

The Association of Cannabis Use Disorder on In-Hospital Lengths of Stay, Medical Complications, and Costs of Care in Patients Undergoing Primary 1- to 2- Level Lumbar Fusion

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INTRODUCTION: As the legalization of cannabis continues to increase nationwide, studies evaluating the association of cannabis use disorder (CUD) on outcomes following primary 1- to 2- level lumbar fusion (1-2LF) for lumbar degenerative disc disease (DDD) is of critical importance. Therefore, the aims of this study were to utilize a large nationwide administrative claims database to determine whether CUD patients undergoing 1-2LF for lumbar is associated with: 1) longer in-hospital lengths of stay (LOS); 2) medical complications; and 3) costs of care.

METHODS: Using a nationwide private payor database, a retrospective query from January 1st, 2010 to December 31st, 2018 was performed. Patients and complications were identified using International Classification of Disease, Ninth Revision (ICD-9), ICD-10, and Current Procedural Terminology (CPT) codes. Using Boolean command operators (“AND”, “NOT”, “OR”) the inclusion criteria for the study group consisted of those patients undergoing primary 1-2LF for lumbar DDD who have CUD, while those patients without CUD served as the comparison cohort. Exclusions from the study were those patients undergoing spine surgery for traumatic causes, malignancy, infections, or more than 1- to 2- levels. To minimize any potential confounding bias, study group patients were 1:5 ratio matched to a comparison cohort by age, sex, and the following comorbid conditions – alcohol abuse, chronic obstructive pulmonary disease (COPD), diabetes mellitus, hyperlipidemia, hypertension, and obesity – defined as a body mass index greater than 30 kilograms per meter squared (kg/m^2). Ratio matching was used to increase the overall sample size of the study. The aforementioned comorbid conditions were used as they have been associated with CUD. Following the random matching sequence, the query yielded 22,815 patients within the study ($n = 3,805$) and comparison ($n = 19,010$) cohort. Matching was successful as there was no statistical significance between the two cohorts (Table 1). Primary endpoints of the study were to compare in-hospital LOS, 90-day medical complications, in addition to day of surgery and total global 90-day episode of care costs. Ninety-day medical complications analyzed included: acute kidney injuries, cerebrovascular accidents, deep vein thromboses, hematomas, episodes of ileus, myocardial infarctions, pneumoniae, respiratory failures, transfusion of blood products, urinary tract infections, venous thromboemboli, and wound disruptions. Welch’s *t*-tests were used to compare in-hospital LOS and costs of care, whereas a multivariate logistic regression model was used to calculate the odds-ratios (OR) and 95% confidence intervals (95%CI) on CUD on 90-day medical complications. Due to the ease of finding statistical significance with large database studies, a Bonferroni correction was performed to reduce the probability of a type I error. Thus, a *p*-value less than 0.001 was considered to be statistically significant.

RESULTS:

CUD patients were found to have significantly longer in-hospital LOS compared to their counterparts (5- vs. 3-days, $p < 0.0001$). Additionally, CUD patients incurred significantly higher rates and odds of developing medical complications (31.88 vs. 18.01%; OR: 1.41, 95%CI: 1.29 to 1.54, $p < 0.0001$) such as deep vein thromboses (0.63 vs. 0.14%; OR: 3.07, 95%CI: 1.73 to 5.41, $p < 0.0001$), respiratory failures (0.81 vs. 0.22%; OR: 2.57, 95%CI: 1.58 to 4.13, $p < 0.0001$), myocardial infarctions (0.87 vs. 0.29%; OR: 2.08, 95%CI: 1.32 to 3.23, $p < 0.0001$), acute kidney injuries (4.05 vs. 1.62%; OR: 1.74, 95%CI: 1.41 to 2.14, $p < 0.0001$), pneumoniae (4.73 vs. 2.35%; OR: 1.51, 95%CI: 1.26 to 1.82, $p < 0.0001$), in addition to other complications (Table 2). CUD patients were also found to have significantly higher day of surgery (\$54,196.00 vs. \$52,717.26, $p < 0.0001$) and total global 90-day episode of care costs (\$58,252.53 vs. \$57,041.93, $p < 0.0001$) (Figure 1).

DISCUSSION AND CONCLUSION: As the number of states continue to decriminalize and legalize cannabis use, understanding the impact of CUD following surgical procedures is of critical importance. This study aimed to analyze the association of CUD on outcomes following 1-2LF for lumbar DDD. After adjusting for baseline covariates, this study of over 22,000 patients demonstrated CUD to be associated with longer in-hospital LOS, and higher rates of 90-day complications and healthcare expenditures. The study is vital as it can allow orthopaedic surgeons and healthcare professionals to adequately educate patients on the outcomes of their procedure.

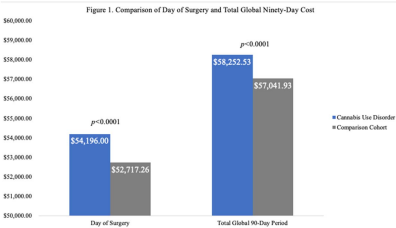


Figure 1. Comparison of Day of Surgery and Total Global Ninety-Day Episode of Care Costs Among Cannabis Use Disorder Patients and Case-Matched Cohort Following Primary 1- to 2-Level Lumbar Fusion for Degenerative Disc Disease

Demographics	Cannabis Use Disorder		Controls		p-value [†]
	n	%	n	%	
Age (Years)					0.08
10 to 14	*	N/A	*	N/A	
15 to 19	23	0.60	112	0.59	
20 to 24	85	2.23	427	2.25	
25 to 29	192	5.05	950	5.00	
30 to 34	357	9.38	1,782	9.37	
35 to 39	423	11.12	2,115	11.13	
40 to 44	540	14.19	2,703	14.22	
45 to 49	686	18.03	3,422	18.00	
50 to 54	632	16.61	3,167	16.66	
55 to 59	482	12.67	2,409	12.67	
60 to 64	233	6.12	1,163	6.12	
65 to 69	92	2.42	460	2.42	
70 to 74	52	1.37	260	1.37	
75 to 79	*	N/A	*	N/A	
Sex					0.99
Female	1,721	45.23	8,600	45.24	
Male	2,084	54.77	10,410	54.76	
Comorbidities					
Alcohol Abuse	1,101	28.94	5,503	28.95	0.99
COPD	1,940	50.99	9,695	51.00	0.99
Diabetes Mellitus	1,480	38.90	7,382	38.83	0.99
Hyperlipidemia	977	25.68	4,870	25.62	0.95
Hypertension	2,798	73.53	13,989	73.59	0.96
Obesity	1,606	42.21	8,027	42.23	0.99

Table 1. Comparison of Baseline Demographics Amongst Cannabis Use Disorder Patients and Controls Undergoing Primary 1- to 2- Level Lumbar Fusion for Degenerative Disorders; * = <11 Patients; N/A = Non-Applicable; [†] = Assessed by Pearson's Chi-Square Analyses

Medical Complications Assessed	CUD (%)	Controls (%)	OR	95%CI	p-value*
Deep Vein Thromboses	0.63	0.14	3.07	1.73 – 5.41	<0.0001
Respiratory Failures	0.81	0.22	2.57	1.58 – 4.13	<0.0001
Myocardial Infarctions	0.87	0.29	2.08	1.32 – 3.23	<0.0001
Acute Kidney Injuries	4.05	1.62	1.74	1.41 – 2.14	<0.0001
Pneumonias	4.73	2.35	1.51	1.26 – 1.82	<0.0001
Hematomas	4.07	2.28	1.48	1.22 – 1.79	<0.0001
Urinary Tract Infections	9.22	5.45	1.44	1.26 – 1.65	<0.0001
Transfusion of Blood Products	1.76	1.08	1.36	1.01 – 1.80	0.03
Cerebrovascular Accidents	1.24	0.79	1.16	0.83 – 1.62	0.37
Disruption of Wound	2.16	1.59	1.08	0.83 – 1.38	0.54
Venous Thromboemboli	1.37	1.14	0.83	0.60 – 1.12	0.24
Episodes of Ileus	0.97	1.06	0.82	0.57 – 1.17	0.31
Total Medical Complications	31.88	18.01	1.41	1.29 – 1.54	<0.0001

Table 2. Frequency of Ninety-Day Medical Complications Observed Amongst Cannabis Use Disorder Patients Undergoing Elective 1- to 2- Level Lumbar Fusion.
CUD = Cannabis Use Disorder;
OR = Odds-Ratio;
95%CI = 95% Confidence Interval;
UTI = Urinary Tract Infection; VTE = Venous Thromboemboli
* = Adjusted for Age, Sex, Geographic Region, Year of Surgery, and Elixhauser-Comorbidity Index