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# Preoperative Predictors of Returning to Work Following Primary Total Knee Arthroplasty

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**Background:** There is little in the literature to guide clinicians in advising patients regarding their return to work following a primary total knee arthroplasty. In this study, we aimed to identify which factors are important in estimating a patient's time to return to work following primary total knee arthroplasty, how long patients can anticipate being off from work, and the types of jobs to which patients are able to return following primary total knee arthroplasty.

**Methods:** A prospective cohort study was performed in which patients scheduled for a primary total knee arthroplasty completed a validated questionnaire preoperatively and at four to six weeks, three months, and six months postoperatively. The questionnaire assessed the patient's occupational physical demands, ability to perform job responsibilities, physical status, and motivation to return to work as well as factors that may impact his or her recovery and other workplace characteristics. Two survival analysis models were constructed to evaluate the time to return to work either at least part-time or full-time. Acceleration factors were calculated to indicate the relative percentage of time until the patient returned to work.

**Results:** The median time to return to work was 8.9 weeks. Patients who reported a sense of urgency about returning to work were found to return in half the time taken by other employees (acceleration factor = 0.468;  $p < 0.001$ ). Other preoperative factors associated with a faster return to work included being female (acceleration factor = 0.783), self-employment (acceleration factor = 0.792), higher mental health scores (acceleration factor = 0.891), higher physical function scores (acceleration factor = 0.809), higher Functional Comorbidity Index scores (acceleration factor = 0.914), and a handicap accessible workplace (acceleration factor = 0.736). A slower return to work was associated with having less pain preoperatively (acceleration factor = 1.132), having a more physically demanding job (acceleration factor = 1.116), and receiving Workers' Compensation (acceleration factor = 4.360).

**Conclusions:** Although the physical demands of a patient's job have a moderate influence on the patient's ability to return to work following a primary total knee arthroplasty, the patient's characteristics, particularly motivation, play a more important role.

**Level of Evidence:** Prognostic Level I. See Instructions to Authors for a complete description of levels of evidence.

Arthritis is the leading cause of disability among working-age Americans<sup>1</sup>, and total knee arthroplasty is recognized as an efficacious and cost-effective treatment for end-stage arthritis<sup>2-9</sup>. The number of total knee arthroplasty procedures performed annually is expected to continue to increase as the population ages and the prevalence of osteoarthritis rises. Kurtz

et al. estimated that, by 2030, the rate of total knee arthroplasties performed annually will be nearly seven times the rate in 2005<sup>10</sup>.

Not only has the number of total knee arthroplasties increased over the past several years, but younger individuals have also accounted for an increasing percentage of the patients receiving total knee arthroplasties. In 1997, patients

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under sixty-five years old accounted for only 24.1% of all hospital discharges after primary total knee arthroplasty; by 2006, that proportion had risen to 42.0%<sup>11</sup>. Younger patients are more likely to cite returning to work as a preoperative concern<sup>12</sup>. Although the average retirement age has decreased over the past several decades, some experts expect that trend to reverse as financial and political pressures on the Social Security system induce many individuals to postpone retirement until later<sup>13,14</sup>. Combining this phenomenon with the trend toward more frequent total knee arthroplasties in younger individuals produces a scenario in which more Americans are undergoing a total knee arthroplasty while they are still actively employed<sup>11</sup>. Consequently, the role of total knee arthroplasty in allowing an individual to continue working needs to be better elucidated.

While several studies have identified factors predicting patient outcomes following total knee arthroplasty, such as functional ability<sup>8,15-17</sup> or the development of complications<sup>18-20</sup>, to our knowledge previous investigators have not attempted to identify factors associated with patients returning to work following total knee arthroplasty. The purpose of this study was to determine how long a patient should anticipate being off from work postoperatively, if there are particular jobs to which patients cannot return postoperatively, and which factors are most important in determining how long a patient should anticipate being off from work postoperatively. The potential factors that we evaluated have been associated with patients' functional outcomes following total knee arthroplasty. Our goal was to provide information that could be used by clinicians to manage patient expectations by identifying realistic outcomes following total knee arthroplasty so that they may help to improve patient functional outcomes and satisfaction<sup>21</sup>.

## Materials and Methods

### Patient Selection

Patients scheduled to undergo a primary total knee arthroplasty at either a large academic tertiary care hospital or an academic community hospital were approached regarding participation in the study, which was approved by the hospital system's institutional review board. Inclusion criteria were an age of eighteen to sixty-nine years, the patient being currently employed and intending to return to work postoperatively, and the patient being scheduled for a primary total knee arthroplasty. Exclusion criteria were a total knee arthroplasty on the contralateral lower limb within six months before the scheduled total knee arthroplasty and a previous high tibial osteotomy or unicompartmental knee replacement on the knee scheduled to be operated on<sup>22,23</sup>. Patients were approached about enrollment during their preoperative medical clearance visit and then prospectively followed at their four to six-week, three-month, and six-month postoperative visits. The study was powered to detect a difference in the effect of work demands on the rate of returning to work. A target sample size of 120 was determined to be sufficient to detect a difference in the rate of returning to work of 50% versus 80% in different work-demand groups. Additional patients were re-

cruited in order to ensure appropriate power in case of loss to follow-up.

### Dependent Variables

Two different parameters were used to evaluate return to work: time to return to work and employment status at a fixed end point. Time to return to work was defined as the length of time from the patients' surgery to their return to any amount of work, and to their return to working full-time. Employment status at a fixed end point was defined as either employed at least part-time or not employed at three months postoperatively, the time point by which most patients would have returned to work. In the analyses regarding returning to work on a full-time basis, patients who had stated preoperatively that their job did not allow them to work at least thirty hours per week were excluded. Returning to work in any capacity was considered a positive outcome regardless of whether the participant met his or her preoperative job demands.

### Independent Variables

The data on each patient were collected with both patient-completed questionnaires and a review of the patient's medical record. Data collected from the medical record included age, sex, race, body-mass index (BMI), Functional Comorbidity Index (FCI)<sup>24</sup>, and the site of surgery. Other patient-derived variables included preoperative knee health and global health, the patients' motivation to return to work, the characteristics of their job, and factors potentially affecting recovery.

The patients' baseline health was measured with two knee-specific measures—the Knee Injury and Osteoarthritis Outcome Score (KOOS)<sup>25,26</sup> and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)<sup>27,28</sup>—as well as a measure of global health, the Medical Outcomes Study 12-Item Short Form Health Survey (SF-12)<sup>29</sup>. The KOOS and SF-12 scores were both calculated on a scale of 0 to 100, with 0 indicating the worst health and 100 indicating no health problems. The SF-12 scores were normalized to the adult population so that a score of 50 indicated the population mean with a standard deviation of 10. The WOMAC scores were converted to a comparable scale of 0 to 100, with 100 indicating perfect health or no knee problems.

The patients' motivation, a potentially key factor affecting return to work, was measured with several questions scored on a 5-point Likert scale. Questions were selected on the basis of the literature regarding occupational motivation, in particular the application of Maslow's hierarchical need theory as it may apply to occupational motivation<sup>30-32</sup>. These questions asked patients about various aspects of their motivation including their perception of the importance of returning to work for themselves; the importance of returning for their family, friends, or coworkers; and the effect of, and impact on, their health.

Patients were also asked about the physical demands of their job and about knee problems impairing their ability to complete their occupational tasks<sup>33</sup>. Since some patients reported being able to modify their work responsibilities to compensate for their knee

**TABLE I Patient Demographics (N = 162)**

Variable*	
Sex (no. [%])	
Male	51 (31.5%)
Female	111 (68.5%)
Median age (interquartile range) (yr)	57 (52, 61)
Race (no. [%])	
White	137 (84.6%)
Black	22 (13.6%)
Asian	2 (1.2%)
Hispanic	1 (0.6%)
Mean BMI (stand. dev.) (kg/m <sup>2</sup> )	
Male	32.5 (6.3)
Female	36.8 (8.0)
FCI (interquartile range)	3 (2, 4)
Site of total knee arthroplasty (no. [%])	
Left	66 (40.7%)
Right	65 (40.1%)
Bilateral	31 (19.1%)
Previous contralateral total knee arthroplasty (no. [%])	25 (15.4%)
Self-employed (no. [%])	26 (16.1%)
Receiving Workers' Compensation (no. [%])	2 (1.2%)
Receiving health insurance through employer (no. [%])	125 (77.2%)
Having disability insurance (no. [%])	65 (40.1%)
Workplace handicap accessible (no. [%])	113 (69.8%)
Knee problems forced patient to alter responsibilities at work (no. [%])	56 (34.6%)
Self-described physical demands of job (no. [%])	
Low	44 (27.2%)
Moderate	74 (45.7%)
High	44 (27.2%)

\*BMI = body-mass index, and FCI = Functional Comorbidity Index.

problems, an interaction term between whether the patient had altered the physical demands of his or her job and his or her reported physical demands was included in the models. This interaction term resulted in the impact of physical demands being evaluated only when work responsibilities had not been modified preoperatively or postoperatively. Other factors, evaluated on a dichotomous scale, included potential workplace characteristics (whether or not the patient was self-employed, received health insurance through his or her job, was employed in a handicap accessible workplace, or received Workers' Compensation<sup>34,35</sup>) as well as other factors that may influence the patient's rate of re-

covery (the availability of someone to assist the patient during recovery<sup>36</sup>, the presence of low-back pain<sup>36</sup>, and possession of disability insurance) (Table I).

### Statistical Methods

A series of factor analyses was performed to identify potential subscale scores on the basis of the questionnaire items assessing three types of motivation: self, family/social, and health. The items that were highly correlated during the factor analysis were summated to construct motivation subscales. The factor analysis resulted in three components representing distinct motivational constructs. The three constructs represented the patient's self-motivation to return to work, familial or social motivation (motivation related to family, friends, or coworkers), and motivation related to health (how work was associated with the patient's knee problems). The self-motivation subscale was the summation of four items, family motivation comprised two items, and health motivation contained three items (Table II). Each of the items used in the motivation subscales was scored on a scale ranging from 0 to 4. The subscale item scores were summated and then divided by the maximum number of points possible, to obtain a motivation subscale score ranging from 0 to 1, with 1 indicating complete motivation. Reliability testing was then performed on each of

**TABLE II Motivation Subscales**

Construct	Items*
Self-motivation	How important is it to you as an individual that you return to work? How important is it to you that you return to work in less than 1 year? How important is it to you that you return to work in less than 6 months? How important is it to you that you return to work in less than 3 months?
Family/social motivation	How important is it to your family that you return to work? How important is it to your friends or coworkers that you return to work?
Health motivation	How often do your current knee problems affect your ability to complete your work assignments? How important of a role did your ability to continue to work play in your decision to receive a knee replacement? Does your work make your knee pain worse?
Sense of urgency to return	How important is it to you that you return to work in less than 1 month?

\*Each question was scored on a scale of 0 to 4, with the summative score for each subscale ranging from 0 to 1.

the subscales in order to maximize their internal consistency reliability coefficients. The three subscales had Cronbach alpha scores ranging from 0.65 to 0.79. The Cronbach alpha measures a scale's internal consistency with possible absolute values between 0 and 1. Higher values indicate that the individual items of a scale have greater internal consistency<sup>37</sup>. One question designed to be included with the items of the self-motivation scale, the importance of returning to work within one month, did not correlate well with the other motivation questions in the factor analysis, and the reliability of the subscale improved when this question was dropped. This variable was therefore included as a separate independent predictor termed "a personal sense of urgency for returning to work." The final motivation subscales were then used as independent predictors of a patient returning to work.

Two parallel survival analyses consisting of accelerated failure time models following a Weibull distribution were performed<sup>38</sup>. In the first model, the time from surgery to the patient's return to any amount of work was the dependent variable. The model was initially run with inclusion of all variables of interest and then was rerun with use of a backward stepwise elimination procedure in which the independent variable with the least significant p value in each step was eliminated until all p values were <0.10. This approach resulted in the most parsimonious significant model. This approach was then duplicated with use of the time between the patient's surgery and his or her return to working full-time as the dependent variable. The acceleration factor is a multiplier of the median survival time. An acceleration factor of greater than one indicates that an individual with that

variable would have a greater median time until he or she returned to work, whereas an acceleration factor of less than one indicates that that variable is associated with the patient returning to work in less time. For example, an acceleration factor of 0.5 indicates a return to work in half the time of the reference group.

A second approach consisted of analysis of return to work at the three-month end point. In this analysis, two separate dichotomous outcomes were used: whether the patient had returned to work at least part-time (yes or no) and whether the patient had returned to work full-time (yes or no). Rather than using logistic regression models, which produce odds ratios, we employed two separate log-binomial models, which produced the relative risks of returning to work. Relative risks are easier to interpret and more meaningful than odds ratios, although odds ratios may be used to estimate relative risks when relative risks cannot be calculated directly. If the prevalence of the outcome is >10%, however, the odds ratio can overestimate the relative risk by a substantial margin<sup>39</sup>.

The interpretability of the magnitudes of the acceleration factors and relative risks is complicated by the inclusion of both dichotomous and continuous variables in all four models. As a result, all of the motivational subscales were scored on a scale of 0 to 1, with 1 indicating that the individual was completely motivated in that subscale. The effect of age was per ten-year interval, while the effects of the preoperative health scores (WOMAC and SF-12) were per standard deviation. This approach was intended to facilitate comparisons in effect sizes per unit change of each of the independent variables.

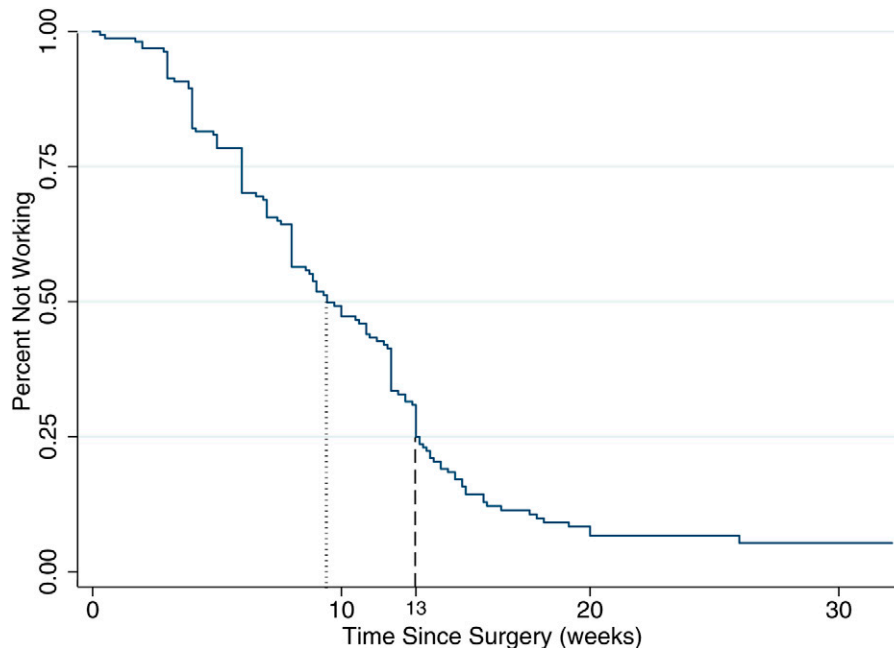


Fig. 1

Survival analysis curve. Solid line = a survival analysis curve showing the percentage of patients who had not returned to work by a given time point. Dotted line = the median time until the patients returned to work (50th percentile = 8.9 weeks). Dashed line = the percentage of patients who had not returned to work by three months postoperatively (27.8%).

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**Results**

Follow-up data were available for 162 (94.2%) of 172 patients enrolled. Of the ten patients (5.8%) for whom follow-up data were not available, five had the total knee arthroplasty canceled, two had a second primary total knee arthroplasty of a staged bilateral operation within the six-month follow-up time

period, and three failed to complete any of the postoperative questionnaires. The patients were predominantly female (111, 68.5%), white (137, 84.6%), and obese (Table I). The median time to return to work was 8.9 weeks (Fig. 1). The proportions of the study population having other independent variables such as being self-employed and having disability insurance are presented in Table I.

One patient was terminated from his employment four months postoperatively; he had not returned to work after the operation. Since this patient was still employed at the three-month end point, he was included in the dichotomous analysis

**TABLE III Multivariate-Adjusted Results of Survival Analysis for Time to Return to Work**

Predictor*	Time to Return to Work at Least Part-Time		Time to Return to Work Full-Time	
	Acceleration Factor (95% Confidence Interval)	P Value	Acceleration Factor (95% Confidence Interval)	P Value
Patient demographics				
Age†	1.079 (0.957, 1.217)	0.213	1.098 (0.975, 1.237)	0.124
Female sex	0.783 (0.639, 0.960)	0.018§	0.785 (0.641, 0.963)	0.020§
Non-white race	1.014 (0.796, 1.293)	0.909	1.041 (0.808, 1.341)	0.755
Morbid obesity (BMI > 40 kg/m <sup>2</sup> )	0.915 (0.744, 1.124)	0.397	0.892 (0.727, 1.095)	0.274
FCI	0.914 (0.850, 0.983)	0.015§	0.923 (0.859, 0.993)	0.031§
Bilateral total knee arthroplasty	0.940 (0.756, 1.169)	0.577	0.917 (0.741, 1.134)	0.423
Preoperative knee score				
WOMAC physical function subscale‡	0.809 (0.717, 0.913)	0.001§	0.801 (0.708, 0.906)	0.032§
WOMAC pain subscale‡	1.132 (1.012, 1.266)	0.030§	1.132 (1.011, 1.267)	<0.001§
Preoperative SF-12 global health score				
Physical composite summary score‡	1.044 (0.918, 1.188)	0.512	1.034 (0.907, 1.179)	0.620
Mental composite summary score‡	0.891 (0.817, 0.972)	0.009§	0.892 (0.818, 0.972)	0.009§
Motivation				
Self-motivation	0.774 (0.400, 1.498)	0.447	0.791 (0.388, 1.616)	0.521
Family/social motivation	1.079 (0.727, 1.602)	0.705	1.017 (0.678, 1.524)	0.936
Health motivation	0.968 (0.699, 1.140)	0.844	0.991 (0.718, 1.368)	0.956
Self-employed	0.792 (0.628, 1.000)	0.050§	0.854 (0.673, 1.084)	0.195
Sense of urgency to return	0.468 (0.372, 0.588)	<0.001§	0.464 (0.370, 0.584)	<0.001§
Work factors				
Physical demands of job‡	1.116 (1.025, 1.215)	0.012§	1.106 (1.015, 1.206)	0.022§
Returning to work main reason for total knee arthroplasty	1.043 (0.964, 1.128)	0.298	1.037 (0.958, 1.124)	0.368
Work associated with knee problems	0.982 (0.802, 1.202)	0.614	0.971 (0.795, 1.186)	0.771
Receiving Workers' Compensation	4.360 (1.632, 11.650)	0.003§	4.146 (1.573, 10.923)	0.004§
Health insurance through employer	0.935 (0.720, 1.215)	0.614	0.926 (0.704, 1.219)	0.583
Work environment handicap accessible	0.736 (0.609, 0.889)	0.002§	0.769 (0.639, 0.927)	0.006§
Recovery factors				
Low-back pain	1.015 (0.836, 1.233)	0.882	0.957 (0.788, 1.163)	0.661
Assistance during recovery from total knee arthroplasty	0.788 (0.536, 1.157)	0.223	0.799 (0.530, 1.205)	0.285
Disability insurance	0.890 (0.745, 1.064)	0.202	0.905 (0.757, 1.081)	0.271

\*BMI = body-mass index, FCI = Functional Comorbidity Index, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index, and SF-12 = Medical Outcomes Study 12-Item Short Form Health Survey. †Per ten-year change. ‡Per standard deviation. §P ≤ 0.05.



as not having returned to work. His data were included in the survival analysis until the termination of his employment.

Some of the independent variables were significantly correlated with each other. Women were more likely to be obese ( $p = 0.001$ ) and were more likely to have a higher FCI score ( $p < 0.001$ ) and less physically demanding jobs ( $p = 0.035$ ). Although self-employed individuals had physical demands that were comparable with those of other employees, they were more likely to report having altered their work responsibilities to compensate for their knee problems ( $p = 0.024$ ). Patients who reported

preoperatively that they had modified their work responsibilities to compensate for their knee problems were more likely to have modified their work responsibilities postoperatively ( $p < 0.001$ ).

The participants' jobs ranged from those with typically fewer physical demands, including executive officer, attorney, and medical secretary, to those with high physical demands, including farmer, mechanic, and warehouse worker. When asked to self-rate the demands placed on their knees by their occupational duties, forty-four (27.2%) rated the demands as low; seventy-four (45.7%), as moderate; and forty-four (27.2%), as high (Table I).

**TABLE IV Multivariate-Adjusted Factors Associated with Returning to Work by Three Months**

Predictor*	Returned to Work at Least Part-Time by Three Months		Returned to Work Full-Time by Three Months	
	Relative Risk (95% Confidence Interval)	P Value	Relative Risk (95% Confidence Interval)	P Value
<b>Patient demographics</b>				
Age†	1.005 (0.895, 1.128)	0.938	0.997 (0.875, 1.136)	0.961
Female sex	1.045 (0.903, 1.209)	0.558	1.047 (0.899, 1.218)	0.556
Non-white race	1.024 (0.851, 1.233)	0.780	1.026 (0.816, 1.291)	0.825
Morbid obesity (BMI > 40 kg/m <sup>2</sup> )	1.018 (0.860, 1.205)	0.832	1.034 (0.877, 1.218)	0.693
FCI	1.007 (0.946, 1.072)	0.822	1.007 (0.949, 1.067)	0.822
Bilateral total knee arthroplasty	1.012 (0.851, 1.204)	0.891	1.014 (0.781, 1.317)	0.918
<b>Preoperative knee score</b>				
WOMAC physical function subscale‡	1.031 (0.943, 1.128)	0.504	1.035 (0.942, 1.137)	0.479
WOMAC pain subscale‡	0.985 (0.877, 1.106)	0.797	0.987 (0.917, 1.063)	0.733
<b>Preoperative SF-12 global health score</b>				
Physical composite summary score‡	0.980 (0.911, 1.055)	0.591	0.976 (0.902, 1.057)	0.554
Mental composite summary score‡	1.003 (0.892, 1.129)	0.955	1.008 (0.909, 1.116)	0.886
<b>Motivation</b>				
Self-motivation	1.867 (0.811, 4.300)	0.142	1.462 (0.571, 3.745)	0.428
Family/social motivation	0.883 (0.652, 1.195)	0.419	0.983 (0.687, 1.407)	0.925
Health motivation	0.929 (0.737, 1.171)	0.532	1.018 (0.712, 1.456)	0.921
Self-employed	1.092 (0.870, 1.371)	0.448	1.090 (0.900, 1.320)	0.380
Sense of urgency to return	1.442 (1.206, 1.724)	<0.0001§	1.541 (1.256, 1.892)	<0.0001§
<b>Work factors</b>				
Physical demands of job‡	0.996 (0.918, 1.081)	0.926	1.001 (0.925, 1.083)	0.977
Returning to work was main reason for total knee arthroplasty	0.973 (0.913, 1.038)	0.407	0.971 (0.909, 1.038)	0.389
Work associated with knee problems	0.984 (0.837, 1.157)	0.846	0.997 (0.844, 1.178)	0.974
Receiving Workers' Compensation	0.035 (0.000, 999.9)	0.548	0.066 (0.000, 129.8)	0.482
Health insurance through employer	1.005 (0.729, 1.385)	0.978	1.027 (0.800, 1.318)	0.835
Work environment handicap accessible	1.086 (0.922, 1.279)	0.323	1.100 (0.911, 1.329)	0.321
<b>Recovery factors</b>				
Low-back pain	1.001 (0.748, 1.339)	0.996	1.007 (0.691, 1.467)	0.972
Assistance during recovery from total knee arthroplasty	0.952 (0.413, 2.195)	0.909	0.942 (0.455, 1.952)	0.873
Disability insurance	1.017 (0.836, 1.238)	0.864	1.005 (0.815, 1.239)	0.965

\*BMI = body-mass index, FCI = Functional Comorbidity Index, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index, and SF-12 = Medical Outcomes Study 12-Item Short Form Health Survey. †Per ten-year change. ‡Per standard deviation. § $P \leq 0.05$ .

The survival analysis predicting the return to work at least part-time identified seven variables that were associated with a faster return to work and three variables that were associated with a slower return to work (Table III). Factors associated with a faster return to work included a sense of urgency about returning (acceleration factor = 0.468), working in a handicap accessible workplace (acceleration factor = 0.736), being female (acceleration factor = 0.783), being self-employed (acceleration factor = 0.792), a higher FCI score (acceleration factor = 0.914), a higher WOMAC physical function score (acceleration factor = 0.809), and a higher mental composite summary score on the SF-12 (acceleration factor = 0.891). These results indicate that patients who have a sense of urgency about returning to work do so in 46.8% of the time taken by those without a sense of urgency; likewise, individuals employed at a handicap accessible workplace returned in 73.6% of the time taken by patients not employed at a handicap accessible workplace. Factors associated with a slower return to work included receiving Workers' Compensation (acceleration factor = 4.360), having a more physically demanding job (acceleration factor = 1.116), and having less pain preoperatively (a higher WOMAC pain score) (acceleration factor = 1.132). These results indicate that for every standard deviation increase in work demands, a patient could anticipate taking 11.6% longer to return to work, whereas for every standard deviation increase in preoperative pain, the patient could anticipate returning to work in 13.2% less time.

The KOOS scores were found to have excessive covariance with the WOMAC scores, thus not providing any information in addition to that conveyed by the WOMAC scores alone. As a result, the KOOS scores are not presented in favor of presenting the results from the WOMAC scores instead. Similar results were obtained in the survival analysis predicting the time to return to working full-time (Table III). Except for self-employment ( $p = 0.195$ ), all of the independent variables that were significant in the previous model were again significant, and in the same direction.

Of the 162 patients, 117 (72.2%) had returned to work at least part-time within the three-month time period (Fig. 1). Ten of the participants reported not having a job involving at least thirty hours of work per week and thus were excluded from the analyses of the return to full-time work. Of the 152 patients included, 109 (71.7%) had returned to work full-time within the three-month time period. Only one independent variable, a personal sense of urgency about returning to work, was a significant predictor of returning to work at least part-time by the three-month time period (relative risk, 1.442). This indicates that, if a person states that he or she has an urgent desire to return to work, he or she is 44.2% more likely to return to work within three months than his or her peers (Table IV). Likewise, only a personal sense of urgency about returning to work was a significant predictor of returning to work full-time, with the patients who expressed a greater sense of urgency being 54.1% more likely to have returned to work within three months (relative risk, 1.541; Table IV).

## Discussion

The study population was consistent with the overall demographics of those seeking total knee arthroplasty—i.e., the patients were predominantly female and white<sup>40</sup>. In addition, the types of jobs and socioeconomic levels represented in the study population were very diverse, with occupations including farming, fast food, education, and business. More than two-thirds of the patients (117 of 162) had returned to work by three months postoperatively (Fig. 1), and most had returned to work full-time. While a set time point like three months postoperatively is easier for patients to understand, the survival analysis provides greater power for detecting variables associated with returning to work across the entire time range of interest.

In all four models, the patients' personal sense of urgency about returning to work was the most important predictor of their actually returning to work (Tables III and IV). An individual's motivation to work is a complex interaction among the individual's personality traits, needs, values, contextual cues to the importance of working, and commitment to his or her work<sup>32,41</sup>. The importance of returning to work quickly was independent of the individual's financial or social motivations to return to work and whether or not they were self-employed. Despite adjustment for many of the individual drivers of a patient's motivation to return to work, a personal sense of urgency remained a significant predictor of the time required to return to work. This suggests that the variable may reflect a complex interaction of various motivational drivers, including the value that the individuals place on the role of work or their commitment to their particular job.

The strength of self-motivation to return to work is especially evident in the magnitude of the size of the effect of being self-employed on a patient's returning to work. For example, being self-employed was a significant predictor of a more rapid return to work independent of the individual's sense of urgency to return. An acceleration factor of 0.792 indicates that, if the median time for an individual employed by a company to return to work is ten weeks, the median time for an otherwise comparable self-employed person to return to work would be approximately eight weeks. Self-employment was only a significant predictor of the timing of a patient's return to work at least part-time; it was not a significant predictor of return to work full-time ( $p = 0.050$  versus  $p = 0.195$ ). Thus, it appears that self-employed individuals may return to work more quickly, but they are not any more likely to resume a full-time schedule faster than employees working for others.

Women returned to work much faster than men. Women were more likely to have less physically demanding jobs and were far more likely to be obese; however, the faster return to work by women was independent of those variables.

It has been shown previously that one of the best predictors of patients' postoperative function is their preoperative function<sup>17,36</sup>. In our study, the patients' return to work was influenced by their preoperative function. Patients with lower preoperative global mental health scores returned to work at slower rates, indicating that patients with poorer emotional health prior to surgery have a slower recovery. A patient's preoperative FCI score

posed an interpretation challenge because of the observation that patients with greater comorbidity returned to work more quickly. This may be a result of the FCI simply not being an accurate predictor of returning to work as it was intended to be a predictor of physical function. In this study, the FCI was not associated with the physical demands of a patient's job.

It is reasonable to expect that patients who still have limited mobility and may require the use of a cane in the early course of recovery will benefit from a work environment that accommodates their limited mobility. Being employed at a handicap accessible workplace was nearly as influential in facilitating a faster return to work as being self-employed was.

The factor with the greatest effect in terms of slowing the patient's return to work was receiving Workers' Compensation. This finding is consistent with the observation that patients receiving Workers' Compensation are more likely to report poorer outcomes following total knee arthroplasty<sup>34,35</sup>. However, the study population included only two patients receiving Workers' Compensation. As a result, generalizations about all patients receiving Workers' Compensation cannot be made on the basis of our results. When these two individuals were dropped from the analysis, the same results were obtained regarding the other variables.

The physical demands of a patient's job were only important when the analysis was limited to patients who were not able to modify their work responsibilities to compensate for their knee problems. Although patients with higher physical demands took slightly longer to return to work, the effect was modest considering that it was per standard deviation in job demands.

The factors affecting a patient's return to work following primary total knee arthroplasty are similar to the factors found to be associated with returning to work following other orthopaedic

procedures or injuries; these include being female, having a less physically demanding job, and being self-employed<sup>42-44</sup>. In study by Mobasheri et al.<sup>45</sup>, patients with a total hip replacement took a slightly longer time to return to work (with an average of 10.5 weeks off work) than did the patients with a total knee replacement in our study.

Our findings suggest that the physical demands of the patient's job play only a marginal role in determining how long it takes for a patient to return to work after total knee arthroplasty. It appears that properly managed, highly motivated patients are capable of returning to work in physically demanding jobs. The implications for advising patients preoperatively are clear: they should be told that returning to work depends more on the patient than his or her type of job. ■

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