

# Impact of the COVID-19 Pandemic on Outcomes and Perioperative Factors Associated with Posterior Cervical Fusion

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**Disclosures:** None

**INTRODUCTION:** While there is anecdotal evidence that the pandemic altered perioperative decision-making in patients requiring PCF, there has not yet been a national-level analysis performed to examine the significance of this hypothesis. This study aimed to evaluate for potential differences in perioperative variables and surgical outcomes of posterior cervical fusion (PCF) performed before vs. during the coronavirus-19 pandemic.

**METHODS:** Adults who underwent PCF were identified in the 2019 (pre-pandemic) and 2020 (intra-pandemic) NSQIP datasets. Differences in 30-day readmission, reoperation, and morbidity were evaluated for using multivariate logistic regression. Differences in operative time and relative value units (RVUs) were estimated via quantile regression. Odds ratios for length of stay (LOS) were estimated via negative binomial regression. Secondary outcomes included rates of non-home discharge and outpatient surgery.

**RESULTS SECTION:** There were 3,444 patients (50.7% from 2020). Readmission, reoperation, morbidity, operative time, and RVUs per minute were similar between cohorts. LOS and RVUs per case were significantly greater in 2020. Operation year 2020 independently predicted lower rates of non-home discharge and greater rates of outpatient surgery.

**DISCUSSION:** During the COVID-19 pandemic, there was 28% decreased odds of nonhome discharge following PCF and 72% increased odds of PCF being performed in an outpatient setting. Rates of readmission, reoperation, and morbidity remained unchanged during this period. This is notable given that patients in the 2020 group were more medically frail.

**SIGNIFICANCE/CLINICAL RELEVANCE:** This suggests that patients were shifted to outpatient centers, possibly to make up for potentially reduced case volume, which highlights the potential to evaluate rehabilitation-discharge criteria. Further research should evaluate these findings in more detail and on a regional basis.

**IMAGES AND TABLES:**

Table 3. Multivariate analysis of impact of operation year 2020 on postoperative outcomes		
30-day outcomes	OR (95% CI)	p-value
Readmission	0.968 (0.736, 1.271)	0.813
Reoperation	0.801 (0.548, 1.170)	0.251
Morbidity	0.915 (0.711, 1.177)	0.489
Perioperative variables	OR (95% CI)	p-value
Length of stay (days)	1.086 (1.037, 1.136)	<0.001
Perioperative variables	Coefficient (95% CI)	p-value
RVUs per minute	0.004 (-0.011, 0.020)	0.589
RVUs per case	0.360 (0.021, 0.699)	<b>0.037</b>
Operative time (min)	1.481 (-4.292, 7.254)	0.615
Bold values indicate statistical significance ( $p<0.05$ ). OR, odds ratio. CI, confidence interval. SSI, surgical site infection.		

Table 2. Unadjusted 30-day outcomes of posterior cervical fusions performed in 2019 vs. 2020			
	2019 N (%)	2020 N (%)	p-value
	N=1,699	N=1,745	
30-day outcomes			
Readmission	122 (7.2%)	124 (7.1%)	0.932
Reoperation	70 (4.1%)	63 (3.6%)	0.438
Morbidity	167 (9.8%)	179 (10.3%)	0.676
Complications			
Superficial SSI	28 (1.6%)	23 (1.3%)	0.423
Deep SSI	7 (0.4%)	12 (0.7%)	0.275
Organ/Space SSI	13 (0.8%)	11 (0.6%)	0.635
Wound disruption	12 (0.7%)	14 (0.8%)	0.745
Pneumonia	13 (0.8%)	17 (1.0%)	0.509
Unplanned intubation	11 (0.6%)	7 (0.4%)	0.316
Pulmonary embolism	13 (0.8%)	14 (0.8%)	0.902
Ventilator >48 hours	4 (0.2%)	4 (0.2%)	1.000 <sup>#</sup>
Renal insufficiency	4 (0.2%)	1 (0.1%)	0.212 <sup>#</sup>
Acute renal failure	2 (0.1%)	1 (0.1%)	0.620 <sup>#</sup>
Urinary tract infection	24 (1.4%)	28 (1.6%)	0.644
Stroke	3 (0.2%)	4 (0.2%)	1.000 <sup>#</sup>
Cardiac arrest requiring CPR	3 (0.2%)	4 (0.2%)	1.000 <sup>#</sup>
Myocardial infarction	8 (0.5%)	10 (0.6%)	0.678
Transfusion	49 (2.9%)	53 (3.0%)	0.791
Deep venous thrombosis	18 (1.1%)	11 (0.6%)	0.168
Sepsis	19 (1.1%)	10 (0.6%)	0.080
Perioperative outcomes			
Operative time (min; median, IQR)	155 (117-208)	159 (118-207)	0.723
RVUs per minute (median, IQR)	0.36 (0.24-0.49)	0.36 (0.26-0.49)	0.558
RVUs per case (median, IQR)	57.8 (48.8-65.3)	57.8 (51.3-65.1)	0.127
Length of stay (days; mean $\pm$ SD)	4.0 (3.2)	4.2 (3.5)	<b>0.015</b>
Bold values indicate statistical significance ( $p<0.05$ ). SSI, surgical site infection. CPR, cardiopulmonary resuscitation. IQR, interquartile range.			

Table 1. Baseline patient characteristics			
	2019 N (%)	2020 N (%)	p-value
	N=1,699	N=1,745	
Demographics			
Age (years), mean $\pm$ SD	63.9 (10.1)	64.2 (10.7)	0.175
Female sex	735 (43.3%)	682 (39.1%)	<b>0.013</b>
Non-white race	279 (19.1%)	344 (22.9%)	<b>0.012</b>
Hispanic ethnicity	114 (7.7%)	133 (8.5%)	0.385
Comorbidities			
5-item modified frailty index			
mFI-5 = 0	538 (31.7%)	513 (29.5%)	0.159
mFI-5 = 1	759 (44.7%)	722 (41.4%)	0.051
mFI-5 $\geq$ 2	402 (23.7%)	509 (29.2%)	<0.001
BMI	30.1 (6.4)	30.0 (6.5)	0.399
Diabetes mellitus	393 (23.1%)	460 (26.4%)	<b>0.028</b>
Dyspnea	125 (7.4%)	125 (7.2%)	0.826
Functional dependence	77 (4.6%)	82 (4.7%)	0.836
Smoker	356 (21.0%)	402 (23.0%)	0.140
COPD	101 (5.9%)	124 (7.1%)	0.168
Congestive heart failure	9 (0.5%)	8 (0.5%)	0.765
Hypertension requiring medication	1,034 (60.9%)	1,132 (64.9%)	<b>0.015</b>
Chronic steroid use	93 (5.5%)	75 (4.3%)	0.109
Bleeding disorder	19 (1.1%)	27 (1.5%)	0.273
ASA class $\geq$ 3	1,147 (67.5%)	1,221 (70.0%)	0.119
Laboratory values			
Creatinine	0.96 (0.54)	1.01 (0.73)	0.056
White cell count	7.4 (2.5)	7.4 (2.5)	0.989
Hematocrit	41.5 (4.5)	41.3 (4.8)	0.175
Platelet count	247 (73)	245 (71)	0.357
Procedural factors			
Nonhome discharge	438 (25.8%)	389 (22.3%)	<b>0.017</b>
Outpatient surgery	51 (3.0%)	84 (4.8%)	<b>0.006</b>
4+ levels fused	260 (15.3%)	270 (15.5%)	0.890
Bold indicates statistical significance ( $p<0.05$ ). SD, standard deviation. COPD, chronic obstructive pulmonary disease. ASA, American Society of Anesthesiologists. mFI-5, 5-item modified frailty index.			