



Lumbar Fusion During the COVID-19 Pandemic: Greater Rates of Morbidity and Longer Procedures

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Background

- The COVID-19 pandemic has altered the standard of care for spine surgery in many ways.
- Lack of literature evaluating the potential changes in surgical outcomes and perioperative factors for spine procedures performed during the pandemic.
 - In particular, no large database study evaluating the impact of the COVID-19 pandemic on spine surgery outcomes has yet been published.
- Therefore, the aim of this study was to evaluate the impact of the COVID-19 pandemic on perioperative factors and postoperative outcomes of lumbar fusion procedures.

- Retrospective cohort study utilizing **ACS-NSQIP database**
- Adult patients who underwent primary lumbar fusion in 2019 and 2020
- Patients were grouped into cohorts based on **2019 (pre-pandemic)** or **2020 (intra-pandemic)** operation year
- Differences in 30-day readmission, reoperation, and morbidity rates were evaluated using **multivariate logistic regression**
- Differences in total RVUs, RVUs per minute, and total operation time were evaluated using **quantile (median) regression**
- Odds ratios for length of stay were estimated via **negative binomial regression**

Results

- Total of 27,446 patients included (12,473 cases in 2020)
- Mean age 61.4±12.6 years
- 14,498 (52.8%) female
- For the 2020 cohort, non-white race, functional dependence, congestive heart failure, ASA class ≥3, and outpatient surgery were more common
- Lumbar fusions performed in 2020 were also associated with longer mean operative time and higher mean fusion levels

Table 1. Baseline patient characteristics			
	2019 N (%)	2020 N (%)	p-value
N of subjects	14,973	12,473	
Age (years), mean±SD	61.4±12.6	61.5±12.6	0.591
Female sex	7,952 (53.1%)	6,546 (52.5%)	0.300
Non-white race	3,501 (23.4%)	3,105 (24.9%)	0.004
Hispanic ethnicity	2,182 (14.6%)	1,821 (14.6%)	0.950
Comorbidities			
Obesity	7,991 (53.4%)	6,524 (52.3%)	0.079
Diabetes mellitus	2,992 (20.0%)	2,469 (19.8%)	0.698
Current smoker	2,500 (16.7%)	1,981 (15.9%)	0.069
Dyspnea	769 (5.1%)	631 (5.1%)	0.773
Functional dependence	216 (1.4%)	224 (1.8%)	0.022
Ventilator dependent	4 (0.0%)	4 (0.0%)	0.796
Severe COPD	672 (4.5%)	576 (4.6%)	0.607
Congestive heart failure	43 (0.3%)	58 (0.5%)	0.015
Hypertension requiring medication	8,760 (58.5%)	7,214 (57.8%)	0.264
Acute renal failure	5 (0.0%)	9 (0.0%)	0.157
Dialysis	26 (0.2%)	18 (0.1%)	0.545
Chronic steroid use	674 (4.5%)	545 (4.4%)	0.597
Bleeding disorder	200 (1.3%)	178 (1.4%)	0.518
Blood transfusions	11 (0.1%)	8 (0.0%)	0.770
ASA class ≥3	7,821 (52.2%)	6,673 (53.5%)	0.037
Laboratory values			
Elevated creatinine	2,870 (19.2%)	2,293 (18.4%)	0.098
Elevated white blood cells	1,863 (12.4%)	1,554 (12.5%)	0.967
Low hematocrit	1,801 (12.0%)	1,552 (12.4%)	0.296
Low platelet	1,666 (11.1%)	1,388 (11.1%)	0.997
Procedural factors			
Outpatient setting	812 (5.4%)	1,334 (10.7%)	<0.001
Operative time (min), mean±SD	205.9±98.6	209.3±99.3	0.005
Wound class ≥2	101 (0.7%)	74 (0.6%)	0.400
Levels fused, mean±SD	1.41±0.65	1.45±0.69	<0.001
1 level	9,960 (66.5%)	7,948 (63.7%)	<0.001
2 levels	4,194 (28.0%)	3,721 (29.8%)	<0.001
3+ levels	819 (5.5%)	804 (6.4%)	<0.001

Bold indicates statistical significance ($p < 0.05$). SD, standard deviation. COPD, chronic obstructive pulmonary disease. ASA, American Society of Anesthesiologists.

Results

- Unadjusted comparisons: lumbar fusions performed in 2020 associated with higher rates of **morbidity, pneumonia, bleeding transfusions, DVT, and sepsis**

Table 2. Unadjusted 30-day outcomes of lumbar fusions performed in 2019 vs. 2020

	2019 N (%)	2020 N (%)	p-value
N of subjects	14,973	12,473	
30-day outcomes			
Readmission	777 (5.2%)	664 (5.3%)	0.620
Reoperation	416 (2.8%)	365 (2.9%)	0.463
Morbidity	1,633 (10.9%)	1,512 (12.1%)	0.002
Complications			
Superficial SSI	193 (1.3%)	161 (1.3%)	0.989
Deep SSI	53 (0.4%)	57 (0.5%)	0.179
Organ/Space SSI	63 (0.4%)	65 (0.5%)	0.224
Wound disruption	50 (0.3%)	50 (0.4%)	0.359
Pneumonia	78 (0.5%)	93 (0.7%)	0.019
Unplanned intubation	25 (0.2%)	31 (0.2%)	0.136
Pulmonary embolism	79 (0.5%)	70 (0.6%)	0.706
Ventilator >48 hours	20 (0.1%)	16 (0.1%)	0.904
Renal insufficiency	27 (0.2%)	23 (0.2%)	0.937
Acute renal failure	9 (0.1%)	8 (0.1%)	0.894
Urinary tract infection	228 (1.5%)	189 (1.5%)	0.960
Stroke	24 (0.2%)	20 (0.2%)	0.999
Cardiac arrest requiring CPR	6 (0.0%)	7 (0.1%)	0.543
Myocardial infarction	49 (0.3%)	53 (0.4%)	0.186
Bleeding transfusions	918 (6.1%)	868 (7.0%)	0.006
Deep venous thrombosis	72 (0.5%)	93 (0.7%)	0.005
Sepsis	63 (0.4%)	81 (0.6%)	0.009
Perioperative variables			
Length of stay (days), mean±SD	3.3±3.9	3.4±2.9	0.002
Non-home discharge	2,274 (15.2%)	1,449 (11.6%)	<0.001
Total RVUs, mean±SD	54.0±21.2	56.0±22.5	<0.001
RVUs per minute, mean±SD	0.316±0.183	0.321±0.190	0.021

Bold values indicate statistical significance ($p < 0.05$). SSI, surgical site infection. CPR, cardiopulmonary resuscitation.

Results



- After adjusting for baseline differences in regression analyses, differences in bleeding transfusions, length of stay, and RVUs per minute were *no longer statistically significant*.
- However, operation year 2020 independently predicted **morbidity, pneumonia, DVT, and sepsis**.
- In terms of perioperative variables, operation year 2020 predicted greater **operative time, non-home discharge, and total RVUs**.

Table 3. Multivariate regression analysis of impact of operation year 2020 on postoperative outcomes following lumbar fusion

	Odds Ratio / Coefficient	95% Confidence Interval	p-value
30-day outcomes			
Readmission	1.009	0.906 - 1.123	0.877
Reoperation	1.028	0.891 - 1.186	0.710
Morbidity	1.087	1.007 - 1.172	0.032
Complications			
Deep SSI	1.301	0.891 - 1.901	0.173
Pneumonia	1.407	1.039 - 1.906	0.027
Bleeding transfusions	1.099	0.995 - 1.212	0.061
Deep venous thrombosis	1.508	1.106 - 2.056	0.009
Sepsis	1.537	1.101 - 2.146	0.012
Perioperative variables			
Length of stay [†]	1.019	0.991 - 1.045	0.178
Operative time*	5.000	2.576 - 7.424	<0.001
Non-home discharge	0.690	0.642 - 0.743	<0.001
Total RVUs*	1.044	1.004 - 1.083	0.006
RVUs per minute*	1.004	1.000 - 1.009	0.060

Bold values indicate statistical significance ($p < 0.05$). *Quantile (median) regression. [†]Negative binomial regression. SSI, surgical site infection.

Conclusions

- Lumbar fusion procedures performed amidst the COVID-19 pandemic were associated with poorer outcomes, including higher rates of **morbidity, pneumonia, DVT, and sepsis.**
- In addition, surgeries performed in 2020 were associated with **longer operative times** and **less frequent non-home discharge disposition.**