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The Impact of Resident and Fellow Involvement in Adult Spinal Deformity Surgery

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Introduction

Adult spinal deformity (ASD) operations are long and complex, often requiring a multi-surgeon team. Simultaneously, it is the responsibility of academic spine surgeons to train future complex spine surgeons. Our objective was to assess the impact of resident and fellow involvement on ASD surgery in the four areas of: 1) perioperative outcomes, 2) length of stay, 3) discharge status, and 4) complications.

TOTAL N=1,471	Attending Only N=687	Resident/Fellow Involvement N=784
Male, n (%)*	288 (42)	310 (40)
Age, mean (SD)	58.1 (14.8)	58.2 (15.6)
BMI, mean (SD)	28.8 (6.7)	27.8 (7.2)
PMH		
HTN, n (%)	367 (53)	402 (51)
Diabetes, n (%)	92 (13)	103 (13)
COPD, n (%)	23 (3)	30 (4)
PVD, n (%)*	6 (1)	4 (1)
Cardiac, n (%)	55 (8)	57 (5)
Dialysis, n (%)	5 (1)	3 (0)
TIA/CVA, n (%)	33 (5)	38 (5)
Cancer history, n (%)	13 (2)	33 (4)
Open wound, n (%)	11 (2)	17 (2)
Steroid, n (%)	24 (3)	38 (5)
Bleeding disorder, n (%)	8 (1)	23 (3)
Social		
Smoker, n (%)	134 (20)	130 (17)
Independent, n (%)*	633 (93)	698 (89)
Ventilator, n (%)	2 (0)	7 (1)
Weight loss, n (%)	5 (1)	14 (2)
Operative CPT Code*		
Smaller Construct (<6 levels), n (%)	284 (57)	342 (54)
Medium Construct (7-11 levels), n (%)	83 (17)	156 (25)
Large Construct (>12 levels), n (%)	135 (27)	133 (21)

Methods

Adults who underwent thoracolumbar spinal deformity correction between 2008 and 2014 were identified in the National Surgical Quality Improvement Program (NSQIP) database. Demographic characteristics were extracted. Cases were divided into those with resident/fellow involvement compared to attendings only. Outcomes of interest were: operative time, number of ransfusions, length of stay (LOS), discharge status, and complications. Univariate followed by multivariable regression modeling was used. Preoperative comorbidities, specialty, and levels fused were covariates.

TOTAL N=1,471	Attending Only N=687	Resident/Fellow Involvement N=784
Perioperative		
Operative time (min), mean (SD)*	250.9 (154.9)	337.6 (158.7)
Transfusion, n (%)	154 (22)	354 (45)
Length of Stay		
LOS (days), mean (SD)*	5.5 (6.2)	8.1 (14.7)
Discharge Status		
IPR/SNF, n (%)*	82 (21)	179 (37)
Complications		
Major, n (%)	70 (10)	117 (15)
Minor, n (%)	174 (25)	374 (48)
Surgical Site Infection, n (%)	9 (1)	33 (4)
Pneumonia, n (%)	12 (2)	19 (2)
DVT, n (%)	11 (2)	16 (2)
PE, n (%)	5 (1)	10 (1)
Stroke, n (%)	4 (1)	4 (1)
MI, n (%)	0 (0)	4 (1)
Sepsis, n (%)	13 (2)	31 (4)

Results

A total of 1,461 patients underwent ASD surgery with orthopedics (707, 48.4%) or neurosurgery (754, 51.2%), with resident/fellow involvement in 778 (53%) operations. After multivariable regression modeling, five outcomes remained significant. Resident/fellow involvement was associated with longer operations (ß 66.01 minutes, 95%CI 35.82-96.19, p<0.001), increased odds of transfusion (OR 2.80, 95%CI 1.81-4.32, p<0.001), longer hospital stay (ß 1.76 days, 95% CI 0.18-3.34, p=0.030), and discharge to inpatient rehab or skilled nursing facility (OR 2.02, 95% CI 1.34-3.05, p<0.001). However, resident/fellow involvement was not associated with any increase in major or minor complications, nor specific complications of infection, pneumonia, DVT, PE, stroke, MI, or sepsis.

	Univariate		Multivariable	
Outcomes	**OR (95% CI)**	**p-value**	**OR (95%CI)**	**p-value**
Perioperative				
Operative time (min)	86.7 (70.63, 102.83)	<0.001	66.01 (35.82, 96.19)	<0.001*
Transfusions	2.84 (2.27, 3.58)	<0.001	2.80 (1.81, 4.32)	<0.001*
Length of Stay				
LOS (days)	2.55 (1.37, 3.73)	<0.001	1.76 (0.18, 3.34)	0.030*
Discharge Status				
Home vs. IPR/SNF	2.22 (1.63, 3.01)	<0.001	2.02 (1.34, 3.05)	0.001*
Complications				
Major	1.56 (1.13, 2.13)	0.006	0.960 (0.65, 1.42)	0.840
Minor	2.69 (2.15, 3.36)	<0.001	0.634 (0.27, 1.47)	0.288
Surgical Site Infection	3.31 (1.57, 6.97)	0.002	1.69 (0.72, 3.94)	0.225
Pneumonia	1.40 (0.67, 2.90)	0.369	0.42 (0.17, 1.07)	0.069
DVT	1.28 (0.59, 2.78)	0.532	0.62 (0.25, 1.52)	0.296
PE	1.76 (0.60, 5.18)	0.303	0.67 (0.17, 2.65)	0.559
Stroke	0.88 (0.22, 3.51)	0.851	0.34 (0.05, 2.28)	0.268
MI	1 (omitted)	--	1 (omitted)	--
Sepsis	2.13 (1.11, 4.11)	0.023	1.49 (0.69, 3.20)	0.312

Conclusions

Involvement of residents/fellows in ASD surgeries was associated with increased operative time, more transfusions, longer LOS, and non-home discharge; however, no increase in major or minor complications was seen. These preliminary data support the continued training of future deformity and complex spine surgeons without fear of worsening complications, yet areas of improvement exist.

Learning Objectives

By the conclusion of this session, participants should be able to:

1.Describe the differences in outcomes of patients undergoing ASD surgery with resident/fellow involvement compared to attendings only.

2.Discuss the implications of these findings on training future deformity and complex spine surgeons.