

Impact of resident versus specialist performed lumbar spine surgery

Tobias Overmark (Aarhus, Denmark), David Kocemba (Aarhus, Denmark), Mikkel M. Rasmussen (Aarhus, Denmark)

Introduction

Lumbar spine surgery for degenerative conditions is frequently performed by neurosurgical residents under specialist supervision as part of surgical training. Previous studies have shown that resident involvement is not associated with increased perioperative complications, however evidence regarding longer-term patient-reported outcomes (PROs) remains limited.

Materials and Methods

We conducted a retrospective cohort study of patients undergoing lumbar spine surgery for degenerative conditions at a tertiary neurosurgical center in Denmark between 2020 and 2024. Clinical data and PROs were obtained from the national registry DaneSpine with prospectively collected baseline and 1-year follow-up outcomes. The exposure was the surgeon’s experience level (resident vs specialist). Primary outcomes were visual analogue scale scores for leg pain (VAS-LP), Oswestry Disability Index (ODI), and European Quality of Life index (EQ5D) at 1-year follow-up. Secondary outcomes were visual analogue scale scores for back pain (VAS-BP) and patient satisfaction. Multivariable ordinal and logistic regression models were adjusted for prespecified confounders.

Results

Among 1815 eligible patients, 1035 with complete follow-up were included; 635 procedures (61%) were performed by specialists and 400 (39%) by supervised residents. Both groups demonstrated improvements from baseline to 1-year follow-up in VAS-LP, VAS-BP, ODI, and EQ5D (all $P < .01$), with similar median improvements between groups. In adjusted analyses, resident-performed surgery was not associated with differences in VAS-LP (OR 1.17, 95% CI 0.93–1.48), VAS-BP (OR 1.06, 95% CI 0.84–1.34), ODI disability categories, or patient satisfaction (OR 1.15, 95% CI 0.85–1.54) when compared to specialists. For EQ5D, resident-performed surgery was associated with 92% higher odds of poor quality of life at 1-year follow-up (OR 1.92, 95% CI 1.22–3.03). Sensitivity analyses, including multiple imputation for missing 1-year follow-up data, supported these findings.

Conclusion

Lumbar spine surgery performed by supervised residents resulted in significant improvements in pain, disability, and quality-of-life at 1-year, similar to specialist-performed surgery across most patient-reported outcomes. When residents and specialists were compared, specialist-performed surgery displayed a non-significant trend towards better pain and function outcomes and a significant difference in quality-of-life measured by EQ5D. These findings support the overall safety of supervised resident training, while highlighting the need for continued attention to training and supervision.

Table 3. PROs at 1-year follow-up and surgery performed by residents

	Unadjusted univariable		Adjusted multivariable		
	OR (95% CI)	P value	OR (95% CI)	P value	<i>n</i>
<i>Specialists</i>	<i>Ref.</i>				
VAS leg pain	1.22 (0.97-1.55)	0.11	1.17 (0.93-1.48)	0.19	892
VAS back pain	1.21 (0.96-1.53)	0.12	1.06 (0.84-1.34)	0.64	888
ODI: Minimal	0.88 (0.67-1.16)	0.37	1.00 (0.73-1.35)	0.98	874
ODI: Severe	1.40 (0.99-1.98)	0.06	1.15 (0.79-1.68)	0.46	874
EQ5D: Poor	2.13 (1.37-3.33)	0.001	1.92 (1.22-3.03)	0.005	881
EQ5D: Good	0.83 (0.62-1.12)	0.22	0.92 (0.67-1.25)	0.58	881
Satisfaction	1.27 (0.96-1.68)	0.10	1.15 (0.85-1.54)	0.36	890

Note: PRO, patient-reported outcome; OR, odds ratio; CI, confidence interval; VAS-LP, Visual Analogue Scale for leg pain (0–100); VAS-BP, Visual Analogue Scale for back pain (0–100); ODI, Oswestry Disability Index; EQ5D, EuroQol 5-dimension index. Odds ratios compare resident-performed surgery with specialist-performed surgery (reference). *Continuous ordinal logistic regression. †Partial proportional odds cumulative logit models; Odds ratios correspond to cumulative contrasts for the named category versus the remaining categories. ‡Binary logistic regression. Adjusted models include prespecified confounders (baseline PROs, pain duration, number of operated levels, prior back surgery, age, sex, BMI), with minor outcome-specific differences due to events-per-variable constraints (see Supplementary S-Table 3).

PROs at 1-year follow-up and surgery performed by residents

Table 2. Pairwise comparison of continuous PROs from baseline to 1-year follow-up

	Baseline median (IQR)	1-year follow-up median (IQR)	Baseline vs 1-year follow-up	
			Median change	P value
Overall				
VAS-LP	71 (51-85)	21 (3-53)	-35	<0.01*
VAS-BP	62 (36-81)	23 (5-53)	-23	<0.01*
ODI	46 (32-58)	21 (9-38)	-20	<0.01*
EQ5D	0.59 (0.29-0.72)	0.72 (0.66-0.82)	0.17	<0.01*
Specialists				
VAS-LP	63 (39-79)	20 (3-51)	-34	<0.01*
VAS-BP	62 (36-80)	26 (4-55)	-22	<0.01*
ODI	46 (32-58)	22 (10-39)	-18	<0.01*
EQ5D	0.56 (0.29-0.72)	0.72 (0.66-0.82)	0.16	<0.01*
Residents				
VAS-LP	72 (51-85)	20 (3-48)	-36	<0.01*
VAS-BP	62 (34-78)	21 (4-50)	-25	<0.01*
ODI	44 (33-58)	20 (6-36)	-21	<0.01*
EQ5D	0.59 (0.32-0.72)	0.77 (0.66-0.82)	0.21	<0.01*

Note: PRO, patient-reported outcome; IQR, interquartile range; VAS-LP, Visual Analogue Scale for leg pain (0–100); VAS-BP, Visual Analogue Scale for back pain (0–100); ODI, Oswestry Disability Index (0–100); EQ5D, EuroQol 5-dimension index (–0.59 to 1). Values are median (IQR). Median change is 1-year minus baseline (negative values indicate improvement for pain/disability; positive values indicate improvement for EQ5D). *Wilcoxon signed-rank test (paired).

Pairwise comparison of continuous PROs from baseline to 1-year follow-up