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Knee Arthroplasty Patients Predicted versus Actual Recovery:

What are their expectations about time of recovery following surgery and how long before they can do the tasks they want to do?

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Conflicts of Interest

None to disclose.

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Knee Arthroplasty Patients Predicted versus Actual Recovery: What are their expectations about time of recovery following surgery and length of time before they can do the tasks they want to do?

Abstract

Objective: (1) To determine evidence-based guidance for the length of time to return to specific valued functional and leisure activities following knee arthroplasty (KA). (2) To determine what patients feel are the most important functional or leisure activities to recover after KA. (3) To collect information about patients' expectations and compare them to the actual time it takes to return.

Design: Prospective longitudinal cohort observational survey

Setting: Specialist orthopaedic hospital

Participants: 99 patients with osteoarthritis or rheumatoid arthritis (mean= 69.9 years old [range 44-88]) listed for Total Knee Arthroplasty (TKA) or Unicompartmental Knee Arthroplasty (UKA)

Interventions: Not applicable

Main Outcome Measure: Valued Activity List (VAL) used to select activities patients expect to return to and report the actual time taken to return.

Results: Participants in UKA group returned to the six most popular valued activities (walking >1km, stairs, housework, driving, gardening and kneeling) 8-33% more quickly than TKA group, and they were satisfied with performing these activities sooner on average (4-18%) than the TKA group. The percentage of participants satisfied at 12 months post-surgery ranged from 96% returning to housework to 36% returning to kneeling. Wilcoxon signed-ranks tests comparing expected time and actual time to return: housework ($Z=-5.631$, $p<0.05$, effect size=0.64) and swimming ($Z=-3.209$, $p<0.05$, effect size=0.59) was quicker than expected and walking > 1km ($Z=-2.324$, $p<0.05$, effect size=0.27) was slower than expected.

Conclusions: A more tailored and personalised approach with consideration of prior level of activity and comorbidities must be taken into account and adequately discussed in order to help bridge the gap between expected and actual recovery time.

Keywords:

Rehabilitation, Expectation, Arthroplasty, Patient education

List of abbreviations:

EQ-5D (Euroqol-5D), KOOS (Knee Injury and Osteoarthritis Outcome), KA (knee arthroplasty), MET (metabolic equivalent of test), OA (osteoarthritis), OKS (Oxford Knee Score), RA (rheumatoid arthritis), TKA (total knee arthroplasty), UKA (unicompartmental knee arthroplasty), VAL (valued activities list), VAS (visual analogue scale)

The decision to undergo a knee arthroplasty is not taken lightly by the patient or the medical team. For many people with arthritis, conservative managements including medication and exercise therapies are successful. For some patients with more persistent problems, an arthroplasty can provide effective pain relief maintain (or improve) their function and quality of life.¹ A large part of the decision-making process when considering a joint arthroplasty is based on personal desired outcomes of function (expectation) and the information given regarding the likely benefits and normal recovery times.

Knee arthroplasty is a successful operation with the majority performed each year in the UK providing good patient outcome and patient satisfaction, which is indicated by increased function and decreased pain ². The National Joint Registry data has revealed that between 10-15% of UK patients undergoing arthroplasty surgery are not satisfied with their outcome.² The National PROMs programme ³⁻⁸ has helped patients by providing a better understanding of the outcome of primary arthroplasty surgery and a decision support for patients ^{9,8}. This population data has allowed us to identify the pre-operative factors that affect outcome and the importance of the patient's perspectives in assessing outcome has been recognized.¹⁰⁻¹³ Expectations of surgery are shaped by multidimensional and complex factors including patient characteristics and diagnosis, information from friends, family and health providers' delivery approach and timing ¹⁴⁻¹⁹. Creating realistic individual expectations of time to recovery is imperative during patients' decision-making about surgery if they are to be satisfied with their clinical outcome. ²⁰.

There remains a gap in the literature in respect to the timeline associated with returning to specific activities valued by the patient. The objectives of this study were to (1) determine evidence based guidance for the length of time to return to specific valued functional and

leisure activities following KA, (2) determine what patients feel were the most important functional or leisure activities to recover after KA, and (3) collect information about patients' expectations and compare them to the actual time it takes to return to activities.

Methods

Participants

Patients were recruited from August 2015 to December 2015 at the Nuffield Orthopaedic Centre in Oxford, United Kingdom. They were included in the study if they were ≥ 18 years old and undergoing a Total Knee Arthroplasty (TKA) or Unicompartamental Knee Arthroplasty (UKA). They were not eligible if they were undergoing KA surgery for a condition other than osteoarthritis (OA) or rheumatoid arthritis (RA) and if they had a planned arthroplasty on the contralateral limb in the following 12 months. All participants gave informed, written consent, and the investigation was approved by the research ethics committee (Reference 15/LO/1507). The medical records of 701 patients were pre-screened, 242 participants met the eligibility criteria, and 107 participants consented and were recruited. Of these, eight did not continue with the study: five surgeries were cancelled or postponed, two died before surgery date, and one operation changed during surgery to an arthroscopy and patellofemoral replacement (Figure 1).

Study design

This study was a prospective longitudinal cohort observational survey containing 4 parts. [i] The development of the Values Activities List (VAL) where patients and experienced clinicians were asked which activities they thought were the most important to return to after KA; [ii] Prior to surgery each patient filled out a VAL to reflect; activities they currently

undertook, those they wished to return to and when they expected to do so.[iii] Follow-up phone calls occurred at five time points post-operatively: 3 weeks, 6 weeks, 3 months, 6 months, and 12 months. Telephone calls were chosen as medical records documentation on return to valued activities was insufficiently detailed. Each call was individualised and based on the patients' VAL with records kept of activities tried and not tried at each time point. This frequent follow-up design aimed to decrease recall bias from the patient. [iv] Finally individual semi-structured interviews were completed with a cohort subset at 12 months post-surgery. Six participants were interviewed, one had a UKA and five had TKA, four of these five had RA. These interviews were conducted, and recorded, by an experienced physiotherapist.

Standard post-operative KA recovery included early mobilisation and knee range of motion exercises. The average length of stay for TKA was 3-4 days and UKA was 2-3 days. Both groups were discharged with a booklet of exercises and attended a routine 6 week follow-up out-patient appointment with the surgeon or consultant physiotherapist.

Outcome measures

Valued Activities List (VAL)

The VAL was the primary outcome measure and was developed for this study as no existing tool or validated instrument was available. This list of 10 activities was derived from consulting patients and experienced surgeons, physiotherapists and occupational therapists involved with KA surgery and rehabilitation. It summarised the functional and leisure activities that patients and health professionals regarded the most important for good outcome following surgery. In addition to the list of 10 most popular activities, the participant could add up to three personal valued activities that were not included in the list. The VAL was divided into 2 sections: the pre-operative section focused on activities the patient would like

to return to and their expectations for how long they thought it would take to do so, whilst the post-operative section recorded when the patient actually returned to the activity.

Oxford Knee Score (OKS)

The OKS is a self-report 12-item questionnaire (each with five response categories) with a range of 0 to 48, with 48 being the best outcome.¹⁹ The questions are specific to the knee joint and are designed to reduce the influence of other joint pathology or illnesses. The OKS has been examined for internal consistency, reproducibility, sensitivity to change and construct validity⁵.

Knee injury and Osteoarthritis Outcome Score – Physical Score (KOOS-PS)

The KOOS-PS is the short form of the KOOS. It has 7 items (each with 5 categories of response) and a total range of 0 to 28, with 0 being the best outcome. It was derived from the KOOS function, daily living and function, sports and recreational activity subscales. It is cross culturally valid and reliable (Cronbach's alpha 0.91) and can be used to measure change in physical function.²⁰

EuroQuol 5D-5L (EQ5D-5L) and EuroQuol Visual Analogue Scale (EQ VAS)

The EQ-5L and EQ VAS are standardised instruments used to measure health outcome. The questionnaire is valid and reliable in the post-operative KA population and contains five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) with five categories of response reflecting levels of severity.^{21,22} A low score (range from 5-25) indicates a better health outcome. The EQ VAS is a standard vertical 20 cm visual analogue scale (0-100) with 100 indicating the highest current health-related quality of life.

Statistical Analysis

The chosen sample size was pragmatic based on the likely numbers needed to reflect a range of views on the VAL. Descriptive statistics were used to characterise the study sample. Data was assessed for normality and as it was not normally distributed the Wilcoxon signed-ranks test was used to compare repeated measures and p-values and effect sizes were calculated. Data were stratified into UKA and TKA groups to compare differences.

Results

Of the 107 patients consented, eight were not analysed since they did not undergo a KR during the time frame. The baseline measures of these eight participants were within the norms of all baseline data enabling exclusion from analysis. The full sample (n=99) averaged 69.9 years of age (range 46-88), 60% female; TKA (n=41) average age 71.2 years old (range 54-88), 68% female; and UKA (n=58) average age 68.9 years old (range 46-87), 53% female (Table 1). There were five patients with RA who underwent TKA surgery. Seventy-nine patients completed the 12 month follow-up phone call and 77 completed the 12 month follow-up self-report outcome questionnaires. The 20 patients who dropped out did not differ significantly in demographics, VAL expectations or baseline questionnaire scores. The attrition rate was expected in this older target population with reasons described in Figure 1.

Self-reported outcome measures compared pre-surgery and 12 months post-surgery improved. The OKS, KOOS-PS and EQ5D-5L had large effect sizes and the EQ5D-VAS had a low effect size in the full sample with a similar pattern when stratified by replacement type (Table 2). The EQ5D-VAS in the TKA group was the only measure that did not show significance ($p>0.05$) and had a low effect size.

Participants who underwent a UKA returned to the six most popular valued activities (walking >1km, stairs, housework, driving, gardening and kneeling) 8-33% more quickly than those with a TKA. The UKA group was satisfied with how they were performing these activities slightly sooner on average (4-18%) than the TKA group (Further details in Tables 3 and 4). The satisfaction in returning to the most popular activities by 12 months post-operatively was widespread, from housework (96% satisfaction) to kneeling (36% satisfaction). When comparing satisfaction between the UKA and TKA groups, a higher percentage of the UKA group (96%) returned to normal stair climbing compared to TKA (88%) with 13% of UKA and 30% of the TKA patients not satisfied with their recovery (Tables 3 and 4). Also seen in Table 3 is the high rate of dissatisfaction in cycling and sport in the TKA group, yet with a small sample size ($n=11$ and $n=10$, respectively) these were the least popular activities to return to.

The gap between expected time and actual time to return to the activity was difficult to define due to the large variance in data sets. From the Wilcoxon signed-ranks tests comparing expected time and actual time to return, there were a five activities that did have a significant difference between expectation and actual return. Participants returned to housework ($Z=-5.631$, $p<0.05$, effect size=0.64) and swimming ($Z=-3.209$, $p<0.05$, effect size=0.59) more quickly than expected, and conversely, returned to walking > 1km ($Z=-2.324$, $p<0.05$, effect size=0.27) more slowly than expected (Table 5).

The results show that recovery from a UKA is faster as patients consistently returned to activities and felt comfortable and satisfied with the activities before the TKA group (Table 6 and Figure 2), with the exception of normal stair climbing where satisfaction occurred at the same time.

Discussion

The six most important activities for patients to return to following KA were walking > 1km, normal stair climbing, housework, driving, gardening and kneeling with more than 70% of participants expecting to return to them. Figure 2 now gives us a tool to use with patients enquiring about the length of time it takes to return to these popular activities and highlights a need to address these activities during patient education before and after surgery. It also highlights the marked variation in expectation and satisfaction with the various activities which should also be highlighted in pre-operative education.

While there is consistent evidence that a KA positively affects pain, physical function and quality of life¹, Harding et al²³ showed no significant change in physical activity levels before and after TKA or total hip arthroplasty. Jones et al²⁴ showed improvement in metabolic equivalent of test (METs) at 12 months post-surgery compared to pre-surgery; however, the participants' reported expectations before surgery were more than double the amount of METs than actually achieved at 12 months. This mismatch in expectation versus reality is also reflected in our results in terms of the percentages of participants returning to activities, especially higher demand sporting activities such as cycling and swimming. The number of patients who were not satisfied with these activities suggests that they would be performing them less often.

The reasons behind a patient not returning to an activity range from loss of confidence to overly optimistic expectations. From the qualitative interviews, a 66 year-old woman (UKA) said at 12 months post-surgery: "My expectations that I put on the form were optimistic. Partly because I'm that kind of person, I want to do things very quickly and, you know, frankly I'm sometimes a bit flippant, I'm thinking 'everybody can do it in 6 weeks, why can't

I do it in 3 weeks, right?’’ This reflects unrealistic expectations set by some patients, perhaps due to the lack of pre-operative information During her recovery, she returned to all activities, but not as soon as she expected for “fear that I damage it.”

The wife of a 77 year-old man (TKA) said about his expectations pre-surgery: “I can remember at the interview that he had when he was saying all these ambitions and I thought, ‘Oh well, it won’t do any harm to let him think,’ and one day there might be a miracle, you never know, but realistically it wasn’t on.” This man’s optimistic expectations were unrealistic and did not fit the KA rehabilitation norms secondary to his underlying comorbidities. Again, this highlights the importance of realistic patient education tailored to each patient’s physical state.

The 12 months of intermittent phone calls revealed that many of these comorbidities and limitations following knee surgery prevented patients from achieving their expected goals. Participants reported various limitations, such as low back and contralateral lower extremity pain, deteriorating vision, poor balance and fear. Additionally they reported other conditions that limited their activities, including: cardiorespiratory conditions, multiple sclerosis, Parkinson’s disease and RA. The effect of comorbidity can be seen in the questionnaires in which there was a large effect size pre and post-surgery in OKS, KOOS and EQ5L, however a small effect size (and no significant difference in the TKA group) in the EQ-VAS which reflects the overall health status was influenced by many factors (Table 2).

In addition to considering comorbidity during recovery from KA, there is also a distinction to be drawn between TKA and UKA recovery. We recognise that the baseline data and VAL’s reflect a UKA group that is a slightly younger and generally more active. However, these

differences at baseline were not statistically significant and may not account for the difference in activity resumption between the groups, which is likely to be multifactorial. The UKA group had a higher percentage who expected to return to activities such as swimming, cycling and sport. This highlights the importance of educating those patients who want to return to higher levels of activity versus more functional activities, such as driving and stair climbing. Overwhelmingly the most important activity to return to in both groups was some form of walking, for example: walking without pain, increasing the walking distance, improving the walking quality or returning to walking involved in social activities. Although not listed as any participant's most important activity, 78% wanted to return to kneeling and this stood out in both groups as there was a high discrepancy between the number of participants wanting to return to it and the number who were satisfied with it at 12 months post-surgery (36%). Participants reported reasons that prevented them from kneeling: pain, numbness or discomfort, fear of damaging the KA and an inability to get up from kneeling. Jenkins et al ²⁵ showed there was a significant improvement in ability to kneel 12 months post-operatively in a group of UKA patients who were taught to kneel at 6 weeks post-operatively showing there is no physiological reason why patients cannot kneel, but the knowledge and confidence to do so often poses a limitation. Additionally, participants listed other activities on their VAL (i.e. jumping, sailing, ice skating, golf, skiing, jogging and yoga) and their success in returning to these activities varied based on their previous level of activity.

In our cohort of 99 participants, RA was slightly over-represented (5%) where the national average of patients with RA having KA surgery is 1% according to the UK National Joint Registry ²⁸. Statistical power is lacking due to the number of RA participants recruited in this study but their documented progress and qualitative feedback points to the overall influence

of systemic RA symptoms and disability. Two of the participants with RA had progressive symptoms that impaired and disabled both lower and upper extremity joints. These participants had decreased pain in the operated knee, yet a poorer functional recovery including continued dependence for some daily activities and primarily home-bound mobility. The other two participants with RA interviewed had very few systemic symptoms from RA and they did not feel that it influenced their recovery.

Study Limitations

The limitations in this study revolve around the reliance on patient reporting. While the study conducted multiple phone calls throughout a 12 month period to capture more data and to decrease non-adherence rates compared to if only a 12 month diary was used, there remains the inherent limitation of patient reporting. Our phone calls also could have acted as a motivating factor and thus an unintentional intervention skewing the results to better than typical recovery times. Agreement to participate in this study could have also self-selected a cohort who was slightly more motivated than the general population. Additionally, some of the activities had relatively few patients returning to them, i.e. return to work (TKA/UKA= 12/14), swimming (TKA/UKA= 11/14), cycling (TKA/UKA= 4/12) and return to sport (TKA/UKA= 5/10), making the sample too small to draw out norms.

Conclusions

The clinical implications of this study focus on improving patient education for return to various realistic levels of activities following KA surgery. A general guideline to returning to activities should be based on a tissue healing time line and should be discussed pre-operatively. However, a more tailored and personalised approach with consideration of pre-

operative levels of activity and comorbidities should be taken into account and discussed in order to help bridge the gap between expected and actual recovery.

References

1. Singh JA, Lewallen DG. Medical and psychological comorbidity predicts poor pain outcomes after total knee arthroplasty. *Rheumatology*. 2013;52(5):916-923. doi:10.1093/rheumatology/kes402.
2. 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 Vol*. 2007;89-B(7):893-900. doi:10.1302/0301-620X.89B7.19091.
3. 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 Vol*. 2010;92-B(9):1253-1258. doi:10.1302/0301-620X.92B9.24394.
4. Winter J. *Patient Reported Outcome Measures (PROMs) in England – Data Quality Note Patient Reported Outcome Measures (PROMs) in England – Finalised Data for April 2014 to March 2015.*; 2016. <http://content.digital.nhs.uk/catalogue/PUB21189/final-proms-eng-apr14-mar15-data-qual-note.pdf>. Accessed July 18, 2017.
5. Dawson J, Fitzpatrick R, Carr A, Murray D. Questionnaire on the perceptions of patients about total hip replacement. *J Bone Joint Surg Br*. 1996;78(2):185-190. <http://www.ncbi.nlm.nih.gov/pubmed/8666621>.
6. Dawson J, Fitzpatrick R, Murray D, Carr A. Questionnaire on the perceptions of patients about total knee replacement. *J Bone Joint Surg Br*. 1998;80(1):63-69. <http://www.ncbi.nlm.nih.gov/pubmed/9460955>.

7. Clement ND, MacDonald D, Howie CR, Biant LC. The outcome of primary total hip and knee arthroplasty in patients aged 80 years or more. *J Bone Joint Surg Br.* 2011;93(9):1265-1270. doi:10.1302/0301-620X.93B9.25962.
8. Judge A, Arden NK, Kiran A, et al. Interpretation of patient-reported outcomes for hip and knee replacement surgery: identification of thresholds associated with satisfaction with surgery. *J Bone Joint Surg Br.* 2012;94(3):412-418. doi:10.1302/0301-620X.94B3.27425.
9. Elwyn G, Laitner S, Coulter A, Walker E, Watson P, Thomson R. Implementing shared decision making in the NHS. *BMJ.* 2010;341:c5146. <http://www.ncbi.nlm.nih.gov/pubmed/20947577>.
10. Woolhead GM, Donovan JL, Dieppe PA. Outcomes of total knee replacement: a qualitative study. *Rheumatology.* 2005;44(8):1032-1037. doi:10.1093/rheumatology/keh674.
11. Peters TJ, Sanders C, Dieppe P, Donovan J. Factors associated with change in pain and disability over time: a community-based prospective observational study of hip and knee osteoarthritis. *Br J Gen Pract.* 2005;55(512):205-211. <http://www.ncbi.nlm.nih.gov/pubmed/15808036>.
12. Hawker GA. Who, when, and why total joint replacement surgery? The patient's perspective. *Curr Opin Rheumatol.* 2006;18(5):526-530. doi:10.1097/01.bor.0000240367.62583.51.
13. Gossec L, Paternotte S, Maillefert JF, et al. The role of pain and functional impairment in the decision to recommend total joint replacement in hip and knee osteoarthritis: an international cross-sectional study of 1909 patients. Report of the OARSI-OMERACT Task Force on total joint replacement. *Osteoarthr Cartil.* 2011;19(2):147-154. doi:10.1016/j.joca.2010.10.025.
14. Mancuso CA, Sculco TP, Wickiewicz TL, et al. Patients' expectations of knee surgery. *J Bone Joint Surg Am.* 2001;83-A(7):1005-1012. <http://www.ncbi.nlm.nih.gov/pubmed/11451969>.
15. Mahomed NN, Liang MH, Cook EF, et al. The importance of patient expectations in

- predicting functional outcomes after total joint arthroplasty. *J Rheumatol.* 2002;29(6).
<http://www.jrheum.org/content/29/6/1273.long>.
16. Bullens PH, van Loon CJ, de Waal Malefijt MC, Laan RF, Veth RP. Patient satisfaction after total knee arthroplasty: a comparison between subjective and objective outcome assessments. *J Arthroplasty.* 2001;16(6):740-747. doi:10.1054/arth.2001.23922.
17. Noble PC, Conditt 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. doi:10.1097/01.blo.0000238825.63648.1e.
18. Mannion AF, Kämpfen S, Munzinger U, Kramers-de Quervain I. The role of patient expectations in predicting outcome after total knee arthroplasty. *Arthritis Res Ther.* 2009;11(5):R139. doi:10.1186/ar2811.
1. Barlow T, Scott P, Griffin D, Realpe A. How outcome prediction could affect patient decision making in knee replacements: A qualitative study. *BMC Musculoskelet Disord.* 2016;17(1):1-11. doi:10.1186/s12891-016-1165-x.
20. de Achaval S, Kallen MA, Amick B, et al. Patients' expectations about total knee arthroplasty outcomes. *Heal Expect.* 2016;19(2):299-308. doi:10.1111/hex.12350.
21. Murray DW, Fitzpatrick R, Rogers K, et al. The use of the Oxford hip and knee scores. *Bone Joint J.* 2007;89-B(8). <http://bjj.boneandjoint.org.uk/content/89-B/8/1010.long>.
22. Perruccio A V., Stefan Lohmander L, Canizares M, et al. The development of a short measure of physical function for knee OA KOOS-Physical Function Shortform (KOOS-PS) - an OARSI/OMERACT initiative. *Osteoarthr Cartil.* 2008;16(5):542-550. doi:10.1016/j.joca.2007.12.014.
23. Fransen M, Edmonds J. Reliability and validity of the EuroQol in patients with osteoarthritis of the knee. *Rheumatol.* 1999;38:807-813. doi:10.1093/rheumatology/38.9.807.

24. Conner-Spady BL, Marshall DA, Bohm E, et al. Reliability and validity of the EQ-5D-5L compared to the EQ-5D-3L in patients with osteoarthritis referred for hip and knee replacement. *Qual Life Res.* 2015;24(7):1775-1784. doi:10.1007/s11136-014-0910-6.
25. Harding P, Holland AE, Delany C, Hinman RS. Do activity levels increase after total hip and knee arthroplasty? *Clin Orthop Relat Res.* 2014;472(5):1502-1511. doi:10.1007/s11999-013-3427-3.
26. Jones DL, Bhanegaonkar AJ, Billings AA, et al. Differences between actual and expected leisure activities after total knee arthroplasty for osteoarthritis. *J Arthroplasty.* 2012;27(7):1289-1296. doi:10.1016/j.arth.2011.10.030.
27. Jenkins C, Barker KL, Pandit H, Dodd CAF, Murray DW. After partial knee replacement, patients can kneel, but they need to be taught to do so: a single-blind randomized controlled trial. *Phys Ther.* 2008;88(9):1012-1021. doi:10.2522/ptj.20070374.
28. *National Joint Registry.* [http://www.njrreports.org.uk/Portals/0/PDFdownloads/NJR 13th Annual Report 2016.pdf](http://www.njrreports.org.uk/Portals/0/PDFdownloads/NJR%2013th%20Annual%20Report%202016.pdf). Accessed July 18, 2017.

Suppliers' list

Not applicable.

Figure legends

Figure 1. Participant flow chart

Figure 2. Length of bars represent the average time that patients started an activity until the average time they reported to be satisfied with the activity. (%) = (patients who reported they are satisfied with the activity / patients who expected to return to the activity) x 100.

Table 1. Baseline characteristics

	Full sample (n=99)	TKA (n=41)	UKA (n=58)
Age (y), mean \pm SD (range)	69.9 \pm 9.08 (46-88)	71.17 \pm 8.91 (54-88)	68.86 \pm 9.21 (46-87)
Gender (male:female)	40:59	13:28	27:31
Side (right:left)	55:44	22:19	33:25
Rheumatoid arthritis	5 (5.1%)	5 (12.2%)	

Table 2. Self-report Outcome Measures

	Outcome measure	Pre-surgery	12 months post-surgery	Wilcoxon Signed Ranks Test	Effect size
All mean \pm SD (range)	Oxford Knee Score (0-48)*	20.46 \pm 7.39 (3-37)	37.86 \pm 8.54 (7-48)	Z= -7.600, p<0.05	0.87
	KOOS-physical function (0-28)†	17.41 \pm 4.51 (4-28)	8.31 \pm 5.77 (0-25)	Z= =7.375, p<0.05	0.85
	EQ5D-5L (5-25)†	12.57 \pm 2.90 (6-21)	8.46 \pm 3.51 (5-19)	Z= -7.064, p<0.05	0.81
	EQ5D-VAS (0-100)*	68.72 \pm 18.94 (20-100)	76.75 \pm 19.55 (15-100)	Z= -3.296, p<0.05	0.38
TKA mean \pm SD (range)	Oxford Knee Score (0-48)*	18.76 \pm 7.99 (3-37)	37.66 \pm 8.60 (13-48)	Z= -5.014, p<0.05	0.87
	KOOS-physical function (0-28)†	17.91 \pm 4.33 (8-28)	9.06 \pm 6.13 (0-22)	Z= -4.905, p<0.05	0.87
	EQ5D-5L (5-25)†	13.16 \pm 3.17 (8-21)	9.06 \pm 3.77 (5-19)	Z= -4.479, p<0.05	0.79
	EQ5D-VAS (0-100)*	69.78 \pm 19.66 (20-100)	74.10 \pm 20.39 (20-97)	Z= -1.133, p=0.257	0.20
UKA mean \pm SD (range)	Oxford Knee Score (0-48)*	21.63 \pm 6.65 (5-36)	38.35 \pm 8.37 (7-48)	Z= -5.732, p<0.05	0.86
	KOOS-physical function (0-28)†	17.05 \pm 4.65 (4-24)	7.74 \pm 5.49 (0-25)	Z= -5.543, p<0.05	0.84
	EQ5D-5L (5-25)†	12.16 \pm 2.66 (6-18)	8.00 \pm 3.27 (5-19)	Z= -5.415, p<0.05	0.82
	EQ5D-VAS (0-100)*	67.95 \pm 18.59 (20-99)	78.67 \pm 19.19 (15-100)	Z= -3.380, p<0.05	0.51

* A higher number indicates a better score

† A lower number indicates a better score

Table 3. TKA activity results from the VAL: pre-surgery to 12 months post-surgery

Activity	Number of participants expecting to return to the activity (%; n=41)	Percentage of expecting participants who returned to the activity	Average expected time to return to activity (days \pm SD (range))	Average actual time to return to activity (days \pm SD (range))	Average time at which patients were <i>satisfied</i> with activity (days \pm SD (range))	Percentage of patients who returned to the activity but <i>NOT satisfied</i> at 12-months
Normal Stairs	35 (85%)	88%	52.8 \pm 63.05 (2-365)	50.4 \pm 39.82 (1-152)	98.6 \pm 84.97 (27-305)	30%
Walking > 1km	34 (83%)	79%	77.4 \pm 52.75 (14-274)	60.1 \pm 54.68 (7-274)	92.7 \pm 66.58 (24-274)	15%
Housework	33 (81%)	100%	42.8 \pm 37.28 (7-182)	21.6 \pm 19.68 (2.5-90)	62.0 \pm 49.35 (4-243)	3%
Gardening	33 (81%)	93%	90.9 \pm 60.52 (14-274)	82.5 \pm 57.71 (28-274)	131.5 \pm 68.63 (28-305)	15%
Driving	31 (76%)	97%	41.7 \pm 20.86 (7-106.5)	58.3 \pm 46.73 (14-244)	67.9 \pm 49.33 (21-213)	7%
Kneeling	29 (71%)	85%	81.7 \pm 55.86 (14-274)	97.1 \pm 67.27 (28-273)	170.9 \pm 81.51 (63-335)	59%
Work	18 (44%)	75%	54.3 \pm 32.17 (1-122)	59.9 \pm 31.29 (8-105.5)	81.7 \pm 44.23 (8-122)	17%
Swimming	14 (34%)	86%	60.8 \pm 31.39 (28-123)	104.7 \pm 72.22 (28-242)	129.4 \pm 86.16 (31.5-244)	9%
Cycling	11 (27%)	40%	88.8 \pm 96.11 (28-365)	83.9 \pm 52.81 (35-136.5)	93.5 \pm 82.73 (35-152)	50%
Sport	10 (24%)	60%	77.9 \pm 37.25 (28-122)	105.8 \pm 81.82 (4-244)	135.7 \pm 101.80 (42-244)	40%

Table 4. UKA activity results from the VAL: pre-surgery to 12 months post-surgery

Activity	Number of participants expecting to return to the activity (%; n=58)	Percentage of expecting participants who returned to the activity	Average expected time to return to activity (days \pm SD (range))	Average actual time to return to activity (days \pm SD (range))	Average time at which patients were <i>satisfied</i> with activity (days \pm SD (range))	Percentage of patients who returned to the activity but <i>NOT satisfied</i> at 12-months
Walking >1KM	54 (93%)	94%	62.5 \pm 48.79 (7-213)	51.0 \pm 46.57 (11-274)	80.4 \pm 66.42 (14-274)	4%
Normal Stairs	51 (88%)	96%	40.6 \pm 32.81 (2-183)	38.7 \pm 40.25 (2-213)	95.0 \pm 95.47 (2-335)	13%
Driving	50 (86%)	94%	37.9 \pm 18.75 (7-92)	37.5 \pm 29.33 (14-198)	60.5 \pm 49.75 (19-244)	4%
Housework	48 (83%)	100%	38.5 \pm 31.90 (2-182)	15.6 \pm 12.63 (2-75)	52.0 \pm 48.86 (7-274)	7%
Kneeling	48 (83%)	88%	82.4 \pm 64.26 (7-365)	65.9 \pm 41.61 (14-183)	164.3 \pm 93.34 (37-335)	57%
Gardening	47 (81%)	84%	65.2 \pm 67.20 (7-365)	76.2 \pm 58.65 (7-183)	128.4 \pm 70.29 (21-304)	15%
Swimming	27 (47%)	69%	66.2 \pm 76.80 (14-365)	92.5 \pm 55.57 (14-167.5)	126.6 \pm 67.34 (28-274)	17%
Cycling	24 (41%)	65%	65.6 \pm 49.70 (14-213)	92.7 \pm 88.46 (9-304)	146.0 \pm 91.77 (42-304)	31%
Sport	21 (36%)	75%	100.6 \pm 93.25 (21-365)	113.5 \pm 67.73 (35-244)	183.8 \pm 79.58 (56-275)	10%
Work	19 (33%)	90%	54.7 \pm 41.12 (7-182)	62.4 \pm 63.35 (7-243)	65.2 \pm 45.25 (10.5-153)	12%

Table 5. Wilcoxon Signed-Ranks Test for VAL

	ALL				TKA				UKA			
	N	Z	p (asyp. sig., 2- tailed)	r (effect size)	N	Z	p (asyp. sig., 2- tailed)	r (effect size)	N	Z	p (asyp. sig., 2- tailed)	r (effect size)
Housework	78	-5.631	0.000*	0.64	33	-3.852	0.000*	0.67	45	-4.175	0.000*	0.62
Walking >1KM	76	-2.324	0.020*	0.27	27	-1.454	0.146	0.28	49	-1.829	0.067	0.26
Normal stair climbing	75	-0.523	0.601	0.06	29	-0.811	0.417	0.15	46	-1.327	0.185	0.20
Driving	72	-0.498	0.618	0.06	28	-2.121	0.034*	0.40	44	-1.096	0.273	0.17
Gardening	64	-1.117	0.264	0.14	28	-0.524	0.600	0.10	36	-2.059	0.040*	0.34
Kneeling	59	-0.608	0.543	0.08	22	-1.201	0.230	0.26	37	-1.925	0.054	0.32
Swimming	30	-3.209	0.001*	0.59	12	-1.647	0.099	0.48	18	-2.811	0.005*	0.66
Return to work	29	-1.499	0.134	0.28	12	-1.687	0.092	0.49	17	-0.440	0.660	0.11
Sporting activities	19	-0.402	0.687	0.09	6	0.000	1.000	0.00	13	-0.594	0.552	0.16
Cycling	17	-2.017	0.044	0.49	4	-1.604	0.109	0.80	13	-1.503	0.133	0.42

*p<0.05

Table 6. Guideline for returning to activities after a knee replacement surgery

	TKA		UKA	
	First try of activity	Feel comfortable / satisfied with activity	First try of activity	Feel comfortable / satisfied with activity
Walking >1km	8.5 weeks	3 months	7 weeks	11.5 weeks
Normal Stairs	7 weeks	3.5 months	5.5 weeks	13.5 weeks
Housework	3 weeks	9 weeks	2 weeks	7.5 weeks
Driving	8.5 weeks	9.5 weeks	5 weeks	8.5 weeks
Gardening	12 weeks	4.5 months	11 weeks	4 months
Kneeling	14 weeks	6 months	9.5 weeks	5.5 months



