How to Raise the Bar in the Capture of Patient Reported Outcome Measures in Total Knee Arthroplasty? Current Results from Active and Passive Follow-up Measures

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INTRODUCTION:

Patient-reported outcome measures (PROMs) are key measures to evaluate patients' perspective following total knee arthroplasty (TKA), including: clinically significant improvements in joint pain and function, attainment of patient satisfaction, and improvements in quality of life. Unsurprisingly, PROMs are fundamental instruments in joint reconstructive surgery and value-based healthcare models. Therefore, considerable effort has been made to capture PROMs at baseline (before surgery) and at follow-up periods (e.g., one-year after surgery). However, a constant challenge is the loss of patients to follow-up. Therefore, the present study aimed to: 1) assess follow-up for one-year PROMs; 2) evaluate the response rates for active and passive follow-up methods at our institution; and 3) compare patient characteristics, PROM values, and satisfaction between follow-up methods.

METHODS:

All patients who underwent primary elective TKA at one of nine hospital sites within a large tertiary academic center between January 2016 and December 2020, were identified using a validated, institutional data collection instrument (n=10,710). Only patients who completed baseline PROMs and elected to enroll in this prospective cohort study were analyzed (n=10,286) (**Figure 1**). Eighty-seven patients (0.85%) died during the study period and were excluded, leaving 10,199 patients for further analysis. The primary outcome was the response rate at one-year follow-up. Secondary outcomes included PROMs and patient satisfaction according to the method used to obtain follow-up (active versus passive). The following PROMS were analyzed: Veterans RAND 12 Item Health Survey (VR-12) Mental Component Score (MCS) and the Knee Disability and Osteoarthritis Outcome Scores (KOOS) for -Pain and -Physical Function Short Form (PS). Overall patient satisfaction with their TKA was evaluated using a binary anchor-based approach to determine attainment of a patient acceptable symptom state (PASS). The study cohort was stratified into three groups: "Passive", "Active", and "Lost to Follow-up" (**Table 1**). "Active" follow-up involved research assistants manually reaching out to patients, while "Passive" follow-up was limited to electronic automated messaging. Patient characteristics and PROM values were compared for each group with univariate analysis. P-values<0.05 were statistically significant.

RESULTS:

Overall, 80% of the study cohort completed one-year follow-up following TKA (8,162 out of 10,199 patients) (**Figure 1**). Specifically, 39% (n=4,001) completed follow-up passively and 41% (n=4,161) were captured actively. Twenty percent (n=2,037 patients) of the study cohort was lost to follow-up despite active and passive measures implemented to obtain PROMs at one-year. Patients lost to follow-up were slightly younger (p<0.001), more commonly Black (p<0.001), current smokers (p<0.001), used narcotics (p<0.001), and were from areas of higher socioeconomic disadvantages as measured by the area of deprivation index score (ADI; p<0.001) (**Table 1**). Furthermore, patients lost to follow-up had lower baseline VR-12 MCS (p<0.001) and KOOS pain scores (p<0.001), compared to active and passive cohorts, respectively (**Table 2**). The active cohort had slightly lower median VR-12 MCS scores at one-year, compared to the passive cohort (p<0.001). However, median one-year KOOS-Pain scores similar among both cohorts (p=0.24). Overall, 85% of patients who completed the binary anchor-based approach met PASS (6725 out of 7898 patients) (**Table 2**). There was no difference in the proportion of patients who met PASS among the active versus passive cohorts (85% and 86%, respectively; p=0.28).

DISCUSSION AND CONCLUSION:

Electronic automated messaging systems while user-friendly, cost-effective, practical, and innovative, fall short in terms of adequately capturing PROMs follow-up in TKA recipients, independent of additional data collection methods. Considering most high-quality studies demand attainment of 80% of follow-up, our institutional use of combined active and passive follow-up methods produced excellent results. Further studies and innovation are needed to develop methods/strategies to target the 20% of patients that were lost to follow-up despite using active and passive methods, in order to raise the bar and increase follow-up in TKA recipients. For example, ancillary methods to increase follow-up among younger patients and those from areas of higher socioeconomic disadvantages may prove beneficial for overall patient care and value-based healthcare models. While patient satisfaction rates were similar for patients followed-up passively and actively, further research is required to assess if the sampling of patients captured via passive follow-up only (39%) was representative of the overall outcome.

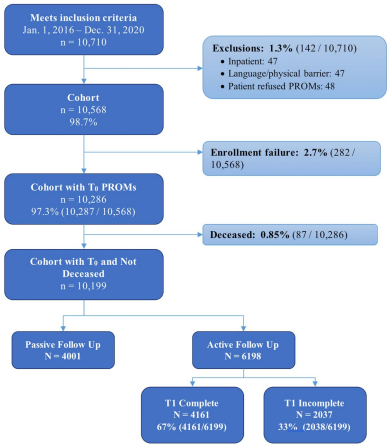

Fig. 1: STROBE diagram for cohort selection and method of follow-up.

Table 1. Characteristics of the study cohort according to the follow-up method

Variable	Level	Total N=10199	Active N=4161	Lost to Follow-up N=2037	Passive N=4001	P-value	N
Age, Median [25th;75th]		66.0 [60.0;72.0]	67.0 [61.0;74.0]	64.0 [57.0;71.0]	66.0 [60.0;72.0]	<0.001	10199
Sex, N (%)	F	6118 (60%)	2490 (60%)	1249 (61%)	2379 (60%)	0.37	10199
	M	4081 (40%)	1671 (40%)	788 (39%)	1622 (41%)		
BMI, Median [25th;75th]		31.9 [27.9;36.8]	31.8 [28.0;36.5]	32.8 [28.3;37.9]	31.8 [27.6;36.7]	<0.001	10197
Race, N (%)	Black	1396 (14%)	585 (14%)	465 (23%)	346 (8.6%)	<0.001	10199
	Other	704 (6.9%)	286 (6.9%)	203 (10%)	215 (5.4%)		
	White	8099 (79%)	3290 (79%)	1369 (67%)	3440 (86%)		
Education, Median [25th;75th]		14.0 [12.0;16.0]	13.0 [12.0;16.0]	12.0 [12.0;15.0]	14.0 [12.0;16.0]	<0.001	10197
Smoking, N (%)	Never	5713 (56%)	2360 (57%)	1116 (55%)	2237 (56%)	<0.001	10197
	Quit 6m+	3407 (33%)	1377 (33%)	567 (28%)	1463 (37%)		
	Quit 0-6m	334 (3.3%)	145 (3.5%)	92 (4.5%)	97 (2.4%)		
	Current	743 (7.3%)	278 (6.7%)	261 (13%)	204 (5.1%)		
Narcotics, N (%)	No	7137 (85%)	2983 (85%)	1279 (78%)	2875 (88.8%)	<0.001	8378
	Yes	1241 (15%)	511 (15%)	367 (22%)	363 (11%)		
Insurance, N (%)	Commercial	2564 (25%)	984 (24%)	489 (24%)	1091 (27%)	<0.001	10199
	Medicare	2231 (22%)	983 (24%)	428 (21%)	820 (21%)		
	Medicaid	151 (1.5%)	43 (1.0%)	62 (3.0%)	46 (1.2%)		
	Self	665 (6.5%)	265 (6.4%)	115 (5.7%)	285 (7.1%)		
	Unknown	4588 (45%)	1886 (45%)	943 (46%)	1759 (44%)		
CCI, Median [25th;75th]		0.00 [0.00;2.00]	0.00 [0.00;2.00]	0.00 [0.00;2.00]	0.00 [0.00;1.00]	0.048	10120
ADI, Median [25th;75th]		47.0 [28.0;68.0]	48.0 [29.0;69.0]	54.0 [33.0;78.0]	42.0 [25.0;63.0]	<0.001	9882
Diagnosis, N (%)	OA	9908 (97%)	4056 (98%)	1963 (96%)	3889 (97%)	0.046	10199
	Non-OA	291 (2.9%)	105 (2.5%)	74 (3.6%)	112 (2.8%)		

BMI: Body Mass Index; CCI: Charlson Comorbidity Index Score; ADI: Area of Deprivation Index, OA: Osteoarthritis

Table 2. Baseline and one-year PROMs for the study cohort according to the follow-up method

Variable	Level	Total N=10199	Active N=4161	Loss to Follow-up N=2037	Passive N=4001	P-value	N
Baseline MCS, Median [25th;75th]		51.7 [41.6;60.6]	51.6 [42.0;60.4]	46.0 [36.7;56.7]	54.3 [44.7;62.0]	<0.001	10199
Baseline KOOS Pain, Median [25th;75th]		38.9 [30.6;50.0]	38.9 [30.6;50.0]	36.1 [22.2;44.4]	41.7 [33.3;52.8]	<0.001	10199
Baseline KOOS PS, Median [25th;75th]		48.5 [42.0;62.0]	48.5 [42.0;62.0]	54.4 [46.1;66.6]	48.5 [40.3;57.9]	<0.001	10193
1-Year MCS, Median [25th;75th]		56.6 [47.9;60.9]	56.1 [46.7;61.0]	. [.;.]	57.3 [49.5;60.9]	<0.001	8111
1-Year KOOS Pain, Median [25th;75th]		88.9 [75.0;97.2]	88.9 [72.2;97.2]	. [.;.]	88.9 [75.0;97.2]	0.24	8093
1-Year KOOS PS, Median [25th;75th]		24.9 [14.8;33.6]	24.9 [14.8;35.3]	. [.;.]	24.9 [14.8;33.6]	<0.001	7658
PASS, N (%)	No	1173 (15%)	601 (15%)	0 (0%)	572 (14%)	0.28	7898
	Yes	6725 (85%)	3328 (85%)	0 (0%)	3397 (86%)		

PROMs: Patient-reported outcomes measures
MCS: Mental Component Score for Veterans RAND 12 Item Health Survey (VR-12)
KOOS: Knee Disability and Osteoarthritis Outcome Score
PASS: Patient Acceptable Symptom State