Preoperative NarxCare Overdose Risk Scores Greater Than 100 Are Associated with Worse PROMs Improvements and Dissatisfaction After Primary THA

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INTRODUCTION:

The NarxCare Overdose Risk Score (ORS) is a weighted scalar measure of patient-specific prescription drug use. It is calculated using a complex algorithm based on dose, duration, and dispensation of narcotics, sedatives, and stimulants. The score can range from 0-999 with higher scores suggesting worse prescription drug use patterns. While a preoperative ORS of ≥ 300 has been linked with increased healthcare utilization following total hip arthroplasty (THA), there is a paucity of literature on the impact of ORS on patient reported outcome measures (PROMs). Therefore, this study aimed to evaluate the association of preoperative NarxCare ORS with (1) achievement of clinically meaningful improvements in PROMs, and (2) self-reported patient satisfaction at 1-year.

METHODS:

All patients who underwent primary THA at a USA tertiary healthcare system from November 2018-December 2022 were eligible. Patients with incomplete PROMs or missing Narx score at any time point were excluded. This led to 3,445 patients being enrolled in this study. Data were collected using the Orthopaedic Minimal Data Set Episode of Care, a validated data-collection system for all elective orthopedic surgical interventions taking place within the health care system. Continuous variables were summarized using medians and interquartile ranges, while categorical variables were summarized using counts and percentages. Multivariable linear regression models were used to assess the relationship between baseline Risk score and 1-year PROMs. The PROMs evaluated included the Hip Disability and Osteoarthritis Outcome Score (HOOS) Pain, Physical Function Shortform (PS), Joint Replacement (JR), and Veteran RAND-12 mental component score (VR-12 MCS). Clinically relevant improvements were determined by the minimal clinically important difference (MCID) and Patient Acceptable Symptom State (PASS) thresholds. All models were controlled for pre-specified demographics and surgical confounding variables. All statistical tests were two-sided with a Type I error rate of 0.05. Cohort characteristics are detailed in **Table 1**.

RESULTS:

A preoperative ORS of 100-199 is significantly associated with failure to achieve MCID in HOOS Pain (OR 2.33; CI 1.49, 3.66; p<0.001), while the ORS has to increase to 400-499 before it becomes associated with failure to achieve MCID in HOOS PS (OR 2.60; CI 1.29, 5.25; p=0.008) and JR (OR 4.29; CI 1.95, 9.46; <0.001) **(Table 2)**. Preoperative ORS of 100-199 is significantly associated with failure to reach PASS threshold in HOOS Pain (OR 1.54; CI 1.26, 1.89; p<0.001), PS (OR 1.56; CI 1.25, 1.94; p<0.001) and JR (OR 1.36; CI 1.12, 1.66; p=0.002), with the odds of failure continually increasing as the ORS increases **(Table 3)**. Patients with a preoperative ORS of 100-199 are 54% more likely to be dissatisfied at 1-year (OR 1.54; CI 1.18,2.03; p=0.002) compared to opioid naïve patients. The likelihood of dissatisfaction increases to 145% in those with an ORS score of ≥ 500 (OR 2.45; CI 1.21,4.98; p=0.013) **(Table 2)**.

DISCUSSION AND CONCLUSION:

Increasing preoperative NarxCare ORS, a measure of prescription drug use, has a dose-dependent association with adverse clinical outcomes after THA. An ORS of just 100 may significantly decrease the chances of clinically meaningful improvements in hip pain and function, as well as satisfaction at 1-year. A multidisciplinary approach is warranted to nullify the detrimental effects of sedatives, opioids, or stimulant drug use and subsequently lower patient ORS. While the ORS does not qualify as a basis for surgical ineligibility as it's a reflection of drug-use patterns rather than health status, surgeons may use the quantitative score to guide a patient centered discussion regarding possible postoperative clinical improvements.

Variable	Level	All (n=3465)	0 (n=1676)	1-99 (n=806)	100-199 (n=356)	200-299 (n=307)	300-399 (n=227)	400-499 (n=181)	500 (n=54)	P-value
Age		68.0 [61.0;73.0]	68.0 [61.0;73.0]	67.0 [62.0;73.0]	68.0 [63.0;74.0]	67.0 [61.0;74.0]	67.0 [60.0;72.0]	64.0 [58.0;70.5]	59.0 [53.2;67.0]	<0.001
Sex	F	2072 (60.1%)	951 (57.7%)	56 (65.1%)	567 (63.4%)	357 (58.8%)	153 (61.9%)	56 (54.9%)	36 (70.4%)	0.053
	M	1373 (39.9%)	625 (42.3%)	30 (34.9%)	327 (36.6%)	249 (41.2%)	94 (38.1%)	41 (45.1%)	16 (29.6%)	
BMI		29.3 [25.7;33.9]	28.8 [25.2;33.1]	29.5 [25.7;33.9]	29.4 [25.8;34.0]	29.9 [26.0;34.2]	30.0 [25.8;34.0]	31.5 [27.2;36.4]	31.3 [27.3;36.3]	<0.001
Education		14.0 [12.0;16.0]	15.0 [12.0;16.0]	13.5 [12.0;16.0]	14.0 [12.0;16.0]	14.0 [12.0;16.0]	14.0 [12.0;16.0]	14.0 [12.0;16.0]	14.5 [12.0;16.0]	<0.001
ADI		52.0 [32.0;71.0]	49.0 [30.0;69.0]	54.0 [37.5;73.5]	55.0 [34.0;75.5]	53.0 [35.0;70.0]	53.0 [31.2;73.0]	53.0 [36.5;69.5]	66.0 [40.0;83.0]	<0.001
Race	White	3046 (89.5%)	1319 (90.5%)	71 (85.5%)	775 (87.7%)	526 (89.2%)	224 (96.7%)	84 (95.5%)	47 (87.0%)	0.121
	Non-white	358 (10.5%)	139 (9.53%)	12 (14.5%)	109 (12.3%)	64 (10.8%)	23 (9.91%)	4 (4.55%)	7 (13.0%)	
Smoking	Never	1857 (53.9%)	674 (58.2%)	49 (46.5%)	469 (52.5%)	300 (50.3%)	122 (49.4%)	33 (36.3%)	19 (35.2%)	<0.001
	Quit 9+	1224 (35.5%)	488 (53.1%)	33 (38.4%)	328 (38.7%)	219 (38.7%)	69 (36.0%)	44 (48.4%)	23 (42.6%)	
	Quit 0-9m	112 (3.25%)	41 (2.76%)	2 (2.33%)	31 (3.47%)	20 (3.35%)	9 (3.64%)	6 (6.59%)	3 (5.56%)	
	Current	252 (7.31%)	73 (4.95%)	11 (12.8%)	66 (7.36%)	58 (9.72%)	27 (10.9%)	8 (8.79%)	9 (16.7%)	
CCI		1.00 [0.00;2.00]	0.00 [0.00;2.00]	1.00 [0.00;3.00]	1.00 [0.00;2.00]	1.00 [0.00;2.00]	1.00 [0.00;2.00]	1.00 [0.00;2.00]	2.00 [0.00;3.00]	<0.001
Insurance	Medicaid/Medicare	2256 (65.5%)	917 (62.2%)	64 (74.4%)	616 (68.9%)	366 (65.3%)	172 (68.6%)	58 (63.7%)	39 (72.2%)	0.006
	Commercial/ Self-pay	1188 (34.5%)	558 (37.8%)	22 (25.6%)	278 (31.1%)	207 (34.7%)	79 (30.4%)	33 (36.3%)	15 (27.8%)	
Diagnosis	Non-OA	318 (9.23%)	110 (7.45%)	7 (8.14%)	58 (6.49%)	70 (11.7%)	32 (13.0%)	20 (22.0%)	21 (38.9%)	<0.001
	OA	3127 (90.8%)	1366 (92.5%)	79 (91.9%)	836 (93.5%)	527 (88.3%)	215 (87.0%)	71 (78.0%)	33 (61.1%)	
Anesthesia	General	936 (27.2%)	362 (24.6%)	28 (32.6%)	233 (26.1%)	177 (29.6%)	61 (32.6%)	35 (39.6%)	19 (35.2%)	0.006
	Spinal	2400 (69.7%)	1061 (72.0%)	57 (66.3%)	642 (71.8%)	409 (67.9%)	155 (82.8%)	52 (57.1%)	33 (61.1%)	
	Other	107 (3.11%)	51 (3.46%)	1 (1.16%)	19 (2.13%)	16 (2.65%)	11 (5.88%)	3 (3.30%)	2 (3.70%)	
Phenotype	P-PS-HCS-	688 (23.3%)	243 (16.5%)	23 (28.7%)	211 (23.6%)	187 (31.3%)	79 (32.0%)	37 (40.7%)	28 (51.9%)	<0.001
	P+PS+HCS+	809 (26.9%)	479 (32.5%)	15 (17.4%)	249 (27.9%)	121 (20.3%)	51 (20.6%)	8 (8.79%)	3 (5.56%)	
	P+PS+HCS-	520 (15.1%)	244 (16.5%)	15 (17.4%)	116 (13.0%)	95 (15.9%)	36 (14.6%)	12 (13.2%)	2 (3.70%)	
	P+PS-HCS+	173 (5.02%)	95 (6.44%)	3 (3.49%)	38 (4.25%)	22 (3.68%)	14 (5.67%)	0 (0.00%)	1 (1.85%)	
	P+PS-HCS-	172 (4.99%)	74 (5.01%)	7 (8.14%)	49 (5.48%)	23 (3.85%)	9 (3.64%)	6 (6.59%)	4 (7.41%)	
	P-PS+HCS+	186 (5.40%)	64 (5.65%)	3 (3.49%)	68 (6.71%)	25 (4.19%)	9 (3.64%)	3 (3.30%)	2 (3.70%)	
	P-PS+HCS-	224 (6.50%)	77 (5.22%)	10 (11.6%)	63 (7.06%)	49 (8.70%)	17 (6.88%)	11 (12.1%)	6 (11.1%)	
	P-PS-HCS+	436 (12.7%)	180 (12.2%)	10 (11.6%)	169 (12.1%)	64 (14.1%)	32 (13.0%)	14 (15.4%)	6 (14.8%)	
Baseline Overall Risk		110 [0.00;200]	0.00 [0.00;0.00]	0.0 [0.00;80.0]	150 [110;190]	200 [200;270]	300 [210;360]	430 [410;450]	660 [520;810]	0.000

Table 2 - Multivariable logistic regression model, using **failure to reach satisfaction and MCID improvements in HOOS Pain, PS, and JR** as outcomes

	Pass (No)		MCID HOOS Pain		MCID HOOS PS		MCID HOOS JR	
Predictors	OR (95%CI)	*P value*	OR (95%CI)	*P value*	OR (95%CI)	*P value*	OR (95%CI)	*P value*
Baseline Risk Score (1-99 v 0)	1.03 (0.48 – 2.21)	0.938	2.66 (0.99 – 7.15)	0.052	1.00 (0.44 – 2.30)	0.997	2.95 (1.35 – 6.43)	**0.007**
Baseline Risk Score (100-199 v 0)	1.54 (1.18 – 2.03)	**0.002**	2.33 (1.49 – 3.66)	**<0.001**	1.21 (0.90 – 1.63)	0.199	1.46 (0.97 – 2.18)	0.067
Baseline Risk Score (200-299 v 0)	1.40 (1.03 – 1.91)	**0.033**	1.90 (1.12 – 3.22)	**0.017**	1.25 (0.88 – 1.77)	0.214	1.43 (0.89 – 2.28)	0.137
Baseline Risk Score (300-399 v 0)	1.79 (1.20 – 2.65)	**0.004**	1.77 (0.85 – 3.65)	0.125	1.29 (0.79 – 2.09)	0.311	1.77 (0.97 – 3.23)	0.064
Baseline Risk Score (400-499 v 0)	2.73 (1.58 – 4.72)	**<0.001**	3.02 (1.11 – 8.19)	**0.030**	2.60 (1.29 – 5.25)	**0.008**	4.29 (1.95 – 9.46)	**<0.001**
Baseline Risk Score (>=500 v 0)	2.45 (1.21 – 4.98)	**0.013**	4.60 (1.60 – 13.24)	**0.005**	6.24 (2.93 – 13.28)	**<0.001**	4.37 (1.72 – 11.12)	**0.002**

This model was adjusted for Age, Sex, BMI, Race, Education, Smoking, ADI, CCI, Insurance, Diagnosis, Anesthesia, PROM Phenotype

Table 3 - Multivariable logistic regression model, using **failure to reach attainment of PASS Threshold in HOOS Pain, PS, and JR** as outcomes

	HOOS Pain PASS		HOOS PS PASS		HOOS JR PASS	
Predictors	OR (95%CI)	*P value*	OR (95%CI)	*P value*	OR (95%CI)	*P value*
Baseline Risk Score (1-99 v 0)	1.57 (0.95 – 2.58)	0.078	1.43 (0.83 – 2.45)	0.197	1.45 (0.89 – 2.36)	0.139
Baseline Risk Score (100-199 v 0)	1.54 (1.26 – 1.89)	**<0.001**	1.56 (1.25 – 1.94)	**<0.001**	1.36 (1.12 – 1.66)	**0.002**
Baseline Risk Score (200-299 v 0)	1.60 (1.27 – 2.00)	**<0.001**	1.53 (1.20 – 1.95)	**0.001**	1.39 (1.11 – 1.74)	**0.004**
Baseline Risk Score (300-399 v 0)	2.06 (1.52 – 2.79)	**<0.001**	1.83 (1.32 – 2.54)	**<0.001**	1.87 (1.38 – 2.53)	**<0.001**
Baseline Risk Score (400-499 v 0)	3.02 (1.90 – 4.82)	**<0.001**	2.97 (1.80 – 4.89)	**<0.001**	2.60 (1.59 – 4.26)	**<0.001**
Baseline Risk Score (>=500 v 0)	2.30 (1.26 – 4.17)	**0.006**	3.25 (1.78 – 5.93)	**<0.001**	3.74 (1.94 – 7.18)	**<0.001**

This model was adjusted for Age, Sex, BMI, Race, Education, Smoking, ADI, CCI, Insurance, Diagnosis, Anesthesia, PROM Phenotype