What are the Postoperative Patient-Reported Pain and Function Levels that Translate into a Patient-Acceptable Symptomatic State after Primary Total Hip Arthroplasty? An Analysis of 4,184 Patients from a Tertiary Academic Center

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INTRODUCTION:

The United States healthcare system is progressively shifting toward patient-centered healthcare provision and individualized outcome evaluation. Such a shift increasingly drives emphasis on patient satisfaction with post-total hip arthroplasty (THA) outcomes. The patient-acceptable symptomatic state (PASS) is a patient-reported outcome measure (PROM) directly gauging postoperative satisfaction relative to patients' preoperative status. While such a measure has been extensively validated, the level of patient-reported pain and function corresponding to achieving a PASS status is yet to be characterized. Therefore, the present investigation aimed to determine 1) the postoperative pain and function levels associated with a postoperative patient-reported PASS, with stratification by preoperative diagnosis (i.e., osteoarthritis vs. non-osteoarthritis); and 2) the pain and function improvement thresholds for designating a minimal clinically important difference (MCID).

METHODS:

A prospective institutional cohort of 5,887 patients who underwent primary THA (January 2016-December,2018) was included. Of these patients, 4,184 (77.0%) completed a one-year follow up. Demographics, comorbidities, preoperative and one-year Hip Disability and Osteoarthritis Outcome Score (HOOS)-pain, HOOS-physical function short form (-PS), and HOOS-Joint related (JR) were recorded (**Table 1**). Postoperative pain (HOOS-Pain), function (HOOS-PS), and overall joint-related health (HOOS-JR) associated with patients reporting achievement of a PASS were estimated using an anchor-based approach that utilized the anchor question "Taking into account all the activity you have during your daily life, your level of pain and also your activity limitations and participation restrictions, do you consider the current state of your hip satisfactory?" Logistic regression models utilized PASS as the outcome, with HOOS-pain, HOOS-PS, and HOOS-JR changes as predictors. The optimal numerical PROM-specific cutoff associated with PASS attainment was defined as the point with the highest discriminating ability.

RESULTS:

Postoperative Pain and Function Associated with Reporting a PASS

Among patients with a preoperative diagnosis of osteoarthritis (OA), patients who attained a one-year postoperative HOOS-Pain, HOOS-PS, and HOOS-JR scores of ≥80.6, ≥83.6, and ≥76.8 were likely to report a concurrent PASS, with area under the curve (AUC) values of 0.88, 0.87, and 0.87, respectively (Table 2). Such values were achieved by 77% of the OA cohort for HOOS-Pain, 77% for HOOS-PS, and 67% for HOOS-JR. Patients with a non-OA diagnosis had slightly lower thresholds of postoperative pain and function scores at reporting PASS. Specifically, patients who attained a one-year postoperative HOOS-Pain, HOOS-PS, and HOOS-JR scores of ≥77.5, ≥83.6, and ≥73.5 were likely to report a concurrent PASS, with AUC values of 0.91, 0.88, and 0.0.92, respectively. Such values were achieved by 78% of the non-OA cohort for HOOS-Pain, 73% for HOOS-PS and 78% for HOOS-JR (**Table 2**).

Minimal Detectable Difference and Minimal Clinically Important Difference (MCID)

MCID thresholds estimated using a distribution-based method were slightly lower in the OA cohort for HOOS-Pain (OA: 8.4 vs. Non-OA: 8.9 points), HOOS-PS (OA: 9.5 vs. Non-OA: 9.0 points), and HOOS-JR (OA: 7.8 vs. Non-OA: 8.5 points). Based on the aforementioned thresholds, 97%, 92%, and 96% of the OA cohort attained MCID for HOOS-Pain, HOOS-PS, and HOOS-JR, respectively. Similarly, 97%, 94%, and 95% of the non-OA cohort attained MCID in HOOS-Pain, HOOS-PS, and HOOS-JR, respectively.

DISCUSSION AND CONCLUSION:

Identifying HOOS thresholds that represent PASS attainment is critical to understanding the postoperative pain and function associated with patient-reported satisfaction. Such metrics could supplement previously described benchmarks including the MCID and substantial clinical benefit (SCB). We found that most OA and non-OA patients attained PASS when their postoperative HOOS pain and function scores >75 points. Further studies are warranted to evaluate the weight of individual pain and function elements in driving PASS attainment post-THA.

Table 1. Description of baseline determinants among included patients with osteoarthritis (OA) vs. non-OA preoperative diagnoses.

VARIABLE	LEVEL	TOTAL (N=4,161)	OA (N=3,613)	NON-OA (N=548)	P-VALUE
AGE		65.0 [58.0;72.0]	66.0 [59.0;73.0]	58.0 [48.0;67.0]	<0.001
SEX	Female	2,402 (57.7%)	2065 (57.2%)	337 (61.5%)	0.061
	Male	1,759 (42.3%)	1,548 (42.8%)	211 (38.5%)	
BMI		29.2 [25.6;33.7]	29.2 [25.7;33.7]	29.0 [25.0;33.6]	0.072
RACE	White	3,441 (82.7%)	3,002 (83.1%)	439 (80.1%)	0.399
	Black	383 (9.20%)	325 (9.00%)	58 (10.6%)	
	Other	79 (1.90%)	67 (1.85%)	12 (2.19%)	
	'Missing'	258 (6.20%)	219 (6.06%)	39 (7.12%)	
EDUCATION		14.0 [12.0;16.0]	14.0 [12.0;16.0]	14.0 [12.0;16.0]	0.003
SMOKING	Never	,2,211 (53.1%)	1,922 (53.2%)	289 (52.7%)	0.001
	Quit 6m+	1,423 (34.2%)	1,261 (34.9%)	162 (29.6%)	
	Quit <6m	167 (4.01%)	142 (3.93%)	25 (4.56%)	
	Current	359 (8.63%)	287 (7.94%)	72 (13.1%)	
	'Missing'	1 (0.02%)	1 (0.03%)	0 (0.00%)	
CCI	0	2513 (60.4%)	2194 (60.7%)	319 (58.2%)	0.305
	1	733 (17.6%)	631 (17.5%)	102 (18.6%)	
	2	461 (11.1%)	405 (11.2%)	56 (10.2%)	
	3+	437 (10.5%)	367 (10.2%)	70 (12.8%)	
	'Missing'	17 (0.41%)	16 (0.44%)	1 (0.18%)	
INSURANCE	Commercial/Private/Other	1,273 (30.6%)	1,096 (30.3%)	177 (32.3%)	0.002
	Medicaid/Medicare	1,732 (41.6%)	1,541 (42.7%)	191 (34.9%)	
	Self-Pay	43 (1.03%)	39 (1.08%)	4 (0.73%)	
	'MISSING'	1113 (26.7%)	937 (25.9%)	176 (32.1%)	

M: Male; F: female; CCI: Charlson comorbidity score

Table 2. Thresholds and percent-attainment of PASS and MCID

Preoperative diagnosis	HOOS subdomain	MCID threshold	% of patients who achieved MCID	Score Threshold associated with PASS achievement	% of patients above the threshold	Sensitivity	Specificity	AUC
Osteoarthritis	Pain	8.35	0.97	80.56	0.77	0.83	0.83	0.88
	PS	9.47	0.92	83.60	0.77	0.83	0.81	0.87
	JR	7.76	0.96	76.78	0.67	0.80	0.82	0.87
Non-Osteoarthritis	Pain	8.85	0.97	77.50	0.78	0.85	0.85	0.91
	PS	9.90	0.94	83.60	0.73	0.79	0.83	0.88
	JR	8.46	0.95	73.47	0.78	0.84	0.91	0.92

AUC: area under the curve; HOOS: Hip Disability and Osteoarthritis Outcome Score; MCID: minimal clinically important difference; PASS: patient acceptable symptomatic state; PS: physical function short form; JR: joint related