Discharge to Facility	3.6x increased risk (p<0.001)	59.3% vs 40.6% (p<0.001)
30-Day Readmission	aOR 1.52 (p=0.013)	6.2% vs 3.8% (p=0.033)
In-Hospital Mortality	aOR 2.86 (p=0.045)	Non-significant in matched cohort

Table 1: Clinical and economic outcomes after an ORAE. All models adjusted for covariates. A secondary analysis was performed on a 1:1 propensity matched cohort, which was balanced on all baseline covariates. Generalized linear models were used for LOS and charges. aOR = adjusted Odds Ratio

Limitations

- Misclassification bias as the data is only as accurate as the ICD-10 coding
- NRD only captures inpatient episode of care and cannot account for outpatient prescriptions or events
- Lack of clinical granularity to account for complexity of surgical procedure, intraoperative anesthetic choices, and doses of opioids administered.

Conclusion

Our results here suggest that ORAEs are a potent predictor for a cascade of in-hospital events, ultimately leading to poorer patient outcomes. Reduction of ORAEs is paramount through multimodal analgesic strategies. This will likely be an effective method to intervene in the cycle of hospitalization, discharge to a facility, and readmission, and result in both better patient health and financial outcomes.

References

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