Obstructive Sleep Apnea is Associated with Increased Rates of Acute Respiratory Failure, Length of Stay, and Hospital Costs in Patients Undergoing Elective Single-Level Anterior Cervical Discectomy and Fusion

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INTRODUCTION:

Obstructive sleep apnea (OSA) is associated with increased perioperative risks across surgical populations. However, its impact on outcomes following anterior cervical discectomy and fusion (ACDF) has not been well defined. This study evaluates the association between OSA and postoperative complications, healthcare utilization, and discharge outcomes following ACDF.

METHODS:

The National Inpatient Sample (NIS) database was queried to identify patients undergoing single-level ACDF between 2016 and 2022. After exclusions, patients were divided into OSA and control groups. Propensity score matching (1:2) controlled for age, sex, obesity, and year of surgery to balance characteristics. Postoperative outcomes, including complications, length of stay (LOS), hospital costs, and discharge disposition, were compared using chi-square tests for categorical variables and t-tests for continuous variables. A Bonferroni correction was applied, with significance set at $P < 0.002$.

RESULTS:

A total of 36,000 matched cases were analyzed (12,000 OSA and 24,000 controls). OSA patients had significantly higher rates of acute respiratory failure (4.7% vs. 1.9%; $P < 0.001$) and mechanical ventilation (1.5% vs. 0.6%; $P < 0.001$). The OSA cohort also had a longer LOS (2.3 vs. 1.9 days; $P < 0.001$), higher hospital costs ($23,300 vs. $21,100; $P < 0.001$), and greater non-routine discharge rates (20.4% vs. 16.8%; $P < 0.001$).

DISCUSSION AND CONCLUSION: OSA is independently associated with increased postoperative complications, prolonged hospitalization, higher costs, and greater likelihood of non-routine discharge following ACDF. These findings highlight the need for preoperative risk stratification and optimization in patients with OSA to mitigate adverse outcomes and healthcare burden.

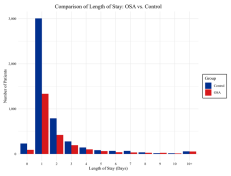

Table 1.
Baseline Demographic Characteristics of Patients Prior to Propensity Score-Matching

		Control N = 181,000 (%)	Obstructive Sleep Apnea N = 12,000 (%)	*P* value
Age (mean ± SD)		56.1 ± 8.1	59.0 ± 9.2	**<0.001**
Race				**<0.001**
	White	77,692 (76.8)	9,495 (79.1)	
	Black	10,625 (10.5)	1,345 (11.2)	
	Hispanic	7,750 (7.7)	730 (6.1)	
	Asian or Pacific Islander	1,745 (1.7)	120 (1.0)	
	Native American	780 (0.7)	70 (0.6)	
	Other	2,915 (2.9)	240 (2.0)	
Sex				**<0.001**
	Male	44,695 (44.0)	7,210 (60.1)	
	Female	56,875 (56.0)	4,790 (39.9)	
Obesity		16,730 (16.5)	5,295 (44.1)	**<0.001**
Year				**<0.001**
	2016	24,440 (24.1)	2,245 (18.6)	
	2017	18,180 (17.9)	1,895 (16.1)	
	2018	15,525 (15.3)	1,795 (15.0)	
	2019	13,740 (13.5)	1,840 (15.3)	
	2020	11,405 (11.3)	1,285 (11.5)	
	2021	9,120 (9.0)	1,455 (12.1)	
	2022	8,010 (8.9)	1,425 (11.9)	

N = Number; % = percentage; SD = standard deviation.
Bold values are statistically significant.

Table 2.
Matched Demographic Characteristics of Patients After Propensity Score-Matching

		Control N = 24,000 (%)	Obstructive Sleep Apnea N = 12,000 (%)	*P* value
Age (mean ± SD)		59.8 ± 8.7	59.8 ± 9.2	0.965
Race				0.300
	White	18,540 (77.4)	9,495 (79.1)	
	Black	2,855 (11.8)	1,345 (11.2)	
	Hispanic	1,711 (7.1)	730 (6.1)	
	Asian or Pacific Islander	240 (1.1)	120 (1.0)	
	Native American	80 (0.4)	70 (0.6)	
	Other	510 (2.1)	240 (2.0)	
Sex				0.965
	Male	14,436 (60.2)	7,210 (60.1)	
	Female	9,564 (40.0)	4,790 (39.9)	
Obesity		10,589 (44.1)	5,295 (44.1)	0.983
Year				0.978
	2016	4,440 (18.4)	2,195 (18.8)	
	2017	3,820 (15.9)	1,855 (16.1)	
	2018	3,725 (15.5)	1,795 (15.8)	
	2019	3,710 (14.6)	1,840 (15.3)	
	2020	2,780 (11.5)	1,385 (11.5)	
	2021	2,990 (12.1)	1,455 (12.1)	
	2022	2,820 (11.8)	1,425 (11.9)	

N = Number; % = percentage.
Bold values are statistically significant.

Table 3.
Comparison of Complications Between Cohorts After Propensity Score-Matching

	Control N = 24,000 (%)	Obstructive Sleep Apnea N = 12,000 (%)	*P* value
Acute post-hemorrhagic anemia	7.1	7.6	0.063
Wound disruption	N<10*	N<10*	-
Dysphagia	7.6	8.3	0.322
Mechanical complication	2.3	2.7	0.330
Hematoma	N<10*	N<10*	-
Nervous system complication	0.4	N<10*	0.131
Acute deep vein thrombosis	0.2	N<10*	0.571
Pulmonary embolism	0.2	N<10*	0.432
Myocardial infarction	0.3	0.3	0.746
Cerebrovascular accident	1.6	2.2	0.010
Venous thromboembolism	0.3	N<10*	0.553
Pneumonia	0.3	0.3	0.660
Acute kidney injury	1.1	1.6	0.053
Urinary retention	N<10*	N<10*	-
Postoperative pain	2.4	2.3	0.824
Acute respiratory failure	1.9	4.7	**<0.001**
Circulatory complications	0.4	0.9	0.001
Mechanical ventilation	0.6	1.5	**<0.001**
Urinary tract infection	0.8	0.8	0.582
Adverse events	17.2	22.4	**<0.001**

N = Number; % = percentage.
* Signifies that the count number is < 10 and cannot be reported.
Adverse events are defined as the presence of 1 or more of the perioperative complications queried.
Bold values are statistically significant.

Table 4.
Comparison of Hospital Course Between Cohorts After Propensity Score-Matching

	Control N = 24,000 (%)	Obstructive Sleep Apnea N = 12,000 (%)	*P* value
LOS	1.9 ± 0.04	2.3 ± 0.1	**<0.001**
Cost	$21,100 ± 200	$23,300 ± 400	**<0.001**
Non-routine discharge	4,030 (16.8)	2,450 (20.4)	**<0.001**

N = Number; % = percentage; LOS = length of stay.
Bold values are statistically significant.