Exploring the Link between Health Inequalities and Pre-Surgical Attitudes on Post-Surgical Outcomes in Spine Surgery: Insights from a Single Institution

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Introduction

- The social determinants of health (SDOH) have substantial influence on health disparities. [1] [2]
- No study has evaluated the impact of both the SDOH and pre-surgical attitudes on post-surgical outcomes. [3]
- This study examines the interplay between pre-surgical attitudes, socio-economic status, and clinical characteristics on post-surgical outcomes.

Methods

- Single-center study examining the impact of pre-surgical attitudes, the SDOH, and clinical on post-surgical outcomes after elective spine surgery.
- Pre-operative attitude assessment with a 14-question survey.
- Computation of area deprivation index (ADI).
- To explore the effects of pre-surgical attitudes, ADI, income, employment, and BMI on p outcomes over 3, 6, 9, and 12 months post-elective spine surgery.

Results

- 127 patients including 71 males (55.9%) with an average age of 68.1±10.9 years were analyzed.
- ADI was associated with higher PROMIS and VAS scores pre-surgery and 3, 6, 9, and 12 months post-surgery ($p<0.05$).
- 1 year post-surgery, patients earning <$25,000 annually had higher PROMIS pain (8.00, p=0.022) than those with ≥$100,000 income (PROMIS pain: 2.81±2.04, p=0.022).
- Unemployed patients had significantly lower social support (rating: 2.67±1.15, p=0.042) compared to employed patients (rating: 1.25±0.73, p=0.042).

Results

Characteristic	Output	Characteristic	Output
[a]Age	68.1 (10.9)	Anxiety:	
Gender:		N	95 (74.8%)
Male	71 (55.9%)	Y	32 (25.2%)
Female	56 (44.1%)	Depression:	
Race:		N	90 (70.9%)
White	115 (90.6%)	Y	37 (29.1%)
African American	5 (3.94%)	Diabetes:	
Asian	2 (1.57%)	N	103 (81.1%)
Other	2 (1.57%)	Y	24 (18.9%)
Unknown	3 (2.36%)	HTN	
Ethnicity:		N	50 (39.4%)
Non-Hispanic	122 (96.1%)	Y	77 (60.6%)
Hispanic or Latino	1 (0.79%)	CHF	
Unavailable/Unknown	4 (3.15%)	N	122 (96.1%)
ADI Percentile	42.6 (25.6)	Y	5 (3.94%)
Marital Status:		CVA	
Divorced	13 (10.2%)	N	122 (96.1%)
Married	89 (70.1%)	Y	5 (3.94%)
Significant Other	1 (0.79%)	COPD	
Single	8 (6.30%)	N	122 (96.1%)
Widowed	16 (12.6%)	Y	5 (3.94%)
[a]BMI (kg/m^2)	30.0 (7.36)	Cancer:	
		N	101 (79.5%)
		Y	26 (20.5%)

[a]Continuous variables reported as mean (standard deviation).

Table 1. Demographics and Clinical Characteristics of Study Participants

	N=127	1st Quintile N=30	2nd Quintile N=30	3rd Quintile N=31	4th Quintile N=26	5th Quintile N=10	p-value
Race:							**0.042**
White	115 (90.6%)	28 (93.3%)	29 (96.7%)	29 (93.5%)	22 (84.6%)	7 (70.0%)	
African American	5 (3.94%)	1 (3.33%)	0 (0.00%)	0 (0.00%)	3 (11.5%)	1 (10.0%)	
Asian	2 (1.57%)	1 (3.33%)	1 (3.33%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	
Other	2 (1.57%)	0 (0.00%)	0 (0.00%)	1 (3.23%)	0 (0.00%)	1 (10.0%)	
Unknown	3 (2.36%)	0 (0.00%)	0 (0.00%)	1 (3.23%)	1 (3.85%)	1 (10.0%)	
Ethnicity:							**0.059**
Non-Hispanic	122 (96.1%)	30 (100%)	29 (96.7%)	29 (93.5%)	26 (100%)	8 (80.0%)	
Hispanic or Latino	1 (0.79%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (10.0%)	
Declined	2 (1.57%)	0 (0.00%)	1 (3.33%)	1 (3.23%)	0 (0.00%)	0 (0.00%)	
Unknown	2 (1.57%)	0 (0.00%)	0 (0.00%)	1 (3.23%)	0 (0.00%)	1 (10.0%)	
Trust in Healthcare System	1.46 (0.72)	1.43 (0.68)	1.40 (0.62)	1.23 (0.50)	1.58 (0.90)	2.10 (0.88)	**0.015**
BMI	30.0 (7.36)	27.7 (6.31)	28.7 (6.26)	31.2 (6.13)	30.4 (7.20)	35.7 (13.1)	**0.027**
Post-op ER Visits	0.06 (0.26)	0.03 (0.18)	0.00 (0.00)	0.03 (0.18)	0.19 (0.49)	0.00 (0.00)	0.049
LOS	2.13 (2.28)	1.77 (2.14)	1.93 (2.82)	1.87 (1.89)	2.73 (1.97)	3.00 (2.62)	0.328
Readmission:							0.174
N	106 (89.1%)	27 (96.4%)	21 (77.8%)	27 (93.1%)	22 (84.6%)	9 (100%)	
Y	13 (10.9%)	1 (3.57%)	6 (22.2%)	2 (6.90%)	4 (15.4%)	0 (0.00%)	
Outpatient Complication:							0.147
N	95 (88.0%)	24 (92.3%)	20 (80.0%)	24 (96.0%)	19 (79.2%)	8 (100%)	
Y	13 (12.0%)	2 (7.69%)	5 (20.0%)	0 (0.00%)	4 (16.7%)	0 (0.00%)	
Additional Spine Surgery:							0.987
N	117 (92.1%)	28 (93.3%)	27 (90.0%)	29 (93.5%)	24 (92.3%)	9 (90.0%)	
Y	10 (7.87%)	2 (6.67%)	3 (10.0%)	2 (6.45%)	2 (7.69%)	1 (10.0%)	
Second Additional Spine Surgery:							0.701
N	124 (97.6%)	29 (96.7%)	30 (100%)	29 (93.5%)	26 (100%)	10 (100%)	
Y	3 (2.36%)	1 (3.33%)	0 (0.00%)	2 (6.45%)	0 (0.00%)	0 (0.00%)	

Significant differences are bolded.

Table 2. Impact of ADI on Patient Health Outcomes

	All (N=127)	$0 to $24,999 (N=14)	$25K <50K $49,999 (N=16)	$50,000 to $74,999 (N=23)	$75,000 to $99,999 (N=26)	≥ $100,000 (N=48)	p-value
Baseline							
NDI	31.8 (20.5)	39.0 (18.7)	43.3 (22.6)	35.3 (24.4)	30.2 (19.4)	25.3 (17.0)	**0.023**
Neck VAS	2.73 (2.99)	4.08 (3.43)	4.86 (3.70)	3.14 (2.90)	2.81 (2.70)	1.49 (2.10)	**0.001**
Arm VAS	2.00 (2.55)	3.23 (3.19)	2.79 (3.40)	2.82 (2.74)	1.65 (1.79)	1.23 (2.10)	**0.020**
Back VAS	5.45 (2.76)	6.85 (1.87)	5.57 (2.93)	6.45 (2.46)	5.38 (2.28)	4.60 (2.96)	**0.011**
PROMIS Pain	5.72 (2.29)	6.69 (1.18)	6.57 (2.79)	6.23 (2.29)	5.31 (2.07)	5.17 (2.35)	0.063
PROMIS PI	13.9 (4.64)	15.8 (3.47)	14.3 (4.91)	15.0 (4.12)	12.9 (4.26)	13.5 (5.16)	0.259
PROMIS Sleep	11.5 (3.66)	13.5 (1.80)	11.6 (2.82)	12.3 (3.76)	11.5 (3.84)	10.6 (3.54)	0.099
PROMIS Fatigue	11.0 (4.37)	14.2 (3.83)	11.4 (3.72)	12.0 (4.90)	9.88 (3.31)	10.1 (4.52)	**0.013**
PROMIS Depression	7.19 (3.64)	11.3 (4.23)	5.57 (1.45)	**8.36 (3.84)**	**6.85 (3.32)**	6.15 (3.06)	**<0.001**
PROMIS Anxiety	8.12 (3.77)	11.8 (3.34)	6.71 (3.38)	9.41 (3.29)	7.54 (3.14)	7.20 (3.82)	**<0.001**
3 Months Post-op							
NDI	28.2 (20.3)	34.4 (12.4)	36.7 (18.0)	45.0 (25.6)	32.7 (22.8)	18.7 (15.4)	**0.026**
Neck VAS	2.41 (4.30)	3.00 (2.49)	3.00 (3.16)	3.07 (2.84)	1.65 (2.10)	**2.78 (8.13)**	0.936
Arm VAS	1.27 (2.13)	1.20 (1.32)	2.00 (3.16)	2.50 (3.46)	1.10 (1.77)	0.66 (1.14)	0.09
Back VAS	3.70 (2.92)	4.80 (2.04)	6.17 (3.66)	5.57 (3.03)	2.95 (3.02)	2.41 (2.20)	**0.001**
PROMIS Pain	4.05 (2.66)	5.11 (1.76)	6.00 (3.06)	5.93 (2.64)	3.10 (2.45)	3.06 (2.22)	**<0.001**
PROMIS PI	11.8 (5.06)	15.1 (3.26)	13.0 (4.83)	14.6 (5.11)	10.3 (5.05)	10.2 (4.67)	**0.007**
PROMIS Sleep	10.0 (4.01)	13.8 (1.14)	**8.86 (2.91)**	10.8 (3.19)	9.70 (3.48)	9.10 (4.04)	**0.025**
PROMIS Fatigue	10.1 (4.53)	13.3 (2.92)	11.1 (5.08)	11.9 (5.76)	9.30 (4.04)	8.55 (3.83)	**0.018**
PROMIS Depression	6.69 (3.33)	9.78 (3.56)	5.00 (1.53)	7.71 (3.50)	6.55 (3.61)	5.81 (2.71)	**0.008**
PROMIS Anxiety	6.91 (3.44)	10.4 (3.68)	5.14 (1.02)	8.00 (3.44)	6.30 (2.68)	6.19 (3.25)	**0.003**
6 Months Post-op							
NDI	23.6 (16.9)	34.0 (12.0)	29.2 (17.4)	32.0 (20.1)	19.4 (18.1)	18.8 (14.9)	0.257
Neck VAS	1.54 (2.03)	3.34 (2.34)	1.50 (1.97)	1.62 (2.50)	1.86 (2.14)	1.00 (1.73)	0.177
Arm VAS	1.18 (1.87)	2.00 (2.31)	0.83 (1.33)	1.88 (2.64)	1.44 (2.24)	0.78 (1.44)	0.524
Back VAS	3.92 (2.69)	4.75 (3.20)	5.17 (2.64)	4.62 (2.39)	3.67 (2.32)	3.30 (2.48)	0.49
PROMIS Pain	4.12 (2.71)	5.24 (1.50)	3.33 (2.50)	4.75 (2.26)	4.83 (2.74)	**3.84 (3.08)**	0.759
PROMIS PI	11.1 (5.44)	12.5 (1.73)	11.5 (3.89)	13.2 (6.04)	11.0 (6.52)	10.0 (5.62)	0.662
PROMIS Sleep	9.81 (3.99)	12.2 (4.86)	8.67 (2.73)	13.0 (4.00)	**8.89 (4.83)**	**8.32 (3.54)**	0.162
PROMIS Fatigue	10.0 (4.37)	12.0 (4.24)	9.00 (3.03)	12.5 (5.95)	9.33 (4.44)	9.40 (3.99)	0.356
PROMIS Depression	6.67 (3.23)	8.00 (2.71)	6.00 (1.90)	7.67 (4.16)	6.44 (3.68)	6.44 (3.24)	0.611
PROMIS Anxiety	7.13 (3.32)	8.75 (1.86)	4.83 (0.75)	8.62 (2.20)	6.67 (3.08)	7.12 (3.78)	0.211
9 Months Post-op							
NDI	25.2 (15.5)	36.0 (.)	NA	20.0 (.)	33.6 (20.4)	20.0 (12.2)	0.412
Neck VAS	1.77 (2.30)	7.00 (.)	NA	3.50 (4.95)	1.57 (2.15)	1.17 (1.64)	0.071
Arm VAS	1.86 (2.66)	7.00 (.)	NA	3.50 (4.95)	2.29 (2.63)	0.92 (1.24)	**0.05**
Back VAS	3.18 (2.13)	7.00 (.)	NA	5.00 (2.83)	4.14 (1.57)	2.00 (1.60)	0.009
PROMIS Pain	3.64 (2.01)	7.00 (.)	NA	5.00 (2.83)	4.71 (1.75)	2.92 (1.80)	0.115
PROMIS PI	11.0 (4.27)	12.0 (.)	NA	12.5 (0.71)	12.3 (5.50)	10.0 (4.30)	0.691
PROMIS Sleep	8.14 (3.30)	**6.00 (.)**	NA	12.5 (6.36)	8.33 (2.07)	7.38 (3.18)	0.249
PROMIS Fatigue	9.68 (3.23)	12.0 (.)	NA	9.50 (0.71)	11.5 (5.31)	8.69 (3.15)	0.317
PROMIS Depression	7.82 (3.94)	10.0 (.)	NA	11.0 (7.07)	7.83 (3.54)	7.15 (3.89)	0.607
PROMIS Anxiety	8.18 (3.85)	9.00 (.)	NA	10.0 (4.24)	8.33 (3.78)	7.77 (4.21)	0.901
12 Months Post-op							
NDI	19.8 (16.5)	44.0 (.)	NA	10.0 (.)	24.0 (21.1)	16.7 (13.5)	0.343
Neck VAS	1.04 (1.37)	5.00 (.)	NA	0.00 (.)	1.38 (1.41)	0.69 (0.95)	**0.007**
Arm VAS	0.96 (1.54)	5.00 (.)	NA	0.00 (.)	1.00 (1.77)	0.75 (1.13)	**0.043**
Back VAS	2.69 (1.98)	7.00 (.)	NA	3.00 (.)	2.62 (1.92)	2.44 (1.86)	0.166
PROMIS Pain	3.21 (2.33)	8.00 (.)	NA	5.67 (2.89)	2.50 (1.69)	2.81 (2.04)	**0.022**
PROMIS PI	10.1 (5.29)	20.0 (.)	NA	16.3 (4.04)	8.12 (3.76)	9.31 (4.96)	**0.018**
PROMIS Sleep	9.68 (4.09)	17.0 (.)	NA	8.67 (4.04)	11.0 (4.41)	8.75 (3.64)	0.167
PROMIS Fatigue	8.93 (4.39)	17.0 (.)	NA	10.7 (7.23)	8.75 (4.23)	8.19 (3.71)	0.233
PROMIS Depression	6.61 (3.51)	10.0 (.)	NA	8.33 (4.16)	6.00 (2.4)	6.50 (3.14)	**0.013**
PROMIS Anxiety	6.79 (3.54)	15.0 (.)	NA	8.33 (4.51)	5.50 (2.00)	6.62 (3.48)	0.06
Post-op ER Visits	0.06 (0.26)	0.21 (0.58)	0.00 (0.00)	0.00 (0.00)	0.08 (0.27)	0.04 (0.20)	0.122

Table 3. Impact of Income on Patient Health Outcomes

Limitations

- Study involved patients from a single center, and thus may not be representative of all institutions.
- ADI usage includes making use of estimates and may consist of incomplete data from the US census. [4] [5]

Conclusion

- Pre-surgical attitudes, the ADI, income, employment status, and BMI emerged as significant and influential factors associated with enhanced surgical outcome measurements.
- Spine surgeons should be attentive to the specific determinants that impact outcomes and consider each patient's capacity to execute adequate post-operative management.

References

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