

Disability after lumbar spine surgery in a Peruvian rehabilitation setting: A cross-sectional study using the Roland-Morris Questionnaire and Oswestry Disability Index

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Abstract

Objectives: This study aims to evaluate functional disability using the Roland-Morris Disability Questionnaire (RMDQ) and Oswestry Disability Index (ODI) as complementary patient-reported outcome measures and to explore their associations with clinical characteristics, work disability, and rehabilitation service utilization among patients receiving postoperative rehabilitation after lumbar spine surgery (LSS).

Patients and methods: During September 2025, a total of 63 adult patients with a history of LSS enrolled in a spine rehabilitation program were included in this cross-sectional, observational study. Sociodemographic, clinical, functional-disability, work-disability, and rehabilitation service-utilization data were recorded. Functional-disability was assessed using the RMDQ and ODI. Pain severity was evaluated using the Visual Analog Scale (VAS).

Results: Of the patients, 29 were male and 34 were female with a median age of 58 (IQR, 51 to 63) years. The median level of work intensity was 3 (range, 2-4). Median pain severity was 6 (range, 4-7). Significant functional-disability was identified in 65.1% of patients using RMDQ and 92.1% using ODI. Median rehabilitation program length of stay was 689 days, and median accumulated work-disability time was 254 days. According to RMDQ, vertebral fracture was more common among patients without significant functional-disability (27.3% vs. 4.9%; $p = 0.018$), whereas lower-limb pain radiation was more frequent among those with significant functional-disability (63.4% vs. 31.8%; $p = 0.017$). Rehabilitation service-utilization did not differ significantly between RMDQ-defined groups. Based on ODI, accumulated work-disability time was significantly greater among patients with significant functional-disability (median 554 vs. 218 days; $p = 0.012$), while no other variables differed significantly ($p > 0.05$).

Conclusion: Significant functional-disability is highly prevalent among LSS patients receiving rehabilitation, particularly when assessed with ODI, and is usually accompanied by prolonged work-disability. Lower-limb pain radiation is associated with greater functional-disability, whereas rehabilitation service-utilization is not associated with lower functional-disability. These findings support the development of targeted multidisciplinary rehabilitation strategies to optimize postoperative recovery after LSS.

Keywords: Disability, lumbosacral region, Peru, rehabilitation, surgical procedures.

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Lumbar disc herniation, spondylolisthesis, and spinal stenosis are among the leading indications for lumbar spine surgery (LSS).^[1] Advances in surgical techniques have substantially increased the number of procedures performed worldwide, with rates reported to be 2.4-fold higher than those observed 15 years ago.^[2] Despite the overall favorable outcomes, a considerable proportion of patients continue to experience persistent pain, functional limitations, and disability after LSS.^[1,3] Several preoperative factors have been associated with postoperative outcomes, including the absence of spinal stenosis as a predictor of greater pain relief and preoperative sensory loss as a predictor of reduced disability.^[4] Moreover, LSS is associated with prolonged work disability and lower rates of return to work.^[5,6]

The Roland Morris Disability Questionnaire (RMDQ) and the Oswestry Disability Index (ODI) are the most widely used patient-reported outcome measures (PROMs) for assessing functional disability in patients with low back pain and LSS, with a primary focus on pain and activities of daily living (ADL).^[7] A 2022 systematic review recommended the use of standardized assessment tools in LSS, as they provide an objective framework and a common language for evaluating treatment effectiveness.^[8] Although the review suggested that the ODI may be more appropriate for patients with severe disability and the RMDQ for those with mild to moderate disability, both are well-established instruments for assessing functional disability in this population.^[8]

Postoperative rehabilitation plays a key role in improving outcomes after LSS, with evidence supporting the effectiveness of supervised exercise, physical therapy (PT), occupational therapy (OT), and psychological interventions in reducing pain and disability.^[1,9-11] However, data on disability and rehabilitation service utilization following LSS remain scarce in Latin America. Although the Global Burden of Disease Study 2021 projected that this region will experience the greatest increase in low back pain prevalence worldwide by 2050,^[12] no studies have evaluated disability and rehabilitation service utilization among patients undergoing postoperative rehabilitation after LSS, to our knowledge.

In the present study, we aimed to evaluate functional disability using the RMDQ and ODI as complementary PROMs and to explore their associations with clinical characteristics, work disability, and rehabilitation service utilization among patients receiving postoperative rehabilitation after LSS.

PATIENTS AND METHODS

A single-center, cross-sectional, observational descriptive study was conducted at Hospital Nacional Edgardo Rebagliati Martins (HNERM), Department of Physical Medicine and Rehabilitation (PMR) during September 2025. Initially, patients who were enrolled in the Occupational Spine Rehabilitation Program (OSRP) were screened. Sociodemographic, clinical, functional-disability, work-disability, and rehabilitation service-utilization data were retrieved from the electronic medical records. Inclusion criteria were age ≥ 18 years, history of LSS, and ongoing rehabilitation in the OSRP. Exclusion criteria were incomplete medical records or cognitive inability to complete the outcome measures. The study population comprised a point-in-time census of 63 eligible patients. A written informed consent was obtained from each patient. The study protocol was approved by the Institutional Ethics Committee for Research of HNERM (Date: 12.12.2025, No: 000954-GRPR-ESSALUD-2025). The study was conducted in accordance with the principles of the Declaration of Helsinki.

The HNERM, located in Lima, the capital of Peru, is one of the country's major national referral hospitals under Peru's Social Health Insurance (EsSalud) and is renowned for its high level of specialization and capacity.^[13] Patients in the Department of PMR at HNERM are referred either from less complex EsSalud healthcare centers outside Lima or from other medical services within HNERM.

In the Rebagliati Healthcare Network of EsSalud, LSS patients are referred to the Department of PMR at HNERM once cleared by their spine surgeon to begin postoperative outpatient rehabilitation. Those who were working up until the time of their surgery enter the OSRP,

which is led by a physiatrist who works alongside a physical therapist, an occupational therapist, a psychologist, and a social worker. Length of stay (LOS) in the rehabilitation program varies depending on functional progress and clinical needs, but it has historically been approximately two years for most patients.

Focusing on patients in the OSRP allowed for standardized and comparable data collection, as this program follows a structured interdisciplinary approach for all participants. The RMDQ and the ODI were administered in person by a physiatrist to all patients as part of their scheduled rehabilitation visits to assess their degree of disability.

Outcome measures

The following sociodemographic, clinical, functional-disability, work-disability, and rehabilitation service-utilization variables were included: age (years), sex (male, female), level of work intensity (patients were asked to

self-rate their work intensity upon entering the OSRP using a five-point Likert scale: 1 = none, 2 = a little, 3 = moderate, 4 = a lot, 5 = very much), diagnosis (reason for surgery: herniated nucleus pulposus, spinal stenosis, foraminal stenosis, spondylolisthesis, vertebral fracture, degenerative scoliosis, vertebral subluxation, other), pain severity (patients were asked to self-rate their pain upon entering the OSRP using the Visual Analog Scale [VAS]), pain radiation to lower limbs (yes, no), muscle weakness in lower limbs (yes, no), significant disability according to RMDQ (score $\geq 58.3\%$),^[14] significant disability according to ODI (score $> 20\%$),^[15] LOS in the rehabilitation program (days in the OSRP), accumulated work-disability time (days on work-disability leave), number of PT sessions, number of OT sessions, and number of psychological therapy sessions.

Statistical analysis

Statistical analysis was performed using the Stata version 18.0 software (StataCorp, College

Table 1. Sociodemographic, clinical, work-disability, rehabilitation service-utilization, and functional-disability characteristics (n = 63)

	n	%	Median	IQR
Age (years)			58	51-63
Sex				
Female	34	54.0		
Level of work intensity			3	2-4
Diagnosis				
Herniated nucleus pulposus	44	69.8		
Spinal stenosis	34	46.0		
Foraminal stenosis	27	42.9		
Spondylolisthesis	16	25.4		
Vertebral fracture	8	12.7		
Degenerative scoliosis	7	11.1		
Vertebral subluxation	3	4.8		
Pain severity (VAS)			6	4-7
Pain radiation to lower limbs	33	52.4		
Muscle weakness in lower limbs	23	36.5		
Number of PT sessions			46	31-84
Number of OT sessions			10	4-14
Number of psychological therapy sessions			7	1-15
LOS in the rehabilitation program (days)			689	351-1190
Accumulated work-disability time (days)			254	67-399
Significant disability according to RMDQ ($\geq 58.3\%$)	41	65.1		
Significant disability according to ODI ($> 20\%$)	58	92.1		

IQR, interquartile range; VAS, Visual Analog Scale; PT, physical therapy; OT, occupational therapy; LOS, length of stay; RMDQ, Roland Morris Disability Questionnaire; ODI, Oswestry Disability Index.

Station, TX, USA). Continuous variables were presented in median and interquartile range (IQR), while categorical variables were presented in number and frequency. To compare categorical variables according to significant disability (RMDQ and ODI), the chi-square test was used or, when expected cell counts were < 5 , Fisher exact test. To compare numerical variables between groups, the Mann-Whitney U test was applied. A p value of < 0.05 was considered statistically significant.

RESULTS

Of a total of 63 LSS patients actively engaged in the OSRP, 29 were male and 34 were female

with a median age of 58 (IQR, 51 to 63) years. The median level of work intensity was 3 (range, 2-4). Clinically, herniated nucleus pulposus (69.8%), spinal stenosis (46.0%), and foraminal stenosis (42.9%) were the most frequent diagnoses. Median pain severity was 6 (range, 4-7), with 52.4% reporting pain radiation and 36.5% presenting muscle weakness, both affecting the lower limbs. Rehabilitation service-utilization included a median of 46 PT sessions, 10 OT sessions, and seven psychological therapy sessions. Median LOS in the rehabilitation program was 689 days, and accumulated work-disability time was 254 days. Functional-disability assessments showed that 65.1% met criteria for significant disability

Table 2. Characteristics related to significant disability according to RMDQ (n = 63)

	Significant disability according to RMDQ (≥ 58.3%)								
	No (n = 22)				Yes (n = 41)				
	n	%	Median	IQR	n	%	Median	IQR	p*
Age (year)*			60	54-65			57	51-63	0.634**
Sex									0.550
Male	9	40.9			20	48.8			
Female	13	59.1			21	51.2			
Level of work intensity			3	2-4			2	1-3	0.351
Herniated nucleus pulposus									0.833
No	7	31.8			12	29.3			
Yes	15	68.2			29	70.7			
Spinal stenosis									0.643
No	11	50.0			18	43.9			
Yes	11	50.0			23	56.1			
Foraminal stenosis									0.446
No	14	63.6			22	53.7			
Yes	8	36.4			19	46.3			
Vertebral fracture									0.018†
No	16	72.7			39	95.1			
Yes	6	27.3			2	4.9			
Pain severity (VAS)			5	4-6			6	4-7	0.111
Pain radiation to lower limbs									0.017
No	15	68.2			15	36.6			
Yes	7	31.8			26	63.4			
Muscle weakness in lower limbs									0.096
No	17	77.3			23	56.1			
Yes	5	22.7			18	43.9			
Number of PT sessions			42	36-69			52	25-93	0.299
Number of OT sessions			9	4-13			10	5-14	0.756
Psychological therapy sessions			7	1-11			7	1-15	0.439
LOS in the rehabilitation program (days)			697.5	309-987			689	450-1283	0.604
Accumulated work disability time (days)			231.5	153-393.5			259	58-399	0.574
RMDQ, Roland Morris Disability Questionnaire; IQR, interquartile range; VAS, Visual Analog Scale; PT, physical therapy; OT, occupational therapy; LOS, length of stay; †, Fisher exact test; *, Chi-square test; **, Mann-Whitney U test.									

RMDQ, Roland Morris Disability Questionnaire; IQR, interquartile range; VAS, Visual Analog Scale; PT, physical therapy; OT, occupational therapy; LOS, length of stay; †, Fisher exact test; *, Chi-square test; **, Mann-Whitney U test.

according to the RMDQ and 92.1% according to the ODI (Table 1).

When comparing patients with and without significant functional disability according to the RMDQ, sociodemographic and most clinical variables showed no significant differences ($p > 0.05$). However, two clinical variables differed: vertebral fracture was more frequent in the non-significant disability group

(27.3% vs. 4.9%, $p = 0.018$), and pain radiation to the lower limbs was more frequent in the significant disability group (63.4% vs. 31.8%, $p = 0.017$). Rehabilitation service-utilization variables, including numbers of PT, OT, and psychological sessions, as well as LOS in the rehabilitation program and accumulated work-disability time, showed no statistically significant differences between the groups ($p > 0.05$) (Table 2).

Table 3. Characteristics related to significant disability according to ODI (n = 63)

	Significant disability according to ODI (> 20%)								
	No (n = 5)				Yes (n = 58)				
	n	%	Median	IQR	n	%	Median	IQR	p*
Age (year)*			63	60-63			56.5	51-63	0.130**
Sex									0.363
Male	1	20.0			28	48.3			
Female	4	80.0			30	51.7			
Level of work intensity			2	2-4			3	2-3	0.927
Herniated nucleus pulposus									1.000
No	1	20.0			18	31.0			
Yes	4	80.0			40	69.0			
Spinal stenosis									0.363
No	1	20.0			28	48.3			
Yes	4	80.0			30	51.7			
Foraminal stenosis									0.115
No	1	20.0			35	60.3			
Yes	4	80.0			23	39.7			
Spondylolisthes									1.000
No	1	20.0			43	74.1			
Yes	4	80.0			15	25.9			
Vertebral fracture									1.000
No	5	100.0			50	86.2			
Yes	0	0.0			8	13.8			
Degenerative scoliosis									0.091
No	3	60.0			53	91.4			
Yes	2	40.0			5	8.6			
Vertebral subluxation									1.000
No	5	100.0			55	94.8			
Yes	0	0.0			3	5.2			
Pain severity (VAS)			6	5-6			6	4-7	0.989
Pain radiation to lower limbs									0.662
No	3	60.0			27	46.6			
Yes	2	40.0			31	53.4			
Muscle weakness in lower limbs									0.644
No	4	80.0			36	62.1			
Yes	1	20.0			22	37.9			
Number of PT sessions			69	36-105			45	25-83	0.309
Number of OT sessions			11	8-18			9	4-14	0.279
Psychological therapy sessions			8	3-11			7	1-15	0.888
LOS in the rehabilitation program (days)			778	296-1231			681	366-1128	0.919
Accumulated work disability time (days)			218	61-359			554	408-765.5	0.012
IQR, interquartile range; VAS, Visual Analog Scale; PT, physical therapy; OT, occupational therapy; LOS, length of stay; *, Fisher exact test; **, Mann-Whitney U test.									

IQR, interquartile range; VAS, Visual Analog Scale; PT, physical therapy; OT, occupational therapy; LOS, length of stay; *, Fisher exact test; **, Mann-Whitney U test.

Based on the ODI, 92.1% of patients met criteria for significant functional disability. No significant differences were observed between ODI-defined groups in sociodemographic characteristics, clinical variables, or rehabilitation service-utilization. The median accumulated work-disability time was higher in patients with significant disability (554 vs. 218 days, $p = 0.012$). No other variables differed significantly (Table 3).

DISCUSSION

In the present study, we evaluated functional disability using the RMDQ and ODI as complementary PROMs and examined their associations with clinical characteristics, work disability, and rehabilitation service utilization among patients receiving postoperative rehabilitation after LSS. The main finding of this study was that median LOS in the rehabilitation program was 689 days, and accumulated work-disability time was 254 days. Functional-disability assessments showed that 65.1% met criteria for significant disability according to the RMDQ and 92.1% according to the ODI. Vertebral fracture was more frequent in the non-significant disability group, and pain radiation to the lower limbs was more frequent in the significant disability group. Rehabilitation service-utilization variables, including numbers of PT, OT, and psychological sessions, as well as LOS in the rehabilitation program and accumulated work-disability time, showed no statistically significant differences between groups. Accumulated work-disability time was higher in patients with significant disability. These findings suggest that a substantial burden of functional and work disability persists in this population despite prolonged rehabilitation, that the RMDQ and ODI capture different dimensions of disability, and that lower-limb pain radiation may identify patients at greater functional impairment after LSS.

In our study, a high proportion of patients were classified as having significant disability, particularly with the ODI. Nevertheless, several findings indicated that most cases were moderate. This interpretation is supported by a median pain severity (VAS) of 6/10 (moderate), the relatively low frequencies of pain radiation (33%) and lower-limb weakness (23%), and the prolonged

duration of rehabilitation (median care duration of nearly two years), suggesting that symptoms were better controlled than at program entry. This interpretation is further supported by a recent Mexican study using the ODI, which found that moderate disability was the most frequent postoperative category after lumbar fusion despite functional improvement in 82% of patients.^[16]

The RMDQ may have been more appropriate for our population, as it is better suited to mild-to-moderate disability.^[8] It is more sensitive to limitations in basic physical activities and pain-related functional restrictions, whereas the ODI places greater emphasis on more demanding physical, occupational, and social activities that may remain impaired despite prolonged rehabilitation.^[14,15] Similar observations have been reported in lumbar fusion populations, supporting selective use of these instruments according to clinical context and severity.^[7] These findings also align with previous comparative studies of both tools.^[7,8]

Pain radiation to the lower limbs emerged as the main clinical factor significantly associated with higher disability according to the RMDQ. This finding is consistent with growing evidence identifying neuropathic pain, whether preoperative or persistent after surgery, as a key determinant of worse functional outcomes, poorer quality of life, and reduced pain relief following LSS.^[4,17] Similarly, studies of patients undergoing lumbar fusion and microdiscectomy have shown that preoperative radicular or neuropathic pain predicts persistent postoperative pain and disability.^[17,18]

Conversely, patients with vertebral fractures showed lower levels of disability compared to those without fractures. This may be explained by the more predictable and acute clinical course of vertebral fractures, which are often treated promptly and follow clearer recovery trajectories.^[19] In contrast, degenerative lumbar conditions are characterized by prolonged symptom duration, structural deterioration, and the influence of psychosocial factors, leading to more heterogeneous and often poorer functional recovery.^[4]

A substantial proportion of patients also reported prolonged work disability, highlighting

the socioeconomic consequences of persistent postoperative limitations. This is consistent with international evidence showing that patients requiring long-term rehabilitation after LSS are less likely to return to work.^[6,20] Similarly, a prospective Spanish study of lumbar arthrodesis reported prolonged temporary work disability and lower return-to-work rates among surgically treated patients, supporting the substantial socioeconomic burden associated with persistent postoperative disability.^[21] In our cohort, rehabilitation service utilization did not differ between disability groups, suggesting that service intensity alone may be insufficient to address residual disability. Multidisciplinary perioperative pathways, including prehabilitation and work-focused rehabilitation strategies, may improve functional recovery while reducing long-term disability and healthcare costs.^[14,22,23]

Nonetheless, this study has several limitations that should be acknowledged. First, its cross-sectional design precludes establishing causal relationships between clinical variables, disability outcomes, and rehabilitation service utilization. Second, the relatively small sample size from a single specialized referral center may limit the generalizability of the findings to other settings or populations. Additionally, only five participants were classified as having no significant disability according to the ODI, resulting in an unbalanced comparison between ODI disability groups. Therefore, findings from the ODI subgroup analyses should be interpreted with caution. Third, data were obtained through retrospective review of electronic medical records, which may be subject to incomplete or inaccurate documentation. Fourth, the lack of baseline (preoperative or early postoperative) functional assessments prevents evaluation of changes in disability over time and limits interpretation of rehabilitation effectiveness. Additionally, potentially relevant factors such as psychosocial variables, comorbidities, surgical techniques, and time from symptom onset to surgery were not available. Consequently, we were unable to evaluate whether postoperative disability differed according to the surgical procedure performed. Finally, although both the RMDQ and ODI were applied, differences

in their measurement properties may affect comparability and interpretation of disability estimates.

Despite these limitations, this study has certain strengths, including the use of standardized and widely validated disability measures, the evaluation of patients within a structured interdisciplinary rehabilitation program, and the comprehensive characterization of clinical features, work disability, and rehabilitation service utilization. To the best of our knowledge, this is the first study in Peru and Latin America to examine disability and rehabilitation service utilization in patients undergoing LSS.

In conclusion, in this Peruvian rehabilitation cohort, patients undergoing LSS showed a high prevalence of persistent postoperative disability, particularly when assessed with the ODI, together with prolonged work-disability time. Differences between the RMDQ and ODI suggest that these instruments may capture distinct dimensions of disability and should be selected according to clinical context and severity. Lower-limb pain radiation is associated with greater disability, underscoring the potential relevance of persistent neuropathic symptoms in postoperative recovery. Rehabilitation service utilization alone is not associated with lower disability, indicating that treatment intensity may be insufficient without more targeted strategies. These findings support the implementation of multidisciplinary perioperative pathways, including symptom-specific and work-focused rehabilitation approaches, and highlight the need for prospective studies in Latin America to identify predictors of recovery and optimize postoperative care after LSS.

Declaration of Conflicting Interests

Roger De la Cerna-Luna, Fiorella Mendoza-Cabrera, Paula Arnillas Brigneti and Nives Santayana-Calisaya work at Hospital Nacional Edgardo Rebagliati Martins. The other authors do not report any potential conflicts of interest related to this study.

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Author Contributions

R.D.L.: Idea/concept, design, control/supervision, data collection and/or processing, literature review, writing the article, critical review, references and funding; D.A.F.: Idea/concept, design, control/supervision, data collection and/or processing, analysis and/or interpretation; F.M.C.: Idea/concept, design, control/supervision, data collection and/or processing, analysis and/or interpretation; N.S.C.: Idea/concept, critical review, references and funding, materials; P.A.B.: Critical review, references and funding, materials; M.C.L.: Analysis and/or interpretation, critical review.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

AI Disclosure

The authors declare that artificial intelligence (AI) tools were not used, or were used solely for language editing, and had no role in data analysis, interpretation, or the formulation of conclusions. All scientific content, data interpretation, and conclusions are the sole responsibility of the authors. The authors further confirm that AI tools were not used to generate, fabricate, or 'hallucinate' references, and that all references have been carefully verified for accuracy.

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