# How to Raise the Bar in the Capture of Patient-Reported Outcome Measures in Total Hip 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 hip arthroplasty (THA), 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 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 THA 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=7,948). Only patients who completed baseline PROMs and elected to enroll in this prospective cohort study were analyzed (n=7,514) (Figure 1). Seventy-eight patients (1.0%) died during the study period and were excluded, leaving 7,436 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 Hip Disability and Osteoarthritis Outcome Scores (HOOS) for -Pain and -Physical Function Short Form (PS). Overall patient satisfaction with their THA 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, 79% of the study cohort completed one-year follow up following THA (5,899 out of 7,436 patients) (Figure 1). Specifically, 38% (n=2,859) completed follow up passively and 40% (n=3,004) were captured actively. Twenty-one percent (n=1,573 patients) of the study cohort was lost to follow up despite active and passive measures. Among the lost to follow-up cohort, patients were younger (p<0.001), more commonly males (p<0.001), treated with narcotics (p<0.001), and had a greater proportion of non-OA diagnoses (p<0.001) (Table 1). Furthermore, patients lost to follow up had lower baseline VR-12 MCS (p<0.001) and HOOS pain scores (p<0.001), compared to active and passive cohorts, respectively (Table 2). The active cohort had marginally lower median VR-12 MCS scores at one-year, compared to the passive cohort (p<0.001). However, median one-year HOOS-Pain and -PS were similar among both cohorts (p=0.07 and p=0.16, respectively. Overall, 90% of patients who completed the binary anchor-based approach met PASS (5,164 out of 5,756 patients) (Table 2). There was no difference in the proportion of patients that met PASS among the active versus passive cohorts (90% vs. 89%, respectively; p=0.13).

DISCUSSION AND CONCLUSION:

Passive, electronic automated messaging systems, while user-friendly, cost-effective, and practical, fall short in terms of adequately capturing PROMs follow up in THA patients when used alone. 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 who were lost to follow up despite active and passive methods, in order to raise the bar and increase follow up in THA recipients. 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 (38%) was representative of the overall outcome.
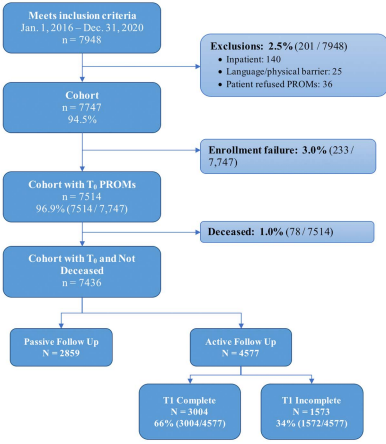
Fig. 1: STROBE diagram for cohort selection and the method of follow-up.

Diagram content:

- **Meets inclusion criteria** Jan. 1, 2016 – Dec. 31, 2020 n = 7948
- **Exclusions: 2.5%** (201 / 7948)
  - Inpatient: 140
  - Language/physical barrier: 25
  - Patient refused PROMs: 36
- **Cohort** n = 7747, 94.5%
- **Enrollment failure: 3.0%** (233 / 7,747)
- **Cohort with T₀ PROMs** n = 7514, 96.9% (7514 / 7,747)
- **Deceased: 1.0%** (78 / 7514)
- **Cohort with T₀ and Not Deceased** n = 7436
- **Passive Follow Up** N = 2859
- **Active Follow Up** N = 4577
  - **T1 Complete** N = 3004, 66% (3004/4577)
  - **T1 Incomplete** N = 1573, 34% (1572/4577)

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

| Variable | Level | Total N=7436 | Active N=3004 | Lost to Follow-up N=1573 | Passive N=2859 | P-value | N |
|---|---|---|---|---|---|---|---|
| Age, Median [25th;75th] | | 65.0 [57.0;72.0] | 66.0 [58.0;73.0] | 61.0 [53.0;70.0] | 66.0 [58.0;71.0] | <0.001 | 7436 |
| Sex, N (%) | F | 4230 (57%) | 1733 (58%) | 819 (52%) | 1678 (59%) | <0.001 | 7436 |
| | M | 3206 (43%) | 1271 (42%) | 754 (48%) | 1181 (41%) | | |
| BMI, Median [25th;75th] | | 29.4 [25.7;34.0] | 29.2 [25.4;33.9] | 30.0 [25.8;34.9] | 29.3 [25.8;33.7] | 0.002 | 7432 |
| Race, N (%) | Black | 885 (12%) | 380 (13%) | 315 (20%) | 190 (6.7%) | <0.001 | 7436 |
| | Other | 433 (5.8%) | 163 (5.4%) | 118 (7.5%) | 152 (5.3%) | | |
| | White | 6118 (82%) | 2461 (83%) | 1140 (73%) | 2517 (88%) | | |
| Education, Median [25th;75th] | | 14.0 [12.0;16.0] | 14.0 [12.0;16.0] | 13.0 [12.0;16.0] | 15.0 [13.0;16.0] | <0.001 | 7435 |
| Smoking, N (%) | Never | 3829 (52%) | 1560 (52%) | 714 (45%) | 1555 (54%) | <0.001 | 7435 |
| | Quit 6m+ | 2439 (33%) | 996 (33%) | 460 (29%) | 983 (34%) | | |
| | Quit 0-6m | 351 (4.7%) | 139 (4.6%) | 108 (6.9%) | 104 (3.6%) | | |
| | Current | 816 (11%) | 309 (10%) | 291 (19%) | 216 (7.6%) | | |
| Narcotics, N (%) | No | 4793 (80%) | 1957 (80%) | 898 (72%) | 1938 (85%) | <0.001 | 5989 |
| | Yes | 1196 (20%) | 493 (20%) | 349 (28%) | 354 (15%) | | |
| Insurance, N (%) | Commercial | 2025 (27%) | 776 (26%) | 442 (28%) | 807 (28%) | <0.001 | 7436 |
| | Medicare | 1666 (22%) | 726 (24%) | 322 (21%) | 618 (22%) | | |
| | Medicaid | 151 (2.0%) | 50 (1.7%) | 72 (4.6%) | 29 (1.0%) | | |
| | Self | 364 (4.9%) | 155 (5.2%) | 59 (3.8%) | 150 (5.3%) | | |
| | Unknown | 3230 (43%) | 1297 (43%) | 678 (43%) | 1255 (44%) | | |
| CCI, Median [25th;75th] | | 0.00 [0.00;1.00] | 0.00 [0.00;1.00] | 0.00 [0.00;1.00] | 0.00 [0.00;1.00] | 0.60 | 7346 |
| ADI, Median [25th;75th] | | 45.0 [25.0;67.0] | 46.0 [27.0;68.0] | 53.0 [29.0;79.0] | 40.0 [22.0;60.0] | <0.001 | 7128 |
| Diagnosis, N (%) | OA | 6443 (87%) | 2631 (88%) | 1292 (82%) | 2520 (88%) | <0.001 | 7436 |
| | Non-OA | 993 (13%) | 373 (12%) | 281 (18%) | 339 (12%) | | |

*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=7436 | Active N=3004 | Loss to Follow-up N=1573 | Passive N=2859 | P-value | N |
|---|---|---|---|---|---|---|---|
| Baseline MCS, Median [25th;75th] | | 50.2 [39.6;59.7] | 49.6 [38.8;58.9] | 46.0 [35.5;56.3] | 53.2 [42.8;61.3] | <0.001 | 7434 |
| Baseline HOOS Pain, Median [25th;75th] | | 35.0 [22.5;45.0] | 35.0 [22.5;45.0] | 30.0 [20.0;42.5] | 37.5 [27.5;47.5] | <0.001 | 7433 |
| Baseline HOOS PS, Median [25th;75th] | | 50.8 [37.7;61.6] | 50.8 [37.7;61.6] | 55.9 [41.7;67.9] | 46.1 [37.7;61.6] | <0.001 | 7426 |
| 1-Year MCS, Median [25th;75th] | | 56.3 [47.9;60.9] | 55.7 [46.8;60.7] | . [.;.] | 57.0 [49.4;61.2] | <0.001 | 5837 |
| 1-Year HOOS Pain, Median [25th;75th] | | 95.0 [80.0;100] | 95.0 [80.0;100] | . [.;.] | 95.0 [82.5;100] | 0.07 | 5819 |
| 1-Year HOOS PS, Median [25th;75th] | | 4.60 [0.00;16.4] | 4.60 [0.00;20.0] | . [.;.] | 4.60 [0.00;16.4] | 0.16 | 5265 |
| PASS, N (%) | No | 592 (10%) | 281 (10%) | 0 (0%) | 311 (11%) | 0.13 | 5756 |
| | Yes | 5164 (90%) | 2625 (90%) | 0 (0%) | 2539 (89%) | | |

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