

Primary total knee arthroplasty in patients receiving workers' compensation benefits

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Objective: To determine the influence of Ontario Workplace Safety and Insurance Board (WSIB) benefits on short-term clinical outcomes of primary unilateral total knee arthroplasty (TKA). **Methods:** In a retrospective matched-cohort study at a single tertiary-care arthroplasty centre in Ontario, we compared a study cohort of 38 successive primary TKA patients receiving WSIB benefits from 1998 to 2002 to 38 controls, a matched cohort of non-WSIB patients, comparing Oxford Knee Score and Knee Society Score (both clinical and functional components) as well as flexion and pain variables, preoperatively and at postoperative intervals of 6 weeks, 6 months and 1 year. At least 1 year after their surgery, all patients were asked to complete a non-validated patient satisfaction survey. The number of clinic visits related to the operation was also compared, by means of Ontario Hospital Insurance Plan billing codes for each individual. **Results:** Preoperative measurements showed the 2 groups to be similar. At follow-up, WSIB patients had significantly higher pain scores, poorer self-perceived functional outcomes and a lower range of knee flexion than the control group. WSIB patients also required more postoperative clinic visits and were more reluctant to answer questions about functional outcome. **Conclusions:** Short-term outcomes of primary TKA in patients receiving WSIB benefits are inferior to those of non-WSIB patients. WSIB patients are seen more frequently for postoperative follow-up, which we would attribute to the persistence of subjective complaints after TKA.

Objectif : Déterminer l'effet des prestations de la Commission de la sécurité professionnelle et de l'assurance contre les accidents du travail (CSPAAT) de l'Ontario sur les résultats cliniques à court terme d'une arthroplastie totale unilatérale primaire du genou (ATG). **Méthodes :** Dans le contexte d'une étude rétrospective de cohorte jumelée effectuée à un seul centre d'arthroplastie de soins tertiaires de l'Ontario, nous avons comparé une cohorte de 38 patients ayant subi une ATG primaire et touchant des prestations de la CSPAAT, de 1998 à 2002, à 38 témoins, cohorte jumelée de non-patients de la CSPAAT, et comparé le score Oxford à celui que propose la Knee Society (éléments cliniques et fonctionnels), ainsi que les variables reliées à la flexion et à la douleur, avant l'intervention et à des intervalles de six semaines, six mois et un an après celle-ci. Au moins un an après avoir subi leur intervention chirurgicale, on a demandé à tous les patients de répondre à un questionnaire non validé sur la satisfaction du patient. On a aussi comparé le nombre de visites à la clinique reliées à l'intervention en utilisant les codes de facturation du régime d'assurance hospitalisation de l'Ontario pour chaque patient. **Résultats :** Des mesures préopératoires ont montré que les deux groupes étaient semblables. Au suivi, les patients de la CSPAAT présentaient des scores de douleur beaucoup plus élevés, des résultats fonctionnels auto-perçus moins bons et une amplitude de flexion du genou moindre que les sujets du groupe témoin. Les patients de la CSPAAT avaient aussi besoin de plus de visites postopératoires à la clinique et hésitaient davantage à répondre aux questions sur leur évolution fonctionnelle. **Conclusions :** Les résultats à court terme de l'ATG primaire pratiquée chez des patients touchant des prestations de la CSPAAT sont inférieurs à ceux des autres patients. Les patients de la CSPAAT sont vus plus souvent pour le suivi postopératoire, ce que nous attribuerions à la persistance des plaintes subjectives après l'ATG.

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We had noted anecdotally an apparent trend toward inferior outcomes and a disproportionate increase in subjective complaints among patients undergoing primary total knee arthroplasty (TKA) who are receiving Workplace Safety and Insurance Board (WSIB) benefits, also known as Workers' Compensation (WC). That factor further appeared to us to result in more follow-up visits and greater resource usage in the initial postoperative phase for these patients. Although many authors¹⁻⁹ have attributed inferior outcomes to WC-associated surgery, there is a relative lack of published reports specific to outcomes of primary TKA in WSIB patients in Canada. We therefore undertook a retrospective study to determine what influence, if any, WC has on the short-term clinical outcomes of primary TKA.

Methods

A retrospective review was conducted on 38 successive patients who underwent primary TKA while receiving WC from 1998 through 2002, treated by 5 surgeons at a single high-volume arthroplasty centre. These patients were matched with a comparative cohort selected from a prospectively gathered arthroplasty database of 1178 cases of primary TKA with surgery dates within the same period. Because range of motion and clinical outcomes have been shown to plateau 12 months after surgery,¹⁰⁻¹² to be included in the study each patient had to have completed at least 1 year of follow-up.

Patients were stratified by surgeon and matched one-to-one for gender, age, body mass index (BMI), preoperative diagnosis and any presence of a previous high tibial osteotomy. Patients in both groups were also assessed preoperatively by an anesthesiologist to determine their level of anesthetic risk according to the American Society of Anesthesiologists (ASA) classification system,¹³ and matched accordingly. The implants inserted, togeth-

er with surgical approach, fixation and use of drains, were similar between the 2 groups.

All patients were examined clinically and radiographically 1-2 weeks before their surgery and at postoperative intervals of 6 weeks, 6 months and 1 year. The primary outcome measure used was the Oxford Knee Score.¹⁴ Secondary outcome measures included the Knee Society Score¹⁵ and its clinical and functional components, as well as flexion and pain variables. At least 1 year after their operation, patients were asked to complete a non-validated patient satisfaction questionnaire by telephone. The number of postoperative clinic visits related to the TKA was also compared via Ontario Hospital Insurance Plan (OHIP) billing codes (A063 — Specific Assessment Other Fracture, and A064 — Partial Assessment) for each individual.

The *Oxford Knee Score*, a subjective functional scoring system completed by the patient, was designed to assess outcomes solely from the patient's perspective and intended to supplement clinical measures of outcome.¹⁴ The questionnaire contains 12 items, each with 5 possible response options scored from 1 to 5, from least difficulty/severity to most. Totalled scores range from 12 points (minimal difficulties) to 60 (major difficulties).

The *Knee Society Score* (KSS) is a 200-point clinical rating system subdivided into 2 components, the knee and function scores (100 points each). The *knee score* rates the pain, stability and range of motion of the joint itself. In addition to the knee score component of KSS, the flexion and pain scores were noted independently. Pain in KSS is rated on a scale of 1-7, from no pain (1) to severe pain (7). The *function score* (100 points) rates a person's ability to walk, climb stairs and perform activities of daily living. The dual rating system eliminates the problem of declining knee scores associated with infirmity.¹⁵

To assess overall patient satisfaction with their primary TKA, a non-validated *patient satisfaction questionnaire* was administered by telephone by an independent observer at an average postoperative period of 34.4 months (range 13.6-50.5 mo). This survey asked 5 questions, each rated on a scale of 1-5, specific to pain relief; ability to perform activities of daily living; how well TKA met patient expectations (rated from excellently to poorly); how willing the patient would be to have another TKA on the contralateral side, if required (from definitely yes to certainly not); and improvement in quality of life (from extremely to not at all improved). Each item was analyzed independently. Although the patient satisfaction tool is non-validated, the information nonetheless addresses specific queries to support hypothesized findings.

Return-to-work status of each patient studied was noted during chart review. Further demographic comparisons were made against the global arthroplasty database, which holds descriptive statistics gathered prospectively on 1178 primary TKAs performed at the centre during the same study period.

To analyze mean differences in outcome scores we did *t* tests of unpaired independent samples and used Levene's test for equality of variances. The χ^2 test was used to analyze proportion of postoperative clinic visits. Values of $p < 0.05$ were considered statistically significant. Comparative analysis between the study group and the global primary TKA database was based on descriptive statistics. All statistical analyses were performed with SPSS version 10.

Results

The WSIB group of patients included 32 males (84%) and 6 females; mean age and BMI and ranges are shown in Table 1. All patients presented with a primary diagnosis of osteoarthritis; the average ASA rating

was 2 for both groups, indicating mild systemic disease. Of the WSIB patients, 5 (13%) had a previous high tibial osteotomy and were matched to 5 non-WSIB patients with the same history. Differences between the 2 groups as of 1–2 weeks before surgery in the scores recorded were not significant (Table 1). Implant knee design, surgical technique and the use of drains were similarly matched between the 2 groups (Table 2). All patients underwent a standard thromboembolic routine, receiving coumadin postoperatively.

Immediate perioperative complications in the groups were similar: 1 WSIB patient experienced cardiac complications, and 1 non-WSIB patient had a postoperative deep-vein thrombosis. No other clinically significant complications were noted. Four patients in the WSIB group had a manipulation under anesthetic for early postoperative stiffness within 8–13 weeks of primary TKA, compared with none in the non-WSIB group ($p = 0.04$).

Mean length of stay in an acute orthopedic ward was 5.3 days for both the WSIB (range 2–9, standard deviation [SD] 1.4) and the matched non-WSIB group (range 3–9, SD 1.5). All patients were discharged home.

In the WSIB group, 1 patient returned 6 months postoperatively for a TKA revision for instability. Another had 2 subsequent surgeries, the first

(20 mo after) a polyethylene insert exchange because of instability. This failed to solve the problem and required formal revision 11 months later with the insertion of a constrained implant. In the non-WSIB group, 1 patient had a TKA revision for instability 22 months after the index surgery. The differences in revision rates between the 2 groups were non-significant ($p = 0.31$). There were no other readmissions in either group.

At 6 weeks after TKA, differences between the WSIB and non-WSIB groups became significant for all outcome variables measured (Table 3), all inferior in the WSIB group. This remained true at 6 months (Table 4), except that the difference in function score had become statistically non-significant ($p = 0.07$). At the 1-year postoperative assessment (Table 5), differences in Oxford Knee Score and flexion range were still statistically significant, but not in the other KSS measurements.

The non-validated patient satisfaction survey, administered over the telephone by an independent observer, was completed by 28 of the 38 WSIB patients at an average of 34.4 months (range 13.6–50.5 mo) post-TKA. Nine WSIB patients refused to participate in the survey, and 1 patient had recently died of prostate cancer. Of the non-WSIB patients, 35 completed the telephone interview; 2 refused, and 1 was lost to follow-up. Rates of refusal to partici-

pate differed significantly between the study groups ($p = 0.022$). The survey results are shown in Table 6.

WSIB patients presented for more clinic visits, an average of 5 (range 3–11 visits, SD 1.9) within the first postoperative year than the matched cohort (an average of 4 visits, range 3–8, SD 1.1; $p = 0.003$), which could be attributed to a persistence of subjective complaints in the WSIB group after primary TKA.

Of the 38 WSIB patients, 16 (42%) were retired at the time of surgery. Within the postoperative study period (mean 34.4 mo, range 13.6–50.5 mo), 15 of the 22 patients who were not retired (68%) did not return to work and were still receiving WC, whereas 7 patients (32%) returned to work and were no longer receiving associated WSIB benefits.

Further demographic comparisons of the WSIB group were made with a global, prospectively gathered arthroplasty database of 1178 primary TKAs. As might be expected, the average WSIB patient (aged 61 yr, range 47–78 yr) is noticeably younger than the average primary TKA patient (71 yr, range 31–92). Interestingly, males make up a considerably greater proportion of the WSIB group (M:F 84.2%:15.8%), whereas the reverse is true of the global population (37.5%:

Table 1

Demographics and preoperative scores, by patient group

| Characteristic or test score | WSIB group, <i>n</i> = 38 | | | Non-WSIB group, <i>n</i> = 38 | | | <i>p</i> value |
|------------------------------|---------------------------|------|-----------|-------------------------------|------|-----------|----------------|
| | Mean | SD | Range | Mean | SD | Range | |
| Age, yr | 61 | 7.5 | 47–78 | 61 | 6.9 | 48–77 | 0.73 |
| Body mass index | 34.5 | 5.8 | 24.1–46.1 | 33.9 | 5.1 | 25.2–50.8 | 0.64 |
| Oxford Knee Score | 41.8 | 7.7 | 25–53 | 39.6 | 6.3 | 29–48 | 0.18 |
| Knee Society Score | 82.4 | 26.5 | 43–151 | 85 | 19.4 | 32–125 | 0.65 |
| Knee score | 38.4 | 16.8 | 8–89 | 39.6 | 14.7 | 3–73 | 0.75 |
| Function score | 44 | 14.2 | 20–80 | 45.4 | 9.1 | 20–70 | 0.64 |
| Flexion | 103.6 | 15.2 | 65–138 | 109 | 13.3 | 75–130 | 0.44 |
| Pain* | 6.3 | 1.0 | 2–7 | 6.2 | 1.0 | 4–7 | 0.77 |

*Possible scores ranged from 1 (no pain) to 7 (severe).

WSIB = receiving Ontario Workplace Safety and Insurance Board benefits

Table 2

Implant factors of total knee arthroplasties, in no. of knees (and % of patients), by group

| Factor | WSIB | Non-WSIB |
|----------------------|----------|----------|
| Implant design | | |
| Posterior stabilized | 30 (79) | 27 (71) |
| Cruciate retaining | 8 (21) | 11 (29) |
| Cemented | 35 (92) | 37 (97) |
| Cementless | 3 (8) | 1 (3) |
| Surgical approach | | |
| Medial parapatellar | 30 (79) | 33 (87) |
| Subvastus medialis | 4 (10.5) | 3 (8) |
| Midvastus medialis | 4 (10.5) | 2 (5) |
| Use of a drain | 27 (71) | 30 (79) |

WSIB = Workplace Safety and Insurance Board

62.5%). Mean BMI was comparable between the WSIB (34.5, range 24.1–46.1) and the global primary TKA group (31.9, range 20.1–67.8), as was ASA rating (both groups presented with a mean rating of 2).

Discussion

Receipt of WC is a recognized factor associated with inferior outcomes of

multiple surgical interventions.^{1–9} There have been few reports on the effect of WC on the outcome of primary TKA,^{7–9} with a relative lack of published reports specific to the outcomes among Canadian WSIB patients, possibly because overall it is relatively uncommon for a patient receiving WSIB benefits to undergo TKA. This review of the experience at our institution identified only 38

WSIB patients out of a total of 1216 cases of primary TKA (3%) performed over the 5-year study period. This is similar to a report by Mont and colleagues⁷ who found that only 2% of 1846 patients undergoing primary TKA at their institution were receiving WC. This was somewhat of a surprise to our senior authors, who were convinced that a greater number of WSIB patients would be identified with this review. The misconception is most likely explained by our finding that WSIB patients attend more frequently for postoperative assessment with more persistent subjective complaints, giving rise to a perception by the attending orthopedic surgeon of a greater burden of care than truly exists.

The WSIB group, as could be expected, had a greater preponderance of males of a younger age than the average patient profile from our global database. This factor also raises concerns about long-term outcomes of this specific subgroup of patients, as they have a higher incidence of subsequent aseptic failure over time.¹⁶ This issue is beyond the scope of this particular study, but all patients continue under routine indefinite long-term clinical and radiographic surveillance, as standard practice at our institution.

One would expect younger patients to recover and recuperate from surgery faster than older patients, with shorter hospital stays and more rapid recovery of both range of movement and function. Nonetheless, Mont's group⁷ found in their review of primary TKA in patients receiving WC that age did not affect outcome. The WSIB patients in our study were matched to account for this variable as well as gender, the effect of previous surgeries and comorbid condition based on ASA rating. No significant difference in length of hospital stay was found between the 2 matched groups, and all patients were discharged directly home without requiring transfer to a rehabilitation facility. Only 32% of non-retired

Table 3

Outcomes 6 weeks after total knee arthroplasty, by patient group

| Test score | WSIB group, n = 38 | | | Non-WSIB group, n = 38 | | | p value |
|--------------------|--------------------|------|--------|------------------------|------|--------|---------|
| | Mean | SD | Range | Mean | SD | Range | |
| Oxford Knee Score | 37.7 | 8.2 | 20–51 | 32.4 | 10.2 | 16–57 | 0.020 |
| Knee Society Score | 107.9 | 29.0 | 62–196 | 129.3 | 31.9 | 42–188 | 0.005 |
| Knee score | 66.0 | 19.8 | 26–96 | 76.7 | 18.9 | 22–98 | 0.027 |
| Function score | 41.9 | 16.5 | 15–100 | 52.6 | 19.4 | 20–95 | 0.017 |
| Flexion | 91.6 | 19.0 | 30–120 | 101.8 | 13.9 | 62–125 | 0.012 |
| Pain* | 3.7 | 2.2 | 1–7 | 2.5 | 1.8 | 1–7 | 0.015 |

WSIB = receiving Ontario Workplace Safety and Insurance Board benefits

All between-group differences were statistically significant ($p \leq 0.05$).

*Possible scores ranged from 1 (no pain) to 7 (severe).

Table 4

Outcomes 6 months after total knee arthroplasty, by patient group

| Test score | WSIB group, n = 38 | | | Non-WSIB group, n = 38 | | | p value |
|--------------------|--------------------|------|--------|------------------------|------|--------|---------|
| | Mean | SD | Range | Mean | SD | Range | |
| Oxford Knee Score | 30.6 | 9.7 | 16–48 | 23.9 | 7.5 | 12–42 | 0.005 |
| Knee Society Score | 144.1 | 33.4 | 81–198 | 162.4 | 30.5 | 79–200 | 0.038 |
| Knee score | 75.7 | 18.9 | 41–99 | 86.9 | 14.5 | 44–100 | 0.019 |
| Function score* | 64.4 | 23.2 | 20–100 | 75.5 | 21.7 | 35–100 | 0.07† |
| Flexion | 105.4 | 13.5 | 25–80 | 112.2 | 9.3 | 94–128 | 0.035 |
| Pain† | 3.1 | 2.1 | 1–7 | 1.9 | 1.5 | 1–7 | 0.018 |

WSIB = patients receiving Ontario Workplace Safety and Insurance Board benefits

*All group differences were statistically significant ($p \leq 0.05$) except for the function score.

†Possible scores ranged from 1 (no pain) to 7 (severe).

Table 5

Outcomes 1 year after total knee arthroplasty, by patient group

| Characteristic or test score | WSIB group, n = 38 | | | Non-WSIB, n = 38 | | | p value |
|------------------------------|--------------------|------|--------|------------------|------|--------|---------|
| | Mean | SD | Range | Mean | SD | Range | |
| Oxford Knee Score* | 29.1 | 10.5 | 13–50 | 21.1 | 9.1 | 12–46 | 0.013 |
| Knee Society Score | 149.7 | 37.8 | 82–196 | 166.1 | 29.9 | 93–200 | 0.12 |
| Knee score | 81.8 | 18.2 | 37–99 | 87.1 | 15.5 | 43–100 | 0.31 |
| Function score | 67.9 | 24.3 | 35–100 | 79.1 | 20.7 | 35–100 | 0.11 |
| Flexion* | 107.1 | 12.3 | 87–128 | 115.5 | 9.1 | 90–130 | 0.013 |
| Pain† | 2.7 | 2 | 1–7 | 1.9 | 1.7 | 1–7 | 0.17 |

WSIB = patients receiving Ontario Workplace Safety and Insurance Board benefits

*Between-group difference is statistically significant ($p \leq 0.05$)

†Possible scores ranged from 1 (no pain) to 7 (severe).

WSIB patients returned to work within the 34-month study period; this could be attributed to factors such as the need for permanent work restrictions to ensure longevity of the TKA. The retrospective nature of this study prevented further pursuit of this issue.

Differences in clinical outcomes at 6 weeks post-TKA clearly showed inferior outcomes in the WSIB group, with statistical significance in almost all parameters. This demonstrated a slower recovery pattern in the WSIB group than in the matched group, with the WSIB group also recording more subjective complaints. It is generally accepted that most (if not all) patients will have reached maximal medical recovery status within 1 year of primary TKA.¹⁰⁻¹² At 1-year review, the only objective difference detected between the 2 groups was a lower flexion range for patients in the WSIB group; all other objective parameters were similar. Patient-driven subjective outcomes in the WSIB group were, however, significantly inferior to those of non-WSIB patients. This was also noted by Mont and co-authors,⁷ who found that the inferior KSS scores achieved by WC patients were attributable to differences in pain scores rather than in range of

movement, stability or function.

Although the objective outcomes of primary TKA in WSIB patients are encouraging, the subjective outcomes clearly are not. In a retrospective review of 10 patients who underwent TKA for a work-related injury, Brinker and associates⁸ found a significant difference between their WSIB and control groups in subjective indices (pain and function), but none in objective measures (range of motion, strength, deformity and instability). Bullens and colleagues¹⁷ reported poor correlations between subjective and objective systems used to evaluate TKA outcomes, suggesting that issues of concern differ for patients and surgeons. Lieberman and collaborators¹⁸ identified a greater discrepancy between a clinician's objective rating of TKA outcome and the patient's subjective rating when patient dissatisfaction is an issue. Patient expectations of and education about the procedure were delineated as significant preoperative factors affecting postoperative subjective outcomes.

Significant differences were also demonstrated in patient satisfaction ratings obtained from the telephone survey that was conducted. We further found a statistically significant

difference in the rate of refusal to participate in the telephonic survey of patient satisfaction and subjective outcome. There is a possibility of "respondent fatigue" being responsible for this discrepancy, as WSIB patients are often required to complete WSIB-related documentation and questionnaires, which is not the case for non-WSIB patients. Alternatively, this may simply be reflective of patient dissatisfaction on the part of the WSIB patients. Mancuso and colleagues¹⁹ reviewed patient expectations and satisfaction with total hip arthroplasty and concluded that patient satisfaction is a complex issue. They found patient satisfaction to be affected by patients' (preoperative) expectations, the objective postoperative clinical outcome and by both the nature and extent of the education/information obtained by the patient before surgery. Furthermore, Robertsson and Dunbar²⁰ have reported that patients unsatisfied with the outcome of TKA are less likely to respond to a questionnaire than those who are satisfied.

It is possible that the inferior subjective outcomes may reflect unrealistic expectations on the part of WSIB patients. Careful preoperative preparation involving specific counselling and discussion about the outcomes and limitations of TKA would therefore appear especially important in WSIB patients and may in turn contribute to improved overall patient satisfaction in this subset of patients.

Our study does have some limitations. The study sample of primary TKA patients receiving WSIB is small; however, it seems to be representative of the incidence among this specifically defined group of patients, as demonstrated by Mont and associates.⁷ Although we were interested in evaluating only the short-term (1 year) outcomes of primary TKA, long-term evaluations may provide more meaningful conclusions. In addition, radiographic analysis was not conducted to correlate with the clinical scores.

Table 6

Responses to a telephone survey (non-validated) on patient satisfaction after total knee arthroplasty, by group receiving/not receiving WSIB benefits

| Survey question* | WSIB group, n = 28† | | | Non-WSIB, n = 35‡ | | | p value |
|---|---------------------|-----|-------|-------------------|------|-------|---------|
| | Mean | SD | Range | Mean | SD | Range | |
| 1. How well did TKA relieve pain in your knee? | 2.1 | 1.2 | 1-5 | 1.8 | 1.1 | 1-5 | 0.24 |
| 2. How well did it allow you to perform regular activities of daily living? | 2.6 | 1.0 | 1-5 | 1.8 | 0.86 | 1-4 | 0.003 |
| 3. How well did TKA meet your expectations? | 2.5 | 1.4 | 1-5 | 1.8 | 0.93 | 1-4 | 0.030 |
| 4. Would you have TKA again if you required it in your other knee? | 1.8 | 0.8 | 1-4 | 1.6 | 0.81 | 1-4 | 0.55 |
| 5. Has your TKA improved your quality of life? | 2.8 | 1.3 | 1-5 | 2.0 | 1.0 | 1-5 | 0.011 |

*All questions were rated on scale of 1-5, as follows.

Questions 1-3: 1 = excellent; 2 = very good; 3 = good; 4 = fair; 5 = poor

Question 4: 1 = definitely yes; 2 = possibly yes; 3 = not sure; 4 = probably not; 5 = certainly not

Question 5: 1 = extremely; 2 = quite a bit; 3 = moderately; 4 = slightly; 5 = not at all

†9 patients refused the survey; 1 had died of cancer.

‡2 patients refused the survey, and 1 was lost to follow-up.

TKA = total knee arthroplasty; WSIB = Ontario Workplace Safety and Insurance Board

It is certainly apparent from our data, however, that there is a correlation between poorer subjective clinical outcomes in WSIB patients undergoing TKA. The results point to the need for a multi-centred prospective study to examine at this question and further identify patient motivation and psychosocial predictors of clinical outcome with WSIB patients undergoing TKA.

Conclusion

Short-term patient-perceived outcomes of primary TKA in patients receiving WSIB benefits are inferior to those of patients not receiving WC. Objective outcomes, however, are equivalent, except for flexion range. WSIB patients are seen more frequently than non-WSIB patients for postoperative follow-up; we would attribute this to the persistence of subjective complaints after primary total knee arthroplasty.

Competing interests: None declared.

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