

Anterior Cervical Discectomy and Fusion in the Ambulatory Surgery Center Versus Outpatient and Inpatient Settings in a Medicare Population: An Analysis of Complications and Cost

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INTRODUCTION:

Background Context: Anterior cervical discectomy & fusion (ACDF) is increasingly performed in hospital outpatient and Ambulatory Surgical Centers (ASC).

Purpose: The aim of this study was to compare differences in post-operative readmission rates, complications, and costs for 1-2 level ACDFs among Medicare fee-for-service beneficiaries performed in an inpatient, hospital outpatient, or ASC.

METHODS: Patients who underwent a primary one- or two-level ACDF from 2016-2021 were retrospectively identified using Current Procedural Terminology (CPT) codes. A total of 118,692 patients were included in the analysis. Demographic data, surgical characteristics, post-operative readmissions and complications, as well as cost data were collected through Centers for Medicare and Medicaid Services. Patients were propensity-score matched by demographic, comorbidity, and surgical characteristics, and univariate analysis was performed to determine differences in outcomes by surgical setting.

RESULTS: The proportion of Medicare patients undergoing ACDF at a hospital outpatient or ASC steadily increased from 2016-2021, ultimately as high as 49.2% in 2021 ($p < 0.001$). Compared to inpatients, those undergoing surgery at an outpatient or ASC were younger, had lower Charlson comorbidity index, shorter LOS, and a higher proportion of 2-level operations ($p < 0.001$). Total adjusted initial ("index") surgery (ASC \$9,898 vs. OP \$13,011 vs. IP \$33,911) and total 90-day episode of care costs (ASC \$13,465 vs. OP \$17,264 vs. IP \$44,016) were significantly lower in both the ASC and outpatient cohorts compared to the inpatient cohort ($p < 0.001$). ACDF's performed in the ASC or outpatient setting had significantly lower rates of adjusted readmission, total complications, infection, VTE, and revision surgery ($p < 0.001$) compared to those in the inpatient setting.

DISCUSSION AND CONCLUSION: One- and two-level ACDF are increasingly being performed in an outpatient setting. Outpatient surgery is associated with lower rates of readmission and complications, likely secondary to patient selection and demand matching patients to the lowest costing facilities. By using the Medicare database and matching patients by demographic data and comorbidities, the results support performing ACDFs at an ASC is safe. Further, lower costs are associated with performing these surgeries in an ASC or outpatient setting as opposed to an inpatient setting.

Table 1: Treatment setting by year

YEAR	Setting					
	ASC	Outpatient		Inpatient		
2016	110	0.6%	1,096	6.0%	17,122	93.4%
2017	179	1.0%	4,660	25.4%	13,496	73.6%
2018	182	1.0%	5,582	29.9%	12,886	69.1%
2019	264	1.4%	5,827	30.5%	13,042	68.2%
2020	279	1.7%	5,098	31.8%	10,638	66.4%
2021	310	1.9%	7,579	47.3%	8,132	50.8%

Frequency (row %) by year Source: Medicare claims 2016 - 2021

Table 2: Differences in inflation-adjusted reimbursement among fee-for-service Medicare beneficiaries undergoing ACDF, by surgical setting

Index (initial admission)	ASC			OP	IP
	Component	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)
Facility	ASC	\$6,977 (6,613, 1,142)	\$9,882 (9,401, 9,903)	\$20,073 (20,720, 30,025)	
	OP				
	IP				
	p-value	<0.001	<0.001	<0.001	
Professional	ASC	\$2,881 (2,224, 2,342)	\$2,590 (2,297, 3,003)	\$3,880 (3,876, 3,891)	
	OP				
	IP				
	p-value	<0.001	<0.001	<0.001	
Imaging	ASC	\$46 (43, 49)	\$44 (42, 45)	\$96 (95, 97)	
	OP				
	IP				
	p-value	<0.001	<0.001	<0.001	
TOTAL*	ASC	\$9,908 (9,559, 10,270)	\$13,011 (12,016, 13,465)	\$33,911 (33,206, 44,086)	
	OP				
	IP				
	p-value	<0.001	<0.001	<0.001	
Post acute OR (day)	TOTAL	\$2,494 (2,085, 3,982)	\$4,110 (4,997, 4,231)	\$9,748 (9,573, 9,980)	
	OP				
	IP				
	p-value	<0.001	<0.001	<0.001	
Episode of Care (90 day)	TOTAL	\$13,465 (12,962, 14,029)	\$17,264 (17,110, 17,438)	\$44,016 (43,797, 44,262)	
	OP				
	IP				
	p-value	<0.001	<0.001	<0.001	

* Sum of items within index admission do not add to total because some relatively small ("other") costs are excluded.

Table 3: Differences across surgical setting in post-operative safety proxy measures among Medicare beneficiaries undergoing ACDF

	Observational, unadjusted %			Regression adjusted differences, ppt (95% CI)		Matched Cohort differences, ppt (95% CI)	
	ASC	OP	IP	ACS vs. OP	IP vs. OP	ACS vs. OP	IP vs. OP
Readmission (90 day)	70	8.5	15.5	-0.9 (2.4, 0.7)	6.2 (5.8, 6.6)	-0.2 (-2.0, 1.5)	6.5 (5.9, 7.0)
				0.9 (0.3, 1.1)	1.0 (1.0, 2.0)	0.91	<0.001
				0.271			
Readmission (60 day)	207	23.4	31.8	-1.2 (2.0, 0.6)	7.0 (6.8, 7.1)	-0.3 (-2.4, 2.0)	7.1 (6.3, 7.9)
				0.9 (0.8, 1.0)	1.2 (1.0, 1.3)	0.68	<0.001
				0.62			
Any Complication (90 day)	261	28.6	48.6	-1.1 (3.7, 1.4)	19.0 (18.3, 19.6)	-0.7 (-2.2, 2.3)	19.1 (18.3, 19.8)
				0.9 (0.8, 1.1)	2.3 (2.2, 2.4)	0.64	<0.001
				0.38			
Complication with readmission (90 day)	207	23.4	38.9	-1.2 (3.9, 1.9)	14.3 (13.6, 15.0)	-0.3 (-2.4, 2.0)	14.2 (13.4, 15.0)
				0.9 (0.8, 1.1)	2.0 (2.0, 2.1)	0.68	<0.001
				0.62			
Complication without readmission (90 day)	143	15.7	26.5	-0.6 (2.0, 1.5)	10.0 (9.5, 10.5)	0.2 (-2.1, 2.5)	10.1 (9.5, 10.7)
				1.0 (0.8, 1.1)	1.8 (1.8, 1.9)	0.54	<0.001
				0.74			
Died (90 day)	0.4	0.5	2.2	0.0 (0.5, 0.8)	0.8 (0.5, 0.8)	0.1 (0.3, 0.5)	1.7 (1.5, 1.8)
				1.0 (0.4, 2.5)	3.6 (3.0, 4.3)	0.69	<0.001
				0.34			
Died (365 days)	1.3	1.8	4.2	0.1 (0.6, 0.8)	1.3 (1.1, 1.4)	0.6 (0.2, 1.0)	2.3 (2.0, 2.5)
				1.1 (0.7, 1.7)	2.1 (2.0, 2.3)	0.56	<0.001
				0.72			
PctVVT	2.6	3.1	7.0	-0.2 (2.2, 2.7)	3.0 (2.1, 3.9)	-0.1 (-1.2, 1.0)	3.6 (3.3, 3.9)
				0.9 (0.7, 1.3)	2.2 (2.0, 2.3)	0.88	<0.001
				0.81			
Infection	1.0	1.1	2.9	0.0 (0.5, 0.5)	1.5 (1.4, 1.7)	0.1 (0.5, 0.9)	1.7 (1.5, 1.9)
				0.9 (0.5, 1.0)	2.0 (2.1, 2.7)	0.71	<0.001
				0.81			
Device problem	2.2	2.3	6.0	-0.1 (0.9, 0.7)	3.3 (3.1, 3.5)	0.2 (0.7, 1.2)	3.7 (3.4, 3.9)
				1.0 (0.7, 1.4)	2.9 (2.8, 2.7)	0.65	<0.001
				0.69			

Observations: ppt - percentage point difference, ASC, ambulatory surgery center, IP, Inpatient setting, OP, Outpatient setting.