Journal of Patient Experience
2020, Vol. 7(4) 484-492

DOI: 10.1177/2374373519853166
journals.sagepub.com/home/jpx
SAGE

Feasibility of Collecting Multiple Patient-Reported Outcome Measures Alongside the Dutch Arthroplasty Register

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Abstract

Background: Compliance rates with patient-reported outcome measures (PROMs) collected alongside arthroplasty registries vary in the literature. We described the feasibility of a routinely collected set PROMs alongside the Dutch Arthroplasty Register. **Methods:** The longitudinal Leiden Orthopaedics Outcomes of OsteoArthritis Study is a multicenter (7 hospitals), observational study including patients undergoing total hip or total knee arthroplasty (THA or TKA). A set of PROMs: Short Form-12, EuroQol 5 Dimensions, Hip/Knee injury and Osteoarthritis Outcome Score, Oxford Hip/Knee Score was collected preoperatively and at 6, 12, 24 months, and every 2 years thereafter. Participation rates and response rates were recorded. **Results:** Between June 2012 and December 2014, 1796 THA and 1636 TKA patients were invited, of whom 1043 THA (58%; mean age 68 years [standard deviation, SD: 10]) and 970 TKA patients (59%; mean age 71 years [SD 9.5]) participated in the study. At 6 months, 35 THA/38 TKA patients were lost to follow-up. Response rates were 90% for THA (898/1000) and 89% for TKA (827/932) participants. At 1 and 2 years, 8 and 18 THA and 17 and 11 TKA patients were lost to follow-up, respectively. The response rates among those eligible were 87% (866/992) and 84% (812/972) for THA and 84% (771/917) and 83% (756/906) for TKA patients, respectively. The 2-year questionnaire was completed by 78.5% of the included THA patients and by 77.9% of the included TKA patients. **Conclusions:** About 60% of patients undergoing THA or TKA complete PROMs preoperatively, with more than 80% returning follow-up PROMs. To increase the participation rates, more efforts concerning the initial recruitment of patients are needed.

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Keywords
patient satisfaction, clinician–patient relationship, communication, quality improvement, quality of life, patient expectations, outpatient satisfaction data, patient feedback

Introduction

Total hip and knee arthroplasty (THA and TKA) are effective interventions to reduce symptoms, improve daily activities and improve quality of life (QoL) in patients with end-stage hip or knee osteoarthritis(1). To monitor the safety and effectiveness of THA and TKA, national arthroplasty registries are instituted. Currently, 40 national, regional, or institutional registries are member of International Society of Arthroplasty Registers (2–5).

By tradition, arthroplasty registries mainly comprise procedure-related data on the characteristics of the implants and surgical techniques as well as their functional outcomes, the focus regarding the latter being mainly on implant survival(6). However, since patient satisfaction as outcome scores after THA and TKA are lower than implant survival rates, there is a growing recognition of the importance of the collection of patient-reported outcomes measures (PROMs) next to survival data within orthopedic arthroplasty registers(7–9). Currently, there are numerous examples of the registration of PROMs alongside orthopedic implant registries in Europe (Sweden, United Kingdom, Norway), North Americas (2,3), and New Zealand (10).

The scientific value of the collected PROMs depends largely on the inclusion rates and completeness of collected data. Rolfson et al presented an overview of inclusion and follow-up response rates specifically for THA and TKA, obtained in 3 national registries: The Swedish Hip Arthroplasty Register (SHAR), New Zealand Joint Registry (NZJR), and the National Joint Registry for England, Wales, Northern Ireland, and the Isle of Man (8). Overall inclusion rates varied between 69% and 86%. Follow-up response rates were around 75% after 6 months, between 64% and 90% after 1 year, and between 72% and 75% until 5 years.

Heterogeneity in completeness of inclusion and follow-up response rates is likely to be related to differences in clinical outcome measures and the logistic procedures of data collection (11–13). This variation raises the question to what extent the collection of PROMs alongside an arthroplasty register or for that matter as a nested study within a national arthroplasty register is feasible in daily clinical practice. In addition, completed follow-up rates are often not mentioned, questioning the achievability of long-term follow-up of such data. The aims of the present study were to evaluate the feasibility of PROMs data collection up to 2-years after THA or TKA in a network of 7 collaborating hospitals, and to evaluate the preoperative characteristics of the patients providing PROMs.

Materials and Methods

Study Design

The longitudinal Leiden Orthopaedics Outcomes of OsteoArthritis Study (LOAS) has a multicenter, observational, prospective design (Trial ID NTR3348), implying level of evidence II. The study was approved by the Medical Ethics Committee of the Leiden University Medical Center (NTR3348) and all local hospital research committees in the participating hospitals. Funding was received from the Dutch Arthritis Foundation (LLP13). The study was supported by 2 patients (JK and GT) providing advice on the relevance of the research questions and the research methodology including the recruitment of patients by means of 2-yearly meetings. All patients in the study provided written informed consent. For the current analysis, the data (up to 30 November, 2015) from the patients enrolled during the first 30 recruitment months (June 2012 until December 2014) were used, yielding data up to and including 24 months of follow-up.

Patients and Recruitment

Hospitals were approached by the coordinating investigator. In return for their participation, each participating hospital received a report on the results within their center as well as anonymized data from the other centers (every 3 months), a website in Dutch for participating patients and health professionals (http://www.loas.nl), newsletters (every 3 months), and an annual meeting for the local investigators.

Patients

All patients undergoing primary THA or TKA in the participating centers, who were able to complete questionnaires in Dutch and 18 years or older were invited by their treating orthopedic surgeon at their visit to the outpatient clinic prior to surgery. Every week, each hospital sent a list of patients who had been invited to the coordinating researcher, who then further informed patients and sent them a patient information letter, the preoperative questionnaire, and an informed consent form. Patients were included in the study once written informed consent was obtained. Included patients were considered lost to follow-up in the study, if (1) they did not return the questionnaires on 2 consecutive follow-up points, (2) on 2 consecutive follow-up points returned questionnaires that were less than half completed, or (3) their contact details were no longer valid and could not be ascertained.

Outcome Measures and Study Procedures in the LOAS Study

A set of PROMs was collected preoperatively and 6, 12, and 24 months after surgery and every 2 year thereafter. Patient-reported outcome measures were primarily chosen based on the mandatory set of PROMS imposed by the Dutch Orthopaedic Society and/or those aspects that are currently underexposed, such as return to society (work, sports). The PROMs were collected alongside the data collection of The Dutch Arthroplasty Register (Landelijke Registratie Orthopedische Implantaten, http://www.lroi.nl/en/home).The total set of PROMS comprised over 200 items to complete, with the estimated time for completion being 45 minutes.

Sociodemographic and Clinical Characteristics

The following data were gathered: age; sex; weight (kg) and length (m) to calculate the body mass index (BMI); and work status (working/retired/housewife or -man/unemployed and/or seeking work/receiving disability benefits).

Patient-Reported Outcome Measures as Advised by the Dutch Orthopaedic Association

Dutch versions of The Hip disability and Osteoarthritis Outcome Score (HOOS), the Knee injury and Osteoarthritis Outcome Score (KOOS), the Oxford Hip Score (OHS), and the Oxford Knee Score (OKS) were used for the preoperative and postoperative assessment of pain, limitations-daily living, sport and recreation, joint function, and joint-related quality of life(14–16).

The Short Form-12 (SF12) and the EuroQol 5 Dimensions, and Visual Analogue Scale (EQ5D and EQ-VAS) were used for general health related quality of life. From the SF12, mental component and physical component summary scales (MCS and PCS) were calculated, reflecting mental and physical health. Data from a Dutch general population were used to standardize our scores in order to apply the norm-based scoring (17,18).

The following assessments were also done according to the study protocol but are not reported in this article: (a) a comorbidity questionnaire from the Dutch Central Bureau of Statistics (19); (b) a self-developed questionnaire to assess work status; (c) the Short Questionnaire to Assess Health-enhancing physical activity (20,21) or by the Dutch Norm of Healthy Exercise and Fit standard; (d) the New York Hospital for Special Surgery Questionnaires on expectations (22); (e) the Groningen Frailty Index (23); (f) a self-reported knee joint instability questionnaire based on Felson et al (24); (g) status of living (living alone or with other people); and (h) smoking status (current smoker/nonsmoker/ex-smoker).

Statistics

Feasibility was determined by calculating the proportion of invited patients in the LOAS study that were included, the proportions of patients lost to follow-up; completion rates of questionnaires among eligible patients after 6, 12, and 24 months; and overall response rates (patients initially included/patients returning a questionnaire). Descriptive statistics were used for the preoperative baseline characteristics of patients, with data presented as mean and standard deviation (SD), median with ranges or numbers with proportions, where appropriate. The age and sex distribution of patients included and not-included preoperatively were compared by means of unpaired t test and χ^2 tests, respectively. Moreover, characteristics of included patients who did and who did not complete the 2-year follow-up were compared by means of unpaired t tests or χ^2 tests, where appropriate.

Results

Participation of Hospitals and Patient Enrollment

From June 2012, the orthopaedic departments of 7 hospitals were invited to participate in the LOAS-study. The 7 participating hospitals comprised 1 academic center, 1 large teaching hospital, and 5 general hospitals. The recruitment and inclusion of patients started in June 2012, within the subsequent 12 months all hospitals started the recruitment of patients.

Participation Rates

Figure 1 describes the flow of patients. Of the 3631 identified and eligible patients who were admitted for THA/TKA surgery from June 2012 to December 2014, 1796/1893 THA (95%) and 1636/1738 TKA (94%) patients agreed to be contacted and were sent a set of PROMs. Of the 3432 invited patients, 1035/1796 THA (58%) and 970/1636 TKA patients (59%) returned the preoperative questionnaire. Table 1 shows the variation of the included patients per hospital, the proportions ranged between 50% and 78% for THA and 50% and 80% for TKA.

Response Rates Over Time in Eligible Patients

At 6-month follow-up, 35 THA and 38 TKA patients were considered lost to follow-up. Therefore, 1000 THA (97%) and 932 (96%) TKA patients were eligible for 6-months follow-up. Of the eligible patients, 898/1000 THA patients (90%) and 827/932 TKA (89%) patients returned the follow-up questionnaire. Between 6 months and 1 year follow-up, 8 THA and 15 TKA patients were lost to follow-up. The response rates at the 1-year follow-up were 866 (87%) of the 992 eligible THA patients and 771 (84%) of the 917 eligible TKA patients.

At 2-year follow-up, with compared to 1-year follow-up, 9 more THA and 6 more TKA patients were lost to

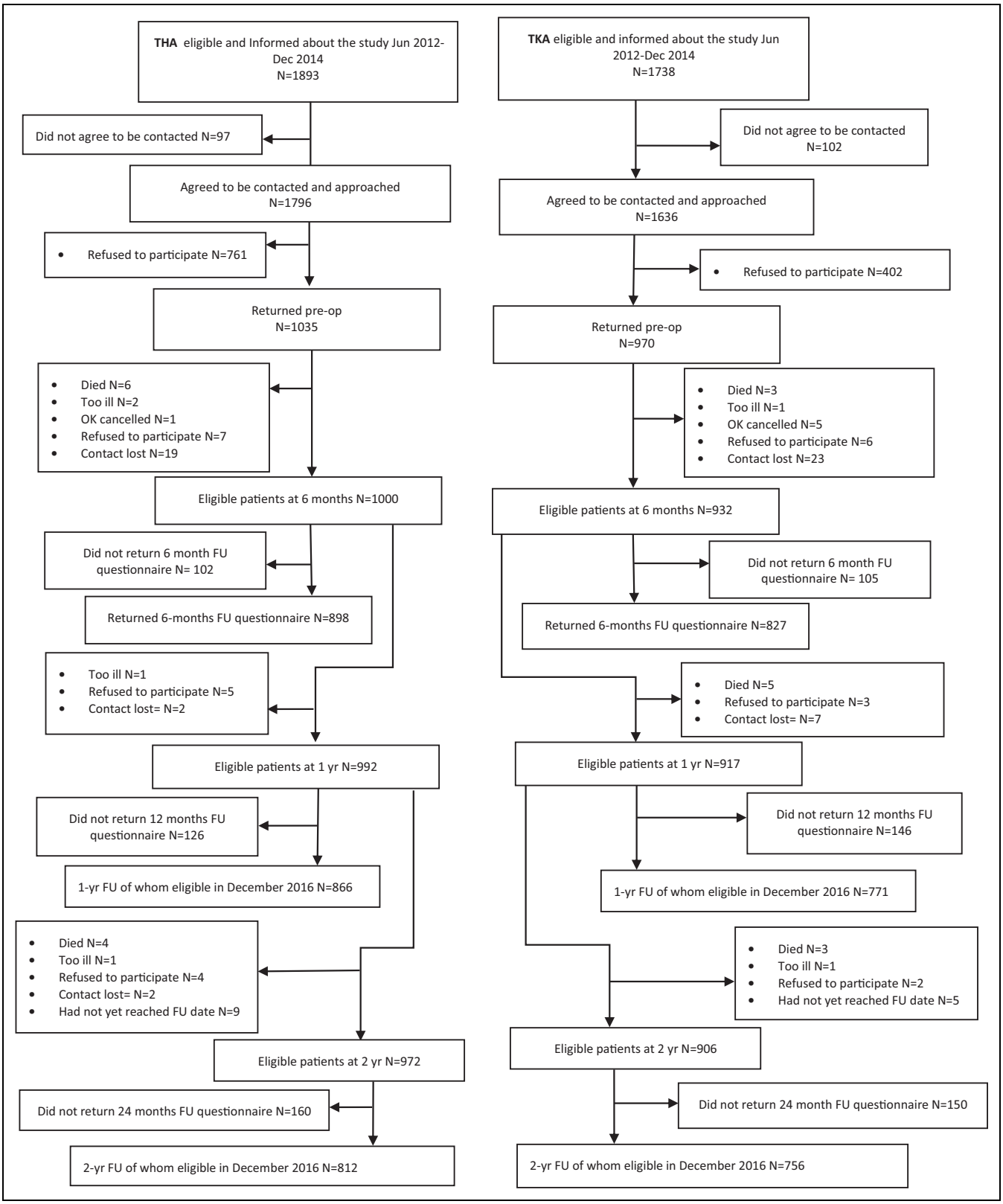

Figure 1. Flow chart: describes the flow of patients. FU indicates follow up; preop, preoperative questionnaire; THA, total hip arthroplasty, TKA, total knee arthroplasty; yr, year.

Table 1. Participating Centers and the Numbers of Participating Patients Undergoing Total Hip or Knee Arthroplasty (THA or TKA) in a Multicentre Study on the Collection of Patient Reported Outcome Measures.

Hospital	Total	1	2	3	4	5	6	7
Number of months including patients in study		30	29	29	12	28	24	11
Number of THA patients								
Informed about the study	1893	484	112	130	97	224	649	197
Agreed to be contacted and thus invited	1796	396	108	130	97	222	647	196
Included (included/invited)	1035 (57.6)	222 (56.1)	64 (59.3)	83 (63.8)	76 (78.4)	128 (57.7)	364 (56.3)	98 (50.0)
Returned 2 year questionnaire	812 (78.5)	170 (76.6)	48 (75%)	62 (74.7%)	59 (77.6)	100 (78.1%)	296 (81.3%)	77 (78.6%)
Number of TKA patients								
Informed about the study	1738	448	103	60	75	221	630	201
Agreed to be contacted and thus invited	1636	370	95	60	75	215	622	199
Included (included/invited)	970 (59.3)	214 (57.8)	62 (65.3)	30 (50.0)	60 (80.0)	142 (66.0)	350 (56.2)	112 (56.3)
Returned 2 year questionnaire	756 (77.9)	162 (75.7)	50 (80.6)	28 (93.3)	50 (83.3)	101 (71.1)	276 (78.9)	89 (79.5)

Abbreviations: PROMs, patient reported outcome measures; THA, total hip arthroplasty; TKA, total knee arthroplasty.

Table 2. Response Rates of Patients Participating in a Multicentre Study on the Collection of Patient Reported Outcome Measures. Results are n or n (%).

	THA				TKA			
	Eligible (n)	Response (n)	Response Rate Eligible Patients	Overall Response Rate	Eligible; n	Response; n	Response Rate Eligible patients	Overall Response Rate
Preoperative	1796	1035	57.6	NA	1636	970	59.3	NA
6-month	1000	898	89.8	86.8	932	827	88.7	85.3
12-month	992	866	87.3	83.7	917	771	84.1	79.5
24-month	972	812	83.5	78.5	906	756	83.4	77.9

Abbreviations: THA, total hip arthroplasty, TKA, total knee arthroplasty, NA, not applicable.
[a]Overall response rate included patients/response.

follow-up. Furthermore, at the date of analysis, 9 THA and 5 TKA patients had not reached the 2-year follow-up yet. Of the 972 eligible THA and 906 eligible TKA patients, 812 THA (84%) and 756 TKA patients (83%) completed the 2-year questionnaire (Table 2).

Overall Response Rates Over Time

As expected, the overall response rates decreased over time (Table 2). The 2-year questionnaire was completed by 78.5% of the initially included THA patients and by 77.9% of the initially included TKA patients.

Characteristics of Patients Included at Baseline

Table 3 presents patients' preoperative characteristics, The mean age of the 1035 THA patients was 68 years (SD: 10.0) and of the 970 TKA patients was 71 years (SD: 9.5), the majority of the patients were female and approximately a quarter of them were gainfully employed.

Preoperative PROMs

The mean (SD) HOOS and KOOS Activity of daily living, Pain, Quality of Life, Sport and Recreation, and Symptoms scores ranged between 18 (SD: 18.9) and 46 (SD: 23.5) for THA patients and 11 (SD: 14.2) and 44 (SD: 18.5) for TKA patients. Furthermore, the OHS and OKS scores were 24 in both groups (SD: 8.4 for OHS and SD: 7.7 for OKS).

The mean EQ5D and EQ VAS scores were 0.60 (SD: 0.26) and 66 (SD: 18.5) for THA patients and 0.64 (SD: 0.24) and 68 (SD: 18.0) for TKA patients. In addition, the mean SF12 MCS and PCS scores were 55 (SD: 9.8 and 9.7) and 32 (SD: 9.4 and 9.1, respectively) in both groups (Table 3).

Included Versus Not-Included Patients

Regarding the comparison of patients who were eligible and who did and who did not return a preoperative questionnaire, no differences were found in the sex distribution. The included patients were however somewhat younger as compared to patients not returning the preoperative questionnaire (Table 3).

Table 3. Preoperative Characteristics of Patients Undergoing Total Hip or Knee Arthroplasty (THA or TKA) of Included or Not-Included in a Multicentre Study on The Collection of Patient Reported Outcome Measures.

	THA	TKA
Included patients N = 1035 and 970		
Sex, female; n (%)	643 (62%)	642 (66%)
Age, years; mean (SD)	68 (10.0)	67 (9.0)
BMI; mean (SD)	28 (9.6)	29 (4.5)
Employed, yes; n (%)	248 (24%)	214 (23%)
HOOS or KOOS; mean (SD)		
Activity daily living	46 (23.5)	44 (18.5)
Pain	38 (18.9)	38 (18.2)
Quality of life	33 (10.5)	34 (10.8)
Sport and recreation	18 (18.9)	11 (14.2)
Symptoms	40 (18.9)	43 (13.2)
Oxford Knee/Hip Score; mean (SD)	24 (8.4)	24 (7.7)
EuroQol (EQ)5D score; mean (SD)	0.60 (0.26)	0.64 (0.24)
EuroQol (EQ) 5D VAS scale; mean (SD)	66 (18.5)	68 (18.0)
Short Form (SF) 12; mean (SD)		
Mental component score	55 (9.8)	55 (9.7)
Physical component score	32 (9.4)	32 (9.1)
Not included patients N = 761 and 666[a]		
Sex, female; n (%)	494 (65%)[b]	474 (71%)[b]
Age, years; mean (SD)	70 (10.2)[c]	69 (10.1)[c]

Abbreviations: BMI, body mass index; HOOS, Hip disability and Osteoarthritis Outcome Score; KOOS, Knee injury and Osteoarthritis Outcome Score; SD, standard deviation; THA, total hip arthroplasty; TKA, total knee arthroplasty; VAS, visual analogue scale.

[a]Eligible patients invited to participate not returning the preoperative questionnaire.

[b]No statistically significant differences between patients included preoperatively or 6 months postoperatively (χ^2 test).

[c]Statistically significant difference between patients included preoperatively or 6 months postoperatively (*P* Value = .001 for THA as well as TKA, unpaired *t* test).

Patients Completing and Not Completing 2-Year Follow-Up

Comparisons of the characteristics of included patients undergoing THA or TKA who did and who did not complete the 2-year follow-up are presented in Tables 4. It appeared that patients undergoing THA or TKA who did not complete the follow-up had a statistically significantly higher BMI, a lower EQ5D score, and SF12 MCS score. In TKA patients, patients who did not complete the 2-year follow-up also had worse KOOS, OKSs, EQ VAS scores, and SF12 PCS scores.

Discussion

The current study demonstrated that nearly 60% of patients undergoing THA or TKA completed a set of PROMs preoperatively, whereas at follow-up more than 80% of the invited patients returned the questionnaire. After 2 years of follow-up, the response rates were 79% and 78% for THA and TKA patients, respectively.

Our inclusion rates were lower than those of the SHAR (86%; set consisting of the EQ5D, Pain [VAS], and Satisfaction [VAS]), the NZJR (69%; EQ5D and the OHS/OKS), and National Joint Registry (NJR) (75%, EQ5D, OHS/OKS, and satisfaction) and recently published data from the Dutch Arthroplasty Register (25,26). Conversely, our postoperative participation rates were comparable to those reported for the SHAR (90% after 6 months) and somewhat higher than the NJR (75%-76% after 6 months and 64% after 1 year) (12,13).

A possible explanation for the higher inclusion rates of the SHAR is that our questionnaire was more extensive, which possibly influenced the response rate. Indeed the quantity of information to be provided by patients was very large, and probably more patients would have participated if a less complicated set of surveys was requested. Another explanation for the different inclusion rates could be that patients in some of the aforementioned studies such as the SHAR (27) completed the preoperative questionnaires at the outpatient clinic, whereas in our study, they were sent to patients' home addresses. This was done as we anticipated that anxiety might be present at the day of hospital admission. However, in retrospect, not using a personal approach may have led to a relatively large proportion of patients not completing the preoperative forms. A last possible explanation is that in our effort to create and investigate a noninvasive structure which would be easy to implement, we did not contact the patients who did not respond to the invitation.

Besides, we observed considerable differences between the inclusion rates of the hospitals. The most likely explanation is that in some hospitals all patients were informed about the study and all patients were seen by the coordinating researcher, whereas in other hospitals, recruitment was not automatically done and if patients were considered, only those probably participating in the study, as judged by the treating physician, were approached. Another possible explanation would be discrepancies in the content of the information provided initially to patients and the way it was provided. To make a more accurate estimation of the patients who were eligible yet not contacted a direct link with the registered patients in the Dutch Arthroplasty Register would be necessary, which is not yet available.

This study found that patients who were included but did not complete the 2-year follow-up had a significantly worse health status at inclusion than those who did, in particular in TKA. As it is conceivable that patients who dropped out based on their initial health status have worse outcomes, their attrition may lead to overestimation of the effect of THA or TKA. This finding indicates that gathering basic information on their postoperative course is extremely important, and that probably other, simpler methods should be used to obtain those data. Apart from reducing the amount of information, gathering a limited amount of data by means of telephone calls, text messages, or apps would probably be an option. In order to stimulate patients to continue participation, we send e-mails to

Table 4. Preoperative Characteristics of Patients Undergoing Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA) Who Did and Did Not Complete the 2-Year Follow-Up in a Multicentre Study on the Collection of Patient Reported Outcome Measures.

	Included TKA	No 2 Year FUP TKA	*P* Value
Included patients N = 756 and patients without 2 year questionnaire N = 214			
Sex, female; n (%)	504 (67%)	143 (67%)	.97
Age, years; mean (SD)	70 (9)	69 (10)	.19
BMI; mean (SD)	29 (4.5)	30 (4.5)	.03
Employed, yes; n (%)	163 (22%)	51 (25%)	.38
KOOS; mean (SD)			
Activity daily living	45 (18)	41 (19.2)	.001
Pain	39 (18.2)	35 (18.3)	.01
Quality of life	27 (15.6)	24 (16.4)	.004
Sport and recreation	11 (13.9)	10 (15.5)	.47
Symptoms	50 (18.9)	46 (18.8)	.03
Oxford Knee Score; mean (SD)	25 (7)	22 (9)	.02
EuroQol (EQ) 5D score; mean (SD)	0.65 (0.23)	0.59 (0.28)	.002
EuroQol (EQ) 5D VAS scale; mean (SD)	69 (17.5)	63 (19.4)	.000
Short Form (SF)-12; mean (SD)			
Mental component score	56 (9.5)	53 (10.5)	.003
Physical component score	33 (9.0)	31 (9.4)	.005
	Included THA	**No 2 Year FUP THA**	***P* Value**
Included patients N = 812 and patients without 2 year questionnaire N = 223			
Sex, female; n (%)	497 (61%)	145 (65%)	.58
Age, years; mean (SD)	70 (9.9)	70 (9.9)	.47
BMI; mean (SD)	27 (4.3)	28 (5.5)	.002
Employed, yes; n (%)	188 (24%)	60 (27%)	.24
HOOS; mean (SD)			
Activity daily living	41 (19.7)	38 (20.1)	.07
Pain	38 (18.9)	36 (18.8)	.18
Quality of life	29 (16.7)	27 (15.9)	.11
Sport and recreation	19 (19.3)	16 (17.2)	.05
Symptoms	40 (18.9)	38 (19.1)	.12
Oxford Hip Score; mean (SD)	24 (8.6)	23 (8.0)	.25
EuroQol (EQ)5D score; mean (SD)	0.61 (0.25)	0.55 (0,28)	.004
EuroQol (EQ) 5D VAS scale; mean (SD)	66 (18.6)	64 (18.2)	.12
Short Form (SF)-12; mean (SD)			
Mental component score	55 (9.4)	53 (11)	.002
Physical component score	32 (9.5)	31 (8.9)	.16

Abbreviations: BMI, body mass index; FUP, follow up; HOOS, Hip disability and Osteoarthritis Outcome Score; KOOS, Knee injury and Osteoarthritis Outcome Score; SD, standard deviation; THA, total hip arthroplasty; TKA, total knee arthroplasty; VAS, visual analogue scale.

participants several times a year (eg, Happy New Year cards and newsletters).

Concerning the mode of administration of the PROMs, only pen-and-paper questionnaires were used, yielding similar response rates as previous studies (8). Previous authors suggested that electronical questionnaires cannot replace pen-on-paper questionnaires (28,29), but, like other registers (8), we are developing an Internet-based structure to collect the PROMs next to the traditional pen-and-paper questionnaires to improve efficiency.

The selection of PROMs to include in patient cohort studies should be based on their relevance and thus should cover the domains of functioning as described in International Classification of Functioning, disability and health core sets for osteoarthritis (30). Recently the International Consortium for Health Outcomes Measurements (ICHOM) published a data collection reference guide with for PROMs to include in joint arthroplasty registers (31). This ICHOM Standard Set for Hip and Knee osteoarthritis outcomes comprises the hip or knee functional status (HOOS-Physical Function Short Form or KOOS-PS), pain (numeric or VAS scales), Quality of life (either the EQ5D-3 L, Veterans RAND 12 Item Health Survey, or SF12), work status, and satisfaction with results (no specific questionnaires). The set of PROMs used in the present study is in line with these concepts, yet it appeared that for the sake of feasibility the total number of questions must also be reasonable to provide a high patient-response rate (8,32).

Although there is room for improvement, our results would probably not have been as favorable without the valuable suggestions from our panel of patients attached to the project as research partners. They provided advice

on the information for participants, as well as the feasibility of paper and electronic versions of the set of PROMs. The engagement of patients as partners in research is now more and more acknowledged (33,34), and their role in research on PROMs in orthopedics could probably be extended in the future.

This study has a number of limitations. First, only about 70% to 80% of the eligible patients were actually informed about the study, probably because orthopedic surgeons excluded patients in an early stage (due to factors such as age, language, mental or physical health problems, or participation in a different THA or TKA study), forgot to inform the patients about the study, or not did not report patients' interest to receive more information to the coordinating researcher. To attain a higher rate of potentially eligible patients who can be informed about and invited for the study, more effort could be put in supporting the hospitals logistically to inform all eligible patients about the study. With these suboptimal inclusion rates, selection bias cannot be excluded. An example of potential selection bias concerns the educational level or literacy of patients. We did not record to what extent these aspects played a role in orthopedic surgeons' decisions not to invite patients. Regarding patients' decisions not to participate in the study, other than their sex or age, we could not record any other of their characteristics, so the role of lack of education or literacy cannot be determined. Another limitation is that about 40% of patients did not fill in the preoperative questionnaire, probably because the information about the study was insufficient or absent, surgery date was too close, the number of PROMs too high, or personal reasons such as not being interested, already participating in a scientific study, or having mental or physical health problems. In conclusion, with about 60% of all contacted patients in both THA and TKA being included in the present study, but relatively low attrition rates, in particular the initial inclusion of patients' needs attention.

Authors' Note

All authors have participated sufficiently in the design of this work, analysis of the data, writing of the manuscript, and all authors are in agreement with the manuscript.

Acknowledgments

Authors are indebted to John Krol and Gonny Tafuni for their valuable advices.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by the Dutch Arthritis Association (grant number LLP13).

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