

Predicting Opioid Use Following Lumbar Fusion Using the NIH All of Us Research Program

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Background

Lumbar spinal fusion is one of the most commonly performed spine surgeries in the United States, with over 400,000 procedures performed annually.¹ Opioid use among lumbar fusion patients is prevalent both before and after surgery, yet the transition from perioperative opioid use to opioid use disorder (OUD) remains poorly understood. Prior studies have established associations between pre-surgical opioid use and continued post-surgical opioid consumption,^{2, 3} however, the differential impact of pre-surgical exposure on two related but distinct outcomes clinically diagnosed OUD and prolonged opioid use has not been systematically evaluated. In this study, we utilize the data from NIH All of Us Research Program and evaluated pre surgical opioid exposure and clinical predictors of post-surgical OUD and prolonged opioid use in a lumbar fusion cohort. A novel three-group OUD timing framework was studied that distinguishes preexisting OUD from new onset OUD.

Methods

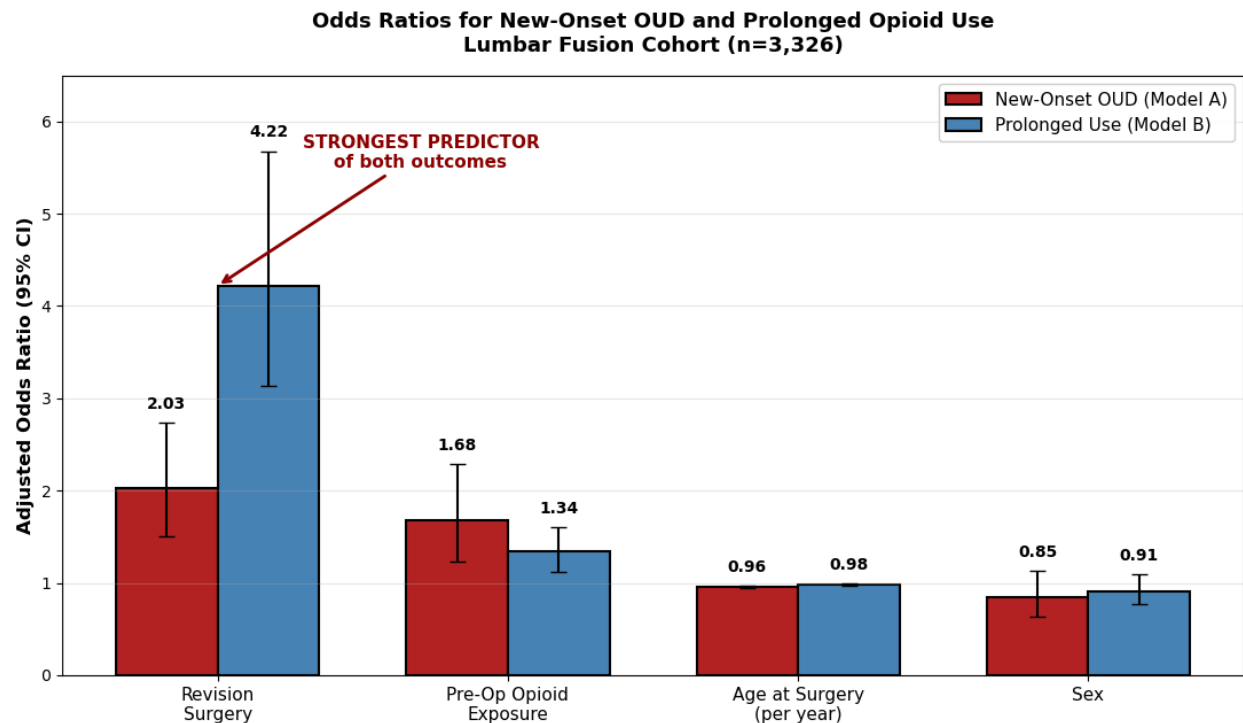
We conducted an observational study using data mapped to the NIH All of Us research program. Patients who underwent lumbar fusion surgery were identified using ICD-9, ICD-10-PCS, and CPT-4 procedure codes. Opioid exposure was accompanied from the NIH All of Us research program drug_exposure table using RxNorm concept codes for five opioid drugs: hydrocodone, oxycodone, morphine, tramadol, and hydromorphone which were the most common drugs. Patients that had an OUD diagnosis were calculated from the condition occurrence table using ICD-9-CM and ICD-10-CM diagnosis codes.

Patients were classified by OUD timing as never gaining OUD long term or after surgery (NO_OUD), pre-existing (OUD_BEFORE), or new-onset post-surgical OUD (OUD_AFTER). Pre-surgical opioid exposure was defined as any opioid prescription fill in the 365 days prior to index surgery. Prolonged opioid use was defined as patients having one or more opioid fills for more than 90 days following surgery. Two multivariable logistic regression models were performed which estimated adjusted odds of each outcome controlling for age at surgery, sex, race, pre-operative prescription count, opioid treatment duration, and revision surgery status.

Results

The final cohort comprised 3,326 lumbar fusion patients with a mean age of 58.6 years; 58.2% were female. Pre-surgical opioid exposure was present in 51.2% of the cohort. Patients were classified by OUD diagnosis timing as NO_OUD (n=2,910, 87.4%) of our cohort and pre-existing OUD was (n=199, 6.0%), or new-onset post-surgical OUD (n=217, 6.5%). Following surgery, 72.9% of patients had prolonged opioid use which was defined as at least one opioid fill more than 90 days post-surgery and 6.5% developed new-onset OUD. Patients with pre-existing OUD had the highest pre-surgical opioid fill counts (mean 92 fills) but standard revision surgery rates (19%). In multivariable logistic regression, pre-surgical opioid exposure

was associated with both post-surgical OUD (OR=1.68, 95% CI 1.23-2.29, $p=0.001$) and prolonged opioid use (OR=1.34, 95% CI 1.12-1.60, $p=0.001$). Revision surgery also was significant as the strongest independent predictor of both outcomes (OUD OR=2.03, 95% CI 1.50-2.74, $p<0.001$; prolonged use OR=4.22, 95% CI 3.14-5.68, $p<0.001$), exceeding the effect of pre-surgical opioid exposure in both models. Younger age at surgery was associated with higher odds of both outcomes (OUD OR=0.96 per year; prolonged use OR=0.98 per year, both $p<0.001$). Sex was not significantly associated with either outcome in the multivariate analyses.



Conclusion

Pre-surgical opioid exposure and revision surgery are associated predictors and both post-surgical OUD and prolonged opioid use following lumbar fusion. The people who had revision surgery emerged as the strongest predictor of both outcomes, more than doubling odds of OUD developed after surgery and prolonged use odds exceeding the significance of pre-surgical opioid exposure in both models. These findings support pre-surgical opioid screening and risk stratified post-operative pain management for patients undergoing revision lumbar fusion.

References

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