The Impact of Health Literacy on 2-year Outcomes After Shoulder Arthroplasty

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INTRODUCTION:

Patients with limited health literacy (LHL) have difficulty comprehending musculoskeletal pathology and may be predisposed to worse postoperative outcomes, which has been substantiated in the medical literature. It has also been previously demonstrated that these patients have greater shoulder symptom severity and activity intolerance in the setting of degenerative joint disease, and also experience longer length of hospitalizations following elective shoulder arthroplasty. These issues are magnified by physician tendencies to overestimate their patient's level of health literacy, and the hesitancies of patients with LHL to ask clarifying questions. The burgeoning demand and costs associated with shoulder arthroplasty require concerted efforts to optimize the value of this procedure. Given the malleable nature of patient health literacy, this represents a domain which may provide an opportunity to achieve this goal while simultaneously addressing a barrier to equitable care. The purpose of our study was to determine the impact of LHL on the 2-year outcomes after shoulder arthroplasty.

METHODS:

We prospectively enrolled 175 consecutive patients who underwent elective reverse or anatomic shoulder arthroplasty by a single fellowship trained shoulder surgeon between January 2018 and May 2020. 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, including arthroplasty type and preoperative diagnosis.

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) (Table 1). 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) (Table 2). 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 the greatest independent predictor of worse final ASES score on multivariable linear regression (β, 95% CI: 8.2, [2.6-13.7], P = 0.004) (Table 3).

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 after shoulder arthroplasty. Postoperative ROM, satisfaction, and SANE scores were not associated with LHL. Orthopaedic providers are charged with the task of identifying patients with limited health literacy and engaging in additional discussion and education regarding their condition and treatment. Such strategies my include setting realistic expectations about postoperative pain and functional limitations. Future research should evaluate the effects of such interventions on patient outcomes.

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)	HHL (n=138)	
VAS-pain Score**			
Pre-op	6.54 (2.33)	5.48 (2.39)	**0.017***
Post-op	1.67 (2.31)	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 (39.47)	55.61 (29.38)	0.723
ASES Score			
Pre-op	30.29 (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 MCID	34 (91.89)	130 (94.2)	0.67
Achieved PASS	30 (81.08)	114 (82.61)	0.99
Satisfaction			
Unsatisfied	0	1 (0.73)	0.1
Neutral	3 (8.57)	3 (2.17)	
Satisfied	9 (25.71)	21 (15.22)	
Very Satisfied	23 (65.71)	113 (81.9)	

Table 3. Linear regressions model for variables associated with postoperative ASES score

Parameter	Standardized Beta†	95% CI	*P*-value
Age	0.18	[0.002 - 0.03]	**0.02***
Female Sex	0.22	[0.13 - 0.48]	**0.001***
BMI	0.04	[-0.01 - 0.02]	0.54
ASA > 2	0.13	[-0.01 - 0.39]	0.07
Depression	0.15	[0.04 - 0.45]	**0.02***
National percentile ADI	0.12	[-0.001 - 0.01]	0.08
Medicare insurance	-0.01	[-0.22 - 0.20]	0.93
Limited health literacy‡	0.14	[0.02 - 0.42]	**0.04***

BMI, body mass index; ADI, area deprivation index; ASA, American Society for Anesthesiologists score

*Denotes statistical significance at *P* <0.05
† Standardized beta coefficient, weighted to allow for comparison of the relative strength of association with the dependent variable between the variables of interest
‡ Defined as a score on the Brief Health Literacy Screening Tool ≤ 17