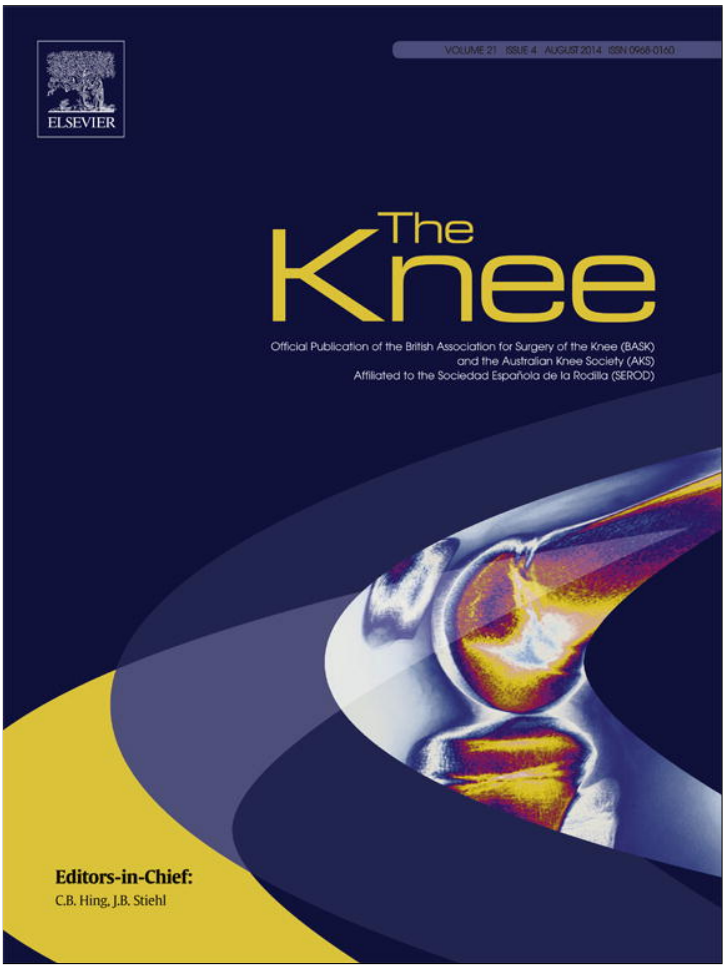

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Patient satisfaction after posterior-stabilized total knee arthroplasty: A functional specific analysis ☆

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ABSTRACT

Background: Despite the success of total knee arthroplasty (TKA) in treating end-stage knee arthritis, 11% to 19% of patients are dissatisfied with the outcome of their surgery. In this study we investigated how satisfied overall patients are with the outcome of posterior stabilized TKA and what particular functional deficits or residual symptoms cause the most dissatisfaction for patients after surgery.
Methods: Using patient-completed validated questionnaires, we retrospectively analyzed data for 1013 posterior-stabilized TKAs performed in 748 Chinese patients regarding the overall satisfaction with surgery and the importance ranking of each of 15 specific functions and residual symptoms.
Results: Our data demonstrate an overall satisfaction rate of 87.4%. Satisfaction percentages ranged from 45.0% to 89.0%. The top 6 dissatisfactory items were sitting with legs crossed (dissatisfaction rate of 55.0%), squatting (51.7%), walking fast or jogging (45.4%), knee clunking (34.5%), abnormal feeling in knee (31.2%), and climbing stairs (28.2%). The top 6 important functions or issues were pain relief, walking on flat ground, climbing stairs, ability to return to household work, decreased limping, and squatting.
Conclusions: Approximately 1 in 8 patients was dissatisfied with overall outcome. Patients were most dissatisfied with climbing stairs and squatting, functions that they considered most important.

1. Introduction

Total knee arthroplasty (TKA) has dramatically improved the care of patients with end-stage knee arthritis. However, several studies have suggested that 11% to 19% of patients are still not satisfied with the outcomes of their primary TKA [1–7].

With the increasing recognition of the importance of patients' assessments of their medical care, patient-centered subjective evaluation is gaining importance in outcome assessment for arthroplasty because of apparent discrepancies between patient-oriented and clinician-oriented outcomes [8–10]. To address the problem areas in modern TKA, we must elucidate the functional areas with which patients remain dissatisfied. However, few reports have focused on patients' rating of their postoperative dissatisfaction with specific functions or residual symptoms.

Many studies have revealed that patients place varying importance on different functions [11], meaning that not all functions should be considered with equal emphasis. Also, it has been reported that perception of the importance of certain physical activities varies between Eastern and Western patients [12]. For example, sitting with legs crossed and kneeling are quite common and important in Eastern cultures but uncommon in Western cultures. These findings make it necessary to take perceived importance into consideration when interpreting satisfaction outcomes for Chinese patients.

To find out what specific outcome aspects warrant further improvement for TKA, we posed 2 major questions: (1) How satisfied overall are patients with the outcome of surgery? (2) What particular functional deficits or residual symptoms cause the most dissatisfaction for patients after surgery?

2. Materials and methods

In this retrospective survey study approved by our institutional review board, we investigated the overall satisfaction rate for 748 patients who underwent posterior-stabilized (PS) TKA. We also researched the specific aspects that the patients reported being dissatisfied with and that they considered important. Nine hundred thirty patients were identified as eligible for our study through the Joint Replacement Registry Center of our hospital because they had undergone primary PS TKA between January 1, 2005 and March 31, 2010. Our inclusion criteria consisted of consenting patients who were scheduled for primary TKA with a PS prosthesis, and Western Ontario and McMaster Universities

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Arthritis Index (WOMAC) scores collected before surgery and at one year after surgery. We excluded patients with a cruciate-retaining prosthesis (because the sample size would have been too small), revision arthroplasty, patients on sick leave from work or receiving disability payments, and those with incomplete contact information. At one year after surgery, we sent one TKA satisfaction questionnaire to those patients who underwent unilateral TKA and two questionnaires to those patients who underwent bilateral operations. Six weeks later, we made follow-up phone calls to nonrespondents to remind them to reply to the questionnaire. Those who could not be reached or refused to complete the questionnaire were considered to be lost to follow-up. Of the 930 patients who were sent questionnaires, 748 (80.4%; 1013 knees) returned 1013 completed questionnaires. One hundred forty-six patients (15.7%) were lost to follow-up, and 36 (3.9%) were dropped from the study because of failure to complete the questionnaires' 16 key questions (overall satisfaction plus satisfaction for the 15 individual items).

The enrolled cohort had an average age of 69 ± 8 years (range, 27–89 years) and was monitored for an average of 4.9 ± 2.2 years (range, 2–7 years). The patients' mean body mass index (BMI) was 26.8 ± 3.7, 78.7% of them were female, 21.3% were male, and 95.1% received a diagnosis of noninflammatory osteoarthritis (4.6%, rheumatoid arthritis; 0.3%, other diseases). Four hundred eighty-three patients (64.6%) underwent unilateral TKA, 217 (29.0%) underwent simultaneous bilateral operations, and 48 (6.4%) underwent staged bilateral surgeries.

Data were collected by physicians and other staff members from our hospital. Preoperative demographic and clinical information collected included age, sex, involved side, primary diagnosis, BMI, and Charnley classification. Also, patients completed a preoperative WOMAC questionnaire. Intraoperatively, it was noted whether a fixed or mobile bearing was implanted. WOMAC scores were also collected at three months, six months, and one year post-operatively.

The satisfaction questionnaire was created and validated through a trial survey conducted before the main study. We asked 50 patients at one year after their surgery to rate their satisfaction regarding 25 functions or residual symptoms. Fifteen questions were retained for the final questionnaire. Ten questions were excluded because <50% of patients stated that they performed the activity or they experienced the symptom in daily life (riding a bicycle, climbing into a bathtub, climbing mountains, jumping, swimming, kneeling, returning to work, engaging in sexual intercourse, decreased depression, gardening).

The final version of satisfaction questionnaire had three sections:

1. Generally speaking, how satisfied are you with the results of your total knee arthroplasty?
2. How satisfied are you with total knee arthroplasty regarding the following 15 items: pain relief, walking on flat ground, climbing stairs, rising from chairs, decreased limping, sitting with legs crossed, avoidance of knee giving way, knee swelling, knee clunking, abnormal feeling in the knee, stiffness relief, range of motion, walking fast or jogging, squatting, ability to return to household work?
3. Among the functions and residual symptoms above, which ones do you think are the 5 most important? ("Important" means those you are concerned with most.)

For each question, patients were asked to grade their degree of satisfaction: very dissatisfied, dissatisfied, neutral, satisfied, or very satisfied. Then a two-category satisfaction outcome was determined for each question by combining patients who were very dissatisfied, dissatisfied, or neutral into a group labeled "dissatisfied," and combining patients who were satisfied or very satisfied into a group labeled "satisfied." These 2 groups were used for all statistical analysis. Patient satisfaction or dissatisfaction was our primary variable.

WOMAC values were reverse-scored and standardized to a score between 0 and 100 (worst to best) [13,14]. The WOMAC change score was determined by subtracting the WOMAC score obtained preoperatively from the 1-year WOMAC. Satisfaction and perceived importance were ranked by percentage. We conducted one-factor analysis of the preoperative, intraoperative, and postoperative factors by dividing all scores for the patients in the "satisfied" group and those for the patients in the "dissatisfied" group by overall satisfaction. Categorical variables (sex, involved side, primary diagnosis, fixed versus mobile bearing, Charnley classification, and insurance status) were tested by cross-tabulation by chi-square analysis; and scale variables (age, BMI, preoperative WOMAC score, postoperative WOMAC score, and change in WOMAC score) were tested with the Wilcoxon nonparametric test. Forward stepwise logistic regression was performed to establish factors that significantly influenced patient satisfaction. Major (1-year WOMAC pain, joint stiffness and function subscales) and other variables that were deemed clinically important (age, gender, preoperative WOMAC scores) were introduced into the regression model. Prior to inclusion, variables were tested for interdependence through correlations and those that were highly correlated were excluded from the regression model (1-year WOMAC total, change WOMAC domains and total score). Odds ratios were reported for significant variables. To clearly show which functions or symptoms require special attention according to patients' perceptions, we created a four-quadrant scattergram to reveal the distribution of dissatisfaction and importance percentages. Functions or symptoms with high importance and high dissatisfaction proportions are those that patients were most concerned about. All statistical analysis was performed with SPSS software (version 15.0; IBM, Armonk, NY, USA), and P values of <.05 were considered significant.

3. Results

Mean scores on WOMAC subscales and total scales significantly improved after surgery. The mean 1-year WOMAC pain score was 91.7 ± 11.0, with a mean score increase of 41.2 ± 20.1. The mean 1-year WOMAC joint stiffness score was 90.0 ± 15.2, with a mean score increase of 38.2 ± 29.0. The mean 1-year WOMAC function score was 89.6 ± 11.1, representing an average improvement of 40.1 ± 20.2. The average total 1-year WOMAC score was 90.0 ± 10.3, with an average score increase of 40.2 ± 18.7.

Our data demonstrate an overall satisfaction (very satisfied and satisfied) rate of 87.4% (n = 885 knees) and an overall dissatisfaction (neutral, dissatisfied, very dissatisfied) rate (Fig. 1) of 12.6% (n = 128 knees). Satisfaction percentages of the 15 items ranged from 45.0% to 89.0%.

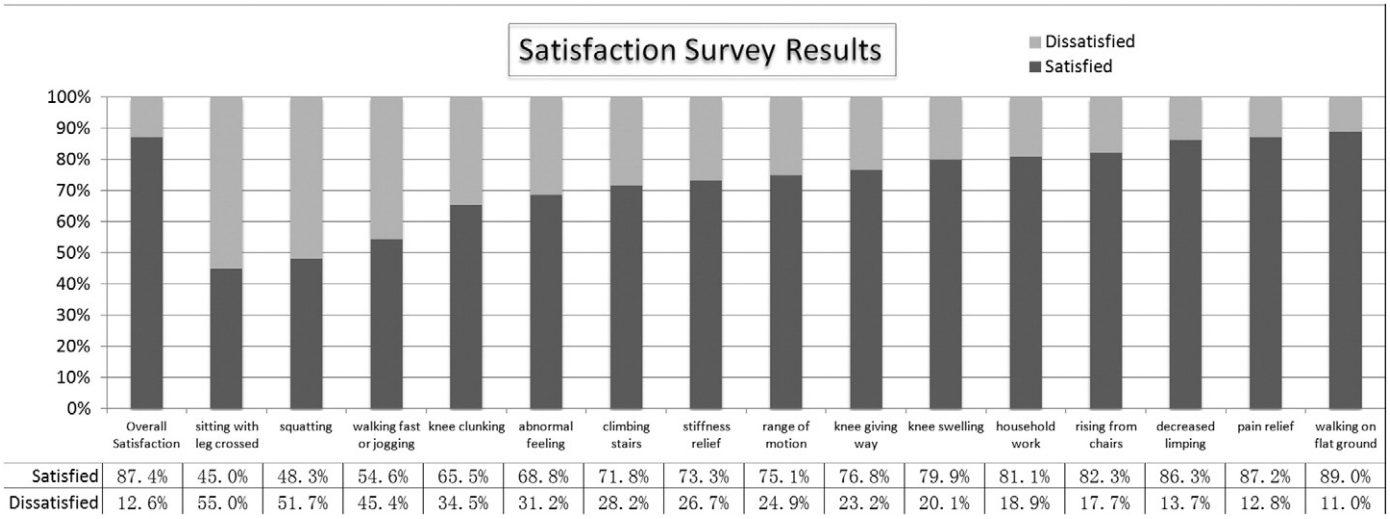
We ranked the 15 items in the questionnaire in descending order according to dissatisfaction rate and importance percentage (Figs. 1 and 2). The top 6 dissatisfactory items (Fig. 1) were sitting with legs crossed (dissatisfaction rate of 55.0%), squatting (51.7%), walking fast or jogging (45.4%), knee clunking (34.5%), abnormal feeling in knee (31.2%), and climbing stairs (28.2%). The top 6 important functions or issues were pain relief, walking on flat ground, climbing stairs, ability to return to household work, decreased limping, and squatting. The items with relatively high importance (the top 6) and dissatisfaction (the top 6) were climbing stairs and squatting, which both fall into the right upper quadrant of the dissatisfaction–importance scattergram (Fig. 3).

Dissatisfied patients had lower postoperative WOMAC total scores and scores on all subscales and a smaller change in WOMAC total scores and in scores on all subscales (except for stiffness). There was no significant difference in other demographic factors between the "satisfied" and "dissatisfied" groups (Table 1). In the regression model, the only significant variable for patient dissatisfaction was a low 1-year WOMAC pain score (P = 0.000). The odds ratio was 1.9.

4. Discussion

We found the postoperative satisfaction rate of Chinese patients for PS TKA to be 87.4%, which is comparable to rates reported for Western populations (Table 2). Patients' satisfaction rates varied widely for specific functions, from 45.0% to 89.0% (Fig. 1). In addition, patients attached varying importance to each function or symptom, indicating that not all items should be weighted evenly (Fig. 2). Most of the important items are related to a high satisfaction rate, which means that the points fall in the lower right quadrant in the dissatisfaction–importance scattergram, except for climbing stairs and squatting. To our knowledge, ours is the first study simultaneously focusing on patient-perceived satisfaction and patient-perceived importance of specific functions and issues after TKA.

Not surprisingly, our study showed that pain relief was the most important issue for most patients. Most importantly, the satisfaction



	Overall Satisfaction	sitting with leg crossed	squatting	walking fast or jogging	knee clunking	abnormal feeling	climbing stairs	stiffness relief	range of motion	knee giving way	knee swelling	household work	rising from chairs	decreased limping	pain relief	walking on flat ground
Satisfied	87. 4%	45. 0%	48. 3%	54. 6%	65. 5%	68. 8%	71. 8%	73. 3%	75. 1%	76. 8%	79. 9%	81. 1%	82. 3%	86. 3%	87. 2%	89. 0%
Dissatisfied	12. 6%	55. 0%	51. 7%	45. 4%	34. 5%	31. 2%	28. 2%	26. 7%	24. 9%	23. 2%	20. 1%	18. 9%	17. 7%	13. 7%	12. 8%	11. 0%

Fig. 1. Results of our satisfaction survey, with 15 specific items arranged in ascending order according to satisfaction percentages.

percentage for pain relief (87.2%) was almost equal to the overall satisfaction rate (87.4%). Baker et al. [15] also found that although both factors influenced satisfaction significantly, pain was a stronger determinant than function was. These findings may suggest that increasing the pain relief provided by TKA can probably improve overall satisfaction most directly. Bourne et al. [7] reported that only 72% of patients were satisfied after TKA with the level of pain relief experienced when going up or down stairs, whereas 85% were satisfied with the level of pain relief experienced when walking on a flat surface.

Although it is widely accepted that TKA produces good results, there is still much to do to minimize postoperative pain for approximately 15% of all patients. However, even when the surgeon is quite skilled, many patients who undergo TKA and experience no complications still report postoperative pain. Brander et al. [16] found that approximately 1 in 8 patients still reports significant pain at 1 year after surgery, despite an absence of clinical or radiographic abnormalities. Many authors [16,17] have found that some factors can predict postoperative pain, including younger age, female sex, the use of a lateral release, the use of a cruciate-sacrificing surgical technique, preoperative depression and anxiety, heightened preoperative pain, and a low pain threshold. Identifying patients at high risk for postoperative pain is critical so that the surgeon can provide detailed preoperative education that will enable patients to have realistic expectations after TKA.

We found that nearly 30% of patients who underwent PS TKA were not satisfied with their ability to climb stairs, an activity that ranked third in our importance survey. Bourne et al. [7] reported only 12.2% of patients were not satisfied with ascending stairs. In Bourne's research, more than half of the patients received CR TKA, while in our study the use of a CR prosthesis was excluded because of small sample size. The midflexion laxity of PS implants might be one possible reason. We are planning to conduct another survey in the near future that will include patients with CR implants, to determine whether there is a difference between the 2 types of implants regarding patient satisfaction.

More than half of the patients in our study were not satisfied with their ability to squat, and squatting was ranked sixth in our importance survey. Squatting requires sufficient range of motion and a strong extensor mechanism. Interestingly, although much effort has been made to achieve a wider degree of flexion, range of motion ranked only ninth in our importance survey and only 25% of our patients were not satisfied with their range of motion. Systematic review and meta-analysis also showed that there was no difference in range of motion between high-flexion PS TKA and standard PS TKA [18,19]. Thus, a high-flexion design may not be as important to patients as we thought, and many patients who are not satisfied with their ability to squat are actually satisfied with their range of motion.

Our study has several limitations, some of which are inherent to any research based on responses to self-administered questionnaires. First, complete follow-up data were available for only 80.4% of our patients. Although we believe that this response rate is acceptable compared with other survey instruments of this type, differences between respondents and nonrespondents can result in a self-selection bias. None of the available demographic parameters could indicate any significant differences between patients who completed the questionnaire and patients who did not. But it is still possible that patients who are dissatisfied with

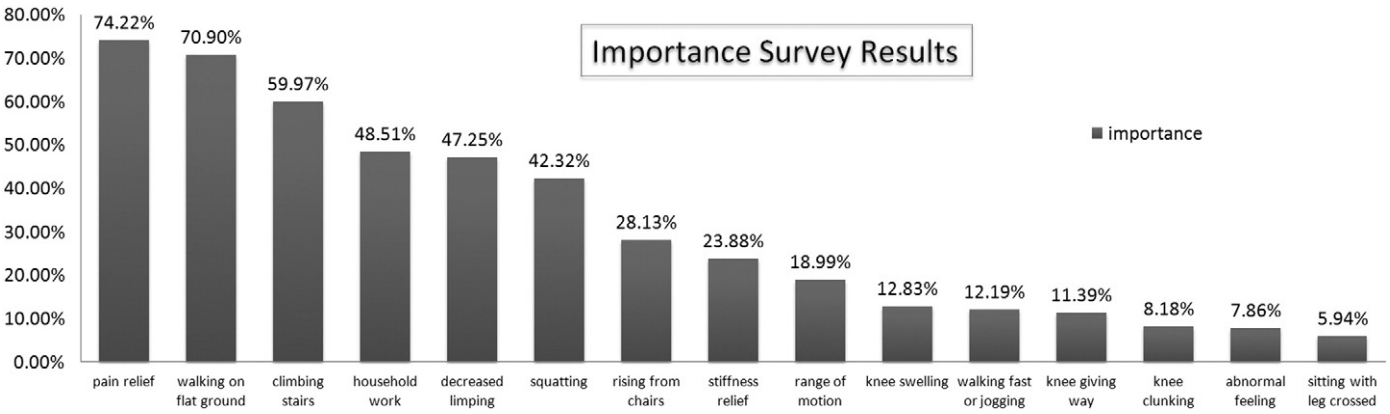


Fig. 2. Results of our importance survey, with 15 items arranged in descending order according to percentages of patients considering each item important.

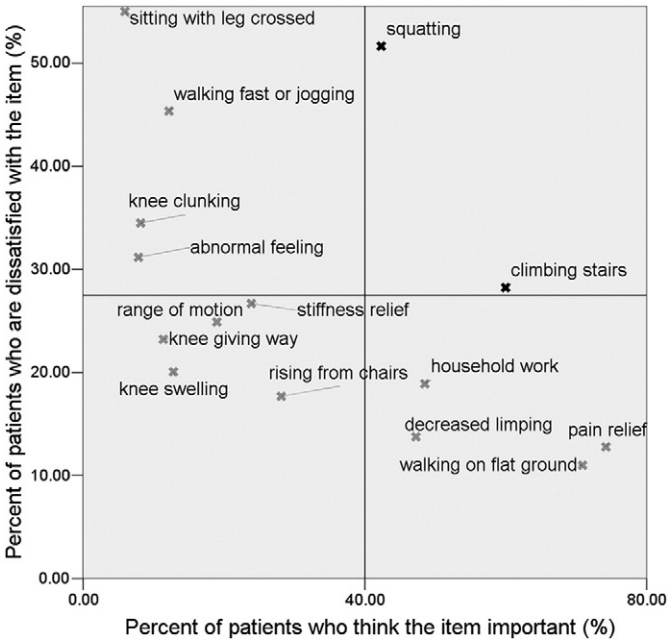


Fig. 3. Scattergram of percentages for dissatisfaction with and importance of each item as evaluated by patients.

Table 1
Comparison of variables between "satisfied" and "dissatisfied" groups.

Variable	Satisfied	Dissatisfied	*P* value
Age (y; mean ± SD)	68.3 ± 8.0	68.3 ± 9.2	.805
Body mass index (mean ± SD)	26.8 ± 3.6	25.9 ± 3.4	.297
Female	81.7%	74.6%	.057
Left side	48.8%	49.2%	.929
Unilateral vs. bilateral TKA			
Unilateral	45.9%	53.1%	
Simultaneous bilateral	44.7%	36.9%	
Staged bilateral	9.4%	10.0%	.192
Covered by insurance			
>70%	1.2%	1.5%	
30%–70%	79.6%	83.1%	
<30%	19.2%	15.5%	.687
Charnley classification			
A	95.6%	91.5%	
B	4.1%	8.5%	
C	0.3%	0	.070
Diagnosis			
Osteoarthritis	95.6%	91.5%	
Rheumatoid arthritis	4.1%	8.5%	
Others	0.3%	0	.070
Tibial platform			
Fixed bearing	93.5%	93.1%	
Mobile bearing	6.5%	6.9%	.840
Preoperative WOMAC scores			
Pain	50.7 ± 17.8	48.8 ± 19.2	.633
Stiffness	54.2 ± 26.6	50.1 ± 26.0	.157
Function	48.9 ± 17.6	47.7 ± 19.0	.686
Total score	49.7 ± 16.4	48.2 ± 17.8	.573
Postoperative WOMAC scores			
Pain	92.5 ± 9.6	79.4 ± 21.2	.000
Stiffness	90.9 ± 13.9	76.6 ± 26.2	.001
Function	90.2 ± 10.6	79.4 ± 14.6	.000
Total score	90.7 ± 9.5	79.1 ± 15.7	.000
Change in WOMAC scores			
Pain	41.9 ± 19.8	30.0 ± 22.4	.007
Stiffness	38.6 ± 28.7	33.0 ± 33.2	.336
Function	40.6 ± 20.1	31.3 ± 20.1	.005
Total score	40.7 ± 18.5	31.2 ± 18.7	.004

Categorical variables are expressed as percentages, and continuous variables as mean ± SD.
P values were considered significant if <.05.
TKA, total knee arthroplasty; WOMAC, Western Ontario and McMaster Universities Arthritis Index.

Table 2
Comparison of reported satisfaction percentages after primary total knee arthroplasty.

Author	N	Duration of follow-up (y)	Satisfaction rate (%)
Anderson et al. [1]	74	1–5.5	89
Noble et al. [2]	253	1	75
Robertsson et al. [3]	27,372	2–17	82
Wylde et al. [4]	228	2	85
Hawker et al. [5]	1193	2–7	85
Heck et al. [6]	291	2	88
Bourne et al. [7]	1703	1	81
Current study	1013	2–7	87

their outcome would be less likely to complete the survey. Second, even though study participants sent back completed questionnaires, accuracy of this survey still relied on the patients' abilities to properly report their feelings. It is hard to tell whether patients unintentionally overstate or understate their satisfaction levels. To minimize the influence of this effect, we gave patients five options (very dissatisfied, dissatisfied, neutral, satisfied, and very satisfied) and combined them into binary system when analyzing. Some patients might report high satisfaction levels than they actually felt, because they were afraid of angering their physicians, although on the questionnaire itself, we assured patients of confidentiality. Third, previous reports show that patient satisfaction is influenced by aging, mental health, socioeconomic status, technical problems (i.e., malalignment), and postoperative complications. We found that it was not influenced by aging, sex, BMI, insurance coverage, diagnosis, or fixed versus mobile bearing. However, we did not include mental status, postoperative complications, or radiologic parameters among the variables in our study. In addition, our survey did not include patients who underwent CR TKA, because they represented too small a sample size compared with patients who underwent PS TKA. We are aware that a comparison of satisfaction rates for PS TKA versus CR TKA would be helpful, and we plan to conduct such a comparison after accumulating sufficient data.

Modern TKA produces high satisfaction rates, especially regarding pain relief, walking on flat ground, and decreased limping. However, Chinese patients are still not satisfied after surgery with their ability to climb stairs or to squat, functions that they consider quite important, so further progress in addressing these concerns is warranted.

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