

The Impact of Health Literacy on Outcomes After Shoulder Arthroplasty

Richard N Puzziello, Daniel Patrick Swanson, Michael A Moverman¹, Mariano Menendez, Jacob Kirsch², Andrew Jawa¹
¹Tufts Medical Center, ²Boston Sports and Shoulder Center

INTRODUCTION: Patients with limited health literacy (LHL) have difficulty comprehending musculoskeletal pathology and may be predisposed to worse postoperative outcomes. The purpose of our study was to determine the impact of LHL on the 2-year outcomes after shoulder arthroplasty.

METHODS: We retrospectively identified 175 consecutive patients who underwent elective reverse or anatomic shoulder arthroplasty between January 2018 and May 2020, with 2-years minimum follow-up, from a prospectively maintained single surgeon registry. The health literacy of each patient was assessed preoperatively using the validated 4-item Brief Health Literacy Screening Tool (BHLST). Patients with a BHLST score of 17 or less were categorized as having LHL. Univariate analysis was performed to determine associations with LHL and clinical outcomes including active range-of-motion (ROM), American Shoulder Elbow Surgeons (ASES) score, Single Assessment Numerical Evaluation (SANE) score, Visual analog scale (VAS) for pain, and satisfaction. Multivariable linear regression modeling was used to determine the association between LHL and 2-year ASES scores while controlling for potentially confounding variables.

RESULTS: Overall, 37 (21.1%) patients were classified as having LHL. Prior to surgery, these patients had significantly higher rates of opioid use (P = .002) and more self-reported allergies (P = .007) but did not significantly differ in terms of other baseline characteristics including diagnosis (P = 0.88) and procedure type (P = 0.16). At 2-year follow-up, patients with LHL had worse final ASES scores (78.3±20.3 vs. 88.2±13.3, P = 0.003) and VAS-pain scores (1.7±2.3 vs. 0.74±1.3, P = 0.002), but demonstrated similar levels of improvement from baseline for these outcomes (ΔASES: 48.4±21.9 vs. 47.8±21.3, P = 0.893; ΔVAS-pain: 4.9±2.8 vs. 4.7±2.7, P = 0.694). There were no significant differences in improvement from baseline or final SANE score (P=0.332, P=0.723), forward elevation (P=0.253, P=0.17), external rotation (P=0.16, P=0.73), or internal rotation (P=0.126, P=0.16). Additionally, there was no difference in levels of final satisfaction (P=0.1). LHL was independently predictive of worse final ASES score on multivariable linear regression (β, 95% CI: 8.2, [2.6-13.7], P = 0.004).

DISCUSSION AND CONCLUSION: Limited health literacy is associated with significantly worse 2-year ASES and VAS-pain scores, but similar levels of improvements from baseline for these outcomes. Postoperative ROM, satisfaction, and SANE scores were not associated with LHL.

Table 1. Univariate Analysis of Patient Characteristics Associated with Health Literacy

Parameter	Limited health literacy (n = 37)	High health literacy† (n = 138)	P - value
Age at surgery (years)	70.49 (8.85)	68.04 (7.61)	0.095
Female sex	19 (51.35)	68 (49.28)	0.823
Non-white race	2 (5.41)	3 (2.17)	0.6
Limited social support‡	16 (42.1)	48 (34.78)	0.96
BMI	31.59 (6.54)	29.92 (6.04)	0.143
Smoker	1 (2.7)	4 (2.9)	0.99
# Allergies	2.8 (3.2)	1.8 (2.1)	0.007*
ASA > 2	10 (27.78)	35 (27.56)	0.979
Diabetes	9 (24.32)	18 (13.04)	0.3
Hypertension	20 (54.05)	78 (56.52)	0.788
Hyperlipidemia	21 (56.76)	61 (44.2)	0.174
Depression	12 (32.43)	30 (21.74)	0.176
Preoperative opioid use	15 (40.54)	17 (12.3)	0.002*
Prior ipsilateral shoulder surgery	12 (32.43)	34 (24.63)	0.351
Medicare insurance	19 (57.58)	68 (50.37)	0.458
Private insurance	13 (39.39)	62 (45.93)	0.499
Workers' Compensation	1 (3.03)	5 (3.7)	0.99
Diagnosis			
Osteoarthritis	27 (72.97)	99 (71.7)	0.882
Rotator cuff arthropathy	10 (27.03)	39 (28.26)	0.882
RSA	31 (83.78)	100 (72.46)	0.159

BMI, body mass index; ASA, American Society for Anesthesiologists score; RSA, reverse total shoulder arthroplasty.
 *Statistically significant at P < 0.05
 † Defined as a score on the Brief Health Literacy Screening Tool ≤ 17
 ‡ Defined as single, divorced, or widowed marital status

Table 2. Influence of Health Literacy on 2-year Clinical Outcomes After Shoulder Arthroplasty

Outcome	Health Literacy Level	P Value*		
	LHL (n=37)	HLE (n=138)		
VAS-pain Score**	Pre-op	6.54 (2.33)	5.48 (2.39)	0.017*
	Post-op	1.67 (2.33)	0.74 (1.32)	0.002*
	Δ	4.91 (2.82)	4.71 (2.69)	0.694
SANE Score**	Pre-op	29.76 (27.54)	30.48 (25.35)	0.881
	Post-op	84.29 (17.76)	87.09 (14.92)	0.332
	Δ	54.53 (29.47)	55.61 (29.38)	0.723
ASES Score	Pre-op	30.39 (17.62)	40.23 (17.7)	0.003*
	Post-op	78.32 (20.25)	88.16 (13.33)	0.001*
	Δ	48.36 (21.88)	47.82 (21.25)	0.893
Achieved MCEID	34 (91.89)	139 (94.2)	0.67	
Achieved PADS	30 (81.08)	114 (82.63)	0.99	
Satisfaction	Unsatisfied	0	1 (0.73)	
	Neutral	3 (8.17)	3 (2.17)	0.1
	Satisfied	9 (25.71)	21 (15.22)	
Very Satisfied	23 (65.71)	113 (81.9)		
Forward Elevation (Degree)	Pre-op	78.11 (30.26)	93.99 (31.41)	0.007*
	Post-op	139.38 (19.99)	143.27 (16.09)	0.253
	Δ	59.38 (34.82)	50.64 (30.84)	0.17
External Rotation (Degree)	Pre-op	21.89 (16.3)	29.64 (16.98)	0.014*
	Post-op	52.03 (17.95)	57.36 (18.26)	0.16
	Δ	29.33 (24.64)	28.0 (20.99)	0.73
Internal Rotation	Pre-op			
	Hip-L4	36 (97.3)	120 (87.0)	
	L3-T12	1 (2.7)	15 (10.87)	0.194
T11-T8	0	3 (2.17)		
Post-op				
Hip-L4	20 (62.5)	49 (42.24)		
L3-T12	11 (44.38)	61 (52.59)	0.126	
T11-T8	1 (3.13)	6 (5.17)		
Δ				
Less or no change	9 (28.13)	33 (28.45)		
Gain in 1-3 levels	12 (37.5)	25 (21.55)	0.16	
Gain in 4-6 levels	8 (25)	31 (43.97)		
Gain in 7+ levels	3 (9.38)	7 (6.03)		

ASES, American Shoulder Elbow Surgeon Score; VAS, Visual Analog Scale; SANE, Single Assessment Numerical Evaluation.
 * Denotes Statistical Significance