

# Fulfilment of preoperative expectations and postoperative patient satisfaction after total knee replacement. A prospective analysis of 200 patients

Angela H. Deakin, Marie Anne Smith, David T. Wallace, Elizabeth J. Smith, Martin Sarungi\*

Department of Orthopaedics, Golden Jubilee National Hospital, Clydebank, UK

## ARTICLE INFO

### Article history:

Received 20 September 2018

Received in revised form 4 March 2019

Accepted 31 July 2019

## ABSTRACT

**Background:** In total knee arthroplasty (TKA), the association between preoperative patient expectations, their postoperative fulfilment, and satisfaction is not well understood. The aim of this study was to quantify these relationships in a cohort of TKA patients with differing socio-economic backgrounds from across Scotland.

**Methods:** Expectations of 200 patients undergoing TKA were assessed using the Hospital for Special Surgery Knee Replacement Expectation Score. Postoperatively, expectation fulfilment was assessed at six weeks and one year. Satisfaction was measured using a five-point Likert scale. Preoperative and postoperative scores were compared across satisfaction groups. Relationships between individual and overall expectation fulfilment, satisfaction, and demographics were analysed.

**Results:** At six weeks, 30% of expectations were fulfilled, increasing to 48% at one year. Corresponding satisfaction rates were 84% and 89%. Higher fulfilment scores were associated with greater satisfaction. Fulfilment of pain and mobility expectations were most predictive of satisfaction. Expectations of kneeling, squatting, paid work and sexual function went unfulfilled. Preoperative expectations were not related to postoperative satisfaction. Males had higher postoperative fulfilment scores.

**Conclusions:** This study showed a clear association between fulfilment of preoperative expectations and patient satisfaction following TKA. However, less than 50% of patient expectations were completely fulfilled. While higher fulfilment scores were predictive of greater satisfaction, low overall fulfilment score did not preclude satisfaction. The high correlation of pain and function expectation fulfilment with satisfaction emphasises the need to relate these as appropriate preoperative expectations, while awareness of unfulfilled expectations may allow engagement with and resolution of ongoing concerns and disappointments.

© 2019 Elsevier B.V. All rights reserved.

## 1. Introduction

Total knee arthroplasty (TKA) is a commonly performed and successful surgical intervention for end-stage osteoarthritis, with 7525 performed in 2016 in Scotland alone [1,2]. Patients tend to report good functional improvement, and the incidence of serious complication is low, however, dissatisfaction rates have historically been as high as 20% [3,4], significantly lagging behind those of total hip replacement [5]. However, more recent papers report only four percent to seven percent of patients having low satisfaction with their TKA [6–8].

Patient-reported outcome measures (PROMs) are now considered to be an important tool to measure the success of surgery as healthcare providers increasingly recognise the value of measuring the patient's perspective of surgical outcome [9–12].

\* Corresponding author at: Department of Orthopaedics, Golden Jubilee National Hospital, Agamemnon Street, Clydebank, West Dunbartonshire G81 4DY, UK.  
E-mail address: martin.sarungi@gjnh.scot.nhs.uk. (M. Sarungi).

Consequently, the collection of PROMs has become mandatory in National Health Service (NHS) England for all patients undergoing hip and knee joint replacement surgery and is reported through the National Joint Registry (NJR) for England and Wales [13]. Commonly used and validated PROMs seek to measure general health and wellbeing [14], satisfaction with procedure, as well as procedure-specific indices such as pain relief or rising from sitting [9,15,16].

It has also been shown that fulfilment of patients' expectations has an impact on patient satisfaction following surgery and that patients with very high expectations are more likely to be disappointed in their results [9,17–22]. However, a recent Delphi consensus study has shown the variability of importance of these expectations in TKA [23]. In a previous paper, we reported the pre-operative findings of this study, showing that patients have very high and sometimes unrealistic expectations regarding the outcomes of their TKA over a wide range of health parameters, despite detailed preoperative consultation and education [24]. Understanding how these expectations are fulfilled is an important step to be able to adequately manage them and so achieve better patient satisfaction and PROMs.

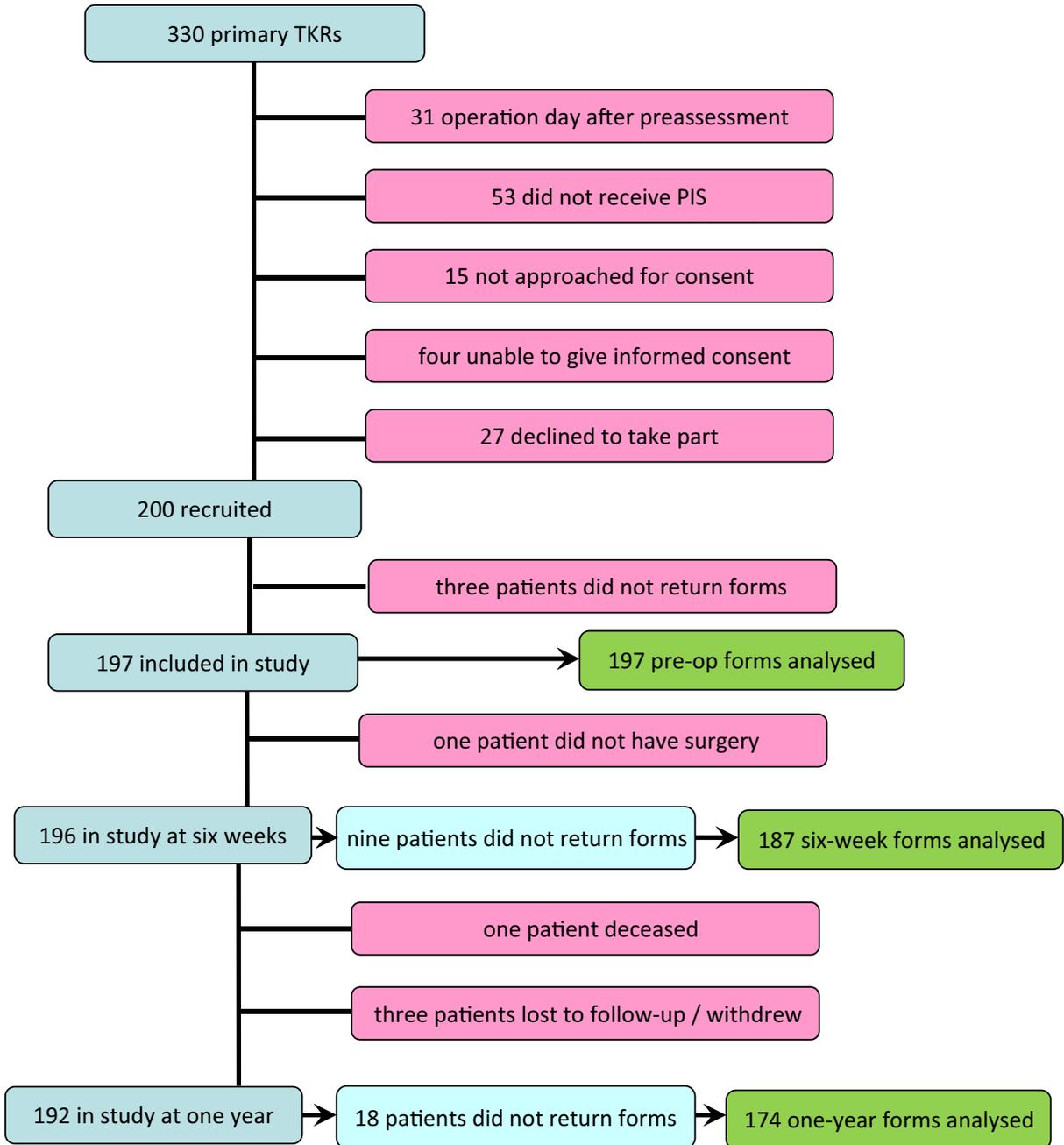


Figure 1. STROBE chart for recruitment.

The aim of the follow-up stage of the study, reported in this paper, was to quantify the fulfilment of preoperative expectations of health improvements following TKA, and assess the association between this and overall satisfaction with TKA through a prospective assessment of patients attending for surgery at our elective arthroplasty unit.

## 2. Materials and methods

This was a prospective cohort study in a single institution. Ethical approval was obtained from the West of Scotland Research Ethics Committee 4. The initial results of this study in the form of the preoperative expectations have already been published with the full methods given but to summarise [24]: Between November 2011 and July 2013, 200 patients undergoing TKA under the care of two consultant orthopaedic surgeons (high volume arthroplasty specialists) were recruited to the study (Figure 1). Patients were excluded if they: declined to take part; were unable to give informed consent; were not scheduled to attend follow-up at our institution (such as those attending from outlying island locations); were scheduled for surgery the day after their preassessment. All patients received standard preoperative preparation including medical assessment and patient education (consultation, booklet and DVD). Baseline demographic details (age, sex, weight, height, preoperative Oxford Knee Score (OKS, 0–48 scale with 0 being worst and 48 being best)) were collected. Data on geographical location and socioeconomic status (Scottish Index of Multiple Deprivation (SIMD)) were taken from the patients' postcode [25]. On the day of admission for surgery, participants preoperatively completed a validated Hospital for Special Surgery (HSS) Knee Replacement Expectations Survey and asked to say whether or not they had each of the 17 defined expectations of their knee replacement [15] and the EuroQol (EQ-5D) health questionnaire [14,24]. The participants were then asked at six weeks and one year postoperatively to complete a further questionnaire indicating to what extent their expectations of their TKA had been fulfilled on a three-point scale of 'completely', 'somewhat' or 'not at all'. Participants also gave their satisfaction with their operation on a five-point Likert scale (very satisfied, satisfied, unsure, dissatisfied and very dissatisfied) and completed an EQ-5D form [26]. For participants who did not return for follow-up, the questionnaires were posted out.

### 2.1. Data analysis and statistics

The study was powered to identify proportions of patients to within an uncertainty of 15%, the 95% confidence intervals for any proportion being  $\pm 7.5\%$ . This required 170 patients so to allow for loss to follow-up 200 patients were recruited [24]. The follow-up at one year was 174 patients, so the power of the study to indicate proportions was maintained.

In calculating the percentage of fulfilled expectations, these were adjusted using the number of expectations given preoperatively as if patient did not expect something preoperatively this could not be fulfilled. The total number of expectations given preoperatively were 2436 (from a maximum of 3349). The proportions of each expectation, completely, somewhere or not all fulfilled, were calculated for the whole cohort and also for satisfied and not satisfied (unsure, dissatisfied or very dissatisfied) groups.

The preoperative expectations score for each patient was calculated by allocating a value of 3 to the response "very important", 2 for "somewhat important", 1 for "a little important" and 0 for "I do not expect this" and "this does not apply to me" and then a total expectation score calculated giving a score with a range from 0 to 51 (0 = no expectations). The postoperative fulfilment score was calculated by using the values of 5 for "completely fulfilled", 2 for "somewhat fulfilled" and 0 for "not at all fulfilled" and then weighting according to preoperative expectation. This gave a total fulfilment score with a range from 0 to 255 (0 = no expectations fulfilled).

The mean preoperative expectations scores and postoperative fulfilment scores for the different levels of satisfaction were calculated. Data were analysed with the Kruskal–Wallis test using RStudio software [27] to assess differences across satisfaction levels. Fisher's exact test was used to assess the relationship between completely fulfilment and being satisfied for each individual expectation. To determine the effect of demographics on fulfilment of expectations, mean fulfilment score was compared between groups for categorical variables (gender, SIMD, geographical location) using independent t-test/Kruskal–Wallis test/Mann–Whitney-U test and the Pearson's correlation coefficients between fulfilment scores and continuous variables (age, Body Mass Index (BMI), preoperative OKS, EQ-5D Health score) were calculated. Given the number of statistical tests carried out, significance was set at  $p < 0.01$ .

## 3. Results

Of the 200 recruited patients, 197 completed and returned preoperative expectations questionnaires. Of these, 192 (97%) completed the follow-up questionnaire at six weeks and 174 (88%) at one year (Figure 1). There was no difference between the

**Table 1**  
Demographics of included patients at each time point.

Appointment	n	% female	Age	BMI	Pre-op OKS
Preoperative	197	59	67.7 (45 to 84)	32.5 (21 to 50)	17 (1 to 44)
Six weeks	192	60	67.6 (45 to 84)	32.2 (21 to 50)	18 (3 to 44)
One year	174	60	67.8 (45 to 84)	32.3 (21 to 50)	17 (3 to 44)

**Table 2**

Fulfilment of TKA patients' preoperative expectations at six weeks and one year postoperation.

Follow-up time	Completely	Somewhat	Not at all	No response
Six weeks	30%	43%	23%	4%
One year	48%	38%	12%	2%

demographics of the patients returning data preoperatively, at six weeks and one year (Table 1). Preoperative expectations, against which postoperative results are compared, have already been published [24].

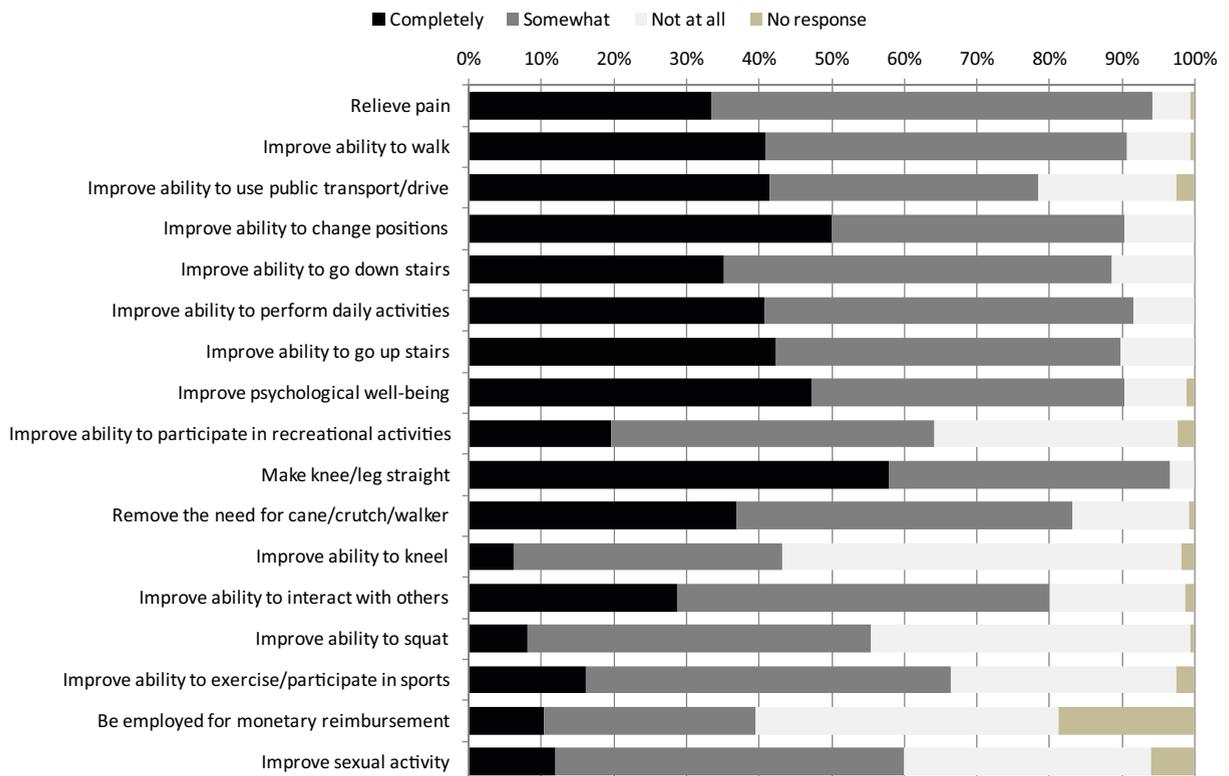
### 3.1. Fulfilment of expectations

At six weeks, the mean number of completely fulfilled expectations per patient was four and at one year, this had increased to seven, compared to a mean of 14 expectations per patient preoperatively. The percentage of completely fulfilled expectations increased from six weeks to one year (Table 2). Overall, at one year postoperatively, 48% of expectations were completely fulfilled, 38% were somewhat fulfilled and 12% were not at all fulfilled (two percent were not given). At one year, the fulfilment of expectations scores ranged from 0 to 226 (highest possible value 255).

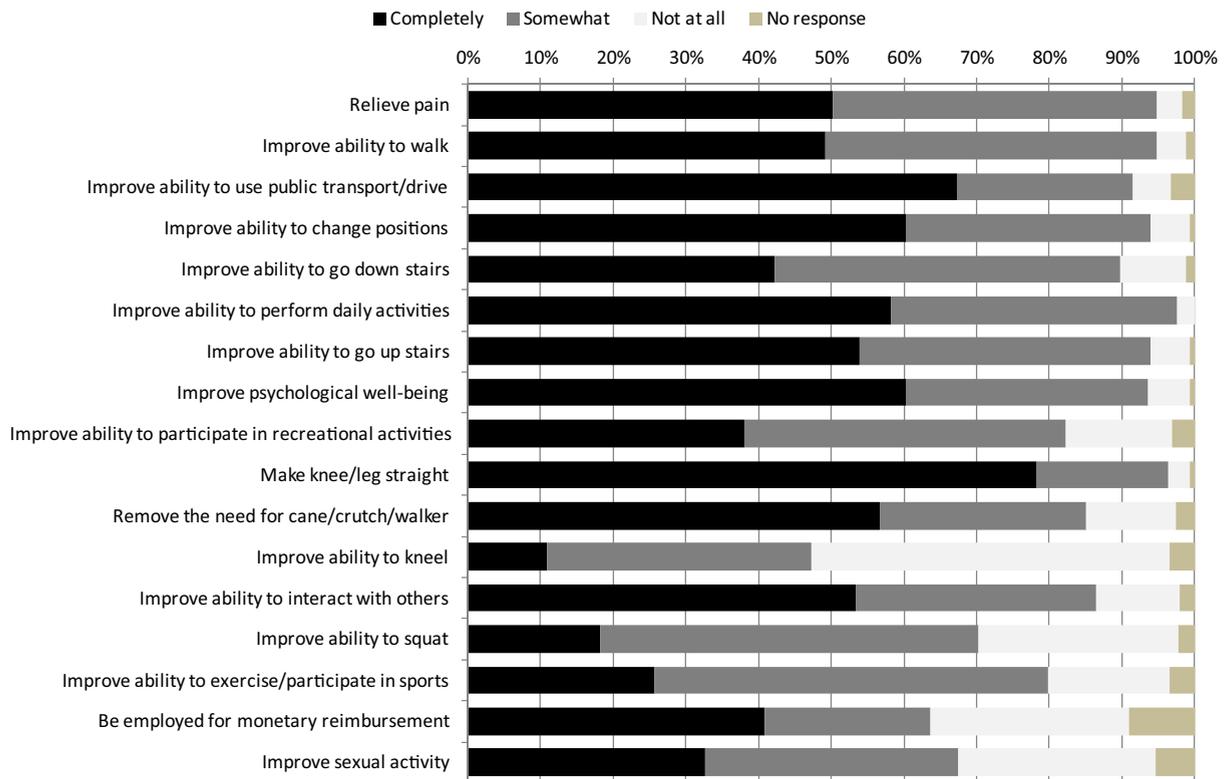
At six weeks, the expectations with the highest reported level of complete fulfilment were those of making the knee straight (58%) and improving the ability to change position (47%) (Figure 2). The expectations with the lowest level of complete fulfilment were the abilities to kneel (five percent) and to squat (nine percent) (Figure 2). At one year, the highest reported level of complete fulfilment were those of making the knee straight (78%) and driving/using public transport (67%) whereas the lowest level of fulfilment unchanged with kneeling (11%) and squatting (18%) (Figure 3). Expectations for relieve of pain and improved ability to walk (the most frequently sited expectations preoperatively) were only completely fulfilled in around half of patients (Figure 3).

### 3.2. Satisfaction and fulfilment of expectations

At six weeks, satisfaction scores were available for 183 of 192 (95%) patients. Seventy percent (128) of patients were very satisfied, 14% (26) were satisfied, 16% (29) were unsure and one patient (<1%) was dissatisfied. No patients reported being very dissatisfied. The patient who was dissatisfied at six weeks reported that no preoperative expectations had been fulfilled. At one year,



**Figure 2.** Fulfilment of expectations of TKA patients at six weeks postoperation. Ordered by % indicating expectation was very important preoperatively [20].



**Figure 3.** Fulfilment of expectations of TKA patients at one year postoperation. Ordered by % indicating expectation was very important preoperatively [20].

satisfaction scores showed that 71% patients (124) reported being very satisfied, 18% (31) were satisfied, eight percent (14) were unsure, two percent (four) were dissatisfied and one patient (<1%) reported being very dissatisfied. Overall, the more satisfied patients had higher percentages of their preoperative expectations completely fulfilled and higher expectation fulfilment scores ( $p < 0.001$ ), however, even in the “very satisfied”, the spread of scores was large (Table 3, Figure 4). Mean preoperative expectations for each group were similar (Table 3, Figure 4).

At one year, postoperation patients who were not satisfied with their TKA had lower fulfilment of their expectation across all 17 expectations when compared to the satisfied patients (Figure 5). For individual expectations, all expectations apart from kneeling, squatting, employment, recreational activity and sexual activity, showed an association between complete fulfilment and being satisfied (Table 4).

### 3.3. Demographics and fulfilment of expectations

Males had a higher mean expectation fulfilment scores than females, 130 vs. 105 ( $p = 0.003$ ). There was no relationship between expectation fulfilment scores and SIMD quintiles ( $p = 0.151$ ) or geographical location ( $p = 0.021$ ). There were no statistically significant correlations between age ( $p = 0.654$ ), BMI ( $p = 0.536$ ), preoperative OKS ( $p = 0.065$ ), EQ-5D scores ( $p = 0.013$ ) and expectation fulfilment scores.

## 4. Discussion

In this prospective longitudinal study, we demonstrate no association between postoperative satisfaction and the extent of preoperative expectations of TKA, but rather, a strong association between satisfaction and the fulfilment of patient-specific expectations. Preoperative expectations from this cohort according to the HSS score were previously published [24]. Rate of fulfilment of expectations after TKA varies in the orthopaedic literature, as do the methods used to assess fulfilment [28–30]. Some studies have reported fulfilment of preoperative expectations from patients to be as high as 61% three years after surgery [31]. Other studies have suggested inferior outcomes in TKA when compared to total hip arthroplasty in fulfilling patient expectations and satisfaction [5,29,32]. In particular, some studies have focused on the inability of modern TKA to meet patient expectations of high knee flexion activities such as kneeling and squatting, a finding supported by our results [32].

In our study, only 48% of the preoperative expectations were completely fulfilled. Yet 89% were satisfied or very satisfied. The most fulfilled expectations were pain relief, mobility, straightening leg and improved daily activities. Unfulfilled pain relief was the most important factor for patients who did not report being satisfied with their surgery at six weeks and one year, which

**Table 3**

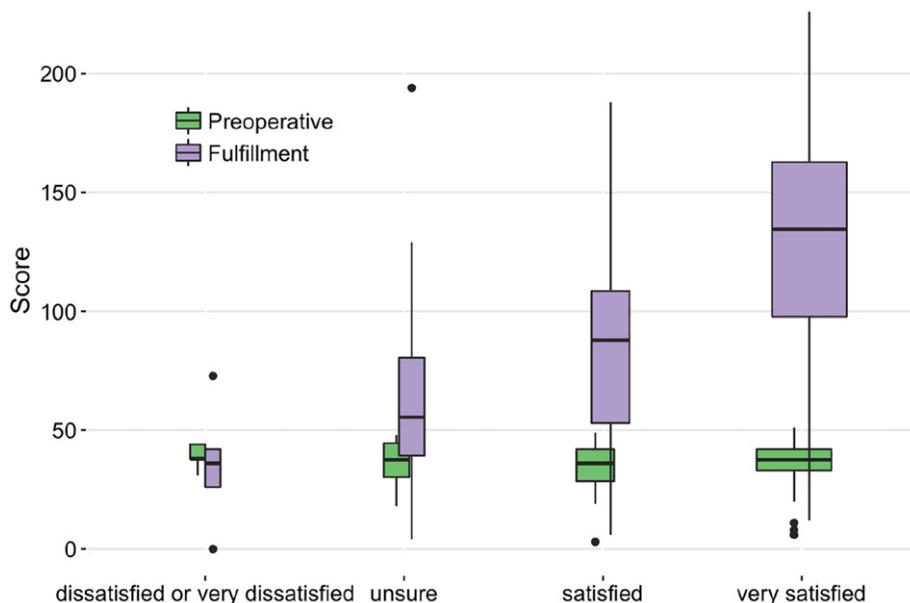
Fulfilment of TKA patients' preoperative expectations at one year postoperation for each satisfaction score. Data are presented as either % or mean (SD) [range].

Satisfaction	n	Expectations completely fulfilled	Fulfilment score	Preoperative expectations score
Very satisfied	124	58%	132 (48) [12 to 226]	36 (9) [6 to 51]
Satisfied	31	28%	86 (45) [6 to 188]	34 (10) [3 to 49]
Unsure	14	15%	66 (48) [4 to 194]	36 (9) [18 to 48]
Dissatisfied	4	2%	44 (20) [26 to 73]	39 (6) [31 to 44]
Very dissatisfied	1	0%	0	38

supports the findings in much of the related literature [12,16,32]. The least fulfilled patient expectations were kneeling, squatting, ability to return to paid work and sexual activity, which are supported by other studies [12,32]. Our female cohort appeared to have fewer of their expectations fulfilled at one year, which concurs with the findings of previous studies [3,33], despite our cohort previously showing that being male was associated with higher preoperative expectations [24] – a finding supported by other studies [32]. And although these expectations were not completely fulfilled, this seemed to have only a modest negative impact on satisfaction at one year. Overall, a high number of patients were satisfied at one year, which is comparable to the results of previous studies [12,16,32,33]. Our satisfied cohort was older than those reported by other studies [16,22].

Satisfaction as an outcome measure of surgery may be affected by a variety of different factors unique to each person's preoperative and postoperative experience [34]. In our cohort, there were no differences in preoperative expectations for the different levels of postoperative satisfaction. Although only 48% of expectations were completely fulfilled, a high number of patients reported being satisfied, suggesting that the total number of expectations fulfilled may be less important to achieving satisfaction with surgery than meeting important expectations such as pain relief and mobility. However, our study also showed a relationship between satisfaction and fulfilment of preoperative expectation, consistent with previous similar studies [3,12,32,35] and the lower the fulfilment score, the less likely that a patient will be satisfied with their operation. However, the wide spread of fulfilment scores for those patients who were satisfied supports the point above that patients may be satisfied when many preoperative expectations are not fulfilled.

Our study did not find a relationship between socioeconomic indicators (SIMD, geographical location) and fulfilment of expectations. Our cohort, as reported previously [24], covered a wide geographic and socioeconomic range as patients were not drawn from the direct locale of the hospital, so if a simple relationship existed we would have expected to see it. When comparison between national healthcare systems has been made it has been shown that patients' expectations vary [36]. Female patients have lower satisfaction with hospital stay following arthroplasty [37], while studies differ as to whether women have lower levels of satisfaction [4,38]. Our cohort showed a significantly lower expectation fulfilment amongst female patients, differing from some studies using the same expectation score [29,30], however, both of these studies involved smaller cohorts that may not have been powered to assess this difference. Given our results also showed an association between satisfaction and expectation fulfilment, further work to understand how these affect outcomes for male and female patients seems warranted.



**Figure 4.** Distribution of preoperative expectation score and postoperative fulfilment score by satisfaction at one year. Box width proportional to square root of group sample size.

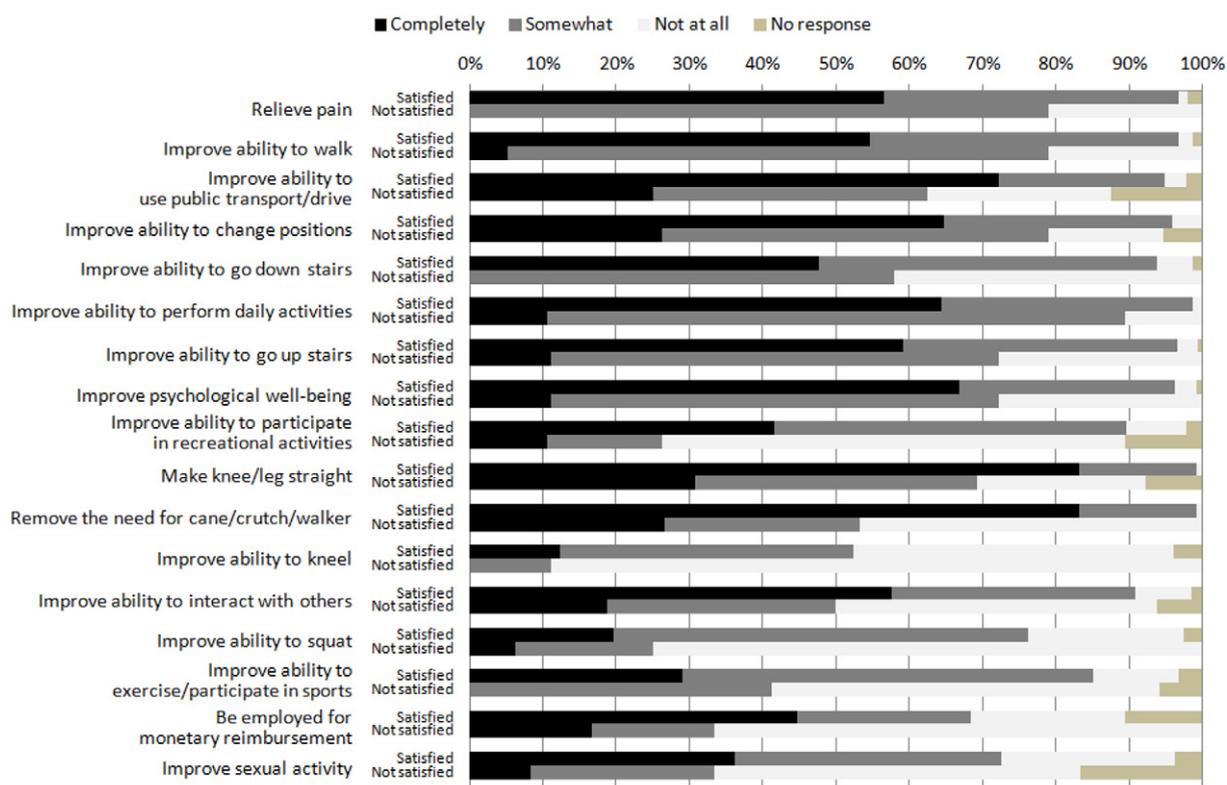


Figure 5. shows how the fulfilment at one year of each particular expectation varied between the satisfied and not satisfied patients.

Analysis of our data showed that some patients remain dissatisfied at one year follow-up for a variety of reasons, which is consistent with other studies; however, this remains a challenge to be addressed [22]. Dissatisfaction in our cohort did not seem to be only a result of unrealistic expectations such as squatting and kneeling, which patients are routinely counselled preoperatively that they may not be able to engage in. Other symptoms unrelated to the operated knee may account for dissatisfaction [18]; however, we noted a combination of factors in our study patients such as persistent pain, co-morbidities and unrealistic expectations that contributed to dissatisfaction. This concurs with the findings of other studies: dissatisfaction is multifactorial [12,16,18,32]. In particular, it has been found that preoperative depression and pain in other joints significantly predicted dissatisfaction while as postoperative pain improves over time, satisfaction also improves and these findings are supported by our results [12,39].

Table 4

Relationship between complete expectation fulfilment and being satisfied for each expectation at one year postoperation.

Expectation	p-Value	Odds ratio (95% CI)
Relieve pain	<0.001*	§
Improve psychological well-being	<0.001*	18.0 (4.0, 81.4)
Improve ability to go upstairs	<0.001*	12.6 (2.8, 56.6)
Improve ability to walk	<0.001*	22.6 (2.9, 174.0)
Improve ability to perform activities of daily living	<0.001*	13.9 (3.1, 62.3)
Improve ability to go down stairs	<0.001*	§
Improve ability to use public transport/drive	<0.001*	8.2 (2.5, 27.0)
Make knee/leg straight	<0.001*	7.8 (2.6, 23.4)
Remove need for cane/crutch/walker	0.002*	6.2 (1.9, 20.3)
Improve ability to interact with others	0.002*	6.4 (1.8, 23.2)
Improve ability to change positions	0.004*	4.7 (1.6, 13.8)
Improve ability to exercise/participate in sports	0.007*	§
Improve ability to participate in recreational activities	0.018	
Be employed for monetary reimbursement	0.160	
Improve sexual activity	0.178	
Improve ability to squat	0.204	
Improve ability to kneel	0.220	

\* Significant at 99% confidence level.

§ No overall satisfied subjects had this expectation not fulfilled.

The use of the HSS questionnaire for measuring satisfaction presents some difficulty with regard to differentiation between probabilistic expectations and value expectations (“I think this is likely” vs “I hope that this happens”), with our study looking at perceived importance rather than probability. This questionnaire could be, and has been, previously criticised for falsely equating what the patient states as important with what they think likely, leading to improper conclusions that better education of the low probability of an outcome will reduce the perceived importance of it [40]. We have previously commented that, while an awareness of this difference in expectation type is important, patient education on the low likelihood of certain expectations is still likely to reduce the probability of dissatisfaction [41], and continue to hold this position with regard to the results reported here.

A limitation of this study is the degree of self-selection due to the nature of questionnaire-based research, similar to other studies. Factors such as low reading age, language, cognitive limitations and sight problems have been reported as independent predictors of non-participation in surveys or questionnaires [42]. Issues with literacy might introduce bias in some patients; however, agreement with this association is not consistent and preoperative education at this institution aims to meet the needs of patients of varying ability [42]. Another limitation of our study was the exclusion of some patients (e.g. those living in isolated islands) because they were unable to return for one year follow-up which potentially changes the demographic of cohort particularly with respect to socioeconomic indicators and geographical location. However, our institution, as a national arthroplasty centre, takes patients from a much wider socioeconomic and geographical spread than most hospitals so even with this limitation, our results show fulfilment of expectations across a wider range of patient demographics than previously reported [12,25]. A further limitation is that outcomes are only recorded at six weeks and one year postoperation. Although TKA is a “long-term” operation and overall outcomes in terms of success or failure are assessed at 10, 15, and 20 years postoperation, the fulfilment of expectations assessed in this study is unlikely to change after one year i.e. if a patient has not achieved an expectation at one year, it is unlikely to be achieved. One year is the standard point of best functional outcome and a common point of outcome reporting, so in terms of aligning expectations and satisfaction, one year is an appropriate point [4,43,44].

A strength of this study is that expectations were assessed using the HSS Knee Replacement Expectations Survey, which is a recognised, validated and non-modified questionnaire [26] whereas other patient expectations studies have used adapted questionnaires or relied on unvalidated questions.

In general, patients' expectations of pain relief and mobility were mostly fulfilled. We previously reported the high incidence of unrealistically high expectations in this cohort [24], however, there was no association found between overall expectations preoperatively and postoperative satisfaction at one year. This may suggest that while fulfilment of all expectations is ideal, for many patients, pain relief and improved mobility are sufficient for satisfaction [45].

These results clearly show the need for patients to fulfil their expectations of TKA. While the needs to educate patients on realistic preoperative expectations have been discussed elsewhere [21,22,24], there may be opportunities to address shortfalls in expectation fulfilment at the point of follow-up, if it is assessed at review. A better understanding of why patient expectations remain unfulfilled following TKA may assist in the design and delivery of better preoperative education focussed on establishing more realistic expectations of surgery, but also move postoperative focus from simple measures of satisfaction and function to exploration of the reasons for unfulfilled expectations. However, our study suggests that a preoperative focus on the pain relief and mobility advantages of TKA is most likely to give an accurate idea of what expectations may be fulfilled by surgery.

## 5. Conclusion

Our prospective, longitudinal study showed that there was a clear association between fulfilment of preoperative expectations and patient satisfaction following TKA. However, the association of pain and mobility was far stronger, with fulfilment of these expectations being most important. Our results also show that TKA did not fulfil patients' expectations of kneeling, squatting, ability to return to paid work and sexual activity, and these expectations should be better managed in the preoperative education process. In addition, less than 50% of patient expectations were completely fulfilled across the cohort as a whole. While higher fulfilment scores were predictive of greater satisfaction, low overall fulfilment score did not preclude high satisfaction. The high correlation with pain and function expectation fulfilment and satisfaction emphasises the need to relate these as appropriate preoperative expectations, while awareness of unfulfilled expectations may allow engagement with these issues and resolution of ongoing concerns and disappointments.

## Ethical declaration

This study received ethical approval from the West of Scotland Research Ethics Committee 4 on 9th September 2011. All patients gave written informed consent to be included in the study on their admission to hospital.

## Funding

There was no external funding for this study. It was carried out by hospital staff as part of their normal roles as approved by the hospital research department and medical director.

## Declaration of competing interest

All authors wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

## Acknowledgements

The authors would like to thank Mr. Maged Sedhom and Dr. David McDonald for their help with setting up the study, Mr. Kedar Chirkputar, Mr. Sarang Sapare and Mr. Rajinder Gaheer for their contribution in recruiting patients, Mr. James McAllister, Miss Frances McConaghie, Mr. V-Liem Soon and Mrs. Annemarie Boyd for their work in recruiting patients, collecting data and all other aspects of running the study, and the hospital Arthroplasty team (Mrs Justine Greaves, Mrs. Tracy Thomas, Mrs. Fiona Macbeth, Mrs. Sandra Tungatt) for collecting follow-up questionnaires.

## References

- [1] Scottish Arthroplasty Project. Scottish arthroplasty project report 2017; 2017.
- [2] 2016 13th Annual Report National Joint Registry for England, Wales, Northern Ireland and the Isle of Man n.d.
- [3] Baker PN, Van Der Meulen JH, Lewsey J, Gregg PJ. The role of pain and function in determining patient satisfaction after total knee replacement. Data from the National Joint Registry for England and Wales. *J Bone Jt Surg [Br]* 2007;89B:893–900. <https://doi.org/10.1302/0301-620X.89B7>.
- [4] Bourne RB, Chesworth BM, Davis AM, Mahomed NN, Charron KD. Patient satisfaction after total knee arthroplasty: who is satisfied and who is not? *Clin Orthop Relat Res* 2010;468:57–63. <https://doi.org/10.1007/s11999-009-1119-9>.
- [5] Bourne RB, Chesworth B, Davis A, Mahomed N, Charron K. Comparing patient outcomes after THA and TKA: is there a difference? *Clin Orthop Relat Res* 2010;468:542–6. <https://doi.org/10.1007/s11999-009-1046-9>.
- [6] Baker PN, Rushton S, Jameson SS, Reed M, Gregg P, Deehan DJ. Patient satisfaction with total knee replacement cannot be predicted from pre-operative variables alone: a cohort study from the National Joint Registry for England and Wales. *Bone Jt J* 2013;95(B):1359–65. <https://doi.org/10.1302/0301-620X.95B10.32281>.
- [7] Katipalli G, Deakin AH, Greaves J, Reynolds T, Picard F. One-year follow-up of 214 total knee arthroplasties with navigated Columbus implants. *Orthopedics* 2008;31:45–50 [doi:orthopedics.35543 | pii].
- [8] Beverland D. Patient satisfaction following TKA: bless them all! *Orthopedics* 2010. <https://doi.org/10.3928/01477447-20100722-23>.
- [9] Murray DW, Fitzpatrick R, Rogers K, Pandit H, Beard DJ, Carr AJ, et al. The use of the Oxford hip and knee scores. *J Bone Jt Surg [Br]* 2007;89:1010–4. <https://doi.org/10.1302/0301-620X.89B8>.
- [10] Xie F, Li S-C, Lo N-N, Yeo S-J, Yang K-Y, Yeo W, et al. Cross-cultural adaptation and validation of Singapore English and Chinese versions of the Oxford Knee Score (OKS) in knee osteoarthritis patients undergoing total knee replacement. *Osteoarthr Cartil* 2007;15:1019–24. <https://doi.org/10.1016/j.joca.2007.02.013>.
- [11] Dawson J, Doll H, Fitzpatrick R, Jenkinson C, Carr AJ. The routine use of patient reported outcome measures in healthcare settings. *BMJ* 2010;340.
- [12] Scott CEH, Howie CR, MacDonald D, Biant LC. Predicting dissatisfaction following total knee replacement: a prospective study of 1217 patients. *J Bone Jt Surg - Br* 2010;92-B:1253–8. <https://doi.org/10.1302/0301-620X.92B9.24394>.
- [13] National Joint Registry. 10th annual report. National Joint Registry for England, Wales and Northern Ireland; 2013.
- [14] Euroqol. EQ-5D n.d. <https://euroqol.org/> (accessed August 30, 2017).
- [15] Mancuso CA, Sculco TP, Wickiewicz TL, Jones EC, Robbins L, Warren RF, et al. Patients' expectations of knee surgery. *J Bone Joint Surg Am* 2001;83(A):1005–12.
- [16] Nilsson AK, Toksvig-Larsen S, Roos EM. Knee arthroplasty: are patients' expectations fulfilled? A prospective study of pain and function in 102 patients with 5-year follow-up. *Acta Orthop* 2009;80:55–61. <https://doi.org/10.1080/17453670902805007>.
- [17] Von Keudell A, Sodha S, Collins J, Minas T, Fitz W, Gomoll AH. Patient satisfaction after primary total and unicompartmental knee arthroplasty: an age-dependent analysis. *Knee* 2014;21:180–4. <https://doi.org/10.1016/j.knee.2013.08.004>.
- [18] Kim TK, Chang CB, Kang YG, Kim SJ, Seong SC. Causes and predictors of patient's dissatisfaction after uncomplicated total knee arthroplasty. *J Arthroplasty* 2009;24:263–71. <https://doi.org/10.1016/j.arth.2007.11.005>.
- [19] Hamilton DF, Lane JV, Gaston P, Patton JT, Macdonald D, Simpson AHRW, et al. What determines patient satisfaction with surgery? A prospective cohort study of 4709 patients following total joint replacement. *BMJ Open* 2013;3. <https://doi.org/10.1136/bmjopen-2012-002525>.
- [20] Choi Y-J, Ra HJ. Patient satisfaction after total knee arthroplasty. *Knee Surg Relat Res* 2016;28:1–15. <https://doi.org/10.5792/ksrr.2016.28.1.1>.
- [21] Culliton SE, Bryant DM, Overend TJ, MacDonald SJ, Chesworth BM. The relationship between expectations and satisfaction in patients undergoing primary total knee arthroplasty. *J Arthroplasty* 2012;27:490–2. <https://doi.org/10.1016/j.arth.2011.10.005>.
- [22] Noble PC, Condit MA, Cook KF, Mathis KB. The John Insall Award: patient expectations affect satisfaction with total knee arthroplasty. *Clin Orthop Relat Res* 2006;452:35–43. <https://doi.org/10.1097/01.blo.0000238825.63648.1e>.
- [23] Lange T, Schmitt J, Kopkow C, Rataj E, Günther KP, Lützner J. What do patients expect from total knee arthroplasty? A Delphi consensus study on patient treatment goals. *J Arthroplasty* 2017;32:2093–2099.e1. <https://doi.org/10.1016/j.arth.2017.01.053>.
- [24] J. Smith E, Soon VL, Boyd A, McAllister J, Deakin AH, Sarungi M. What do Scottish patients expect of their total knee arthroplasty? *J Arthroplasty* 2016;31:786–92. <https://doi.org/10.1016/j.arth.2015.10.021>.
- [25] Government S. Introducing the Scottish index of multiple deprivation 2016. n.d.
- [26] Mahomed N, Gandhi R, Daltroy L, Katz JN. The self-administered patient satisfaction scale for primary hip and knee arthroplasty. *Arthritis* 2011;2011:591253. <https://doi.org/10.1155/2011/591253>.
- [27] R Core Team. R: a language and environment for statistical computing. *R A Lang Environ Stat Comput* 2017 (doi:[ISBN] 3-900051-07-0).
- [28] Kumar M, Bhattepathi P, Bangalore P. Expectation fulfilment and satisfaction in total knee arthroplasty patients using the "PROFEX" questionnaire. *Orthop Traumatol Surg Res* 2015;101:325–30. <https://doi.org/10.1016/j.otsr.2014.12.016>.
- [29] Neuprez A, Delcour J-P, Fatemi F, Gillet P, Crielaard J-M, Bruyère O, et al. Patients' expectations impact their satisfaction following total hip or knee arthroplasty. *PLoS One* 2016;11:e0167911. <https://doi.org/10.1371/journal.pone.0167911>.
- [30] Jain D, Nguyen L-CL, Bendich I, Nguyen LL, Lewis CG, Huddleston JI, et al. Higher patient expectations predict higher patient-reported outcomes, but not satisfaction, in total knee arthroplasty patients: a prospective multicenter study. *J Arthroplasty* 2017;32:S166–70. <https://doi.org/10.1016/j.arth.2017.01.008>.
- [31] Suda AJ, Seeger JB, Bitsch RG, Krueger M, Clarius M. Are patients' expectations of hip and knee arthroplasty fulfilled? A prospective study of 130 patients. *Orthopedics* 2010;33:76–80. <https://doi.org/10.3928/01477447-20100104-07>.
- [32] Scott CEH, Bugler KE, Clement ND, MacDonald D, Howie CR, Biant LC. Patient expectations of arthroplasty of the hip and knee. *Bone Joint J* 2012. <https://doi.org/10.1302/0301-620X.94B7.28219>.
- [33] Gandhi R, Davey JR, Mahomed N, et al. Patient expectations predict greater pain relief with joint arthroplasty. *J Arthroplasty* 2009;24:716–21. <https://doi.org/10.1016/j.arth.2008.05.016>.
- [34] Clement ND. Patient factors that influence the outcome of total knee replacement: a critical review of the literature. *OA Orthop* 2013;01:11.
- [35] Dunbar MJ, Richardson G, Robertsson O. I can't get no satisfaction after my total knee replacement: rhymes and reasons. *Bone Joint J* 2013. <https://doi.org/10.1302/0301-620X.95B11.32767>.
- [36] Lingard EA, Sledge CB, Learmonth ID. Patient expectations regarding total knee arthroplasty. *J Bone Jt Surg* 2006;88:1201–7. <https://doi.org/10.2106/JBJS.E.00147>.

- [37] Clement ND, Macdonald D, Burnett R, Simpson AHRW, Howie CR. A patient's perception of their hospital stay influences the functional outcome and satisfaction of total knee arthroplasty. *Arch Orthop Trauma Surg* 2017;137:693–700. <https://doi.org/10.1007/s00402-017-2661-7>.
- [38] Nam D, Nunley RM, Barrack RL. Patient dissatisfaction following total knee replacement a growing concern? *Bone Jt J* 2014;96:96–100. <https://doi.org/10.1302/0301-620X.96B11>.
- [39] Brander V, Gondek S, Martin E, Stulberg SD. The John Insall Award. *Clin Orthop Relat Res* 2007;PAP:21–6. <https://doi.org/10.1097/BLO.0b013e318126c032>.
- [40] Tolk JJ, Haanstra TM, Reijman M. Letter to the editor on “what do Scottish patients expect of their total knee arthroplasty?”. *J Arthroplasty* 2016;31:2374. <https://doi.org/10.1016/j.arth.2016.05.023>.
- [41] Sarungi M, Deakin AH. Response to letter to the editor on “what do Scottish patients expect of their total knee arthroplasty?”. *J Arthroplasty* 2016;31:2374–5. <https://doi.org/10.1016/j.arth.2016.05.021>.
- [42] le Gayet-Ageron A, Agoritsas T, Schiesari L, ronique Kolly V, Perneger TV, Ross JS. Barriers to participation in a patient satisfaction survey: who are we missing?; 2011. <https://doi.org/10.1371/journal.pone.0026852>.
- [43] Mizner RL, Petterson SC, Clements KE, Zeni JA, Irrgang JJ, Snyder-Mackler L. Measuring functional improvement after total knee arthroplasty requires both performance-based and patient-report assessments. *A Longitudinal Analysis of Outcomes J Arthroplasty* 2011;26:728–37. <https://doi.org/10.1016/j.arth.2010.06.004>.
- [44] Klit J, Jacobsen S, Rosenlund S, Sonne-Holm S, Troelsen A. Total knee arthroplasty in younger patients evaluated by alternative outcome measures. *J Arthroplasty* 2014;29:912–7. <https://doi.org/10.1016/j.arth.2013.09.035>.
- [45] Lucas B, Cox C, Perry L, Bridges J. Pre-operative preparation of patients for total knee replacement: an action research study. *Int J Orthop Trauma Nurs* 2013;17:79–90. <https://doi.org/10.1016/j.ijotn.2012.08.005>.