

# Patient satisfaction with inpatient versus outpatient reconstruction of the anterior cruciate ligament: a randomized clinical trial

Steven A. Krywulak, MD;\* Nicholas G.H. Mohtadi, MD;\* Margaret L. Russell, MD;† Treny M. Sasyniuk, BPE\*

**Objective:** To compare satisfaction levels after reconstruction of the anterior cruciate ligament (ACL) between inpatients and outpatients by means of a valid and comprehensive outcome tool. **Methods:** Fifty patients examined at a tertiary clinic who met the study's inclusion criteria (15–50 yr old, no previous ACL reconstruction, >6 h after injury, living <1 h from hospital, assigned a caregiver for outpatient management within 48 h of injury, no serious health condition, no known hypersensitivity to ASA/NSAIDs, bleeding disorder or gastric ulcer, ability to cope at home after operation) were recruited and randomized into either the inpatient or outpatient groups. Inpatients stayed overnight in hospital after their ACL reconstruction and were discharged home the next day. Outpatients were discharged home on the day of the procedure. All patients attended a preoperative educational session and were required to meet the same discharge criteria (able to bear weight using crutches and to void, to be reasonably pain free, no nausea or vomiting, no excess bleeding or drainage, be alert, be given take-home medications and be in the company of a caregiver). Standardized anesthetic and postoperative analgesic protocols were used. One week after ACL reconstruction, patient satisfaction was quantified with a previously validated visual analogue questionnaire (maximum score of 100). **Results:** We collected data on 21 inpatients and 19 outpatients. The mean overall-satisfaction score of the outpatient group was higher than that of the inpatient group (85.1 v. 78.2,  $p = 0.015$ ). Between-group differences in postoperative pain, nausea, rate of readmission and complications were not significant. **Conclusion:** As determined by a comprehensive, population-specific, validated outcome, patient satisfaction is higher when ACL reconstruction is done on an outpatient basis.

**Objectif :** Comparer, au moyen d'un outil valide et détaillé d'analyse des résultats, les taux de satisfaction après une reconstruction du ligament croisé antérieur (LCA) entre les patients traités en service interne et en service externe. **Méthodes :** On a recruté 50 patients examinés à une clinique de soins tertiaires qui satisfaisaient aux critères d'inclusion de l'étude (15 à 50 ans, sans antécédents de reconstruction du LCA, > 6 h après le traumatisme, habitant < 1 h de l'hôpital, jumelage avec un soignant chargé de la prise en charge en service externe au cours des 48 h suivant le traumatisme, sans problème de santé grave, sans hypersensibilité connue à l'AAS ou aux AINS, sans trouble de saignement ou ulcère gastrique, capacité à se débrouiller à domicile après l'intervention) et on les a affectés par randomisation aux groupes traités en service interne ou en service externe. Ceux qui ont été traités en service interne ont passé la nuit à l'hôpital après la reconstruction du LCA et ont reçu leur congé le lendemain. Les patients traités en service externe ont reçu leur congé le jour même de la chirurgie. Tous les patients ont assisté à une séance d'information préopératoire et devaient satisfaire aux mêmes critères relatifs au congé (capacité à supporter son poids au moyen de béquilles, ainsi qu'à évacuer, ne pas ressentir de douleurs excessives, ne pas être aux prises avec des nausées ou vomissements, ou encore avec des saignements ou écoulements excessifs, être alerte, recevoir des médicaments à emporter et être accompagné d'un soignant). On a utilisé des protocoles normalisés d'anesthésie et d'analgésie postopératoire. Une semaine après la reconstruction du LCA, on a quantifié la satisfaction des patients au moyen d'un questionnaire analogue visuel validé plus tôt (résultat maximal de 100). **Résultats :** On a recueilli des don-

From the \*Division of Orthopedic Surgery, University of Calgary Sport Medicine Centre, and †Department of Community Health Sciences, University of Calgary, Calgary, Alta.

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**Correspondence to:** Dr. Nicholas Mohtadi, University of Calgary Sport Medicine Centre, 2500 University Dr. NW, Calgary AB T2N 1N4; fax 403 282-6170; mohtadi@ucalgary.ca

nées sur 21 patients traités en service interne et 19 autres traités en service externe. Le taux moyen de satisfaction globale chez ceux qui ont été traités en service externe était plus élevé que celui qu'on a enregistré chez les patients traités en service interne (85,1 c. 78,2,  $p = 0,015$ ). Les différences entre les deux groupes sur les plans de la douleur postopératoire, des nausées, de la réhospitalisation et des complications n'étaient pas significatives. **Conclusion :** Comme le démontre un résultat validé détaillé spécifique à la population, les patients sont plus satisfaits lorsqu'ils subissent une reconstruction du LCA en service externe.

Before the late 1990s, surgical reconstruction of the anterior cruciate ligament (ACL) in our setting was done on an inpatient basis, with hospital stays of 2–3 days. At present, most such patients are treated as outpatients.<sup>1-7</sup> The main impetus to change to outpatient surgery has been cost reduction and the need for an inpatient bed. Several studies have shown that outpatient ACL reconstruction is safe, effective for pain control and without increased incidence of complications or readmissions to hospital.<sup>1-7</sup> Daycare ACL surgery offers potential advantages to all those involved in the process: patients are permitted to recover in a secure, private and comfortable home environment, and surgeons gain from the improved efficiency and time management associated with decreased responsibilities of having to visit their inpatients. However, no studies have clearly demonstrated, from the patient's perspective, whether the move to outpatient surgery is truly beneficial. Patient satisfaction is recognized as an important outcome in health care, including surgery.<sup>8,9</sup>

Patient satisfaction is a multifactorial concept that encompasses various domains such as access to care, continuity of care, availability of services, physician conduct and overall outcome.<sup>3,10</sup> Research has shown that patients tend to rate their satisfaction levels higher when asked for global assessments but are more critical when asked about specific aspects of their care.

One reason for the deficiency in reporting patient satisfaction with outcomes has been the lack of a valid measure. We have recently developed a population-specific, valid and reli-

able patient satisfaction outcome questionnaire (PSOQ).<sup>11</sup> It consists of 19 questions, each rated on a 100-mm visual analogue scale (VAS) with a score of 100 representing the highest possible satisfaction. An overall satisfaction score is then computed by summing scores across the items and calculating the average.

The purpose of our study was to evaluate patient satisfaction as the primary outcome of a randomized trial of inpatient versus outpatient ACL reconstruction, by use of the PSOQ.

## Methods

The Conjoint Health Research Ethics Board at the University of Calgary approved the study. Patients presenting to 1 of 4 subspecialty orthopedic knee surgeons at the University of Calgary Sport Medicine Centre who met the study inclusion criteria (Box 1) were recruited into

the study. Patients were allocated to the inpatient or outpatient group with blocked randomization envelopes, stratified by surgeon. A study research assistant (T.M.S.) randomized the cases preoperatively in the surgeon's clinic.

Inpatients stayed in hospital overnight after their ACL reconstruction and were discharged home the next day. Outpatients were discharged home on the day of surgery. All patients in the study were required to meet the same discharge criteria (Box 2). Regardless of group, all study patients were scheduled as the first or second case of the day. Demographic information obtained included patient age, sex, level of education, income, marital status and whether or not the patient lived in the city.

Study patients in both groups were required to attend a compulsory preoperative patient education seminar taught by a nurse and a physiotherapist. Patients were educated on all aspects of their pre- and postoperative care in a standardized fashion, with identical information presented to both groups. An instructional handout was given to

### Box 1: Study inclusion criteria

For inclusion in the study, the patient must be/have

1. 15–50 years of age
2. No previous anterior cruciate ligament reconstruction
3. >6 weeks from injury
4. Live <1 hour from hospital
5. Must have an assigned caregiver for outpatient management for the 1st 48 hours after surgery
6. No serious health condition requiring in-hospital supervision after the operation
7. No known hypersensitivity to ASA/NSAIDs, and no known bleeding disorder or active peptic ulcer disease
8. Perceived psychological ability to cope at home after surgery

### Box 2: Hospital discharge criteria

For discharge home, patients must be

1. Capable of partial weight-bearing and using crutches
2. Able to void
3. Relatively free of pain (VAS <5)
4. Free of nausea and vomiting
5. Without drainage or excess bleeding
6. Alert and oriented
7. Given take-home medications
8. In the company of a caregiver

each patient to reinforce the information received at the seminar. This seminar was incorporated and funded as part of the hospital's pre-assessment clinic used for all surgical procedures. Patients were encouraged to bring along their mandatory caregiver. Patients who did not attend this teaching session were excluded from the study.

The anesthetic and postoperative analgesic protocol was developed with the assistance of the department of anesthesia at our institution (Box 3). An arthroscopically assisted ACL reconstruction was performed using the central third patellar tendon. All procedures involved bone tunnels in the tibia and femur and a 2-incision technique. Following the procedure, inpatients were transferred to the orthopedic ward and outpatients to the daycare surgery unit. Analgesics and antiemetics used in the postoperative period were identical for both groups with the exception of those inpatients who had access to intravenous or intramuscular narcotics while in hospital.

Box 3: Perioperative protocol	
<b>1 hour before the procedure:</b>	
1.	Naproxen 500 mg orally
2.	Metoclopramide 10 mg orally
<b>In the operating room:</b>	
3.	GA induction: propofol
4.	GA maintenance: inhalational nitrous oxide/narcotic
5.	Intra-articular bupivacaine (0.25%) 20 mL, with epinephrine (1:200 000)
<b>In the recovery room:</b>	
6.	Apply Cryocuff knee-icing brace
7.	Intravenous narcotic
8.	If narcotic is ineffective, give ketorolac tromethamine, intramuscularly or intravenously
9.	If preceding analgesics fail, perform a femoral nerve block
10.	For nausea, give dimenhydrinate or metoclopramide
11.	If preceding antiemetics are ineffective, give ondansetron
GA = general anesthesia	

All patients in the study were supplied with a Cryocuff (AirCast Inc. Summit, NJ) knee icing system for use in hospital and at home. Once at home, patients had a 24-hour supply of anileridine and a prescription of Tylenol with codeine along with an anti-inflammatory (naproxen) for analgesia. Nausea was treated with either dimenhydrinate or metoclopramide. Each patient completed a VAS pain and nausea log book at 1-, 4- and 12-hour intervals and then every 12 hours for the next 4 days. At 1 week, all patients completed the PSQ and returned it at their first postoperative visit. Questionnaires not received at this time were solicited by a phone call from our research assistant.

All study patients were asked if they required further medical attention for postoperative problems. Surgeons documented readmissions to hospital

and complications at 1- and 6-week follow-up visits.

A total sample size of 32 patients was calculated based on a power level of 80%, an alpha error of 0.05, and a difference in satisfaction scores between the 2 groups of 10%.<sup>11</sup> A target total sample size of 50 patients was set to account for patient drop-outs and loss to follow-up.

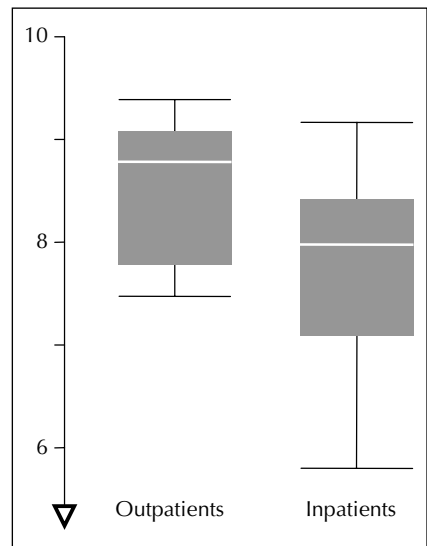
Descriptive statistics were computed to compare the spread of responses between groups for the overall PSQ. The mean overall PSQ scores in the inpatient and outpatient groups were then compared using the *t* test.<sup>12</sup> Descriptive statistics were also computed and graphed for each individual question. A 1-way analysis of variance was used to analyze data from patients' pain and nausea log books, controlling for changes over time.<sup>13</sup>

**Results**

Fifty patients were recruited into the study. Ten patients (4 inpatients and 6 outpatients) were subsequently excluded, after randomization but before surgery, for the following reasons: 4 did not attend the education class, 1 patient did not understand English well enough to complete the questionnaire, 3 patients elected to

**Table 1**

Patient demographics by group		
Characteristic	InP (n = 21)	OutP (n = 19)
Age, yr		
Mean	27.1	27.8
Range	15-45	16-43
Males:females	12:9	15:4
Level of education		
Did not graduate	2	2
High-school	6	3
Certificate/diploma	4	4
College/university	8	3
Postgraduate	1	5
Did not respond	0	2
Household income*		
0-25 000	6	6
25 001-40 000	2	2
40 001-75 000	4	4
75 001-100 000	3	2
>100 000	5	1
Marital status		
Single	11	11
Married	7	5
Common law†	2	1
Divorced	1	0
InP = inpatients; OutP = outpatients Values are no. of patients, unless otherwise indicated. *Combined annual income, Canadian dollars †As defined by the Province of Alberta		



**FIG. 1. Plot of overall Patient Satisfaction Outcome Questionnaire for inpatients and outpatients.**

withdraw from the study and 2 cancelled their surgery. Demographic information on the remaining 40 patients is presented in Table 1. The randomization process resulted in comparable groups with respect to age, level of education and marital status. There were some minor sex differences with a greater percentage of males and fewer people in the higher income category in the outpatient group. Five outpatients did not return their questionnaires, leaving

35 patient (21 inpatient and 14 outpatient) data sets for final analysis.

**Overall patient satisfaction outcome questionnaire**

The distribution of the overall PSOQ for each group and the median values are represented in Figure 1. The overall mean PSOQ scores for the outpatient and inpatient groups were 85.1 and 78.2, respectively. This difference between means of

6.9 points was statistically significant ( $p = 0.015$ ).

**Individual questions**

The outpatient group scored higher in terms of their satisfaction on 18 out of the 19 questions in the PSOQ. The only question favouring the inpatient group was related to the side effects of medication, but this difference was not clinically or statistically significant (Table 2).

**Table 2**  
Individual questions in the Patient Satisfaction Outcome Questionnaire and results by patient group

Question	Inpatients (n = 21)			Outpatients (n = 14)		
	Mean	SD	Range	Mean	SD	Range
1. After surgery, the overall effectiveness of your pain control medications <b>received in hospital</b> at relieving your pain was:	76.0	21.6	28-100	87.0	9	67-100
2. After surgery, the overall effectiveness of your pain control medications <b>taken at home</b> in relieving your pain was:	75.9	21.3	20-100	80.5	17.4	44-100
3. How much stress did you experience due to uncontrolled pain after your surgery?	73.4	25.7	12-100	77.0	21.5	26-100
4. How bad were the side effects from the pain medications you used either in hospital or at home in the week after surgery (i.e., constipation, inability to void, drowsiness, nausea or vomiting, itching)?	55.7	30.5	11-100	46.4	24.8	15-77
5. If you used a Cryocuff icing device, did you have any difficulties operating it after surgery?	91.1	13.4	45-100	95.1	6	78-100
6. In your opinion, how would you rate the overall quality of the nursing care that you received in hospital?	78.0	18.2	47-100	90.8	13.4	50-100
7. Did you have any questions or concerns about your surgery or postoperative care that <b>were not addressed before</b> your surgery?	90.9	9	75-100	95.5	4.8	85-100
8. Do you feel that all of your questions regarding postoperative care were answered <b>after</b> your surgery (i.e., before discharge from hospital)?	85.0	21.9	4-100	93.9	5.9	80-100
9. Did you feel that you were given enough information to know what to expect after you were discharged from hospital in terms of your recovery, rehabilitation, physiotherapy, dressing changes, etc.?	76.6	24.7	16-100	89.0	97.6	71-100
10. Do you feel strongly that you should have been kept in hospital longer to recover from your operation?	87.6	23.3	9-100	93.5	7.2	80-100
11. Did you receive adequate feedback from your surgeon regarding the results of your surgery (i.e., in the recovery room, ward) ?	80.0	23.1	1-100	91.7	10.9	60-100
12. Was your surgeon available and easily accessible if you needed him or her after your surgery?	81.6	14.5	50-100	87.3	17.2	53-98
13. How peaceful and restful were your surroundings (either hospital ward or home) the <b>first night after</b> surgery?	54.5	35.8	0-98	75.2	28.3	18-100
14. Did you feel that your surroundings (ward or home) gave you an adequate amount of personal privacy the <b>first night after surgery</b> ?	72.3	28.3	0-100	85.7	21.2	25-100
15. Overall, I would rate the <b>quality of care</b> that I received <b>before</b> surgery as:	86.8	18.9	18-100	89.9	11.5	57-100
16. Overall, I would rate the <b>quality of care</b> that I received <b>after</b> surgery as:	79.1	16.5	35-99	91.0	12.3	56-100
17. Considering all factors (i.e., preoperative teaching, nursing, doctors, hospital) <b>how satisfied were you as a patient</b> with the reconstruction surgery, from the time you first met your surgeon and including up until the second week after your surgery? (This question does not relate to your knee function per se.)	87.7	10.8	54-100	93.5	6.5	75-100
18. How strongly would you feel about recommending this procedure (ACL reconstruction) to a friend or family member?	81.2	16.1	50-100	88.1	12.4	57-100
19. If you had a choice, how willing would you be to have this procedure (ACL reconstruction) done again under the same circumstances?	83.9	27.5	2-100	85.0	11.9	59-100

ACL = anterior cruciate ligament, SD = standard deviation

**Pain and nausea log book**

Pain and nausea log-book data revealed that pain increased steadily in both the inpatient and outpatient groups over the first day and peaked at 24 hours postoperatively in both groups (Fig. 2). There was a steady decline in mean pain scores in both groups after the first 24 hours. Overall, no statistically significant difference was found between inpatients and outpatients over time ( $p = 0.79$ ).

Mean nausea scores were initially higher in the inpatient group but equalized with the outpatient group after 48 hours (Fig. 3). No statistically significant differences were seen in the mean nausea scores over time between the 2 groups ( $p = 0.26$ ). Again there was a difference in the peak nausea levels in each group. The outpatients experienced their peak at 24 hours. This is likely because in the outpatients nausea was well controlled before discharge and because of the time required for oral medications to have their effect.

**Adverse events**

Five patients had problems postoperatively (3 outpatients and 2 inpatients). One outpatient could not be discharged home the day of surgery because of persistent nausea and vomiting despite treatment with ondansetron. The symptoms resolved, and this patient was discharged the

next day. Two other outpatients contacted their surgeons because of pain and swelling. One required a repeat prescription of Tylenol with codeine, and the other was reassured over the phone. One inpatient suffered low-pressure pulmonary edema and remained in hospital for 3 days. The pulmonary problem resolved without further complication. The second inpatient contacted the surgeon because of postoperative pain and swelling and was reassured over the phone.

Acute tibial periostitis was diagnosed in 1 patient at the first postoperative visit. The condition resolved with oral anti-inflammatory medications. There were no major postoperative complications such as deep vein thrombosis, pulmonary embolism or infection.

**Discussion**

This study has evaluated patient satisfaction using a multifactorial approach by exploring all aspects of patient satisfaction relevant to the population in question. The PSOQ was previously developed with this evaluation in mind.<sup>11</sup>

The cost-effectiveness of outpatient ACL reconstruction was not addressed in this study, although outpatient surgery is consistently reported to be less expensive than the same procedure performed on inpatients.<sup>1,2,4</sup> A cost analysis in this set-

ting would be required to confirm this assumption.

The patient population in our study represented a typical cross-section of patients undergoing ACL reconstruction at our centre. The 2 groups were comparable in all respects except that the outpatient cohort was male-predominant and had no patients in the highest income bracket. Although these potential biases could account for the results, it is not clear which direction the bias would take.

A more important concern is the incomplete data on 5 patients from the outpatient group. None of these patients reported any adverse events or other problems to suggest a poorer outcome. However, to quantitatively assess this potential bias a sensitivity analysis was performed. All 5 patients were assigned the average PSOQ score from the inpatient group, and the primary analysis was repeated. The final result remained statistically significant at  $p = 0.048$  in favour of the outpatient group.

There were many potential explanations for the findings of this study. The acute-care hospital setting for this study is representative of most hospitals in the Canadian health care system. There has been a dramatic increase in the acuity and turnover volume on inpatient orthopedic units. Orthopedic nurses are faced with caring for a cross-section of patients, ranging from elderly patients with

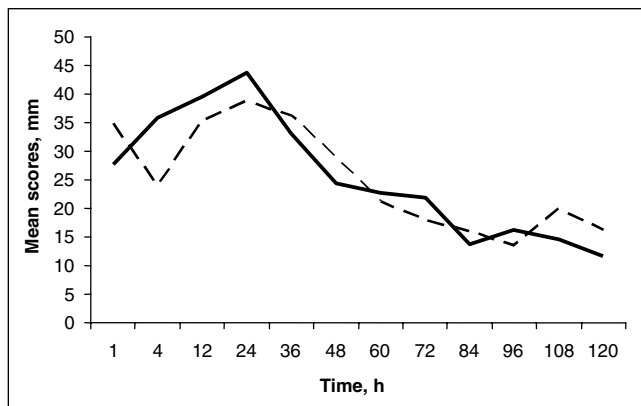


FIG. 2. Pain as reported by inpatients (solid line) and outpatients (dashed line) 1-120 hours postoperatively.

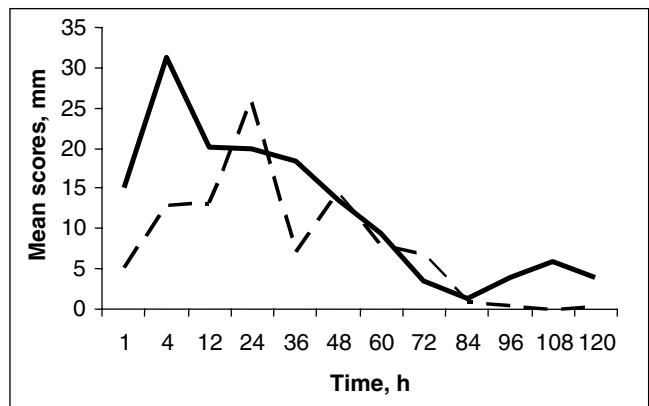


FIG. 3. Nausea as reported by inpatients (solid line) and outpatients (dashed line) 1-120 hours postoperatively.

broken hips to the young, healthy ACL population. The elderly patients require more labour-intensive care and as a result the ACL patients may have been overlooked. The outpatients had a dedicated caregiver (family member or friend) as part of the protocol, who was available for one-on-one care of the patient.

Pain control in the postoperative period was comparable between both our study groups as demonstrated by the pain and nausea log-book results and responses to similar questions in the questionnaire. However, a trend was observed toward slightly better pain control in the outpatient group. This observation may reflect the fact that outpatients were immediately placed in control of their analgesic regimen at discharge and were able to titrate their own medication dosages without having to wait for nursing staff to respond to requests for analgesics. Patients on the ward may have found themselves waiting for some time before receiving analgesics from nursing staff. Side effects from medications taken in the postoperative period were similar in both inpatient and outpatient groups. One outpatient required overnight admission due to side effects from the anesthetic.

The results of this study are best generalized to the population from which the results were obtained. Social, cultural, political and economic factors differ from country to country and even among different regions of the same country. All of these factors can potentially influence the way health care is provided and the expectations of the particular patient population. The results of this study are most generalizable to tertiary care centres in Canada. Whether or not patient satisfaction with outpatient ACL reconstruction would be as

high in smaller centres or in international centres is unknown. Also, not all patients booked for an ACL reconstruction will be candidates for outpatient care. Patients with significant medical problems requiring monitoring, those needing to travel long distances, and those who do not have the independence, social support or maturity to undertake the postoperative care should be considered for inpatient surgery. This study demonstrated that the perioperative management and education protocol were effective in providing appropriate patient comfort and safety despite early discharge from hospital.

### Conclusion

This randomized clinical trial has shown that outpatient satisfaction following ACL reconstruction is higher than inpatient satisfaction as determined by a comprehensive, population-specific, validated outcome.

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**Competing interests:** None declared.

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