

Navigating the wait: Unraveling the impact of social determinants of health on timely access to spinal surgery

Alyssa Capasso, Samuel K Ezeonu¹, Nicholas Scott Vollano¹, Juan Rodriguez-Rivera, Constance Maglaras, Tina Raman², Themistocles Stavros Protopsaltis³, Charla R Fischer

¹NYU Langone Health, ²NYU Langone Orthopedic Hospital, ³NYU Hospital For Joint Disorders

INTRODUCTION: Social determinants of health (SDH) are factors which impact the patient experience of care outside the hospital environment. Although there are various studies pertaining to social determinants of health affecting patient care and healthcare access in various specialties, the related literature in spine surgery is sparse. This study evaluates various social indices and social determinants of health in relation to time to surgical intervention since onset of pain. This is vital information to understanding the complex variables which can lead to delayed surgical intervention in spinal surgery and improving health equity in spinal care.

METHODS: Retrospective chart review of 1-2 level ALIF, LLIF, TLIF spinal fusions for Area Deprivation Index (ADI), Social Vulnerability Index, self-reported race/ethnicity, Household Median Income (HMI) and PROMIS data. Excluded dx of trauma, dx of infection and revision surgeries. Time from onset of pain to surgical intervention (TTS) was calculated from the numerical value reported by patient of their pain onset, and date of surgery. The study cohort was divided into groups based on quartile ranks of time to surgical intervention since onset of pain (TTS). Analyses of Variance (ANOVA) and χ^2 tests were used to analyze differences in outcomes with significance set at $p < 0.05$. Post-hoc Tukey's test and multinomial regression were performed for significant results.

RESULTS: 437 patients were included (Q1: ≤ 1 year = 171; Q2: $> 1-2$ years = 76; Q3: $> 2-5$ years = 93; Q4: > 5 years = 97). Results indicated that compared to the Q3 TTS group, the Q1 TTS group had a lower Area Deprivation Index National % (14.22 vs. 19.98, $p = .012$) and a lower Area Deprivation Index State % (3.41 vs. 4.21, $p = .012$). Chi squared analysis also indicated that race was a significant predictor of TTS. Subsequent multinomial regression revealed that patients who self-reported as white had greater odds of being placed into the Q1 TTS group than the Q3 TTS percentile group (OR = 2.05, 95% CI 0.67-3.970, $p = .031$). Patients who self-identified as Asian significantly increased the likelihood of being in the Q4 TTS group than the Q3 TTS group (OR = 4.312, CI 95% 1.176-15.809, $p = .027$). Further regression analysis indicated that when Area Deprivation Index National % was split into quartile groups the Q1 ADI group had greater odds of also being in the Q1 TTS group than the Q3 TTS group (OR = 2.511, CI 95% 1.122-5.620, $p = .025$). Although there was overall statistical significance difference in age and household median income Tukey's post-hoc test failed to find significant differences between groups. There were no significant differences found in PROMIS score outcomes.

DISCUSSION AND CONCLUSION: Our results indicate that Social Determinants of Health are associated with time to surgical intervention from symptom onset, which may contribute to delayed surgical intervention and healthcare disparity in spinal surgery. Furthermore, spine surgeons should consider patient Social Determinants of Health when treating and preparing patients for surgical intervention. Further studies of analyzing the interaction between Social Determinants of Health and spine surgery should be conducted to further understand the complex experiences of patient care beyond the clinical setting.

Time from Onset of Pain to Surgical Intervention		≤ 1 Year		>1.0 - 2.0 Years		>2.0 - 5.0 Years		> 5.0		p-value
Quartiles (n=437)		Q1 (n=171)		Q2 (n=76)		Q3 (n=93)		Q4 (n=97)		
Social Demographics	Age	61.22 ± 13.47		58.66 ± 12.81		57.27 ± 10.91		57.13 ± 12.34		0.027
	BMI	28.81 ± 5.94		29.29 ± 5.74		30.34 ± 6.56		29.47 ± 5.71		0.289
	Gender (% Female)	86 (50.3%)		42 (55.3%)		52 (55.9%)		54 (55.7%)		0.752
	Smoking Status	12 (10.6%)		9 (20.0%)		8 (16.3%)		10 (16.9%)		0.796
	Smoking Present %	12 (10.6%)		9 (20.0%)		8 (16.3%)		10 (16.9%)		0.796
	Smoking Past %	58 (21.8%)		19 (42.2%)		23 (46.5%)		27 (45.8%)		0.045
Social Class Indicator	Household Median Income	\$13,089.14 ± \$46,751		\$107,426 ± \$42,486.45		\$99,951.53 ± \$40,355.60		\$101,777.52 ± \$44,152		0.045
	Area Deprivation Index National %	14.22 ± 11.40		17.81 ± 15.63		19.98 ± 14.99		16.53 ± 13.9		0.012
	Area Deprivation Index State %	3.41 ± 2.63		3.78 ± 2.27		4.21 ± 2.07		3.73 ± 2.16		0.012
	Social Vulnerability Index Score	48 ± 30		48 ± 29		50 ± 29		56 ± 29		0.068
	Medicare/Ticare (n=110)	50 (29.2%)		23 (20.8%)		19 (20.4%)		18 (18.6%)		0.103
Insurance Type	Managed Care (n=169)	63 (36.8%)		27 (35.5%)		33 (35.5%)		46 (47.4%)		0.103
	Worker's Comp/No Fault (n= 67)	24 (14.0%)		16 (21.1%)		17 (18.3%)		10 (10.3%)		0.103
	Commercial (n = 91)	34 (19.9%)		10 (13.2%)		24 (25.8%)		23 (23.7%)		0.103
	Unknown/Other (n=80)	14 (8.2%)		6 (7.9%)		4 (4.3%)		12 (12.4%)		0.034
Self-Reported Race/Ethnicity	White (n=263)	116 (67.8%)		41 (53.9%)		54 (58.1%)		52 (53.6%)		0.034
	Asian (n=36)	14 (8.2%)		6 (7.9%)		4 (4.3%)		12 (12.4%)		0.034
	Black (n=56)	17 (9.9%)		12 (15.8%)		10 (10.8%)		17 (17.5%)		0.034
	Hispanic (n=2)	0 (0.0%)		0 (0.0%)		2 (2.2%)		0 (0.0%)		0.034
	Hippos/H2p2r (n=80)	24 (16.2%)		12 (15.8%)		21 (23.3%)		16 (16.2%)		0.034

Time from Onset of Pain to Surgical Intervention		≤ 1 Year		>1.0 - 2.0 Years		>2.0 - 5.0 Years		> 5.0		p-value
Quartiles (n=437)		Q1 (n=171)		Q2 (n=76)		Q3 (n=93)		Q4 (n=97)		
PROMIS Scoring	Baseline	n	n	n	n	n	n	n	n	
	Mental Health	23	45.06 ± 8.32	15	42.46 ± 8.32	15	44.95 ± 7.61	13	37.89 ± 8.97	0.136
	Physical Health	23	37.37 ± 7.24	15	39.11 ± 9.74	15	36.58 ± 6.66	14	33.77 ± 8.09	0.334
	1 Year									
	Mental Health	35	49.61 ± 10.92	17	49.65 ± 13.17	27	45.98 ± 12.23	22	43.14 ± 9.21	0.147
	Physical Health	35	42.48 ± 9.57	20	42.40 ± 12.27	27	41.67 ± 9.51	23	40.21 ± 9.51	0.842
	Baseline 6 1 Y									
	Mental Health	10	2.66 ± 7.87	8	5.86 ± 8.04	10	-1.52 ± 12.36	11	3.69 ± 6.33	0.356
	Physical Health	10	5.44 ± 7.47	11	2.64 ± 11.15	10	1.84 ± 9.02	12	5.78 ± 6.92	0.655
	Baseline 6 2 Y									
Mental Health	6	8.51 ± 11.87	9	6.65 ± 12.24	4	-6.8 ± 9.88	7	-3.45 ± 6.84	0.089	
Physical Health	6	5.30 ± 10.02	10	-6.2 ± 12.0	4	-9.2 ± 10.79	8	1.93 ± 8.45	0.841	
Follow Up	Follow Up 3 Months	147 (86.0%)	66 (86.8%)	82 (88.2%)	89 (91.8%)	56 (60.5%)	52 (55.8%)	55 (56.7%)	56 (57.7%)	0.565
	Follow Up 6 Months	100 (58.5%)	39 (51.3%)	48 (51.6%)	55 (56.7%)	42 (45.2%)	40 (42.9%)	43 (44.3%)	43 (44.3%)	0.620
	Follow Up 1 Year	111 (64.9%)	52 (68.4%)	72 (77.4%)	73 (75.3%)	53 (57.0%)	50 (53.7%)	52 (53.7%)	52 (53.7%)	0.116
	Follow Up 2 Years	74 (43.3%)	37 (48.7%)	41 (44.1%)	54 (55.7%)	38 (40.9%)	36 (38.7%)	40 (41.3%)	40 (41.3%)	0.233
	Follow Up 2 + Years	12 (7.0%)	9 (11.8%)	9 (9.7%)	13 (13.4%)	10 (10.8%)	10 (10.8%)	10 (10.3%)	10 (10.3%)	0.352