

Employment status and personal characteristics in patients awaiting hip-replacement surgery

Eric R. Bohm, BEng, MD, MSc

From the University of Manitoba Joint Replacement Group, Winnipeg, Man.

Presented as a poster at the 60th annual meeting of the Canadian Orthopaedic Association, Jun. 3–5, 2005, Montréal, Que.

Accepted for publication
Mar. 18, 2008

Correspondence to:

Dr. E.R. Bohm
University of Manitoba Joint Replacement Group
Concordia Hospital, Room N115
1095 Concordia Ave.
Winnipeg MB R2K 3S8
fax 204 661-7420
ebohm@concordiahospital.mb.ca

Background: Total hip arthroplasty (THA) is a cost-effective surgical intervention that substantially improves quality of life. Recent advances have broadened the indications to include younger, working-age patients. Despite these benefits, there are often long waits for this procedure in Canada. Furthermore, there exists little documentation of the ability of patients waiting for THA to maintain employment or perform their occupational duties.

Methods: I prospectively identified patients younger than 65 years from a primary hip-replacement surgery waiting list. The study coordinator contacted patients by phone and asked them to participate; if they agreed, we mailed them a validated questionnaire. To compare working with nonworking patients, I used univariate analysis and logistic regression modeling.

Results: A total of 84 of the 100 patients who agreed to participate returned the questionnaire. While awaiting THA, 20% of patients who considered themselves to be in the workforce were off work owing to their hip conditions. Work cessation resulted in a median drop in income of \$15 000 CDN and forgone tax revenues of \$3800. Poor hip function was related to both lowered productivity and work cessation before surgery. Patients with an Oxford 12 hip score of 50 or worse appeared to have about a 50% chance of stopping work before THA, whereas those with a score of 40 or better appeared to have only a 10% chance of stopping work.

Conclusion: About 20% of patients in the workforce who are awaiting THA are off work owing to their hip conditions while on the waiting list. Poor hip function is associated with work cessation and decreased productivity.

Contexte : L'arthroplastie totale de la hanche est une intervention chirurgicale rentable, qui améliore substantiellement la qualité de la vie; de récents progrès ont permis d'en élargir les indications : elle est maintenant offerte à des patients plus jeunes, professionnellement actifs. Malgré ces avantages, les patients doivent souvent attendre longtemps avant de subir leur intervention au Canada. On déplore en outre l'absence de données sur la capacité des patients en attente d'une arthroplastie totale de la hanche de conserver leur emploi ou de s'acquitter de leurs tâches professionnelles.

Méthodes : J'ai recensé de manière prospective les patients de moins de 65 ans inscrits sur une liste d'attente en vue d'une première chirurgie pour prothèse de hanche. La coordonnatrice de l'étude a communiqué avec ces patients par téléphone et les a invités à participer à l'étude. S'ils acceptaient, nous leur faisons parvenir par la poste un questionnaire validé. Pour comparer les patients professionnellement actifs et les patients en arrêt de travail, j'ai utilisé une analyse univariée et un modèle de régression logistique.

Résultats : En tout, 84 des 100 patients rejoints ont accepté de participer et ont retourné leur questionnaire. Alors qu'ils attendaient de subir leur intervention pour arthroplastie totale de la hanche, 20 % des patients qui se considéraient sur le marché du travail ne travaillaient pas en raison de leur problème de hanche. Cet arrêt de travail a entraîné une baisse médiane de revenu de 15 000 \$CAN et un manque de 3800 \$ en revenus fiscaux. Un mauvais fonctionnement de la hanche a été associé à une baisse de productivité et à un arrêt de travail avant la chirurgie. On a estimé à environ 50 % le risque que les patients présentant un score Oxford-12 pour la hanche de 50 ou plus doivent cesser de travailler avant leur arthroplastie totale de la hanche, contre 10 % seulement pour les patients présentant un score de 40 ou moins.

Conclusion : Environ 20 % des patients professionnellement actifs qui se trouvent inscrits sur une liste d'attente pour une arthroplastie totale de la hanche ne travaillent pas en raison de leurs problèmes articulaires. On associe la dysfonction de la hanche à un arrêt de travail et à une baisse de productivité.

Total hip arthroplasty (THA) is a cost-effective surgical intervention¹ that produces substantial improvement in pain, physical function and quality of life.²⁻⁴ Despite these benefits, there are often long waits for this procedure in Canada, as demonstrated by attention given to the issue nationally.⁵ For example, in the Winnipeg Regional Health Authority, the median wait for THA at the end of 2005 was 40 weeks (Ms. Linda MacDonald, Winnipeg Regional Health Authority, Winnipeg, MB: personal communication, 2006). With recent advances in the durability of THA implants, including the use of ceramic, metal and cross-linked polyethylene-bearing surfaces, the indications for surgery have broadened to include younger, working-age patients.⁶ Only 2 studies within western countries examine the impact of waiting for lower extremity surgery on patients' abilities to maintain employment and fulfill their occupational duties.^{7,8} This paucity of data may be in part related to the lack of a validated tool to undertake this assessment.

I have previously reported on the conceptualization of employment and associated factors in the context of patients waiting for THA, and on the development and validation of a self-administered questionnaire for assessing the impact of THA on employment.⁹ Work can be conceptualized into 8 measurable facets: occupation, remuneration, hours of work, workplace physical demands, job flexibility, productivity and ability to meet workplace physical demands, work attitude and job satisfaction. Factors that can confound or modify the effect of THA on resumption of occupational activities can be grouped into 3 main headings: biological (e.g., age), biomechanical (e.g., hip function) and psychosocial (e.g., job motivation).

The purpose of the present study is to document the employment status and associated characteristics of working-age patients awaiting THA and to compare the characteristics of patients who continue to work with those of patients who stop working while on the waiting list. It is hypothesized that patients may be forced to stop working while waiting for surgery primarily owing to functional limitations arising from their hip conditions.

METHODS

I prospectively identified working-age patients (defined as < 65 yr) from my academic arthroplasty group's elective, primary hip-replacement surgery waiting list. I excluded patients unable to comprehend English. The study coordinator contacted patients and asked them to participate. If they agreed, we mailed them a questionnaire and consent form to complete (questionnaire available from author upon request). No alteration to the scheduling of their surgeries or perioperative care was made. The validity and reliability of the questionnaire has been previously reported.⁹ In addition to basic demographic information, the self-administered questionnaire measures level of

education, social support, smoking status, risk of alcohol abuse, number of dependants, household income, personal income, collection of disability insurance, self-employment status, job tenure, physical function, hip function, limitations from medical comorbidities, limitations from musculoskeletal comorbidities, job motivation, job satisfaction, weekly hours of work (paid, unpaid and overtime), workplace physical demands, workplace flexibility, ability to meet workplace physical demands and workplace productivity. The University of Manitoba health research ethics board approved this research, and all participants provided informed consent.

Statistical analysis

The research coordinator entered the responses to the questionnaires into a Microsoft Access database. I performed statistical analysis using SAS 9.1 software (SAS Institute Inc.). I plotted all continuous variables to assess normalcy and used summary statistics to assess patients in an aggregate fashion. To compare working and non-working patients, I performed a univariate analysis using either the Student *t* test or Wilcoxon test for continuous variables and the χ^2 test or Fisher exact test for ordinal and dichotomous variables. I did not adjust the significance level to correct for multiple comparisons. I entered variables that significantly differed between groups and were not correlated with each other into a logistic regression model. I used a receiver operating characteristic (ROC) curve analysis to graphically assess the usefulness of hip function scores as a predictor of employment status.

To facilitate further planned research looking at change in employment status before and after hip replacement, I set the sample size at 100, which gave a power of more than 90% at a significance level of 5% to detect an absolute change of 25% in employment status before and after surgery.

I based the calculation of forgone income tax revenue on the federal and Manitoba provincial tax rates. The combined tax rate for income between \$10 000 and \$35 000 is 25% (15% federal and 10% provincial).

RESULTS

Between October 2003 and July 2005, I contacted 118 patients who were within 1–12 months of undergoing hip-replacement surgery and asked them to participate in the study. Of the 118 patients asked, 100 agreed to complete the questionnaire. Of these, 84 (84%) returned the questionnaires: 42 men and 42 women with a mean age of 51.7 years. The nonresponders were 13 men and 5 women with a mean age of 51.3 years.

Sixty of 84 respondents (71%) classified themselves as being in the workforce; 12 of these 60 patients (20%) indicated they were off work owing to their hip conditions.

Compared with patients who continued to work while waiting for hip-replacement surgery, those off work were older; had fewer dependants, lower household income, poorer physical function and hip-specific scores; were more limited by medical comorbidities; had lower job motivation; and, before they stopped working, earned less money, worked fewer unpaid hours per week, were less able to meet workplace physical demands and had lower productivity ($p < 0.05$ for all measures) (Table 1).

I entered statistically significant factors that were not intercorrelated and that could intuitively be related to a patient's working status while awaiting THA (e.g., age, hip function, limitation from medical comorbidities and job motivation) into a multiple logistic regression analysis model. This revealed that both hip function (odds ratio [OR] 1.250, $p = 0.007$) and job motivation (OR 6.658, $p = 0.022$) were independent positive predictors of employment status while awaiting THA (Table 2).

The ROC curve (Fig. 1) demonstrates the relation between sensitivity and specificity of the Oxford-12 hip score's ability to predict employment status. The curve trends to the upper left corner of the graph, and the area

under the curve is 0.842, both of which indicate good predictive accuracy. The plot of estimated probability of employment versus Oxford-12 hip function score (Fig. 2) further demonstrates the positive relation between hip function and employment status; in other words, good hip function predicts being employed.

Patients forced to stop working while awaiting surgery owing to their hip conditions experienced a drop in household income of \$15 000; their median personal income of \$32 500 before stopping work dropped to a total household income of \$17 500 after stopping work (Table 1). At the time the study was undertaken, most patients were waiting more than 1 year for surgery. If patients were forced to stop working because of their hip conditions for a single tax year, forgone federal and provincial income taxes would total about \$3800.

DISCUSSION

In the present study, 71% of working-age patients awaiting THA considered themselves to be in the workforce. This is in line with an expected work force participation

Table 1. Factors related to employment status*

Factor	Patients working	Patients not working	<i>p</i> value
No. patients (%)	48/60 (80)	12/60 (20)	
Mean age, yr	48.67	56.7	0.002
Sex, male:female	26:22	3:9	0.11
Education, median level	Technical/trade school grad	Some technical/trade school	0.32
Social support*	79	71	0.25
Smokers, no (%)	9/48 (18.75)	3/12 (25)	0.69
Risk of alcohol abuse, low:med:high	40:8:0	11:0:0	0.33
No. of dependants, 0:1 or more	15:33	10:2	0.002
Median income			
Household	\$70 000	\$17 500	0.004
Personal	\$55 000	\$32 500 (before stopping work)	0.022
Collecting disability, %	4	75	< 0.001
Self employed, no:yes	37:11	7:1	0.67
Job tenure, < 1:1-5:> 5 yr	2:8:37	0:3:5	0.37
Physical function*	29	8	< 0.001
Oxford-12 hip score*	40	20	< 0.001
Functional limitation from medical conditions, none:some:severe	34:12:1	5:4:3	0.011
Median no. of other painful and limiting joints	3	6.5	0.12
Job motivation*	56	35	0.008
Job satisfaction*	21	35	0.13
Weekly hours			
Work	37.7	36.7	0.78
Overtime	1.1	5.1	0.16
Unpaid	7.25	1.43	0.018
Workplace physical demands*	53	56	0.69
Workplace flexibility*	38	35	0.75
Ability to meet workplace physical demands*	66	37	< 0.001
Productivity*	65	35	0.007

*Scales standardized from worst to best: 0-100.

rate of 75% based on age, sex and province of residence.¹⁰ However, 20% of these patients indicated that they had stopped working owing to their hip conditions.

Several observations support the patients' assertions that they were off work owing to their poor hip function and not other factors. After controlling for age, job motivation and functional limitations from medical conditions, the hip-specific score remained an independent predictor of work status. In addition, before they stopped working patients reported working fewer unpaid hours per week, being less able to meet workplace physical demands and lower productivity; these factors are all consistent with impaired physical function. No differences between the groups could be detected in terms of the number of other painful joints, workplace flexibility or workplace physical demands. In other words, it didn't appear that physical limitations from other musculoskeletal conditions or differences in work environment could explain the differences in work status. Lastly, I detected no differences in other variables that may be independently associated with employment status: sex, education, social support, smoking status, risk of alcohol abuse, self-employment status, job tenure and job satisfaction.⁹

Inspection of the graph demonstrating the probability of employment based on Oxford-12 hip score (Fig. 2) is quite informative. Using the original scale for this questionnaire (12 is the best possible score and 60 is the worst possible) one can see that an Oxford-12 hip score of 40 or

better predicted a 90% chance of remaining employed, whereas a score of 50 or worse predicted only a 50% chance of remaining employed while awaiting THA. This can be a useful clinical tool for identifying patients at risk of ceasing work while awaiting THA.

Among patients who stopped working while awaiting surgery, the combined drop in median income of \$15 000 plus the forgone provincial and federal tax revenues of \$3800 equalled \$18 800. This amount is nearly equal to the incremental cost of 2 THAs in the Winnipeg Regional Health Authority.

The author is aware of only 2 comparable studies looking at employment status of patients awaiting THA. Palmer and colleagues⁷ received 370 responses from 498 patients awaiting either hip or knee arthroplasty, arthroscopy or acetabular osteotomy. Thirty percent of their patients reported being off work owing to their joints, which is similar to the 20% reported in the present study. However, the psychometric validity of their questionnaire was not stated, and stratification by procedure and joint was not reported. Their main finding was that workplace flexibility had a positive effect on the patients' ability to remain employed. Their surrogate measure of workplace flexibility was employer size, as presumably larger employers were better able to find less physically demanding jobs for employees with functional limitations. In the present study, self-reported workplace flexibility and physical occupational demands were both measured using validated scales; no differences were detected between patients off work and patients who remained at work while awaiting THA.

In another study, Mobasheri and colleagues⁸ found that 12 of 63 patients (19%) were off work while awaiting THA owing to their hips, which is also similar to the 20% reported in the present study. Interestingly, they found that 11 of the 12 patients returned to work after surgery,

Table 2. Adjusted odds ratios*

Factor	Adjusted OR (95% CI)	p value
Age, yr	0.867 (0.719–1.046)	0.14
Oxford-12 hip function	1.250 (1.064–1.469)	0.007
Motivation	6.658 (1.318–33.641)	0.022
Functional limitations from medical conditions	0.333 (0.073–1.513)	0.15

CI = confidence interval; OR = odds ratio.
*Calculated using each item's original scale.

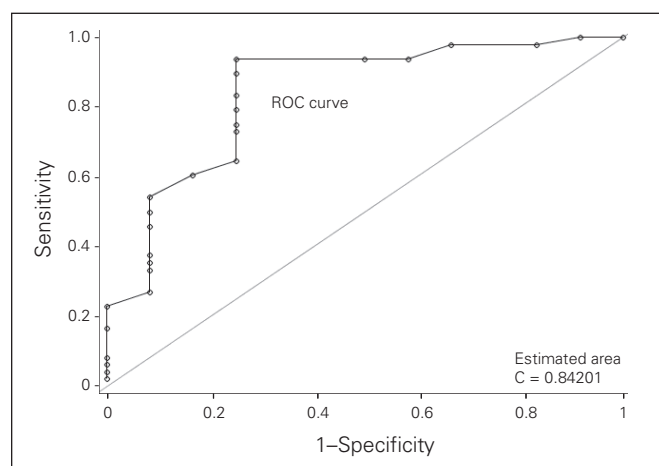


Fig. 1. Receiver operating characteristic (ROC) curve for Oxford-12 hip score as a predictor of employment status.

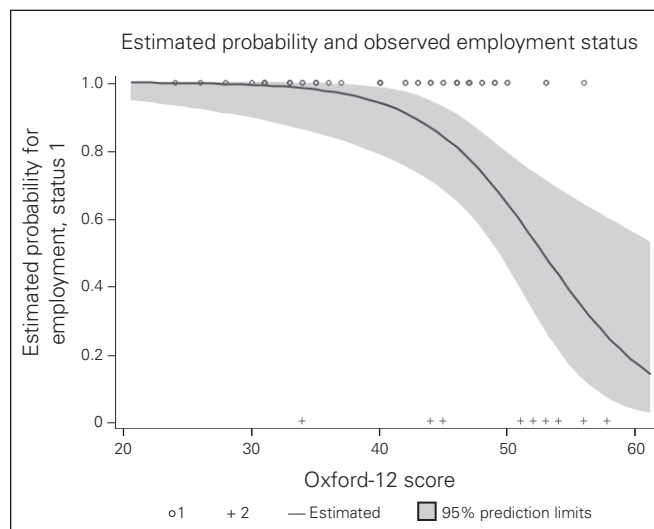


Fig. 2. Probability of employment based on Oxford-12 score. An Oxford score of 12 is the best possible score and 60 is the worst possible.

supporting the patients' assertions that they were off work owing to their hips. This coincides with the present study's finding that patients off work do have more impairment from their hip conditions than those who continue to work.

This study has some weaknesses. Patients completed questionnaires within 12 months of surgery; presumably the patients who completed the questionnaires far in advance of surgery would have continuing deterioration of function during the wait¹¹ and could be forced to stop working. This would result in an under-reporting of the hip-related unemployment. Statistical power considerations limited the number of variables that could be included in the multiple logistic regression analysis; however, the 4 included (age, job motivation, hip function and functional limitations from medical conditions) are intuitively the most important factors impacting patients' decisions to remain employed while awaiting surgery. The present study did not report on the employment status after surgery. Investigation into the impact of surgery on both resumption of employment and fulfillment of occupational duties is underway and will be reported shortly. The length of time that a patient waited for surgery will also be included in that analysis.

CONCLUSION

While awaiting THA, 20% of patients under the age of 65 who consider themselves to be in the workforce are off work owing to their hip conditions. Stopping work results in a drop in median income of \$15 000 CDN and forgone tax revenues of about \$3800. After controlling for age and functional limitation from medical conditions, both poor hip function and lower job motivation are statistically related factors to a patient stopping work while awaiting THA. Poor hip function also appears to impact job productivity negatively: patients who stopped working before surgery also reported lower productivity than patients who did not stop. Patients with an Oxford-12 hip score of 50 or worse appear to have about a 50% chance of stopping work before THA surgery because of their hip conditions, whereas those with a score of 40 or better appear

to have only a 10% chance of stopping work. The impact of THA on resumption of employment and fulfillment of occupational duties has yet to be fully delineated; this will be documented in work currently underway.

Acknowledgements: I would like to thank the University of Manitoba Joint Replacement Group surgeons and research staff and Mr. Jarret Woodmass.

Competing interests: None declared.

References

1. Chang RW, Pellisier JM, Hazen GB. A cost-effectiveness analysis of total hip arthroplasty for osteoarthritis of the hip. *JAMA* 1996; 275:858-65.
2. Espehaug B, Havelin LI, Engesaeter LB, et al. Patient satisfaction and function after primary and revision total hip replacement. *Clin Orthop Relat Res* 1998;(351):135-48.
3. Laupacis A, Bourne R, Rorabeck C, et al. The effect of elective total hip replacement on health-related quality of life. *J Bone Joint Surg Am* 1993;75:1619-26.
4. Wiklund I, Romanus B. A comparison of quality of life before and after arthroplasty in patients who had arthrosis of the hip joint. *J Bone Joint Surg Am* 1991;73:765-9.
5. Wait Time Alliance for Timely Access to Health Care. *Time's up! Achieving meaningful reductions in wait times. Progress report.* Ottawa (ON): Canadian Medical Association; 2007. Available: www.waittimealliance.ca/images/resport_times_up.pdf (accessed 2009 Feb. 24).
6. Mancuso CA, Ranawat CS, Esdaile JM, et al. Indications for total hip and total knee arthroplasties. *J Arthroplasty* 1996;11:34-46.
7. Palmer KT, Milne P, Poole J, et al. Employment characteristics and job loss in patients awaiting surgery on the hip or knee. *Occup Environ Med* 2005;62:54-7.
8. Mobasheri R, Gidwani S, Rosson JW. The effect of total hip replacement on the employment status of patients under the age of 60 years. *Ann R Coll Surg Engl* 2006;88:131-3.
9. Bohm E. *Resumption of employment after hip replacement surgery: What to measure, and how?* [thesis]. Halifax (NS): Dalhousie University; 2002.
10. Market Research Handbook. Ottawa (ON): Statistics Canada; 2008. Cat no 63-224-X. Available: www.statcan.gc.ca/pub/63-224-x/63-224-x2007000-eng.pdf (accessed 2009 Mar. 03).
11. Mahon JL, Bourne RB, Rorabeck CH, et al. Health-related quality of life and mobility of patients awaiting elective total hip arthroplasty: a prospective study. *CMAJ* 2002;167:1115-21.