

Patient-related and work-related factors play an important role in return to work after total knee arthroplasty: a systematic review

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ABSTRACT

Importance A growing group of patients with a total knee arthroplasty (TKA) are still working at the time of the surgery. The average time to return to work (RTW) is estimated at 3–6 months. There is a large range of time that patients need to RTW.

Objective The objective of this review is to systematically identify beneficial and limiting factors that affect RTW after TKA.

Evidence review PubMed and Embase were searched systematically to find studies that analysed prognostic factors for RTW in patients undergoing TKA. The following inclusion and exclusion criteria were used: patients with a TKA, studies that reported on RTW after TKA, patients had to be between 18 and 65 years and beneficial or limiting factors affecting RTW were described. Studies were included if written in English, German, French or Dutch. The Quality-in-Prognostic-Studies tool was used for the quality assessment of the included studies.

Findings 11 of the 306 primarily identified studies met the inclusion criteria. 7 patient-specific and 11 work-related factors were beneficial for a faster RTW, like being male and having a high job qualification. There were three patient-specific and eight work-related factors that were limiting factors for the RTW, like being female and preoperative sick leave.

Conclusions and relevance Patients that are male, have a high sense of urgency to return to work, have a high job qualification, are self-employed, with limited sick leave are those that are most likely for a successful and fast RTW. With the use of these factors, patients can be earlier identified as requiring better guidance preoperative and postoperatively for a more successful RTW.

Level of evidence Level III.

INTRODUCTION

Total knee arthroplasty (TKA) is one of the most successful orthopaedic procedures. The procedure is well documented in the medical literature and has satisfactory long-term results and low complication rates.¹ Historically the procedure is performed in the older, retired patient, with an average age of 67 years. This was the typical patient demographic which due to osteoarthritis was suitable for TKA.

Recent studies however show a steady increase in patients who receive or are eligible for this procedure at a younger age and even predict a further rise in the necessity of TKA in this specific 'young' patient group.^{2,3}

What is already known?

- 71–83% of patients with a total knee arthroplasty (TKA) return to work after 3–6 months.
- There is a large range of amount of time patients required to return to work after TKA. Also a substantial number of patients are unable to return to work.

What are the new findings?

- This review identifies patient-related and work-related factors affecting return to work.
- The results of this review can be used for early identification of patients whom are at risk for delayed or no return to work.
- This information is a prerequisite for better preoperative information for the patient on return to work and better vocational rehabilitation.

Whereas the 'classic' TKA patient was retired, there will be a growing group who is still employed at time of operation and want to continue working after the operation.

Being employed is a major contribution to the quality of life for patients.⁴ The primary goal of TKA has been relief of pain and restoration of knee function.¹ However, for the younger patient returning to work must be a goal as well.⁵

Over the last years, several studies were conducted to investigate return to work after TKA. A recent systematic review by Tilbury *et al* showed that 71–83% returned to work after 3–6 months. The average time to return to work varied from 8.0 to 12.0 weeks after TKA.⁶

Remarkably, there is a large range in the amount of time patients require to return to work after TKA. Also a substantial amount of patients are unable to return to work.⁷

When we want to optimise the TKA procedure for this specific patient population, it is necessary to find out which factors are beneficial or limiting for returning to work. This is not only important because of the financial aspect or the quality of life of these patients. These factors could also be beneficial in the vocational rehabilitation because of the high demand and expectations these specific patients have of their new implant for leading an active lifestyle.



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The goal of this review is to systematically describe the beneficial and limiting factors mentioned in the existing literature for return to work after TKA. Thereby, this information can be used to optimise the vocational rehabilitation for return to work after TKA surgery.

METHODS

This systematic review was performed in line with the online supplementary file 1 statement.

Search strategy

The search strategy was developed with the support of a clinical librarian (F.S. van Etten). The search strategy consisted of two parts which were combined using AND. The parts were 'return to work' AND 'TKA'. The search was adjusted for the databases in which it was searched, namely PubMed and Embase. The search was performed in March 2016. In addition, also the references of the included articles were checked for additional useful articles. Details of the search strategy are displayed in online supplementary file 2.

Inclusion criteria

The following inclusion criteria must be met for inclusion:

- ▶ inclusion of patients with a TKA
- ▶ report of return to work after TKA
- ▶ report or description of beneficial or limiting factors affecting return to work
- ▶ patients' demographics between 18 and 65 years
- ▶ papers were written in English, German, French or Dutch.

Data collection and analysis

Selection

To assess whether the studies met the inclusion criteria, the following steps were taken. First, the found studies were screened on title and abstract, then the full text was read. This was done independently by TP and AH. If there was any discrepancy, another author (PK) was consulted and the study was only included when consensus was reached.

Quality assessment

The Quality-in-Prognostic-Studies (QUIPS) Risk of Bias Assessment Instrument for Prognostic Factor Studies⁸ was used to assess the methodological quality of the included studies (see online supplementary file 3). Two authors (TP and PK) independently rated the quality of the included studies. The QUIPS Risk of Bias Assessment Instrument for Prognostic Factor Studies uses six categories to assess the risk of bias: (1) study participation, (2) study attrition, (3) prognostic factor measurement, (4) outcome measurement, (5) study confounding and (6) statistical analysis and reporting.

The quality of an article was deemed high when the risks of bias were low. A study is of low risk of bias when the methodological risk of bias was rated as low or moderate on all of the six domains, with at least four domains rated as low. When there was any discrepancy in the rating between the authors, consensus was reached after discussion between both authors.

Data extraction

The following data were extracted from the included studies: first author, study design, country, title, population (number of TKAs performed and age), average time to return to work, percentage that returned to work, prognostic outcome measures

for return to work and significant beneficial and limiting factors for return to work.

RESULTS

In the initial search and after the duplicate studies were removed, 376 studies remained. After analysing the titles, 56 studies remained. After reading the abstract, 26 studies remained. When screening the full text of those studies, 11 articles met the inclusion and exclusion criteria. After inspection of the references, no other studies were included (see figure 1).

Eleven studies were included in this review. Three studies had a prospective study design and eight were of a retrospective study design (table 1). In total, 1625 (1603 patients) TKAs were performed. The follow-up time of the included studies ranged from 6 to 112 months. The percentage of patient that returned to work ranged from 59.0% to 98.0%, with an average return to work of 82.0% across all included studies.

In total, 33 beneficial and limiting factors were investigated by the included studies. The WHO states that through the International Classification of Functioning (ICF) these factors can be subdivided into patient-specific factors and work-related factors. There were 17 patient-specific factors, subdivided into four categories: patient demographics, clinical outcome, functional outcome and quality of life (QoL). These categories include age, Kellgren & Lawrence grading system, Knee injury and Osteoarthritis Outcome Score (KOOS) and QoL (table 2).

Fifteen work-related factors were investigated in the included studies divided into socioeconomic factors and occupational factors. These factors varied from individual work status, job demands, to support from employers. The work-related factors are displayed in table 3.

A total of 7 patient-specific factors and 11 work-related factors were found beneficial for return to work. Three patient-specific factors and eight work-related factors were limiting factors for return to work (table 4).

DISCUSSION

In our systematic review, we found 11 studies that mentioned beneficial and limiting factors for return to work after TKA. These factors can be subdivided into patient-specific factors and work-related factors. This is in line with the ICF proposed by the WHO.⁹ The ICF states that workability can be based on six components: disease, body functions and structures, activities and participation, environmental and personal factors.

A systematic review of Kuijer *et al* showed that there was a paucity in information about beneficial and limiting factors for return to work after TKA in 2009.¹⁰ This review shows that the most recent literature mentions 18 beneficial factors and 11 limiting factors for return to work after TKA. This shows that over the last years an increased interest to better understand what the influence of TKA is on the ability to return to work. This review identifies prognostic factors that contribute to a faster or slower return to work or an inability to return to work at all.

Despite the large spread in individual outcome measures, leading to heterogeneity across the included studies, this review identifies important patient factors like sex, age, motivation, physical and mental functioning for successful return to work. Also, specific work-related factors like job demands, job type, employment, sick leave and workers' compensation are important predictors in time taken to return to work. These patient-related and work-related factors play an important role in advising patients on their return to work after TKA or referring them

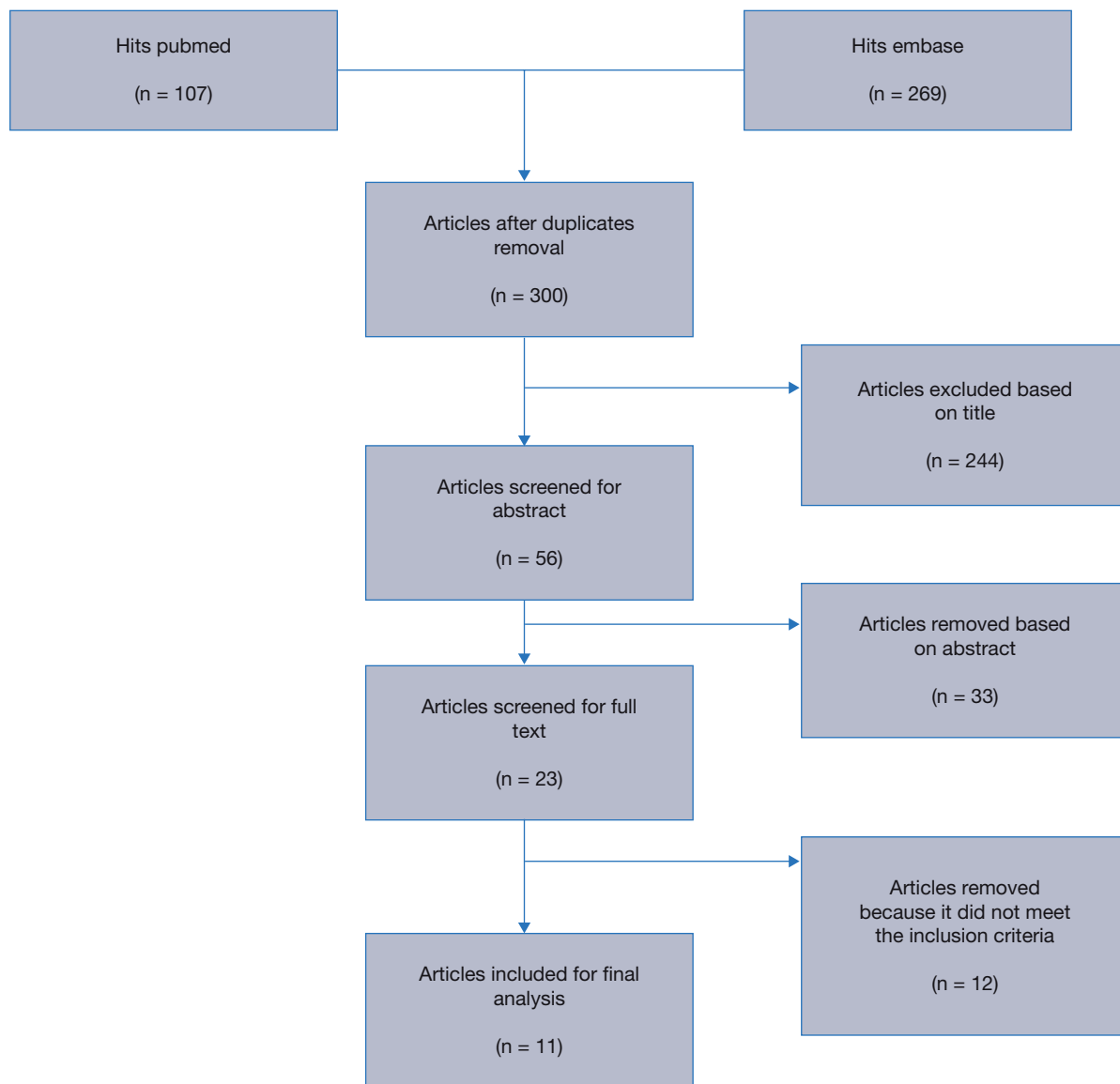


Figure 1 Flow diagram.

for additional work-directed care. This review shows that of the included patients 82.0% return to work. Patient factors like a higher level of qualification, which subsequently leads to higher job classes such as business, finance, administration, health, science and arts and more self-employment, are beneficial for a faster return to work.^{11–13} These occupations can be considered as mainly sedentary and have a light physical workload for the knee, which is also considered to be a beneficial work-related factor as stated by Lombardi *et al*, Clyde *et al* and Jorn *et al*.

When analysing the extent to which the physical job demands play a beneficial factor in return to work, four studies showed conflicting results. Lombardi *et al* stated that heavy or medium workload and sedentary work is beneficial for a faster return to work.¹⁴ Clyde *et al* mentioned that non-manual labour is a beneficial factor for return to work.¹⁵ Jorn *et al* showed that a light workload is a beneficial factor, and Sankar *et al* stated that a physically demanding job is a beneficial factor.^{11,16} Two studies showed that having a physically demanding job or a higher level of manual occupational level was a limiting factor for return to work.^{12,13} The study of Kuijer *et al* reported that patients with a medium-knee-demanding job were slower in return to work compared with patients with a light demanding job, but

this difference was not found for patients that had a high-knee-demanding occupation.¹⁷ These conflicting results can partly be explained by the various definitions that were used to quantify job demands. Whereas Lombardi *et al* made use of the Dictionary of Occupational Titles to retrieve the described job demands, Clyde *et al* made use of only three categories based on a rotator cuff repair study, where patients who lifted 9–23 kg were considered as performing strenuous labour, <9 kg as moderate labour and the other category was considered as sedentary labour. Jorn *et al* did not give a clear definition. Sankar *et al* only had two categories, low and high demand labour, which was rated by the authors. The included studies use arbitrary constructs and as a result many patients might fall in different categories in these studies. The included studies showed that job demand can be a beneficial or a limiting factor for return to work. Future studies should preferably use reliable exposure assessments based on the work demands for especially the knee or specific patient-reported outcome measures to get a better insight into these effects of occupational factors on return to work. The WAI¹⁸ and WALS¹⁹ are such tools, and also the more specific Work, Osteoarthritis, joint-Replacement Questionnaire²⁰ might be useful to assess the experienced work capability of patients undergoing

Table 1 Characteristics of the 11 included studies for return to work after total knee arthroplasty (TKA)

Author	Country	Study design	TKA population (n)	Age at operation (years)	Time to return to work (weeks)	Patients who return to work (n, %)	Follow-up	Risk of bias
Tilbury <i>et al</i> ⁶	Netherlands	Pro	64	56.2	Mean 12.9 (SD 8.0)	89.0	12 months	Low
Styron <i>et al</i> ¹²	USA	Pro	162	57.0	Median 8.9	71.0	4–6 weeks, 3 months and 6 months	Low
Sankar <i>et al</i> ¹¹	Canada	Pro	170	57.5	Median 12	85.0	1, 3, 6 and 12 months	Moderate
Lyall <i>et al</i>	UK	Retr	56	57.9	Median 10 (6–25)	71.0	47–112 months	High
Lombardi <i>et al</i> ¹⁴	USA	Retr	494	54.0	Median 8.9 (0–104)	98.0	1–3 years	Moderate
Kleim <i>et al</i> ¹³	UK	Retr	50	54.0	Mean 13 (SD 10)	82.0	6 months to 3 years after TKA	High
Kuijjer <i>et al</i> ¹⁷	Netherlands	Retr	167	60.0	Median 12–24	72.0	Minimal follow-up of 2 years	Low
Jorn <i>et al</i> ¹⁶	Sweden	Retr	162	*	*	59.0	Two years after TKA	Moderate
Foote <i>et al</i> ²¹	UK	Retr	41	54.1	Median 12 (4–52)	81.5	14–61 months	Moderate
Belmont Jr ²⁶	USA	Retr	181 (159 patients)	45.7	*	82.0	Two years after TKA	Low
Clyde <i>et al</i> ¹⁵	USA	Retr	78	55.0	Median 15.9 (3–52)	67.9	Minimal follow-up of 2 years	High

*Missing data.

Pro, prospective cohort study; Retr, retrospective cohort study.

joint replacement surgery. Although different tools were used to measure job demand, studies showed that job demand is a prognostic factor for return to work. However, having a high-knee-demanding occupation does not necessarily mean that this a predictor for no return or a slower return to work.

The limiting patient-related factors for return to work were being female stated by Foote *et al* and Kuijjer *et al*, body mass index (BMI) ≥30.0 by Kuijjer *et al* and having less pain

preoperatively by Styron *et al*.^{12 17 21} An increased BMI is a risk factor for the development of osteoarthritis.¹ These studies suggest that it is also a risk factor for a prolonged or no return to work. Less pain preoperatively is also a risk factor. This is in line with the clinical results of TKA where patients with less knee complaints are those who least benefit from the operation.²²

Although the limiting work-related factors show some conflicting results, overall it appears that receiving workers' compensation or having a complete disability pension, a prolonged preoperative sick leave and self-reported work-relatedness of the knee complaints are associated with a prolonged or no return to work after TKA.

Clinical implications

Over the last years, several studies investigated return to work after TKA and overall the results in the amount of time to return to work were comparable. However, these studies also showed a large spread in return to work. That is why it is important to

Table 2 Patient-specific factors that were studied for return to work

Outcome measures: prognostic factors	(Number of studies) Authors
<i>Patient demographics</i>	
Age	(11) Til, Sty, San, Lya, Lom, Kle, Kui, Jor, Foo, Bel, Cly
Sex	(11) Til, Sty, San, Lya, Lom, Kle, Kui, Jor, Foo, Bel, Cly
BMI	(5) Til, Sty, San, Lya, Cly
Education qualification level	(3) Til, San, Kle
Marital status	(2) Til, San
Motivation to return to work	(1) Sty
WAI	(1) Kui
<i>Clinical outcome</i>	
Kellgren & Lawrence grading system	(1) Til
Current knee pain	(1) Jor
ASA class	(1) Kui
<i>Functional outcome</i>	
KOOS	(2) Til, Sty, Kui
OKS	(2) Til, Foo
WOMAC	(3) Sty, San, Foo
SF-12	(1) Sty
ASA class	(1) Kui
<i>Quality of life</i>	
SF-36	(1) Til
EQ-5D	(1) Til

ASA, American Society of Anesthesiologists; EQ-5D, EuroQol five-dimensional questionnaire; KOOS, Knee Osteoarthritis Outcome Score; OKS, Oxford Knee Score; SF-12, Physical and Mental Health Summary score; SF-36, Short-Form (36) Health Survey; WAI, Work Ability Index score; WOMAC, Western Ontario & McMaster Universities Osteoarthritis Index.

Table 3 Work-related factors that were studied for return to work (RTW)

Outcomes measures	(Number of studies) Authors
<i>Socioeconomic factors</i>	
Work hours	(2) Til, San
Being self-employed or wage earner	(3) Til, Kui, Sty
Sick leave before total knee arthroplasty	(4) Til, Kle, Kui, Jor
Disability benefits	(3) Til, Sty, San
Job sector	(1) San
<i>Occupational factors</i>	
Job/workplace characteristics	(8) Sty, San, Lya, Lom, Kle, Kui, Jor, Cly
Handicap accessible workplace	(1) Sty
Physical demands at work	(6) San, Lom, Kui, Jor, Foo, Cly
Workplace Activity Limitations Score	(1) San
Changes in work pattern	(2) Lya, Kui
Employers support for RTW	(1) Kle
Improvement at work	(3) Kle, Kui, Foo
Military occupational specialty	(1) Bel
Military status	(1) Bel
Knee-related military separation	(1) Bel

Table 4 Beneficial and limiting prognostic factors for return to work after total knee arthroplasty

Beneficial factors	Outcome measure	Authors	Limiting factors	Authors	Outcome measure
<i>Patient specific</i>					
Sense of urgency about returning	Acc factor 0.468	Sty	Having less pain preoperatively	Sty	*
Being female	Acc factor 0.783	Sty	Being female	Kui, Foo	OR 3.2 (95% CI 1.3 to 8.2), HR 1.62 (0.81 to 3.23)
Higher FCI	Acc factor 0.914	Sty	Body mass index \geq 30.0	Kui	OR 2.8 (CI 1.1 to 7.1)
Higher WOMAC physical function score	Acc factor 0.809	Sty			
Higher mental composite SF-12	Acc factor 0.891	Sty			
Being male	OR 4.4	San			
Age group<45 years	OR 3.10, 95% CI 1.29 to 7.47	Bel			
<i>Work-related</i>					
Working handicap- accessible workplace	Acc factor 0.783	Sty	Receiving workers compensation	Sty	Acc factor 4.360
Being self-employed	Acc factor 0.792	Sty	Having a more physically demanding job	Sty	Acc factor 1.116
Job class (business, finance, administration)	OR 5.5	San	Job type (sales and services)	San	Sales and services OR 0.9
Job class health, science, arts	OR 4.0	San	Not being employed	Lya	*
Physical demanding	OR 1.3	San	Very heavy work/higher level of manual occupational level	Kle	6.2 weeks longer p=0.001
Being employed	*	Lya	Preoperative sick leave	Kle, Kui, Jor	Average 4.6 longer p=0.016, OR 12.5 (95% CI 5.0 to 31.5)*
Heavy or medium work load	0.4 weeks faster p=0.011	Lom	Subjectively work-relatedness of knee symptoms	Kui	OR 5.3 (95% CI 2.0 to 14.1)
Sedentary work/light workload	2.4 weeks faster p=0.011*	Lom, Cly, Jor	Medium knee-demanding job (reference to light)	Kui	OR 3.3 (95% CI 1.3 to 8.2)
Higher level of qualification	2.7 weeks faster p=0.041	Kle			
Duration of preoperative sick leave and postoperative sick leave	*	Jor			
Combat arms	OR 2.75, 95% CI 1.13 to 6.73	Bel			

*Data missing.

Acc factor, acceleration factor; FCI, Functional Comorbidity Index; SF-12, Physical and Mental Health Summary score; WOMAC, Western Ontario & McMaster Universities Osteoarthritis Index.

assess which factors play an important role in the return to work and especially the factors that can be preoperatively identified. This information might be used for better patient information and provides the opportunity to more timely and adequate treatment for these patients postoperatively. In 2009, a systematic review by Kuijer *et al* was performed to retrieve the beneficial and limiting factors after TKA and total hip arthroplasty (THA). They concluded that the knowledge was sparse. This review showed that in the meantime more studies are performed to obtain knowledge on this emerging topic. The present review shows that both patient-related and work-related factors have a positive effect on time taken to return to work. Early identification of these factors gives clinicians the opportunity to enhance and improve work-directed care.

Due to the heterogeneity of the included studies, the effect of physical job demand on return to work remains unclear. This review shows that having a high-knee-demanding occupation does not necessarily result in no return or a prolonged vocational rehabilitation period and that other factors may be more important. This stresses the importance of guidance of these TKA patients by an occupational physician.

At the moment, the description of the beneficial and limiting factors in the included studies is mainly approached from a clinical perspective. However, to enhance the return to work it is also important to know the patient's perspective. Qualitative research is necessary to better understand the patient's perspective about their knee prosthesis, their work capability and their return to work process. This patient's perspective is a vital part

to further enhance our treatment and can be used to identify gaps in our patient information and in the rehabilitation process. At the moment, only a limited number of qualitative studies have been performed over the last years and they all underline the need of more qualitative research to fully understand the patient-related factors.^{5 23–25}

Strengths and weaknesses

A weakness of the present review is that of the 11 included studies, 8 were of a retrospective design. These studies are subject to recall bias so caution should be taken when interpreting their results. However, when we compare the number of patients and the time needed to return to work, the included studies show comparable results. The exception is the study of Lombardi *et al* that reported a return to work of 98%. This is probably due to the fact that they only included patients who were working 3 months preoperatively and thereby excluding the limiting factor 'preoperatively sick leave'. This review showed that not working prior to TKA is a limiting factor in the time needed to return to work. Especially this group appears at risk for unfulfilled expectations regarding return to work and might benefit most from proper guidance postoperatively.

A special remark has to be made regarding the results of Belmont *et al*.²⁶ This study is performed among a special patient group, namely U.S. Military Service members. The aetiology of osteoarthritis in this cohort seems a direct result of the high knee demands that these patients have to endure during their

service. This might also explain why this group is younger than the other patients with a TKA. Therefore, these patients seem less comparable with the other TKA patients. This study might give an underestimation of the percentage patients who returned to work because of the high job demands. However, this group of well-trained patients having a high physical capability and great determination achieved by their training might exemplify what the possibilities are in the rehabilitation process to optimise return to high-knee-demanding work for other TKA patients.

CONCLUSION

This review identifies patient-related and work-related factors that affect return to work. Patients that are male, have a high sense of urgency to return to work, have a high job qualification, are self-employed, with limited sick leave are those that are most likely for a successful and fast return to work. These factors are important for the treating orthopaedic surgeon as for occupational physicians and other specialties that guide these patients. The results of this review can be used for early identification of patients at risk for no or delayed return to work. This information is a prerequisite for better preoperative information regarding return to work and more timely referral for better vocational rehabilitation. In this way, patients' expectations regarding return to work might be better met and earlier vocational rehabilitation might result in a higher proportion of patients that are able to return to work.

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Contributors Each of the authors has read the final manuscript and concurs with its content. All authors have made a substantial contribution to the realisation of this study.

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