

# Patients With Asthma Are At Increased Odds of Pulmonary Adverse Events Following Posterior Spinal Fusion For Adolescent Idiopathic Scoliosis

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**INTRODUCTION:** Posterior spinal fusion (PSF) is a highly successful treatment for adolescent idiopathic scoliosis (AIS). Asthma is one of the most common illnesses affecting young patients and has been shown to affect outcomes in other orthopaedic procedures. The correlation of asthma and postoperative adverse outcomes following PSF had not been well characterized. The present study aims define the incidence of asthma in patients undergoing PSF for AIS and to determine if matched cohorts had different rates of perioperative complications and revision surgery for asthma in general and graded by asthma severity.

**METHODS:** Adolescent patients undergoing PSF for AIS between 2015 and 2023 were identified using the large, national, administrative PearlDiver M165 database. Due to the use of de-identified, aggregate data, studies using this database were deemed exempt from review by our Institutional Review Board. Patients were excluded for the following criteria: age <10, age >21, history of trauma, neoplasm, or infectious diagnosis within 90 days before PSF, and patients with < 90 days follow up in the database. Those with versus without asthma were then matched 1:4 based on age, sex and Elixhauser Comorbidity Index (ECI).

Matched populations with versus without asthma were compared for incidence of 90-day postoperative adverse events using multivariable logistic regression, controlling for patient age, sex, and ECI. Revision surgery within 5 years was compared using Kaplan-Meier analysis and the log-rank test. Secondary multivariable analysis was performed comparing odds of 90-day postoperative adverse events for different levels of asthma severity (mild intermittent, mild persistent, moderate/severe) relative to non-asthma patients, controlling for patient age, sex, and ECI.

**RESULTS SECTION:** Of 10,196 PSF patients meeting study criteria, asthma was noted for 1,616 (15.8%). The matched cohorts consisted of 1,025 asthma patients and 4,051 non-asthma patients. Of the asthma cohort, 72.6% of patients were female, while in the non-asthma cohort there were 72.8% females. After matching, those with asthma were at higher odds of pneumonia (odds ratio [OR] 1.91,  $p < 0.001$ ), respiratory failure (OR 1.67,  $p = 0.002$ ), and atelectasis (OR 1.36,  $p = 0.029$ ), as well as emergency department visit (OR 1.61,  $p < 0.001$ ) and readmissions (OR 1.61,  $p < 0.001$ ). Differences were not identified for non-pulmonary adverse events. On Kaplan-Meier analysis, the log-rank test demonstrated no significant difference in survival to revision ( $p = 0.900$ ). As asthma severity increased from mild intermittent, to mild persistent, to moderate/severe, odds ratios incrementally increased for pneumonia (OR 1.92, 3.31, 4.58, respectively), respiratory failure (OR 1.91, 2.51, 2.84, respectively), and atelectasis (OR not significant, 1.82, 2.77, respectively) ( $p < 0.05$  for each listed).

**DISCUSSION:** Overall, asthma is a common comorbidity for adolescent patients undergoing PSF for AIS and is associated with higher odds of pulmonary adverse events, including postoperative pneumonia, respiratory failure, and atelectasis. These adverse outcomes increase with increased asthma severity. While the present study is limited by its retrospective nature and reliance on administrative data these results can be used to guide surgeons and illustrate the importance of properly stratifying asthma severity as part of risk stratification.

**SIGNIFICANCE/CLINICAL RELEVANCE:** (1-2 sentences): Asthma is a common comorbidity in adolescents undergoing posterior spinal fusion for adolescent idiopathic scoliosis. The present study indicates that comorbid asthma increases risk for pulmonary adverse events, with risk increasing by asthma severity.

**IMAGES AND TABLES:**

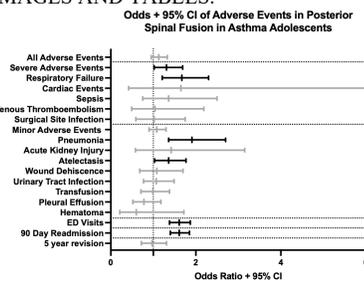


Figure 1: Odds ratio and 95% confidence interval for postoperative complications for matched asthma patients relative to control

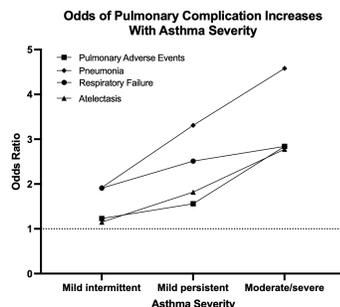


Figure 2: Odds ratio for pulmonary complications progressively increases as the severity of asthma increases