The Influence of Unemployment and Disability Status on Clinical Outcomes in Patients Receiving Surgery for Low Back-Related Disorders: An Observational Study

Chad E Cook[1], Alessandra N Garcia[2], Christopher Shaffrey[3] and Oren Gottfried[4]

1) Duke University Division of Physical Therapy, Duke Department of Orthopaedic Surgery, Duke Clinical Research Institute, Durham, USA
2) Physical Therapy Program, College of Pharmacy and Health Sciences, Campbell University, Lillington, USA
3) Duke Neurosurgery and Orthopaedic Surgery, Duke University Medical Center, Durham, USA
4) Department of Neurosurgery, Duke University Medical Center, Durham, USA

Abstract:

Introduction: Employment status plays an essential role as a social determinant of health.

Unemployed are more likely to have a longer length of hospital stay and a nearly twofold greater rate of 30 day readmission than those who were well employed at the time of back surgery. This study aimed to investigate whether employment status influenced post-surgery outcomes and if so, the differences were clinically meaningful among groups.

Methods: This retrospective observational study used data from the Quality Outcomes Database Lumbar Registry. Data refinement was used to isolate individuals 18 to 64 who received primary spine surgeries and had a designation of employed, unemployed, or disabled. Outcomes included 12 and 24 month back and leg pain, disability, patient satisfaction, and quality of life. Differences in descriptive variables, comorbidities, and outcomes measures (at 12 and 24 months) were analyzed using chi-square and linear mixed-effects modeling. When differences were present among groups, we evaluated whether they were clinically significant or not.

Results: Differences (between employed, unemployed, and disabled) among baseline characteristics and comorbidities were present in nearly every category ($p<0.01$). In all cases, those who were disabled represented the least healthy, followed by unemployed, and then employed. Clinically meaningful differences for all outcomes were present at 12 and 24 months ($p<0.01$). In post hoc analyses, differences between each group at nearly all periods were found.

Conclusions: The findings support that the health-related characteristics are markedly different among employment status groups. Group designation strongly differentiated outcomes. These findings suggest that disability and unemployment should be considered when determining prognosis of the individual.

Keywords:

low back pain, spine, registries, employment, unemployed

Spine Surg Relat Res 2021; 5(3): 182-188
dx.doi.org/10.22603/ssrr.2020-0156

Introduction

Employment is a dynamic status that ranges from full, gainful employment to experiencing voluntary or involuntary, short- or long-term, unemployment, or permanent disability. According to the United States Bureau of Labor Statistics[1], unemployment, which may lead to provisional financial hardship[2], reflects a state of temporary joblessness, when individuals are actively looking for available work. An extreme of unemployment is the designation of disability, which is a situation that reflects a more permanent mental or physical health condition and involves recognized or imposed protection by law. Sociologically, employment status plays an essential role as a social determinant of health[3-5]. Social epidemiologic evidence supports that, at a rate much stronger degree than other measures of wealth and education, employment status has influenced health and chronic disease etiology[3].

Corresponding author: Alessandra N Garcia, alessandra.garcia.pt@gmail.com
Received: August 18, 2020, Accepted: October 14, 2020, Advance Publication: November 20, 2020

Low back pain (LBP) has the highest global burden of disease related to years lived with disability worldwide[6]. For the management of LBP, conservative treatment is generally the first step in recommended care[7]. In cases of persistent, chronic pain, clear identification of the pain source, and unsuccessful conservative treatments, surgical intervention may be required[8]. Notably, costs related to low back-related surgery are very high. In 2013, conservative and non-conservative interventions for neck and back pain, accounted for the third-largest portion of total national health spending, with approximately 25% of those surgery-related costs[9]. Intriguingly, outcomes associated with low back-related surgery for different diagnostic types vary markedly among recipients[10-12], suggesting that appropriate patient selection is especially critical.

Although limited to small, site-specific, regionally isolated studies, the interactions between employment status and LBP-related surgery has demonstrated intriguing results. Previous research has revealed that unemployed surgical recipients are more commonly depressed[13,14], have higher comorbidity rates, and experience higher healthcare costs[15]. Poorer patient satisfaction, disability scores, and quality of life measures were found in those who were unemployed and/or on disability at the time of surgery, for up to 12 months after surgery[13]. Despite similarities in surgery type, operative time, or perioperative complication rates, the unemployed had a longer length of hospital stay and a nearly twofold greater rate of 30 day readmission than those who were well employed at the time of back surgery[16].

We endeavored to explore whether employment status influenced outcomes associated with self-reported disability, back and leg pain, patient satisfaction, and quality of life, when evaluated across multiple institutions, with a large sample size and a litany of different surgical approaches. We hypothesized that outcomes would be markedly worse in individuals who were *disabled* and *unemployed* versus those who were employed at baseline, with outcomes for the disabled group yielding the worst of the three employment categories. We further attempted to explore the clinical meaningfulness of the differences (if present) by analyzing minimum clinically important difference (MCID) values across employment categories.

Materials and Methods

Study design and setting

This was a retrospective, observational cohort using the Quality Outcomes Database (QOD) Spine Registry. The registry included patient participation from 2012 to 2018[17]. The QOD is a prospective observational registry that includes common neurosurgical and spine procedures applied for both cervical and lumbar spine disorders, including spinal deformities. Our dataset involved the lumbar spine registry only. The QOD registry is populated from multiple clinical sites from 145 hospitals across 38 US states. The QOD reports health-related factors and outcomes measures with baseline, 3 month, 1 year, and 2 year follow up. Treatments are limited to surgical recipients and our specific download was provided in the fall of 2019.

We followed the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement to guide the study reporting[18]. RECORD is an extension of the existing STrengthening the Reporting of OBservational studies in Epidemiology guidelines and endeavors to enhance transparency by providing researchers with the minimum reporting requirements needed to adequately convey the methods and results of their research[19]. The Institutional Review Board at Duke University determined the protocol to be exempt (Pro00029554).

Participants

Our goal was to identify individuals who were of employment age and were seeking or engaged in employment (not students), who received primary surgeries, and had self-report disability measures at 1 year. We removed individuals 65 and older, individuals without 1 year disability measures, those who reported they were full time students, missing values associated with employment, and those who received revision surgeries.

Variables

Outcome variables: Outcomes included 12 and 24 month back and leg pain intensity, disability, patient satisfaction, and quality of life. Within the QOD, back and leg pain was measured are measured quantitatively using the 0-10 visual analog scale (VAS), in which 0 represents “no pain” and 10 represents the “worst possible pain.”[20] Disability was measured using the Oswestry Disability Index (ODI)[21], in which low scores indicate minimal disability, whereas higher scores indicate severe disability. The North American Spine Surgery (NASS) Patient Satisfaction Index was used to measure satisfaction[22]. The NASS ranges from 1 to 4, in which 1 indicates “the treatment met my expectations,” 2 indicates “I did not improve as much as I had hoped, but I would undergo the same treatment for the same outcome,” 3 indicates “I did not improve as much as I had hoped, and I would not undergo the same treatment for the same outcome,” and 4 indicates “I am the same or worse than before treatment.” Quality of life was measured using the EuroQol 5 Dimension, 5-Level (EQ-5D-5L) VAS (EQ-5D VAS) at 1 and 2 years[23]. For the EQ-5D VAS, values are scored from 0 to 100, with higher values reflecting better-reported levels of quality of life.

Independent variables: Employment status was coded by merging the findings from two different variables within the QOD: Variable 1, which included a) employment status (i.e., employed and currently working, employed but not working [on short-term disability or on leave], or unemployed) and Variable 2, which included b) disability reason (i.e., due to spine problems or to other condition). For the first variable (employment status), codes for “employed and currently

working" and "employed but not working" were consolidated into one single variable "employed." This left two different selections within the employment status variable: 1) the newly consolidated "employed" and "unemployed." Unemployed was further divided into two different variables (unemployed and disabled) after consulting Variable 2 (disability reason). If individuals were labeled as "disabled" in the second variable, they were coded as "disabled." Those who were not labeled as "disabled" in the second variable, remained coded as unemployed.

Descriptive variables: We reported the descriptive variables of age, gender, race (Caucasian percentage), Hispanic ethnicity, patient education (divided into high school or less, college and post-college), body mass index, insurance type, duration of symptoms (in months), baseline report of pain, numbness, and weakness, as well as whether the patient was taking pain medication at baseline. We also captured American Society of Anesthesiologists (ASA) grade, which reflects the general health of an individual and is categorized into six groups: ASA 1) a healthy individual, ASA 2) a mild systemic disease, ASA 3) a severe systemic disease, ASA 4) a patient with severe systemic disease that is a constant threat to life, ASA 5) a moribund patient who is not expected to survive the operation, and ASA 6) a declared brain-dead patient whose organs are being removed for donor purposes[24].

To describe the health of our sample, baseline comorbidities were captured as well. Within the QOD, comorbidity medical diagnoses are labeled as present or absent. We included medical diagnoses of diabetes, coronary artery disease, peripheral vascular disease, anxiety, depression, osteoarthritis, renal disease, chronic obstructive pulmonary disease (COPD), osteoporosis, and multiple sclerosis.

Missing data and cleaning

After data refinement, we had less than 0.2% of missing variables for our descriptive variables and our 12 month ODI measures. However, the missingness of comorbidity variables varied widely (0.1% for depression and anxiety to 28.9% for OA) and nearly 85% of 24 month outcomes were missing. Little's MCAR test suggested that the data were missing at random. We elected to use Listwise deletion, a method for handling missing data, in which an entire record is excluded from analysis if any single value is missing[25].

Statistical analysis

We calculated differences among employment, unemployment, and disability status for descriptive and outcome variables. Descriptive categorical and continuous variables were summarized using frequency counts (percentages), and means (standard deviations), respectively. Linear mixed-effects modeling was performed for continuous variables and Pearson's Chi-square test was conducted for categorical variables. During linear mixed-effects modeling, we controlled for the baseline value (e.g., baseline ODI for 12 months ODI outcomes) but not for comorbidities, since missing values were not missing at random and imputation is ill-advised. We evaluated post hoc analyses (Tukey) for each of the 12 month and 24 outcomes. All analyses were conducted in IBM Statistical Package for the Social Sciences, version 25.0. Statistical significance was set at $p<0.05$ for all tests.

Clinically meaningful differences among outcomes in the three groups were interpreted based on the MCID values determined by a previous study investigating individuals who underwent lumbar spine surgery; MCIDs values in this study were 1.2 points for back pain, 1.6 for leg pain, and 12.8 points for disability[26]. To our knowledge, there are no defined MCID values for EQ-5D VAS values or patient satisfaction.

Results

Sample

Our initial QOD download comprised 57,199 subjects. After the removal of revision surgeries (N=7,889 subjects) our sample size decreased to 49,310. Removal of students and missing values for the employment categories and primary or revision type further reduced the sample to 31,636. Of those, 16,605 did not have 12 month ODI values and were also removed, which left 15,031. Lastly, we remove all individuals who were 65 and older, and we were left with a sample of 8,037. Of the 8,037, 1,195 (14.9%) presented with outcomes findings at 2 years and were included for 24 month analyses (Fig. 1).

Descriptive characteristics

Notable statistically significant differences ($p<0.01$) were present between those who at baseline were employed, unemployed, and disabled (Table 1). A lower percentage of males were unemployed (39.8%) or disabled (46.6%), and a higher percentage of non-whites were disabled (20.2%). Those who were unemployed or disabled reported higher levels of baseline disability (mean=51.3, SD=17.2, mean= 58.1, SD=14.4), leg pain (mean=6.9, SD=2.7, mean=7.4, SD =2.5), and back pain (mean=7.1, SD=2.5, mean=7.8, SD= 2.0), as well as a longer duration of symptoms. Significantly more individuals who were disabled or unemployed took pain medication at baseline (86.2% and 84.3%), and a much higher percentage of disabled individuals used governmental insurances such as Medicaid or Medicare. Baseline report of weakness was more common in those individuals who were employed (57.4%), whereas significantly more individuals with disability reported a baseline report of numbness (50.5%).

Table 2 reflects the differences in comorbidity statuses of those who at baseline were employed, unemployed, and disabled. For diagnoses of diabetes, coronary artery disease, peripheral vascular disease, anxiety, depression, osteoarthritis, renal disease, COPD, osteoporosis, and multiple sclerosis, those who were unemployed or disabled were statisti-

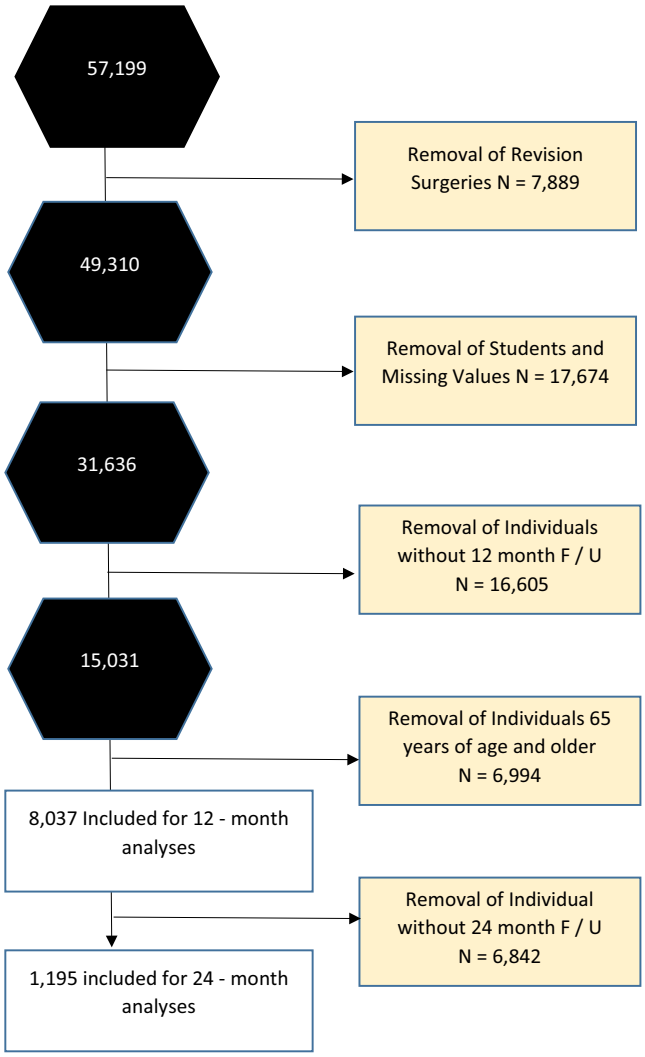

Figure 1. Flow diagram of participants included in the study.

cally significantly more likely to have the conditions ($p< 0.01$).

Role of employment and disability status on outcomes at 12 and 24 months

Statistically significant differences ($p<0.01$) were present among all outcome variables at 12 months (Table 3). In all cases, those who were disabled scored the worse outcomes followed by the unemployed. Post hoc analyses showed statistically significant differences ($p<0.01$) among all groups (e.g., employed to unemployed, unemployed to disabled, and employed to disabled) for ODI, back pain, leg pain, patient satisfaction, and EQ-5D VAS. Clinically meaningful differences were present between the employed and those who were disabled for disability, back pain, and leg pain, and quality of life. Clinically meaningful differences were present between those who were unemployed and those who were disabled only for back pain.

Statistically significant differences ($p<0.01$) were also present among all outcomes at 24 months (Table 4). Similar to the findings at 12 months, worse outcomes were present in those who were disabled, followed by the unemployed. Post hoc analyses demonstrated statistically significant differences ($p<0.01$) among all groups for ODI, back pain, and EQ-5D VAS. Statistically significant differences ($p<0.05$) for leg pain for all groups and patient satisfaction between employed and disabled only. Clinically meaningful differences were present between those who were employed and those who were disabled for ODI, back pain, and leg pain and between those who were unemployed and those who were disabled for ODI and back pain only.

Discussion

This study aimed to evaluate the role of employment, unemployment, and disability status on outcomes associated with LBP-related surgery at 12 and 24 months in individuals 18 to 64 years of age. As hypothesized, individuals who were unemployed or disabled exhibited worse health-related outcomes across all categories at follow-up designations. Secondarily, those who were disabled exhibited the worst outcomes of the three groups, regardless of the measure used and the timing of the measure. Most importantly, clinically meaningful differences were present between those who were disabled and employed for nearly all measures, which further substantiates the importance of the role of employment status when evaluating prognosis and, potentially, surgical recipient selection. We believe there are a number of reasons for the findings, reasons that often extend beyond the pathology being treated.

We believe that the most compelling finding in our study is that sociologically, physically, and psychologically, employment status differentiates and classifies three markedly diverse populations. Within our study, the general classification of an individual who is unemployed or disabled suggests an increased likelihood of a female of older age, with lower education, higher comorbidities, higher baseline disability, higher ASA classifications, lower baseline quality of life, and higher governmental insurances (Medicare and Medicaid). In each of these descriptive cases, disability represents a more extreme version than unemployed; both are markedly different in composite than one who is employed.

Our descriptive classification identified in our study is indirectly supported within the literature for individuals who are unemployed. In the United States, unemployment is affiliated with lower-level job skills, lower education, and a disproportionate amount of racial and ethnic minorities[27]. Unemployment status has been associated with higher downstream comorbidity rates, including depression[15] and subsequent surgical costs[13,15]. When we compared baseline comorbidity rates between the unemployed and employed, there are notably more cases of diabetes, coronary artery disease, OA, anxiety, depression, and COPD. Unemployment may be a consequence of the severity of impairments associated with leg and back pain, and chronic LBP has been associated with acquiring unemployment and disability status[28,29].

Within our study, higher proportions of comorbidities were more common in the disabled group than the em-

Table 1. Baseline Characteristics of Employed, Unemployed, and Disabled Surgical Recipients.

Variable	Employed (N=5,480)	Unemployed (N=1,636)	Disabled (N=921)	P-value
Age, mean (SD)	49.3 (10.6)	53.6 (10.7)	54.1 (7.7)	*<0.01*
Gender (male)	3,166 (57.7%)	652 (39.8%)	430 (46.6%)	*<0.01*
Race (White)	4,802 (87.6%)	1,403 (85.7%)	735 (79.8%)	*<0.01*
Hispanic	178 (3.2%)	68 (4.1%)	23 (2.4%)	0.08
Patient education				*<0.01*
High school or less	2,113 (38.5%)	843 (51.5%)	628 (68.1%)	
College	2,379 (43.4%)	565 (34.5%)	224 (24.3%)	
Post-college	841 (15.3%)	216 (13.2%)	66 (7.1%)	
ASA classification (≥3)	1,394 (25.4%)	679 (41.5%)	562 (61.0%)	*<0.01*
BMI, mean (SD)	30.9 (6.5)	31.2 (6.9)	32.1 (7.1)	*<0.01*
Disability, mean (SD)	45.3 (16.8)	51.3 (17.2)	58.1 (14.4)	*<0.01*
Back pain, mean (SD)	6.3 (2.7)	7.1 (2.5)	7.8 (2.0)	*<0.01*
Leg pain, mean (SD)	6.8 (2.6)	6.9 (2.7)	7.4 (2.5)	*<0.01*
Health-related quality of life, mean (SD)	61.2 (20.4)	55.9 (21.8)	49.3 (21.8)	*<0.01*
Taking pain medication	4,525 (82.5%)	1,380 (84.3%)	794 (86.2%)	*0.01*
Duration of symptoms ≥3 months, mean (SD)	<3=757 (13.8%) ≥3=4,608 (84.1%)	<3=140 (8.6%) ≥3=1,474 (90.1%)	<3=57 (6.1%) ≥3=846 (91.9%)	*<0.01*
Baseline report of pain	5,409 (98.7%)	1,610 (98.4%)	911 (98.9%)	0.06
Baseline report numbness	2,436 (44.4%)	723 (44.1%)	466 (50.5%)	*<0.01*
Baseline report of weakness	3,146 (57.4%)	911 (55.6%)	51 (5.5%)	*0.01*
Insurance type				*<0.01*
Uninsured	60 (1.0%)	33 (2.0%)	6 (0.6%)	
Medicare	67 (1.2%)	181 (11.0%)	431 (46.7%)	
Medicaid	206 (3.7%)	223 (13.6%)	157 (17.0%)	
VA/Gov	213 (3.8%)	110 (6.7%)	49 (5.3%)	
Private	4,925 (89.8%)	1,084 (66.2%)	276 (29.9%)	

Values reflect percentages of total population. When values do not equal 100%, the remainder includes missing values.

Table 2. Recorded Baseline Comorbidities of Employed, Unemployed, and Disabled Surgical Recipients.

Variable	Employed (N=5,480)	Unemployed (N=1,636)	Disabled (N=921)	P-value
Diabetes	638 (11.6%)	1322 (80.8%)	681 (73.9%)	*<0.01*
Coronary artery disease	266 (4.8%)	116 (7.0%)	97 (10.5%)	*<0.01*
Peripheral vascular disease	68 (1.2%)	23 (1.4%)	36 (3.9%)	*<0.01*
Anxiety	926 (16.8%)	341 (20.8%)	393 (42.6%)	*<0.01*
Depression	986 (17.9%)	471 (28.7%)	423 (45.9%)	*<0.01*
Osteoarthritis	837 (15.2%)	369 (22.5%)	296 (32.1%)	*<0.01*
Renal disease	69 (1.2%)	39 (2.3%)	41 (4.4%)	*<0.01*
Chronic obstructive pulmonary disease	119 (2.1%)	98 (6.0%)	126 (13.6%)	*<0.01*
Osteoporosis	88 (1.6%)	23 (1.4%)	23 (2.4%)	*<0.01*
Multiple sclerosis	23 (0.4%)	16 (0.9%)	13 (1.4%)	*<0.01*

ployed and unemployed groups. In the United States, where the patient population was pulled, disability is a designated status that is related to qualifying for a designated level of disability. Diagnostic criteria associated with the status include a litany of autoimmune, cardiovascular, digestive, endocrine, respiratory, oncological, genitourinary, and musculoskeletal disorders. By the nature of its qualification criteria to receive disability, it is expected that individuals would have higher numbers of serious health conditions, including the comorbidities represented in our study.

We found that, compared with those who were employed, patient-reported outcomes were worse for those who unemployed and disabled at 12 and 24 months. Post hoc analyses showed that for most outcomes, disability status also yielded worse results when compared with unemployed status. The mean differences among disability, leg pain and back pain, reached clinically meaningful levels when comparing disability with employed and unemployed groups (sans leg pain at 24 months), a finding that was not replicated when comparing employed and unemployed. Job loss and unemployment have a long-term negative impact on wellbeing and health[30], and disability is the essence of long-term job loss. Outcomes affiliated with time off work and return to work are dependent more on sociodemographic and job-

Table 3. Differences in Outcomes at 12 Months between Those Who Reported Unemployed versus "Other" Employment Distinction at Baseline.

Outcome measure	Employed (N=5480)	Unemployed (N=1636)	Disabled (N=921)	P-value
	Mean (95% confidence interval)			
Disability (ODI, 0–100) *	18.6 (18.0, 19.1)	26.8 (25.9, 27.8)	38.9 (37.6, 40.1)	*<0.01*
Back pain intensity (VAS, 0–10) †	2.8 (2.7, 2.9)	3.6 (3.5, 3.8)	5.1 (4.9, 5.3)	*<0.01*
Leg pain intensity (VAS, 0–10) †	2.2 (2.1, 2.3)	2.8 (2.7, 2.9)	4.2 (4.0, 4.4)	*<0.01*
Patient satisfaction (NASS, 1–4) ‡	1.5 (1.4, 1.5)	1.7 (1.6, 1.8)	1.9 (1.8, 2.0)	*<0.01*
Health-related quality of life (EQ-VAS, 0–100) §	76.8 (76.3, 77.3)	69.9 (69.0, 70.9)	60.6 (59.4, 61.9)	*<0.01*

*ODI: Oswestry Disability Index (higher scores indicates severe disability), †VAS: visual analogue scale (higher scores indicate higher pain intensity). ‡NASS: North American Spine Surgery (1 indicates "the treatment met my expectations," 2 indicates "I did not improve as much as I had hoped, but I would undergo the same treatment for the same outcome," 3 indicates "I did not improve as much as I had hoped, and I would not undergo the same treatment for the same outcome," and 4 indicates "I am the same or worse than before treatment.") §EQ-VAS: EuroQol, visual analogue scale (higher scores indicate better health-related quality of life)

Table 4. Differences in Outcomes at 24 Months between Those Who Reported Unemployed versus "Other" Employment Distinction at Baseline.

Outcome measure	Employed N=852	Unemployed N=224	Disabled N=119	P-value
	Mean (95% confidence interval)			
Disability (ODI, 0–100) *	17.6 (16.2, 18.9)	23.7 (21.1, 26.3)	40.0 (36.5, 43.6)	*<0.01*
Back pain intensity (VAS, 0–10) †	2.8 (2.6, 2.9)	3.4 (3.0, 3.8)	5.3 (4.8, 5.8)	*<0.01*
Leg pain intensity (VAS, 0–10) †	2.3 (2.1, 2.5)	2.9 (2.5, 3.3)	4.1 (3.6, 4.7)	*<0.01*
Patient satisfaction (NASS, 1–4) ‡	1.5 (1.4, 1.6)	1.6 (1.5, 1.7)	1.8 (1.6, 1.9)	*<0.01*
Health-related quality of life (EQ-VAS, 0–100) §	76.0 (74.8, 77.3)	69.3 (66.8, 71.8)	60.7 (57.2, 64.1)	*<0.01*

*ODI: Oswestry Disability Index (higher scores indicates severe disability), †VAS: visual analogue scale (higher scores indicate higher pain intensity). ‡NASS: North American Spine Surgery (1 indicates "the treatment met my expectations," 2 indicates "I did not improve as much as I had hoped, but I would undergo the same treatment for the same outcome," 3 indicates "I did not improve as much as I had hoped, and I would not undergo the same treatment for the same outcome," and 4 indicates "I am the same or worse than before treatment.") §EQ-VAS: EuroQol, visual analogue scale (higher scores indicate better health-related quality of life)

related influences than other predictors[31]. The study used a large patient-based surgical registry, which well represents actual clinical practice results. However, limitations associated with administrative datasets, including registries, such as including missing values, data refinement strategies, and the potential for coding variabilities across sites, must be recognized. Additionally, despite that we statistically controlled for baseline differences among the three groups (employed, unemployed, and disabled) the variations in the groups may have played a role in the differences in the outcomes.

Employment status strongly differentiated patient-reported outcomes at 12 and 24 months and discriminately divided patients into homogenous classifications. This study's findings do suggest that employment status has a strong prognostic influence on outcomes at 12 and 24 months, outcomes that are clinically meaningfully different based on classification.

Conflicts of Interest: The authors declare that there are no relevant conflicts of interest.

Ethical Approval: This is an observational study. The Institutional Review Board has confirmed that no ethical approval is required (exempt protocol ID-Pro00029554).

Author Contributions: All listed authors meet the Authorship and contributorship criteria of the International Committee of Medical Journal Editors.

References

1. Statistics UBoL: Labor Force Statistics from the Current Population Survey. 2020.
2. Health WCoSDo. Closing the gap in a generation: Health equity through action on the social determinants of health: Commission on Social Determinants of Health final report. World Health Organization; 2008.
3. Clougherty JE, Souza K, Cullen MR. Work and its role in shaping the social gradient in health. Ann N Y Acad Sci. 2010;1186:102-24.
4. Renahy E, Mitchell C, Molnar A, et al. Connections between unemployment insurance, poverty and health: a systematic review. Eur J Public Health. 2018;28(2):269-75.
5. Sareen J, Afifi TO, McMillan KA, et al. Relationship between household income and mental disorders: findings from a population-based longitudinal study. Arch Gen Psychiatry. 2011;68(4):419-27.

6. Wu A, Dong W, Liu S, et al. The prevalence and years lived with disability caused by low back pain in China, 1990 to 2016: findings from the global burden of disease study 2016. Pain. 2019;160 (1):237-45.

7. Foster NE, Anema JR, Cherkin D, et al. Prevention and treatment of low back pain: evidence, challenges, and promising directions. Lancet. 2018;391(10137):2368-83.

8. Jacobs WC, Rubinstein SM, Willems PC, et al. The evidence on surgical interventions for low back disorders, an overview of systematic reviews. Eur Spine J. 2013;22(9):1936-49.

9. Kim LH, Vail D, Azad TD, et al. Expenditures and health care utilization among adults with newly diagnosed low back and lower extremity pain. JAMA Netw Open. 2019;2(5):1-12.

10. Masuda S, Kanba Y, Kawai J, et al. Outcomes after decompression surgery without fusion for patients with lumbar spinal stenosis and substantial low back pain. Eur Spine J. 2020;29(1):147-52.

11. Karsy M, Bisson EF. Surgical versus nonsurgical treatment of lumbar Spondylolisthesis. Neurosurg Clin N Am. 2019;30(3):333-40.

12. Rigoard P, Gatzinsky K, Deneuville JP, et al. Optimizing the management and outcomes of failed back surgery syndrome: a consensus Statement on definition and outlines for patient assessment. Pain Res Manag. 2019;2019:1-12.

13. Chapin L, Ward K, Ryken T. Preoperative depression, smoking, and employment Status are significant factors in patient satisfaction after lumbar Spine surgery. Clin Spine Surg. 2017;30(6):725-32.

14. Walid MS, Zaytseva N. The relationship of unemployment and depression with history of spine surgery. Perm J. 2011;15(1):19-22.

15. Walid MS, Robinson EC, Robinson JS. Higher comorbidity rates in unemployed patients may significantly impact the cost of spine surgery. J Clin Neurosci. 2011;18(5):640-4.

16. Adogwa O, Elsamadicy AA, Fialkoff J, et al. Effect of employment status on length of hospital stay, 30-day readmission and patient reported outcomes after spine surgery. J Spine Surg. 2017;3 (1):44-9.

17. Asher AL, Speroff T, Dittus RS, et al. The National Neurosurgery Quality and Outcomes Database (N2QOD): a collaborative North American outcomes registry to advance value-based spine care. Spine. 2014;39(22 Suppl 1):106-16.

18. Benchimol EI, Smeeth L, Guttmann A, et al. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement. PLoS Med. 2015;12(10):e1001885.

19. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Int J Surg. 2014;12(12):1495-9.

20. Bijur PE, Silver W, Gallagher EJ. Reliability of the visual analog scale for measurement of acute pain. Acad Emerg Med. 2001;8 (12):1153-7.

21. Fairbank JC, Pynsent PB. The Oswestry Disability Index. Spine. 2000;25(22):2940-52.

22. Daltroy LH, Cats-Baril WL, Katz JN, et al. The North American spine society lumbar spine outcome assessment Instrument: reliability and validity tests. Spine. 1996;21(6):741-9.

23. Mueller B, Carreon LY, Glassman SD. Comparison of the EuroQOL-5D with the Oswestry Disability Index, back and leg pain scores in patients with degenerative lumbar spine pathology. Spine. 2013;38(9):757-61.

24. Doyle DJ, Garmon EH. American Society of Anesthesiologists classification (ASA class). ed.: StatPearls Publishing; 2019. StatPearls [Internet]

25. Jiang ZW, Li CJ, Wang L, et al. Prevention and handling of missing data in clinical trials. Yao Xue Xue Bao. 2015;50(11):1402-7.

26. Copay AG, Glassman SD, Subach BR, et al. Minimum clinically important difference in lumbar spine surgery patients: a choice of methods using the Oswestry Disability Index, Medical Outcomes Study questionnaire Short Form 36, and pain scales. Spine J. 2008;8(6):968-74.

27. Farley JE. Disproportionate black and hispanic unemployment in US metropolitan areas: The roles of racial inequality, segregation and discrimination in male joblessness. Am J Econ Sociol. 1987; 46(2):129-50.

28. Walid MS, Robinson JS, Robinson ER, et al. Comparison of outpatient and inpatient spine surgery patients with regards to obesity, comorbidities and readmission for infection. J Clin Neurosci. 2010;17(12):1497-8.

29. Watson PJ, Booker CK, Moores L, et al. Returning the chronically unemployed with low back pain to employment. Eur J Pain. 2004; 8(4):359-69.

30. Mendoza MD, Lopez M. Culture, race, and ethnicity issues in health care. Family medicine: Principles and practice. 2017:27-38.

31. Coste J, Delecoeuillerie G, Cohen de Lara A, et al. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. BMJ. 1994;308(6928):577-80.