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ORIGINAL ARTICLE

Retrospective Cohort Study

Eight of ten patients return to daily activities, work, and sports after total knee arthroplasty

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Abstract

BACKGROUND

Besides return to work (RTW) and return to sports (RTS), patients also prefer to return to daily activities (RTA) such as walking, sleeping, grocery shopping, and domestic work following total knee arthroplasty (TKA). However, evidence on the timelines and probability of patients' RTA is sparse.

AIM

To assess the percentage of patients able to RTA, RTW, and RTS after TKA, as well as the timeframe and influencing factors of this return.

METHODS

A retrospective cohort study with prospectively collected data was conducted at a medium-sized Dutch orthopedic hospital. Assessments of RTA, RTW, and RTS were performed at 3 mo and/or 6 mo following TKA. Investigated factors encompassed patient characteristics, surgical characteristics, and preoperative patient-reported outcomes.

RESULTS

TKA patients [n = 2063; 66 years old (interquartile range [IQR]: 7 years); 47% male; 28 kg/m^2 (IQR: 4 kg/m^2)] showed RTA ranging from 28% for kneeling to 94% for grocery shopping, with 20 d (IQR: 27 d) spent for putting on shoes to 74 d (IQR: 57 d) for kneeling. RTW rates varied from 62% for medium-impact work to 87% for low-impact work, taking 33 d (IQR: 29 d) to 78 d (IQR: 55 d). RTS ranged from 48% for medium-impact sports to 90% for low-impact sports, occurring within 43 d (IQR: 24 d) to 90 d (IQR: 60 d). One or more of the investigated factors influenced the return to each of the 14 activities examined, with R^2 values ranging from 0.013 to 0.127.

CONCLUSION
Approximately 80% of patients can RTA, RTW, and RTS within 6 mo after TKA. Return is not consistently influenced by predictive factors. Results help set realistic pre- and postoperative expectations.

Key Words: Knee; Arthroplasty; Replacement; Return to work; Return to daily activities; Return to sports

Core Tip: Everyday, patients with knee osteoarthritis and knee arthroplasty are seen in consultation rooms. In this large sample study (n = 2063 patients), approximately 80% of patients were able to return to daily activities, work, and sports within 6 mo after total knee arthroplasty. Return was not consistently influenced by identifiable predictive factors. This new knowledge creates realistic pre- and postoperative expectations.

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INTRODUCTION

In cases where conservative treatment is ineffective, total knee arthroplasty (TKA) is an established intervention for patients with end-stage osteoarthritis. TKA alleviates pain, restores function, and improves quality of life[1-3]. The prevalence of osteoarthritis is projected to increase 40% between 2015 and 2040. In combination with the rising prevalence of obesity and longer life expectancy, physical activity has become a crucial component of successful aging[4-6].

Physical activity following TKA encompasses return to daily activities (RTA), return to work (RTW), and return to sports (RTS). Wide ranges of RTW and RTS rates have been reported[7,8]. Nevertheless, there is limited evidence regarding RTA such as walking, sleeping, grocery shopping, and domestic work after TKA.

Moreover, recommendations regarding RTA, RTW, and RTS following TKA significantly vary among Dutch hospitals and clinics[8]. Consequently, these discrepancies contribute to a lack of consistent evidence and suboptimal implementation when evidence is available.

Therefore, evidence-based patient-specific recommendations are essential for setting realistic patient expectations[9]. Accordingly, this study assessed the percentage of patients able to RTA, RTW, and RTS after TKA. As a secondary goal, this study investigated the timeframe for this return and identified the influencing factors. It was hypothesized that the majority of patients will successfully RTA, RTW, and RTS within 6 mo after TKA.

MATERIALS AND METHODS

Patients and setting

A retrospective cohort study with prospectively collected data of primary TKA patients was conducted. The study involved patients who underwent TKA from August 2019 to November 2022 at a medium-sized Dutch orthopedic hospital (Kliniek ViaSana, Mill, The Netherlands). Patients were characterized by an American Society of Anesthesiologists (ASA) score of I-II and body mass index (BMI) ≤ 35 kg/m^2.

As part of routine clinical practice, patients started doing exercises guided by a physiotherapist within a few hours after surgery. Approximately 4 d post-surgery, patients started home-based physiotherapy. Furthermore, these patients were advised to gradually resume daily activities and swimming (no breaststroke) 4 wk post-surgery, engage in low-impact sports and work 6 wk post-surgery, and participate in swimming (all techniques), medium-impact sports, and work 3 mo post-surgery. Patients were also advised to avoid engagement in heavy-impact sports (*e.g.*, squash, contact sports, and running) and work (*e.g.*, construction, paving, and plumbing). Patients were encouraged not to rush these returns and to do so only when they felt ready.

Eligibility for inclusion required informed consent for the use of anonymized data for scientific analysis prior to undergoing primary TKA and completion of a questionnaire at 3 mo and/or 6 mo after TKA. The institutional review board determined that formal approval was not required.

Outcomes and measurements

Primary outcome focused on the percentage of respondents who had returned to daily activities, work, and sports following TKA. This was evaluated separately at 3 mo and 6 mo postoperatively. These timeframes were determined during an expert consensus meeting involving three experienced high-volume orthopedic knee surgeons. These timeframes were based on clinical practice when the majority of patients returned to the activities. A total of 14 different

activities related to daily life, work, or sports were assessed *via* questionnaire at 3 mo. Daily life activities consisted of night rest, walking without aid, stair climbing, grocery shopping, domestic work, putting on shoes/socks, kneeling, driving a car, and outdoor cycling. Work-related activities included low-impact work (*e.g.*, office or education) and medium-impact work (*e.g.*, healthcare, painter, or hospitality industry). Sports activities assessed included low-impact sports (*e.g.*, walking or cycling), medium-impact sports [*e.g.*, full-swing golf, fitness, dancing, skiing, and tennis (no competitions)], and swimming. At the 6-mo follow-up, reassessment focused on kneeling, medium-impact work, medium-impact sports, and swimming. Participants indicated whether they had resumed each activity (yes, no, or not applicable). 'Not applicable' was defined as activities not aligning with the patient's pre-surgery lifestyle (*e.g.*, not employed in a low-impact job sector or lacking a driver's license). The first secondary outcome included the time to RTA, RTW, and RTS measured in days. Patients who reported being able to return to a certain activity were asked to provide the date of their return (dd/mm/yyyy).

The second secondary outcome involved identifying potential predictive factors for returning to each activity individually. These factors were determined through literature review, expert opinions, and their availability[10-16]. Factors were categorized into patient characteristics, surgical characteristics, and preoperative patient-reported outcomes (PROs). Investigated patient characteristics included age (years), sex (male = 0, female = 1), BMI (kg/m^2), ASA (I = 0 or II = 1), Charnley classification, diagnosis (osteoarthritis = 1, other = 0), history of previous knee surgery (yes = 1, no = 0), smoking status (yes = 1, no/quit = 0), and alcohol consumption (yes = 1, no/quit = 0)[10-12,17-20]. Surgical characteristics examined were anesthesia technique (general = 0, spinal = 1), operative duration (min from time of incision to a closed wound), and occurrence of complications (yes = 1, no = 0). Both patient and surgical characteristics were obtained from the electronic patient records. The studied preoperative PROs included pain at rest and pain during activity, function, and quality of life. Pain scores were measured using the Numeric Rating Scale (NRS) on a scale from 0 (no pain) to 10 (worst imaginable pain). Function was evaluated using the Knee Injury and Osteoarthritis Outcome Score - Physical Function Short Form scored from 0 (no difficulty) to 100 (extreme difficulty)[21]. Combined pain and function were measured with Oxford Knee Score (OKS) scored from 0 (most severe symptoms) to 48 (least severe symptoms)[22]. Furthermore, quality of life was assessed with the 5-level version of the EuroQol 5 dimensions (EQ-5D-5L) consisting of a Visual Analogue Scale (EQ VAS) and descriptive system (EQ-5D descriptive system). EQ VAS was scored from 0 (worst imaginable health state) to 100 (best imaginable health state)[23].

Preoperative PROs were primary collected digitally (OnlinePROMs, Interactive Studios-Hertogenbosch, The Netherlands). In case that a patient was not able to handle a computer, paper forms were sent. Postoperative RTA, RTW, and RTS were exclusively collected digitally. A maximum of two digital reminders were sent.

Statistical analysis

Data were analyzed using SPSS version 29.0 (IBM Corp, Armonk, NY, United States). Differences between patients who completed the questionnaires at 3 mo and/or 6 mo (respondents) and patients who did not respond to the questionnaires (non-respondents) were examined to evaluate the generalizability of results. *T*-tests were used for normally distributed data, Mann-Whitney *U* test for not normally distributed data, and χ^2 tests for categorical data. Descriptive statistics are reported as the mean with SD, median with interquartile range (IQR), or number with percentages.

Primary outcome was calculated by dividing the number of patients who had returned to a specific activity by the number of patients who completed the corresponding question minus the number of patients for whom the activity was not applicable or not applicable anymore. In cases where activities were queried at both 3 mo and 6 mo, within-6-mo scores were created by merging 3-mo and 6-mo responses. When patients indicated a return at 6 mo, this response overruled 3-mo responses. If a patient responded with 'yes' or 'no' at 3 mo and 'no' or 'not applicable' at 6 mo for a certain activity, their return to that activity was considered not applicable anymore. Percentages were calculated for each activity separately. Mean percentages of RTA, RTW, and RTS were calculated by dividing the sum of percentages for RTA, RTW, or RTS by the number of activities in each respective category.

The first secondary outcome, time to return to an activity, was calculated for each activity by subtracting the date of surgery from the date of return to that activity. If patients provided responses for time to return for activities queried at both 3 mo and 6 mo, the 3-mo responses were utilized unless the differences fell within a 14-d timeframe. When differences exceeded the 14-d timeframe, time to return was defined as missing value. This was the case for 2.1% of the outcomes for medium-impact sports, 2.8% of the outcomes for swimming and medium-impact work, and 5.1% of the outcomes for kneeling. For each activity, the distribution of answers for the time to return in days was assessed using histograms accompanied by Shapiro-Wilk tests. Descriptive statistics are reported based on the distribution of the data as follows: Mean and SD if data were normally distributed; median and IQR if data were not normally distributed; and mode with percentage if more than 50% of the responses were similar.

For the second secondary outcome, logistic regression models were applied to evaluate the factors influencing patients' return to each activity separately (no = 0, yes = 1). Initially, the presence of missing values was investigated, revealing that these were below 15% (≤ 3.4%) for all factors and thus considered to be missing at random. Subsequently, each factor was tested individually in a univariate regression model. Then, characteristics with $P < 0.05$ were assessed using a multiple logistic regression model with backward selection. The same set of all on beforehand selected, potential predictive factors was utilized for each model to ensure comparability. The Nagelkerke R^2 was calculated for each model to assess model fit. R^2 values ranged from 0 to 1 and higher values represented more reliable models. Odds ratios (ORs) were calculated to determine the effect of the factors on return to each activity separately. Statistical significance was set at $P < 0.05$.

RESULTS

A total of 2430 patients underwent primary TKA surgery between August 2019 and November 2022. Among these individuals, 2327 (95.8%) responded to the follow-up questionnaires at either 3 mo and/or 6 mo postoperatively. At 3 mo postoperatively, 2063 (84.9%) patients responded. In total, 2114 (87.0%) patients responded at 6 mo postoperatively. The preoperative PRO response rate was 99.4%. Distinctions were observed between respondents and nonrespondents in smoking status, alcohol consumption, NRS pain score at rest, EQ-5D descriptive system score, and OKS (Table 1), but these differences were not clinically relevant.

RTA

A mean 8 of 10 patients RTA within 6 mo following their surgery. The proportion of patients who RTA varied across specific activities, ranging from 27.7% (551 of 1439) for kneeling to 94.4% (1867 of 1977) for grocery shopping. First, patients returned to putting on shoes/socks at 20 d (IQR: 27 d) followed by night rest at 26 d (IQR: 36 d). It took patients the longest to return to kneeling [74 d (IQR: 57 d); Table 2]. Return to each daily activity separately was predicted by one or more of the selected predictive factors in the multivariate models. R^2 scores ranged from 0.029 (night rest) to 0.127 (driving a car) (Table 3).

RTW

A mean 7 of 10 patients RTW within 6 mo after TKA. Specifically, 86.6% (691 of 798) of the patients returned to low-impact work at 33 d (IQR: 29 d; Table 2). Preoperative EQ-5D descriptive system score was a significant predictive factor for the return to low-impact work (odds ratio [OR]: 2.540; P = 0.021; R^2 = 0.026; Table 3). Medium-impact work was returned to by 62.1% (422 of 680) of the patients at 78 d (IQR: 55 d; Table 2). For 9.2% (192 of 2090) of patients, this activity was defined as not applicable anymore. Preoperative EQ VAS score was a significant predictor for return to medium-impact work (OR: 1.015; P = 0.007; R^2 = 0.069; Table 3).

RTS

A mean 7 of 10 patients RTS within 6 mo after TKA. Low-impact sports were returned to by 89.5% (1588 of 1775) of the patients at 43 d (IQR: 24.0 d; Table 2). Age (OR: 1.038; P = 0.001) and preoperative EQ VAS score (OR: 1.009; P = 0.032) significantly predicted the return to low-impact sports (R^2 = 0.022; Table 3).

A total of 48.4% (381 of 788) of the patients returned to medium-impact sports at 89.5 d (IQR: 60 d; Table 2). For 12.0% (251 of 2089) of patients, this specific activity was defined as not applicable anymore. Return to medium-impact sports was significantly predicted by operative duration (OR: 0.985; P = 0.044) and preoperative OKS (OR: 1.026; P = 0.018; R^2 = 0.028; Table 3).

Swimming was returned to by 68.6% (468 of 682) of patients at 80 d (IQR: 61; Table 2). For 9.5% of patients (198 of 2089), this specific activity was defined as not applicable anymore. RTS was significantly predicted by preoperative EQ-5D descriptive system score (OR: 0.398; P = 0.041) and OKS (OR: 1.039; P = 0.016; R^2 = 0.013; Table 3).

DISCUSSION

This study's primary aim was to assess the percentage of patients who were able to RTA, RTW, and RTS after TKA. Secondarily, the time to RTA, RTW, and RTS, and factors influencing the return were identified. Eight of ten patients managed to RTA, RTW, and RTS within 6 mo after TKA. Specifically, less than half of the patients managed to return to kneeling and medium-impact sports. Putting on shoes and socks was the first activity that patients returned to, while returning to medium-impact sports generally took the longest. Although various factors were identified influencing the return to all studied activities, the reliability of each predictive model was low.

Interestingly, a significant proportion of patients, approximately 80%, returned to their daily routines within the first 6 wk (40 d) post-surgery. The exception was kneeling. Only 28% of patients managed to return to kneeling within 6 mo. A previous study highlighted the challenges associated with kneeling post-surgery. Two-thirds of the patients reported difficulties with kneeling even 5 years after TKA[24]. However, there was an observable discrepancy between patients' self-reported inability to kneel and their actual capacity to do so when observed by healthcare professionals. Half of the studied patients reported the inability to kneel, whereas 80% of the patients were able to do so easily[25]. This suggests that supervised practice of kneeling might enhance patients' likelihood of successfully resuming this activity. Consequently, both pre- and postoperative patient education should include information on kneeling to improve its return rates.

Regarding RTW, 70% of the patients returned to their professional activities with higher resumption rates observed in low-impact jobs (87% within 33 d) compared to medium-impact ones (62% within 78 d). Existing systematic reviews on RTW report the following wide range of return rates: 10% to 98% with an average time to RTW of 8 wk to 16 wk[7,26]. These variations seem to be related to the physical demands of different job types. Comparable to the present study, Scott *et al*[27] categorized the physical nature of work into sedentary, light, moderate, and heavy manual work. They found that approximately 50% of participants returned to moderate manual work and about 66% returned to light manual work within a mean of 13.5 wk. These return rates were below the percentages observed in the current study. Interestingly, studies focusing exclusively on patients employed prior to surgery reported significantly higher RTW rates (scores above 92%)[13,28-30]. This indicates that preoperative employment status is an influential factor and should be included in future studies.

Table 1 Patient characteristics, surgical characteristics, and preoperative patient-reported outcomes, *n* (%)

Characteristics	Respondents, *n* = 2063	Nonrespondents, *n* = 367	*P* value
Patient characteristics			
Age in year, median (IQR)	65.80 (7.19)	65.13 (8.39)	0.222
BMI in kg/m^2, median (IQR)	27.77 (3.44)	27.84 (3.31)	0.516
Sex, male	973 (47.2)	190 (51.8)	0.112
ASA, I	799 (38.7)	143 (39.0)	0.954
Smoking status, yes	156 (7.6)	42 (11.4)	0.017[a]
Alcohol consumption, yes	1499 (72.7)	244 (66.5)	0.020[a]
Previous knee surgery, yes	986 (47.8)	173 (47.1)	0.821
Charnley classification			0.113
A Unilateral knee arthritis	972 (47.1)	160 (43.6)	
B1 Unilateral knee TKA	482 (23.4)	78 (21.3)	
B2 Bilateral TKA	412 (20.0)	94 (25.6)	
C more joints affected	197 (9.5)	34 (9.3)	
Surgical characteristics			
Diagnosis, osteoarthritis	2021 (98.0)	355 (96.7)	0.175
Anesthesia technique, spinal	2043 (99.0)	362 (98.6)	0.763
Operative duration in min, median (IQR)	40.77 (9.51)	41.04 (9.83)	0.551
Complication, yes	62 (3.0)	18 (4.9)	0.078
Preoperative PROs			
NRS pain score at rest, median (IQR)	4.92 (2.38)	5.23 (2.43)	0.021[a]
NRS pain score during activity, median (IQR)	7.18 (1.88)	7.18 (2.00)	0.558
KOOS-PS score, median (IQR)	47.23 (12.74)	48.98 (14.19)	0.084
EQVAS score, median (IQR)	72.91 (18.65)	72.96 (19.03)	0.906
EQ-5D descriptive system score, median (IQR)	0.590 (0.250)	0.551 (0.273)	0.013[a]
OKS, median (IQR)	24.92 (7.16)	23.83 (7.64)	0.042[a]

[a]$P < 0.05$.

ASA: American Society of Anesthesiologists score; BMI: Body mass index; EQ-5D descriptive system: EuroQol five dimensions descriptive system; EQ VAS: EuroQol five dimensions Visual Analogue Scale; KOOS-PS: Knee Injury and Osteoarthritis Outcome Score - Physical Function Short Form; NRS: Numeric rating scale; OKS: Oxford knee score; PRO: Patient-reported outcomes; TKA: Total knee arthroplasty; IQR: Interquartile range.

RTS was achieved by 70% of the patients with variations depending on the impact level of sports. Swimming was returned to by 69% within 80 d, 90% returned to low-impact sports within 43 d, and 48% returned to medium-impact sports within 90 d. The low resumption rate for medium-impact sports could indicate either an ongoing recovery process at the 6-mo mark or a permanent shift in patients' sporting preferences. A prolonged study period might gain further insights into the return to medium-impact sports. As seen for RTW, previous studies combined in an umbrella review on RTS after TKA reported wide ranges from 34% to 100% at 13 wk[14]. This could be explained by different definitions of sports participation used in these studies. Furthermore, there are different definitions of activity levels. For instance, Konings *et al*[31] categorized dancing and tennis as high-impact sport activities with participation rates of 128% and 106% within 1 year after surgery, respectively. The present study categorized these activities as medium-impact sports. Categorization of low- and medium-impact sports is a potential explanation for the lower RTS rates observed in the present study. To facilitate study comparisons and develop evidence-based, patient-specific recommendations for setting realistic patient expectations, uniform definitions for RTW and RTS are crucial. Additionally, there is a need for consensus on categorizing activity levels for both RTW and RTS[9]. This study provides valuable information for formulating these recommendations. Regarding swimming, 69% returned in 80 d after TKA in the present study. Another study reported an RTS rate of 107% due to increased postoperative swimming participation[30]. One study accounting for pre- and postoperative sports participation reported that 81% of participants returned to swimming at 13.1 wk after

Table 2 Return to daily activities, work, and sports within 6 mo after total knee arthroplasty

Activity	3 mo		6 mo		Within 6 mo	
	Return to activity, *n* (%)[1]	Time to return in days, median (IQR)	Return to activity, *n* (%)[1]	Time to return in days, median (IQR)	Return to activity, *n* (%)[1]	Time to return in days, median (IQR)
Daily activities						
Night rest	1435 (72.6)	26.0 (36.0)	-	-	1435 (72.6)	26.0 (36.0)
Walking without aids	1859 (94.0)	32.0 (23.5)	-	-	1859 (94.0)	32.0 (23.5)
Stair climbing	1655 (83.7)	42.0 (26.0)	-	-	1655 (83.7)	42.0 (26.0)
Grocery shopping	1867 (94.4)	37.0 (23.0)	-	-	1867 (94.4)	37.0 (23.0)
Domestic work	1700 (86.0)	42.0 (25.0)	-	-	1700 (86.0)	42.0 (25.0)
Putting on shoes/socks	1940 (98.1)	20.0 (27.0)	-	-	1940 (98.1)	20.0 (27.0)
Kneeling	403 (20.4)	57.0 (25.0)	439 (30.0)	96.0 (50.3)	551 (27.7)	74.0 (56.5)
Driving a car	1725 (91.7)	42.0 (20.0)	-	-	1725 (91.7)	42.0 (20.0)
Outdoor cycling	1518 (80.8)	43.0 (24.0)	-	-	1518 (80.8)	43.0 (24.0)
Work						
Low-impact work	691 (86.6)	33.0 (29.0)	-	-	691 (86.6)	33.0 (29.0)
Medium-impact work	238 (34.9)	57.0 (24.0)	342 (72.3)	97.0 (54.0)	422 (62.1)	78.0 (55.0)
Sports						
Low-impact sports	1588 (89.5)	43.0 (24.0)	-	-	1588 (89.5)	43.0 (24.0)
Medium-impact sports	185 (21.7)	57.0 (26.0)	327 (63.0)	98.0 (52.0)	381 (48.4)	89.5 (60.0)
Swimming	231 (34.9)	51.0 (28.5)	385 (81.6)	90.8 (36.0)	468 (68.6)	80.0 (61.0)

[1]Percentages represent the portion of patients who answered "yes" on the questionnaire out of the total number of patients who answered "yes" or "no" to that specific question.
IQR: Interquartile range.

surgery[32]. This shows that preoperative sports participation should be included in future studies.

Several predictive factors for RTA, RTW, and RTS were identified in this study. Moreover, this study confirmed the impact of demographic factors and preoperative aspects on the return to activities[10-12]. For the factors BMI, ASA, preoperative function, and preoperative quality of life, the observed associations showed identical alignment. However, contradictory evidence was found regarding the influence of age, sex, and preoperative pain scores on the return of activities. Despite these findings, the predictive value of these factors was relatively low ($R^2 < 0.127$) diminishing their clinical relevance. Interestingly, preoperative participation in sports or work emerged as the most significant predictive factor of return[14,16], alongside the level of activity and urgency felt regarding the return[11,12,16]. These factors were not included in the present study due to its retrospective nature. This highlights an area for future prospective research.

It is important to mention the potential influence of recall bias on the study's results. It is a common challenge in retrospective studies where longer recall periods can lead to less accurate reporting[33]. Four out of the fourteen activities were questioned at both 3 mo and 6 mo after TKA. The analyses revealed acceptable discrepancies in the recall of return dates within a maximum 5% of patients per activity.

The current study has several strengths. First, to the best of the authors' knowledge, this study represents the first comprehensive investigation into RTA after TKA. By investigating a broad range of activities, it offers an almost total perspective of the recovery process. Additionally, the inclusion of a large sample size strengthens the reliability of the findings. The study's approach of examining the combination of RTA, RTW, and RTS puts the outcomes in perspective. This helps in setting realistic expectations for patients and healthcare providers. As a limitation of the present study, the generalizability of the results may be restricted. This study only included patients who were characterized by an ASA score of I to II and a BMI of ≤ 35 kg/m^2, representing 80% of the total TKA population. Moreover, the retrospective research design is a limitation. Consequently, it was not possible to include preoperative work experience, preoperative sports participation, and whether patients adhered to the advised rehabilitation protocol. Future research should address these limitations by extending the study timeframe, incorporating preoperative work status and/or sport participation,

Table 3 Factors predicting return to daily activities, work, and sports within 6 mo after total knee arthroplasty

Activity	*n*	R^2	Predictive factors	OR (95%CI)	*P* value
Daily activities					
Night rest	1901	0.029	Sex	0.734 (0.589-0.913)	0.006[b]
			ASA	1.217 (0.989-1.498)	0.064
			Previous surgery	0.829 (0.670-1.025)	0.083
			Operative duration	0.989 (0.978-1.000)	0.047[a]
			NRS pain at rest	0.912 (0.863-0.964)	0.001[b]
			NRS pain during activity	1.080 (1.003-1.163)	0.042[a]
			OKS	1.020 (1.002-1.038)	0.030[a]
Walking without aids	1901	0.033	Sex	0.681 (0.456-1.016)	0.06
			Anesthesia technique	4.456 (1.232-16.120)	0.023[a]
			OKS	1.054 (1.024-1.084)	< 0.001[b]
Stair climbing	1901	0.05	BMI	0.941 (0.908-0.975)	< 0.001[b]
			Sex	0.499 (0.381-0.653)	< 0.001[b]
			Operative duration	0.987 (0.974-1.000)	0.053
			OKS	1.024 (1.006-1.043)	0.010[a]
Grocery shopping	1901	0.051	Age	0.960 (0.933-0.989)	0.007[b]
			BMI	0.939 (0.886-0.996)	0.037[a]
			EQ-5D descriptive system	0.299 (0.106-0.846)	0.023[a]
			OKS	1.094 (1.052-1.137)	< 0.001[b]
Domestic work	1901	0.05	Age	0.958 (0.940-0.977)	< 0.001[b]
			BMI	0.924 (0.889-0.961)	< 0.001[b]
			NRS pain during activity	1.082 (0.995-1.178)	0.067
			OKS	1.054 (1.031-1.078)	< 0.001[b]
Putting on shoes/socks	1901	0.067	Sex	2.794 (1.366-5.712)	0.005[b]
			OKS	1.106 (1.052-1.163)	< 0.001[b]
Kneeling	1910	0.1	BMI	0.946 (0.917-0.976)	< 0.001[b]
			Sex	0.433 (0.349-0.538)	< 0.001[b]
			Alcohol consumption	1.305 (1.015-1.681)	0.039[a]
			KOOS-PS	0.989 (0.978-1.001)	0.083
			OKS	1.022 (1.000-1.044)	0.048[a]
Driving a car	1811	0.127	Age	0.966 (0.941-0.990)	0.007[b]
			Sex	0.217 (0.140-0.337)	< 0.001[b]
			ASA	0.678 (0.461-0.998)	0.049[a]
			Anesthesia technique	3.815 (0.970-14.998)	0.055
			Charnley classification	1.173 (0.988-1.391)	0.068
			OKS	1.055 (1.028-1.083)	< 0.001[b]
Outdoor cycling	1806	0.123	Age	0.949 (0.931-0.967)	< 0.001[b]
			BMI	0.937 (0.903-0.972)	< 0.001[b]
			Sex	0.347 (0.266-0.452)	< 0.001[b]
			ASA	0.763 (0.580-1.004)	0.053
			Charnley classification	1.175 (1.041-1.326)	0.009[b]

			OKS	1.032 (1.013-1.051)	< 0.001[b]
Work					
Low-impact work	765	0.026	Age	1.032 (0.999-1.065)	0.054
			EQ-5D descriptive system	2.540 (1.150-5.612)	0.021[a]
Medium-impact work	448	0.069	Alcohol consumption	1.497 (0.932-2.406)	0.095
			EQ VAS	1.015 (1.004-1.027)	0.007[b]
			OKS	1.030 (0.997-1.065)	0.075
Sports					
Low-impact sports	1705	0.022	Age	1.038 (1.015-1.062)	0.001[b]
			ASA	0.728 (0.519-1.021)	0.066
			EQ VAS	1.009 (1.001-1.017)	0.032[a]
Medium-impact sports	758	0.028	Operative duration	0.985 (0.971-1.000)	0.044[a]
			EQ VAS	1.007 (0.999-1.016)	0.071
			OKS	1.026 (1.004-1.048)	0.018[a]
Swimming	658	0.013	EQ-5D descriptive system	0.398 (0.164-0.961)	0.041[a]
			OKS	1.039 (1.007-1.071)	0.016[a]

[a]$P < 0.05$.
[b]$P < 0.01$.
ASA: American Society of Anesthesiologists score; BMI: Body mass index; EQ-5D descriptive system: EuroQol five dimensions descriptive system; EQ VAS: EuroQol five dimensions Visual Analogue Scale; KOOS-PS: Knee Injury and Osteoarthritis Outcome Score - Physical Function Short Form; NRS: Numeric rating scale; OKS: Oxford knee score; OR: Odds ratio; TKA: Total knee arthroplasty.

setting uniform definitions for RTW and RTS, finding a consensus on categorizing activity levels for RTW and RTS, and externally validating the data to confirm and generalize the results.

CONCLUSION

Eight of ten patients were able to RTA, RTW, and RTS within 6 mo after TKA. The time to return to these activities ranges from 20 d to 61 d postoperatively. Although factors that influence return to activities were found, they were not at a reliability level that is clinically useful. These findings are useful in creating realistic pre- and postoperative expectations on RTA, RTW, and RTS after TKA.

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FOOTNOTES

Author contributions: Peters MCWM, Pronk Y, and Brinkman JM designed the research study; Peters MCWM performed the research, analyzed the data, and drafted the manuscript; Pronk Y and Brinkman JM critically read and revised the manuscript; all authors have read and approved the final manuscript.

Institutional review board statement: The institutional review board declares, after having reviewed the retrospective study (study ID: 2022-6) by the Department of Orthopaedic Surgery, that this study can safely be performed in Kliniek ViaSana, without any special recommendations required.

Informed consent statement: All study participants provided informed written consent for the use of anonymized data for scientific analysis prior to undergoing primary total knee arthroplasty.

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Data sharing statement: Technical appendix, statistical code, and dataset available from the corresponding author at m.peters@viasana.nl

upon reasonable request. Participants did not give informed consent for data sharing, but the presented data are anonymized and risk of identification is low.

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