Supplementary Table I. Baseline characteristics of 12-month ODI model responders and non-responders

Variable	Responders (*N* = 2,412)	Non-responders (*N* = 934)	*p*-value
Female, *n* (%)	1186 (49.2)	392 (42.0)	**<0.001**†
Age, years (SD)	62.0 (15.1)	51.7 (16.1)	**<0.001***
Baseline back pain (SD)	5.7 (2.8)	5.7 (2.7)	0.288*
Baseline leg pain (SD)	6.6 (2.5)	6.7 (2.5)	0.314*
Baseline ODI (SD)	43.6 (17.2)	45.9 (17.4)	**<0.001***
BMI			0.278†
Underweight (<18.5 kg/m^2), *n* (%)	19 (0.8)	8 (0.9)	
Normal (18.5–24.9 kg/m^2), *n* (%)	620 (25.7)	237 (25.4)	
Overweight (25.0–29.9 kg/m^2), *n* (%)	1043 (43.2)	371 (39.7)	
Obese class 1 (30.0–34.9 kg/m^2), *n* (%)	539 (22.3)	225 (24.1)	
Obese class 2 (35.0–39.9 kg/m^2), *n* (%)	158 (6.6)	78 (8.4)	
Obese class 3 (≥40.0 kg/m^2), *n* (%)	33 (1.4)	15 (1.6)	
Procedure, *n* (%)			**<0.001**†
Discectomy	1038 (43.0)	554 (59.3)	
Discectomy and fusion	97 (4.0)	50 (5.4)	
Laminectomy	1089 (45.1)	276 (29.6)	
Laminectomy and fusion	188 (7.8)	54 (5.8)	
Leg pain duration, *n* (%)			0.094†
Up to 3 months	441 (18.3)	196 (21.0)	
3–12 months	1077 (44.7)	429 (45.9)	
1–2 years	379 (15.7)	139 (14.9)	
More than 2 years	515 (21.4)	170 (18.2)	
Previous lumbar operation, *n* (%)			0.715†
None	2019 (83.7)	772 (82.7)	
One	315 (13.1)	132 (14.1)	
Two or more	78 (3.2)	30 (3.2)	
Index-level facet cyst, *n* (%)	166 (6.9)	35 (3.7)	**<0.001**†
Scoliosis Cobb angle ≥30°, *n* (%)	37 (1.5)	13 (1.4)	0.761†
Vertebral body fracture[#], *n* (%)	76 (3.2)	29 (3.1)	0.945†
Preexisting cauda equina, *n* (%)	15 (1.2)	7 (0.7)	0.682†
Preexisting myelopathy, *n* (%)	35 (1.5)	17 (1.8)	0.439†
Major psychological disorder, *n* (%)	11 (0.5)	5 (0.5)	0.766†
Existing (non-spinal) cancer, *n* (%)	28 (1.2)	6 (0.6)	0.180†
Multiple joint osteoarthritis, *n* (%)	51 (2.1)	19 (2.0)	0.884†
Rheumatoid arthritis, *n* (%)	63 (2.6)	17 (1.8)	0.179†
Spondyloarthropathy, *n* (%)	22 (0.9)	10 (1.1)	0.672†
Inflammatory bowel disease, *n* (%)	25 (1.0)	5 (0.5)	0.168†
Hypermobility spectrum disorder, *n* (%)	8 (0.3)	6 (0.6)	0.212†
Diabetes mellitus, *n* (%)	182 (7.5)	65 (7.0)	0.561†
Previous lower-limb arthroplasty, *n* (%)	307 (12.7)	78 (8.4)	**<0.001**†
Mobility aided, *n* (%)	57 (2.4)	23 (2.5)	0.866†
Depression / anxiety, *n* (%)	327 (13.6)	164 (17.6)	**0.003**†
Current smoker, *n* (%)	265 (11.0)	240 (25.7)	**<0.001**†
Public-funded healthcare, *n* (%)	670 (27.8)	291 (31.2)	0.053†

Work status			**<0.001**†
Unemployed, *n* (%)	71 (2.9)	67 (7.2)	
On disability benefits, *n* (%)	34 (1.4)	28 (3.0)	
Other, *n* (%)	2307 (95.6)	839 (89.8)	

*Independent-samples t-test; †Chi-squared test; *p*-values ≤0.05 in bold
SD, standard deviation; # T8 to S1 inclusive

Supplementary Table II. 12-month ODI model in 2008–2025

Variable	**Non-specific**			
	Coef.	(95% CI)		*p*-value
Intercept	3.903	-3.388	11.194	0.294
Clinical indication (discectomy)	0.640	-2.068	3.348	0.643
Procedure type [a]				**0.009**
Instrumented fusion	-1.162	-3.233	0.909	0.271
Uninstrumented fusion	7.981	2.478	13.484	**0.004**
Sex (female)	2.924	1.595	4.999	**<0.001**
Age*	0.126	0.071	0.181	**<0.001**
Baseline back pain*	0.437	0.176	0.698	**0.001**
Baseline leg pain*	-0.646	-0.943	-0.349	**<0.001**
Baseline ODI*	0.348	0.304	0.393	**<0.001**
Preexisting cauda equina	7.468	-0.415	15.351	0.063
Preexisting myelopathy	3.535	-1.646	8.717	0.181
Major psychiatric disorder	16.531	7.153	25.909	**<0.001**
Existing (non-spinal) cancer	6.169	0.407	11.932	**0.036**
Previous lumbar operation [b]				<**0.001**
One	3.663	1.816	5.511	**<0.001**
Two or more	8.878	5.361	12.395	**<0.001**
Scoliosis Cobb angle >30°	6.401	1.316	11.486	**0.014**
Vertebral body fracture	4.726	1.146	8.306	**0.010**
Index-level facet cyst	-3.680	-6.212	-1.148	**0.004**
Diabetes mellitus	2.729	0.342	5.117	**0.025**
Hypermobility spectrum disorder	15.471	4.715	26.227	0.005
Multiple-joint osteoarthritis	10.652	6.286	15.018	**<0.001**
Rheumatoid arthritis	6.104	2.202	10.005	**0.002**
Spondyloarthritis	8.841	2.32	15.362	**0.008**
Inflammatory bowel disease	6.775	0.663	12.886	**0.030**
Previous lower-limb arthroplasty	2.995	1.006	4.984	**0.003**
Mobility aided	10.961	6.794	15.127	**<0.001**
Depression/anxiety	2.955	1.037	4.873	**0.003**
Provider status (public-funded)	3.066	1.569	4.563	**<0.001**
Duration of leg pain [c]				<**0.001**
3–12 months	2.697	0.623	4.771	**0.011**
1–2 years	5.228	3.496	6.960	**<0.001**
2 years or more	8.005	5.784	10.227	**<0.001**
Current smoker	4.690	2.631	6.75	**<0.001**
Work status [d]				<**0.001**
Unemployed	9.130	5.406	12.854	**<0.001**
On disability benefits	19.225	13.756	24.695	**<0.001**
BMI [e] (stenosis)				<**0.001**
<18.5 kg/m^2	15.417	5.143	25.692	**0.003**
25–29.9 kg/m^2	1.237	-0.949	3.423	0.268
30–34.9 kg/m^2	1.893	-0.597	4.382	0.136
35–39.9 kg/m^2	7.923	4.195	11.650	**<0.001**
≥40.0 kg/m^2	17.83	10.025	25.636	**<0.001**

BMI [e] (discectomy)**				**0.001**
<18.5 kg/m^2	-11.554	-25.685	2.577	0.109
25–29.9 kg/m^2	-1.408	-4.479	1.663	0.369
30–34.9 kg/m^2	-1.731	-5.322	1.859	0.345
35–39.9 kg/m^2	-3.504	-8.974	1.966	0.209
≥40.0 kg/m^2	-23.259	-34.082	-12.437	**<0.001**

Beta coefficient (Coef.) and 95% confidence intervals (CI), with *p*-values in bold for statistically significant predictors where n≥10

Model algorithm: intercept + ∑(continuous variable x coef.) + ∑(categorical variables except BMI ((‘1’ if present; ‘0’ if not present) x coef.) + ∑(BMI stenosis coef.) + (‘1’ if present; ‘0’ if not present) x discectomy coef.))

ODI, Oswestry Disability Index

* Increments in ODI, pain, and age are per 1 unit

** BMI (discectomy) *p*-values for interaction of discectomy with stenosis.

[a] Procedure type reference category is ‘non-fusion’

[b] Previous lumbar operation reference category is ‘No previous lumbar operation’

[c] Duration of leg pain reference category is ‘<3 months’

[d] Work status reference category is ‘Other’ (employed, sick leave, retired, homemaker, full-time student)

[e] BMI (Body Mass Index) reference category is ‘18.5–24.9’ Kg/m^2

Supplementary Table III. Baseline characteristics by ODI response status in 2020–2025

Variable	12-month responders (*N*=1,193)	Last ODI at 3 months (*N*=216)	ODI non-responders (*N*=115)	*p*-value
Age, years (SD)	64.9 (14.4)	56.2 (17.9)	50.2 (15.3)	**<0.001***
Sex (female), *n* (%)	601 (50.4)	96 (44.4)	51 (44.3)	0.158†
BMI, kg/m^2 (SD)	28.3 (4.8)	28.3 (4.8)	28.9 (6.0)	0.220*
BMI				0.502†
Underweight (<18.5 kg/m2), *n* (%)	5 (0.4)	1 (0.5)	1 (0.9)	
Normal (18.5–24.9 kg/m2), *n* (%)	292 (24.5)	44 (20.4)	27 (23.5)	
Overweight (25.0–29.9 kg/m2), *n* (%)	492 (41.2)	85 (39.4)	42 (36.5)	
Obese class 1 (30.0–34.9 kg/m2), *n* (%)	288 (24.1)	65 (30.1)	28 (24.3)	
Obese class 2 (35.0–39.9 kg/m2), *n* (%)	96 (8.0)	19 (8.8)	13 (11.3)	
Obese class 3 (≥40.0 kg/m2), *n* (%)	20 (1.7)	2 (0.9)	4 (3.5)	
Procedure, *n* (%)				**<0.001**†
Discectomy	441 (37.0)	111 (51.4)	78 (67.8)	
Laminectomy	637 (53.4)	88 (40.7)	33 (28.7)	
Laminectomy and fusion	99 (8.3)	15 (6.9)	3 (2.6)	
Discectomy and fusion	16 (1.3)	2 (0.9)	1 (0.9)	
Leg pain duration, *n* (%)				0.585†
Up to 3 months	135 (11.3)	33 (15.3)	16 (13.9)	
3–12 months	476 (39.9)	81 (37.5)	50 (43.5)	
1–2 years	239 (20.0)	40 (18.5)	18 (15.7)	
More than 2 years	343 (28.8)	62 (28.7)	31 (27.0)	
Previous lumbar operation, *n* (%)				0.879 †
None	997 (83.6)	180 (83.3)	98 (85.2)	
One	152 (12.7)	28 (13.0)	15 (13.0)	
Two or more	44 (3.7)	8 (3.7)	2 (1.7)	
ASA class 3+, *n* (%)	161 (13.5)	27 (12.6)	12 (10.4)	0.627†
Index-level facet cyst, *n* (%)	99 (8.3)	11 (5.1)	5 (4.3)	0.104†
Scoliosis Cobb angle ≥30°, *n* (%)	6 (0.5)	1 (0.5)	0 (0.0)	0.748†
Vertebral body fracture#, *n* (%)	42 (3.5)	12 (5.6)	4 (3.5)	0.349†
Preexisting cauda equina, *n* (%)	9 (0.8)	3 (1.4)	0 (0.0)	0.381†
Preexisting myelopathy, *n* (%)	22 (1.8)	4 (1.9)	3 (2.6)	0.847†
Preexisting non-spinal cancer, *n* (%)	9 (0.8)	1 (0.5)	0 (0.0)	0.589†
Multiple joint osteoarthritis, *n* (%)	14 (1.2)	1 (0.5)	1 (0.9)	0.629†
Rheumatoid arthritis, *n* (%)	32 (2.7)	5 (2.3)	1 (0.9)	0.484†
Spondyloarthropathy, *n* (%)	15 (1.3)	2 (0.9)	2 (1.7)	0.815†
Inflammatory bowel disease, *n* (%)	13 (1.1)	0 (0.0)	0 (0.0)	0.162†
Hypermobility spectrum disorder, *n* (%)	4 (0.3)	1 (0.5)	3 (2.6)	0.006†
Diabetes mellitus, *n* (%)	104 (8.7)	15 (6.9)	12 (10.4)	0.531†
Previous lower-limb arthroplasty, *n* (%)	161 (13.5)	29 (13.4)	5 (4.3)	**0.019**†
Mobility aided, *n* (%)	40 (3.4)	5 (2.3)	1 (0.9)	0.268†
Depression / anxiety, *n* (%)	199 (16.7)	43 (19.9)	31 (27.0)	**0.016**†
Major psychological disorder, *n* (%)	7 (0.6)	2 (0.9)	0 (0.0)	0.578†
Current smoker, *n* (%)	113 (9.5)	26 (12.0)	37 (32.2)	**<0.001**†
Public-funded healthcare, *n* (%)	303 (25.4)	46 (21.3)	30 (26.1)	0.418†

*ANOVA and †Chi-squared test on the 3 groups; *p*-values ≤0.05 where *n*≥10 in bold
SD, standard deviation; ASA, American Society of Anesthesiologists; # T8 to S1 inclusive

Supplementary Table IV. Patient-reported outcome measures by ODI response status in 2020–2025

Patient-reported outcome measure	12-month responders (*N*=1,193)	Last ODI at 3-months (*N*=216)	ODI non-responders (*N*=115)	*p*-value
Oswestry Disability Index				
Baseline (SD) (*N*=1513)	43.8 (17.4)	45.4 (17.2)	48.5 (17.2)	**0.015****
3-month (SD) (*N*=1335)	22.2 (17.7)	25.8 (19.1)		**0.008***
12-month (SD) (*N*=1193)	23.3 (20.2)			N/A
ODI model (SD) *(N*=1507)	21.9 (11.4)	21.9 (13.0)	22.9 (12.5)	0.706*
Change score (SD) (*N*=1325)	21.5 (18.5)	19.8 (18.5)		0.202*
3-month PASS, *n* (%) (*N*=1335)	659 (58.9)	103 (52.3)		0.073†
3-month MCID, *n* (%) (*N*=1323)	774 (69.7)	140 (66.0)		0.295†
Leg pain				
Baseline (SD) (*N*=1517)	6.5 (2.5)	6.4 (2.6)	6.8 (2.4)	0.327**
3-month (SD) (*N*=1326)	2.4 (2.7)	2.7 (3.0)		0.127*
12-month (SD) (*N*=1189)	2.7 (3.0)			N/A
Change score (SD) (*N*=1321)	4.1 (3.3)	3.7 (3.5)		0.115*
3-month PASS, *n* (%) (*N*=1326)	788 (70.9)	143 (66. 5)		0.195†
3-month MCID, *n* (%) (*N*=1294)	851 (78.4)	144 (68.9)		**0.003**†
Back pain				
Baseline (SD) (*N*=1517)	5.8 (2.7)	6.2 (2.6)	6.3 (2.6)	0.104**
3-month (SD) (*N*=1331)	2.6 (2.4)	3.0 (2.6)		**0.031***
12-month (SD) (*N*=1193)	2.9 (2.7)			N/A
Change score (SD) (*N*=1325)	3.2 (3.1)	3.2 (3.2)		0.771*
3-month PASS, *n* (%) (*N*=1331)	763 (68.4)	136 (63.0)		0.116†
3-month MCID, *n* (%) (*N*=1286)	779 (72.5)	152 (71.7)		0.804†
EQ-5D Index				
Baseline (SD) *(N*=1325)	0.441 (0.248)	0.426 (0.257)	0.397 (0.252)	0.163**
3-month (SD) *(N*=1324)	0.700 (0.209)	0.661 (0.241)		**0.012***
12-month (SD) *(N*=1184)	0.683 (0.248)			
Change score (SD) (*N*=1314)	0.260 (0.260)	0.235 (0.280)		0.203*
3-month PASS, *n* (%) (*N*=1324)	716 (64.4)	111 (52.1)		**<0.001**†
3-month MCID, *n* (%) (*N*=1314)	770 (69.8)	136 (64.5)		0.124†

*Independent-samples t-test, **ANOVA, and †Chi-squared test
p-values ≤0.05 in bold
Score range: Oswestry Disability Index 0–100; Pain 0–10; EQ-5D -0.594–1.000
SD, standard deviation
Change score = baseline PROM - 3-month PROM
PASS, patient acceptable symptom state (defined as ODI ≤22, pain ≤3, or EQ-5D ≥0.692)
MCID, minimal clinically important difference (defined as ≥30% reduction in baseline ODI or pain, ≥0.105 increase in baseline EQ-5D)

Supplementary Table V. Perioperative hospital and healthcare metrics by ODI response status in 2020–2025

Metric	12-month responders (n=1,193)	Last ODI at 3 months (n=216)	ODI non-responders (n=115)	*p*-value
Perioperative hospital metrics				
Operative time, min (SD) (*N*=1515)	66.0 (35.9)	63.1 (33.2)	51.8 (24.1)	**<0.001***
Length of stay, days (SD)	1.55 (1.07)	1.54 (1.19)	1.32 (0.95)	0.104*
Prolonged hospital stay ¥, *n* (%)	76 (6.4)	18 (8.3)	5 (4.3)	0.349†
Dural tear, *n* (%)	66 (5.5)	5 (2.3)	2 (1.7)	**0.035**†
Iatrogenic nerve root injury, *n* (%)	27 (2.3)	6 (2.8)	2 (1.7)	0.824†
Deep wound infection, *n* (%)	0 (0.0)	2 (0.9)	0 (0.0)	0.002†
≤30-day return to theatre, *n* (%)	13 (1.1)	3 (1.4)	1 (0.9)	0.897†
≤30-day unplanned readmission, *n* (%)	27 (2.3)	9 (4.2)	3 (2.6)	0.265†
Rehabilitation				
Physiotherapy at centre, *n* (%)	1183 (99.2)	213 (98.6)	113 (98.3)	0.523†
Physiotherapy sessions, *n* (SD)	5.0 (2.2)	5.0 (2.1)	3.2 (2.0)	**<0.001***
Lower-limb arthroplasty ≤12-months				0.510†
LLA performed, *n* (%)	22 (1.8)	2 (0.9)	0 (0.0)	
Awaiting LLA surgery at 12 months, *n* (%)	32 (2.6)	7 (3.3)	1 (0.9)	
Lumbar spine injections and MRI				
12-month L/S injection, *n* (%)	45 (3.8)	11 (5.1)	1 (0.9)	0.155†
12-month lumbar MRI, *n* (%)	168 (14.1)	43 (19.9)	12 (10.4)	**0.035**†
18-month lumbar MRI, events (incidence) [Number at risk]	220 (19.3) [785]	49 (47.9) [31]	18 (44.3) [14]	**<0.001**^

*ANOVA, †Chi-squared test, and ^ log-rank on the 3 groups,
p-values ≤0.05 in bold
¥ Prolonged hospital stay defined as >2 days for non-fusion and >4 days for fusion
SD: standard deviation; LLA: postoperative lower-limb arthroplasty for osteoarthritis; L/S: lumbosacral

Supplementary Table VI. Baseline characteristics by last ODI at 3-month category in 2020–2025

Variable	Comorbid condition (*N* = 31)	Acceptable (*N* = 113)	Lumbar condition (*N* = 72)	*p*-value
Age, years (SD)	62.9 (16.5)	54.0 (17.5)	56.8 (18.6)	**0.046***
Sex (female), *n* (%)	17 (54.8)	44 (38.9)	35 (48.6)	0.197†
BMI, kg/m^2 (SD)	29.7 (4.8)	28.1 (4.6)	29.7 (5.0)	**0.046***
BMI				0.460†
Underweight (<18.5 kg/m^2), *n* (%)	0 (0.0)	1 (0.9)	0 (0.0)	
Normal (18.5–24.9 kg/m^2), *n* (%)	5 (16.1)	29 (25.7)	10 (13.9)	
Overweight (25.0–29.9 kg/m^2), *n* (%)	11 (35.5)	46 (40.7)	28 (38.9)	
Obese class 1 (30.0–34.9 kg/m^2), *n* (%)	11 (35.5)	29 (25.7)	25 (34.7)	
Obese class 2 (35.0–39.9 kg/m^2), *n* (%)	3 (9.7)	8 (7.1)	8 (11.1)	
Obese class 3 (≥40.0 kg/m^2), *n* (%)	1 (3.2)	0 (0.0)	1 (1.4)	
Procedure, *n* (%)				0.084†
Discectomy	11 (35.5)	65 (57.5)	35 (48.6)	
Laminectomy	20 (64.5)	38 (33.6)	30 (41.7)	
Laminectomy and fusion	0 (0.0)	9 (8.0)	6 (8.3)	
Discectomy and fusion	0 (0.0)	1 (0.9)	1 (1.4)	
Leg pain duration, *n* (%)				**0.017**†
Up to 3 months	5 (16.1)	22 (19.5)	6 (8.3)	
3–12 months	4 (12.9)	46 (40.7)	31 (43.1)	
1–2 years	7 (22.6)	19 (16.8)	14 (19.4)	
More than 2 years	15 (48.4)	26 (23.0)	21 (29.2)	
Previous lumbar operation, *n* (%)				0.197†
None	23 (74.2)	99 (87.6)	58 (80.6)	
One	5 (16.1)	11 (9.7)	12 (16.7)	
Two or more	3 (9.7)	3 (2.7)	2 (2.8)	
ASA class 3+, *n* (%)	7 (22.6)	8 (7.1)	12 (16.7)	**0.031**†
Index-level facet cyst, *n* (%)	2 (6.5%	6 (5.3%	3 (4.2%	0.879†
Scoliosis Cobb angle ≥30°, *n* (%)	0 (0.0)	0 (0.0)	1 (1.4)	0.366†
Vertebral body fracture#, *n* (%)	1 (3.2)	3 (2.7)	8 (11.1)	**0.041**†
Preexisting cauda equina, *n* (%)	0 (0.0)	1 (0.9)	2 (2.8)	0.436†
Preexisting myelopathy, *n* (%)	3 (9.7)	0 (0.0)	1 (1.4)	0.002†
Preexisting non-spinal cancer, *n* (%)	0 (0.0)	0 (0.0)	1 (1.4)	0.366†
Multiple joint osteoarthritis, *n* (%)	0 (0.0)	1 (0.9)	0 (0.0)	0.633†
Rheumatoid arthritis, *n* (%)	0 (0.0)	2 (1.8)	3 (4.2)	0.373†
Spondyloarthropathy, *n* (%)	1 (3.2)	0 (0.0)	1 (1.4)	0.222†
Inflammatory bowel disease, *n* (%)	0 (0.0)	0 (0.0)	0 (0.0)	N/A
Hypermobility spectrum disorder, *n* (%)	1 (3.2)	0 (0.0)	0 (0.0)	0.050†
Diabetes mellitus, *n* (%)	5 (16.1)	3 (2.7)	7 (9.7)	**0.017**†
Previous lower-limb arthroplasty, *n* (%)	6 (19.4)	15 (13.3)	8 (11.1)	0.529†
Mobility aided, *n* (%)	0 (0.0)	1 (0.9)	4 (5.6)	0.078†
Depression/anxiety, *n* (%)	12 (38.7)	15 (13.3)	16 (22.2)	**0.006**†
Major psychological disorder, *n* (%)	1 (3.2)	0 (0.0)	1 (1.4)	0.222†
Current smoker, *n* (%)	3 (9.7)	15 (13.3)	8 (11.1)	0.825†
Public-funded healthcare, *n* (%)	11 (35.5)	17 (15.0)	18 (25.0)	**0.031**†

*ANOVA and †Chi-squared test on the 3 groups; *p*-values ≤0.05 where *n*≥10 in bold
SD, standard deviation; ASA, American Society of Anesthesiologists; # T8 to S1 inclusive

Supplementary Table VII. Patient-reported outcome measures by last ODI at 3-month category in 2020–2025

Patient-reported outcome measure	Comorbid condition (*N* = 31)	Acceptable (*N* = 113)	Lumbar condition (*N* = 72)	*p*-value
Oswestry Disability Index				
Baseline (SD) (*N* = 212)	55.1 (17.4)	39.1 (15.9)	51.4 (15.0)	0.279*
3-month (SD) (*N* = 216)	42.6 (12.1)	10.8 (7.5)	42.2 (14.1)	0.875*
ODI model (SD) (*N* = 211)	31.3 (12.1)	16.4 (8.7)	26.6 (15.0)	0.128*
Change score (SD) (*N* = 212)	12.5 (18.5)	28.3 (16.0)	9.2 (15.5)	0.359*
PASS, n (%) (*N* = 216)	0 (0.0)	113 (100.0)	0 (0.0)	N/A
MCID, n (%) (*N* = 212)	13 (41.9)	105 (93.8)	22 (31.9)	0.330†
Leg pain				
Baseline (SD) (*N* = 214)	6.9 (2.3)	6.0 (2.7)	6.8 (2.6)	0.867*
3-month (SD) (*N* = 215)	4.1 (2.8)	1.4 (1.9)	4.1 (3.6)	0.975*
Change score (SD) *N* = 213)	2.8 (3.7)	4.7 (3.2)	2.6 (3.4)	0.749*
PASS, n (%) (*N* = 215)	13 (41.9)	94 (83.2)	36 (50.7)	0.415†
MCID, n (%) (*N* = 209)	14 (45.2)	95 (85.6)	35 (52.2)	0.515†
Back pain				
Baseline (SD) (*N* = 215)	7.1 (2.0)	5.6 (2.6)	6.7 (2.5)	0.358*
3-month (SD) (*N* = 216)	3.9 (2.8)	1.5 (1.6)	4.9 (2.5)	0.085*
Change score (SD) (*N* = 215)	3.2 (3.6)	4.0 (2.9)	1.8 (3.0)	**0.036***
PASS, n (%) (*N* = 216)	16 (51.6)	99 (87.6)	21 (29.2)	**0.029†**
MCID, n (%) (*N* = 212)	20 (64.5)	99 (89.2)	33 (47.1)	0.107†
EQ-5D Index				
Baseline (SD) (*N* = 214)	0.259 (0.271)	0.505 (0.230)	0.373 (0.245)	**0.040***
3-month (SD) (*N* = 213)	0.498 (0.212)	0.804 (0.140)	0.499 (0.236)	0.979*
Change score (SD) (*N* = 211)	0.251 (0.332)	0.299 (0.242)	0.125 (0.285)	0.061*
PASS, n (%) (*N* = 213)	3 (10.3)	93 (82.3)	15 (21.1)	0.203†
MCID, n (%) (*N* = 211)	17 (58.6)	87 (77.0)	32 (46.4)	0.269†

*Independent-samples t-test and †Chi-squared test of lumbar condition vs. comorbid condition
p-values ≤0.05 in bold
Score range: Oswestry Disability Index 0–100; Pain 0–10; EQ-5D -0.594–1.000
SD, standard deviation
Change score = baseline PROM - 3-month PROM
PASS, patient acceptable symptom state (defined as ODI ≤22, pain ≤3, or EQ-5D ≥0.692)
MCID, minimal clinically important difference (defined as ≥30% reduction in baseline ODI or pain, ≥0.105 increase in baseline EQ-5D)

Supplementary Table VIII. Comorbid diagnoses linked to unacceptable disability for last ODI response at 3-month in 2020–2025

Comorbid condition	*N* = 31 *n* (%)	Diagnosis (*n*)	3-month ODI (SD)
Lower-limb joint OA	9 (29)	Unilateral knee OA (4) Unilateral hip OA (3) ≥3 lower limb-joint OA (1) Unilateral ankle/foot OA (1)	39.4 (11.1)
Cervicogenic	4 (13)	Myelopathy (3) Other dorsopathies (1)	53.3 (10.0)
Lower-limb MSK	3 (10)	Hip tendinopathy (2) Gt. trochanteric pain syndrome (1)	39.3 (9.1)
Multiple conditions	3 (10)	Two conditions (3): Fibromyalgia and diverticulitis PTSD and PVD Right knee OA and pyelonephritis with resultant sepsis	56.7 (14.0)
Rheumatological	3 (10)	Polymyalgia rheumatica (1) Psoriatic arthritis (1) Seronegative inflammatory arthritis (1)	48.3 (10.0)
Undiagnosed illness	3 (10)	Undiagnosed illness (3)	33.7 (4.0)
Brain disease	2 (6)	Dementia (1) Parkinson's disease (1)	37.5 (14.8)
Digestive system	1 (3)	Prolonged PONV (1)	29.0 (-)
Falls	1 (3)	Low velocity falls (1)	27.0 (-)
Gynaecological	1 (3)	Premenstrual dysphoric disorder (1)	38.0 (-)
Mental disorders	1 (3)	Anxiety/depression (1)	50.0 (-)

ODI: Oswestry Disability Index; OA: osteoarthritis; MSK: musculoskeletal disorder; PTSD: post-traumatic stress disorder; PVD: peripheral vascular disease; PONV: Postoperative nausea and vomiting;

Supplementary Table IX. Perioperative hospital and healthcare metrics by last ODI at 3-month category in 2020–2025

Metric	Comorbid condition (*N* = 31)	Acceptable (*N* = 113)	Lumbar condition (*N* = 72)	*p*-value
Perioperative hospital metrics				
Operative time, min (SD)	66.2 (24.5)	61.2 (33.0)	64.6 (36.8)	0.678*
Length of stay, days (SD)	1.94 (1.55)	1.38 (0.70)	1.61 (1.53)	0.055*
Prolonged hospital stay ¥, *n* (%)	7 (22.6)	6 (5.3)	5 (6.9)	**0.008**†
Dural tear, *n* (%)	3 (9.7)	2 (1.8)	0 (0.0)	0.010†
Iatrogenic nerve root injury, *n* (%)	1 (3.2)	2 (1.8)	3 (4.2)	0.618†
Deep wound infection, *n* (%)	0 (0.0)	1 (0.9)	1 (1.4)	0.795†
≤30-day return to theatre, *n* (%)	0 (0.0)	1 (0.9)	2 (2.8)	0.436†
≤30-day unplanned readmission, *n* (%)	0 (0.0)	3 (2.7)	6 (8.3)	0.077†
Rehabilitation				
Physiotherapy at centre, *n* (%)	31 (100.0)	111 (98.2)	71 (98.6)	0.757†
Physiotherapy sessions, *n* (SD)	5.7 (2.3)	4.5 (1.7)	5.5 (2.5)	**<0.001***
Lower-limb arthroplasty ≤12-months				**<0.001**†
LLA performed, *n* (%)	0 (0.0)	2 (1.8)	0 (0.0)	
Awaiting LLA surgery at 12 months, *n* (%)	6 (19.4)	1 (0.9)	0 (0.0)	
Lumbar spine injections and MRI				
12-month L/S injection, *n* (%)	1 (3.2)	1 (0.9)	9 (12.5)	**0.002**†
12-month lumbar MRI, *n* (%)	2 (6.5)	10 (8.8)	31 (43.1)	**<0.001**†

*ANOVA, †Chi-squared test, and ^ log-rank of the 3 groups
p-values ≤0.05 where n≥10 in bold
¥ Prolonged hospital stay defined as >2 days for non-fusion and >4 days for fusion
SD: standard deviation; LLA: postoperative lower-limb arthroplasty for osteoarthritis; L/S: lumbosacral

Supplementary Fig. I Variable operationalisation

Significant factors retained in the 12-month PROM prediction models

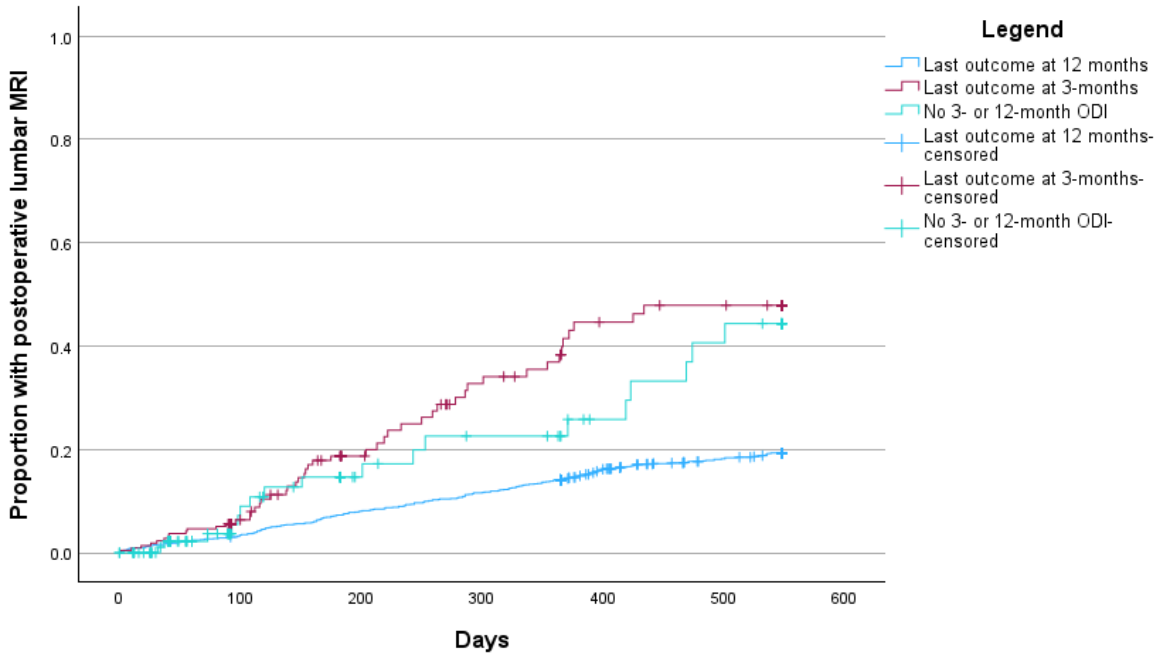
1. Sex (biological male/female)
2. Age (years)
3. Body mass index; underweight (<18.5kg/m^2) vs. normal (18.5–24.9 kg/m^2) vs. overweight (25.0–29.9 kg/m^2) vs. obesity class I (30.0–34.9 kg/m^2) vs. obesity class II (35.0–39.9 kg/m^2) vs. obesity class III (≥40.0kg/m^2)
4. Surgical indication (discectomy ± fusion vs. stenosis ± fusion)
5. Fusion (none vs. non-instrumented fusion vs. instrumented fusion [posterior +/- anterior fixation])
6. Duration of leg pain (<3 months vs. 3–12 months vs. 1–2 years vs. >2 years)
7. Previous lumbar operation (none vs. one vs. ≥2)
8. Facet cyst (defined by cyst involvement with nerve root compression on symptomatic side at the index level)
9. Scoliosis Cobb angle >30° on radiology
10. Vertebral body fracture between T8 and S1 inclusive, confirmed with radiology. Includes anterior vertebral body compression fracture and endplate fracture. Does not include Schmorl's nodes, endplate irregularity due to disc degeneration, pars fracture, or transverse process fracture.
11. Preexisting cauda equina, onset prior to current spinal episode
12. Preexisting myelopathy, defined by clinical diagnosis with MRI findings of spinal cord compression with myelitic change; onset prior to current spinal episode
13. Multiple-joint osteoarthritis (MJOA) under current treatment. Also termed generalized osteoarthritis, MJOA is the relatively rare phenotype of osteoarthritis, defined in the study by ≥5 painful and swollen (effusion) joints with radiographic evidence of osteoarthritis (include in total joints replaced due to osteoarthritis) and diagnosed by consultant.
14. Hypermobility spectrum disorder (defined by diagnosis of joint hypermobility related to symptoms or Ehlers–Danlos syndrome)
15. Rheumatoid arthritis (seropositive or seronegative) under current treatment
16. Spondyloarthropathy (ankylosing spondylitis, psoriatic arthritis, reactive arthritis, enteropathic arthritis, undifferentiated spondyloarthropathy) under current treatment
17. Inflammatory bowel disease (Crohn’s disease, ulcerative colitis) under current treatment
18. Diabetes mellitus (defined by diagnosis of Type I or Type II diabetes mellitus). Does not include prediabetes
19. Existing (non-spinal) cancer (non-spinal cancer under current treatment)
20. Previous lower-limb arthroplasty (defined by hip, knee, or ankle joint partial or complete replacement; does not include joint fusion)
21. Mobility aided (defined by most ambulation aided by wheelchair and/or walking frame. Does not include mobilising with stick(s))
22. Depression or anxiety defined by diagnosis and under current pharmacological and/or psychological treatment
23. Major psychological disorder under current pharmacological and/or psychological treatment
24. Smoker status (former/never vs. current)
25. Funding status (public-funded [care pathway funded by NHS] vs. private funded healthcare [care pathway funded by insurance or patient self-funded])

26. Work status (patient self-categorises as: unemployed vs. on disability benefits vs. other [employed / sick leave / retired / homemaker / full-time student])

Factors not reaching significance for inclusion in the 12-month PROM prediction models

27. Hysterectomy (defined by partial or total hysterectomy)
28. Polyendocrine metabolic ovarian syndrome (defined by diagnosis)
29. Index-level degenerative spondylolisthesis (defined as any anterior slip of a superior vertebra on an adjacent inferior vertebra with the pars interarticularis intact)
30. Index-level isthmic (spondylolysis) spondylolisthesis (defined as a pars interarticularis deficit with any anterior slip of a superior vertebra on an adjacent inferior vertebra at that level)
31. American Society of Anesthesiologists (ASA) class (1 or 2 vs. 3+)
32. Polymyalgia rheumatica under current treatment (defined by diagnosis)
33. Gout under current treatment (defined by diagnosis)
34. Other rheumatic disorders (Paget's disease, diffuse sclerosing idiopathic hypertrophy, Behcet's syndrome, vasculitis, Lupus, Sjögren's syndrome, defined by diagnosis)
35. Heart disease, defined as myocardial infarction or cardiac surgery (does not include atrial fibrillation or other heart disease)
36. Number of operated levels (1 vs. 2 vs. 3)
37. Peptic ulcer disease (defined by diagnosis or proton pump inhibitor medication)
38. Aortic disease (defined by diagnosis of aneurysm or stenosis)
39. Hypertension (defined by diagnosis or medication for hypertension)
40. (Other) cardiovascular disease (defined by transient ischemic attack, stroke with full recovery, vascular dementia)
41. Peripheral arterial disease (defined by diagnosis)
42. Pulmonary disease (defined by diagnosis of COPD, bronchiectasis, lobectomy, bronchitis, severe asthma, interstitial lung disease)
43. Central nervous system disease (examples: Parkinson's, stroke (with ongoing disability), epilepsy, multiple sclerosis, poliomyelitis)
44. Kidney disease: mild, moderate, or severe (defined by diagnosis). Note: does not include kidney stones
45. Liver disease: mild, moderate, or severe (defined by diagnosis)
46. AIDS/HIV (defined by diagnosis)
47. Osteoporosis (defined by diagnosis)

Supplementary Fig. II Kaplan-Meier curves of 18-month lumbar MRI by ODI response status in 2020–2025



p<0.001, log-rank test