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Abstract: 1964

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A Predictive Model for Persistent Opioid Use Following Total Joint Arthroplasty

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Introduction

Over the last decade there has been a significant increase in total knee arthroplasty (TKA) and total hip arthroplasty (THA) performed in the United States, with an anticipated growth by 174% by the year 2030.1 These surgical interventions aim to improve functional status and restore patient's quality of life after failure of conservative management. While opioids remain the cornerstone of acute postoperative pain management, multimodal analgesia models have emerged to shorten hospital days and enhance patient recovery.2 However, despite these efforts, about 10% of THR patients and 20% of TKA patients experience chronic postsurgical pain.3 Studies have shown a correlation between preoperative opioid use and persistent use of opioid postoperatively, specifically persistent use of opioids for 4 months or longer prior to joint arthroplasty is considered a strong predictor of chronic opioid use after surgery.4 Other patient characteristics include history of depression, higher baseline pain scores, younger age and female gender.5 The objective of this case-controlled study was to analyze 30 different perioperative variables to create a predictive model for persistent opioid use ≥3 months following total joint arthroplasty.

Materials and Methods

Our institutional review board approved this study and waived any consent requirements. This was a retrospective single institution case-controlled study, in which we identified patients that had persistent opioid use for ≥3 months following knee or hip arthroplasty. The outcome was identified via manual chart review from their postoperative appointment with orthopedic surgery. We collected 30 different perioperative variables – including comorbidities, surgical diagnosis, surgery type, preoperative medications, demographics, lifestyle habits, anesthesia type, acute opioid use, pain scores, and hospital length of stay. We performed a multivariable logistic regression with variable selection to develop a predictive model for the outcome and report the odds ratio (OR) and 95% confidence intervals (CI) for each significant covariate. The model was developed via a combination of backwards elimination and forward selection. We used bootstrapping to create 1,000 replicates – in which each replicate was split into 75% training and 25% validation set. The area under the receiver operating characteristics curve (AUC) was calculated on each validation set and the average AUC with the 95% CI was reported.

Results/Case Report

There were 198 patients included in this study, in which 87 (43.9%) required persistent opioid use for at least 3 months following surgery. The predictive model included: revision total knee arthroplasty (OR 8.04, 95% CI 1.49 – 43.43, p=0.02), female sex (OR 2.56, 95% CI 1.23 – 5.26, p = 0.01), preoperative opioid use (OR 5.73, 95% CI 2.65 – 12.40, p<0.001), active smoking history (OR 8.16, 95% CI 1.45 – 45.90, p = 0.02), hospital length of stay ≥ 3 days (OR 1.98, 95% CI 0.92 – 4.27, p = 0.08), and postoperative day 1 opioid use ≥ 75% quartile (OR 1.67, 95% CI 0.77 – 3.61, p = 0.19) (Table 1). The average AUC was 0.787 (95% CI 0.718 – 0.856).

Discussion

Our results suggest that nearly 44% of patients required opioids at least 3 months after total joint arthroplasty. The predictive model for persistent opioid use included revision TKA, female sex, preoperative opioid use, active smoking history, hospital length of stay ≥ 3 days, and postoperative day 1 opioid use ≥ 75% quartile. This model can help guide clinical decisions for our surgery and anesthesia teams to offer additional pain related services for these patients who are at increased risk of persistent opioid use after joint arthroplasty.

References

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Disclosures

Yes

Tables / Images

	Coefficient	OR (95% CI)	p-value
Intercept	0.32		0.0003
Surgical Procedure			
Total Knee Arthroplasty	0.52	1.68 (0.80, 3.53)	0.17
Revision Total Knee Arthroplasty	2.09	8.04 (1.49, 43.43)	0.02
Male Sex	-0.94	0.39 (0.19, 0.81)	0.01
Preoperative Opioid Use	1.75	5.73 (2.65, 12.40)	<0.0001
Active Smoking History	2.09	8.16 (1.45, 45.90)	0.02
Hospital Length of Stay (≥3 days)	0.68	1.98 (0.92, 4.27)	0.08
Postoperative Day 1 Opioid Use, (≥35g OEQ)	0.51	1.67 (0.77, 3.61)	0.19

Table 1. Covariates included in the final multivariable logistic regression model. Covariates were selected via forward selection and backwards elimination based on the Akaike Information Criterion and only variables with p-value <0.2 were allowed to remain in the final model. Abbreviations: CI = confidence interval, OEQ = oxycodone equivalents, OR = odds ratio