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Research Article

Comparison of Day-Care Versus In-Patient Acl Reconstruction in Terms of Postoperative Pain and Patient Satisfaction: A Prospective Randomized Study (N=30)

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ABSTRACT
Background: Health systems increasingly favor same-day discharge after anterior cruciate ligament reconstruction (ACLR) to reduce costs and improve patient flow; however, concerns persist regarding early postoperative pain control and patient experience. Prior randomized evidence suggests outpatient ACLR can yield equal safety and higher satisfaction, but results vary across pathways and settings.
Methods: A prospective randomized study was conducted in a tertiary orthopedic center over 12 months. Thirty adults undergoing primary arthroscopic ACLR with hamstring autograft were randomized 1:1 to day-care discharge (DC) or in-patient admission (IP). Pain was measured using a 0–10 visual analogue scale (VAS) at 6, 24, and 48 hours. Satisfaction was measured at postoperative day 7 using a 0–100 satisfaction VAS (higher scores indicating greater satisfaction). Secondary outcomes included rescue opioid use, postoperative nausea/vomiting (PONV), unplanned contacts, and readmissions within 7 days. Between-group comparisons used independent-samples tests; pain trajectories were assessed with mixed-effects modeling.
Results: Baseline characteristics were comparable between groups (mean age 26.9±5.4 years; 70% male). Mean VAS pain scores (DC vs IP) were 5.2±1.3 vs 4.6±1.4 at 6 h (p=0.18), 3.4±1.1 vs 3.6±1.2 at 24 h (p=0.62), and 2.1±0.9 vs 2.3±1.0 at 48 h (p=0.55). Satisfaction at day 7 was higher in DC (88.1±7.6) versus IP (79.4±9.8), mean difference 8.7 points (95% CI 1.8–15.6; p=0.016). Rescue opioid consumption and PONV rates were not significantly different. No participant required hospital readmission within 7 days.
Conclusion: In this randomized cohort (n=30), day-care ACLR achieved pain outcomes comparable to in-patient care while producing meaningfully higher patient satisfaction, without increased early adverse events. These findings support structured day-care pathways for appropriately selected ACLR patients.

Keywords: Anterior Cruciate Ligament Reconstruction; Day-Care Surgery; Outpatient; Pain; Patient Satisfaction; Enhanced Recovery.

INTRODUCTION

Anterior cruciate ligament (ACL) rupture is among the most frequent serious knee injuries in young and physically active populations, often resulting in recurrent instability, reduced activity participation, and secondary meniscal or chondral injury when functional instability persists. Contemporary management includes structured rehabilitation with selective reconstruction, but ACL reconstruction (ACLR) remains a widely performed procedure for patients with symptomatic instability and activity demands, particularly in pivoting sports.

As surgical volumes rise, health systems increasingly prioritize care pathways that maintain safety and patient-centered outcomes while reducing hospital resource utilization and length of stay. Enhanced recovery concepts and modern perioperative practice have accelerated the shift of arthroscopic procedures—including ACLR—toward ambulatory models, with same-day discharge now feasible in many centers. [7] Despite this transition, early postoperative pain and overall patient experience remain central determinants of pathway success. Pain after ACLR can delay mobilization, increase rescue

opioid consumption, contribute to postoperative nausea and vomiting, and drive unplanned healthcare contact—all of which may influence satisfaction and perceived quality of care. Standardized multimodal analgesia strategies (e.g., neuraxial or general anesthesia with peripheral nerve blocks, scheduled non-opioid analgesics, and rescue opioids) aim to provide predictable pain control compatible with safe early discharge. However, patient perception of pain control and readiness for discharge may differ from clinician expectations, and these perceptions can significantly shape satisfaction with care. [8]

Evidence comparing outpatient (day-care) and in-patient ACLR generally suggests comparable clinical safety and pain outcomes when perioperative pathways are structured, although heterogeneity in "outpatient" definitions and outcome measurement persists. A randomized clinical trial by Krywulak et al. demonstrated that outpatient ACLR achieved similar postoperative pain and nausea outcomes compared with in-patient care while yielding higher patient satisfaction, supporting the patient-centered appeal of ambulatory pathways. [1] Similarly, Valkering et al. conducted an equivalence randomized trial and reported comparable pain experience and functional outcomes between outpatient and inpatient ACLR, reinforcing the feasibility of outpatient pathways under standardized protocols. [2] A systematic review further concluded that outpatient ACLR can be safe and effective, though emphasized that pathway components, discharge criteria, and postoperative follow-up structures vary considerably and may influence results across settings. [3]

Patient satisfaction has emerged as a critical outcome metric in orthopedics, yet measurement approaches remain inconsistent following ACLR. A systematic review evaluating satisfaction measurement after ACLR highlighted variability in instruments, timing, and reporting, limiting comparisons across studies and complicating translation into routine clinical quality improvement. [4-6] Beyond clinical outcomes, satisfaction is shaped by factors such as comfort, autonomy, sleep quality, and perceived efficiency of care—domains potentially improved by home recovery when pain is well controlled.

Because local infrastructure, counseling, analgesic access, and follow-up support can modify the real-world performance of day-care surgery, pathway evaluation in specific contexts remains clinically important. Therefore, the present study aimed to compare day-care versus in-patient ACLR in terms of early postoperative pain and patient satisfaction in a prospective randomized cohort of 30 patients. Secondary objectives included describing early postoperative adverse events and unplanned healthcare contact within the first postoperative week.

MATERIALS AND METHODS

Study Design, Setting and Duration

A prospective, parallel-group randomized comparative study was conducted in the Department of Orthopedics of a tertiary care teaching hospital over a 12-month period (January 2025 to December 2025).

Sample Size

A total of 30 participants were included and analyzed. Participants were randomized in a 1:1 ratio into Day-Care (DC; n=15) and In-Patient (IP; n=15) groups.

Participants and Recruitment

Adults presenting with symptomatic unilateral ACL rupture and scheduled for elective primary arthroscopic ACL reconstruction were screened consecutively. Written informed consent was obtained prior to enrollment.

Inclusion Criteria: age 18–45 years; unilateral ACL tear confirmed clinically and by MRI; planned primary arthroscopic ACL reconstruction; ASA physical status I–II; ability to comprehend and report pain and satisfaction scores; availability of a responsible adult caregiver at home for at least 24 hours after discharge (required for day-care eligibility).

Exclusion Criteria: revision ACL reconstruction; multi-ligament knee injury; associated fracture or neurovascular injury; concurrent procedures expected to significantly increase postoperative pain burden (e.g., high tibial osteotomy); chronic opioid use or substance dependence; severe comorbidity (ASA ≥III); contraindication to spinal anesthesia or peripheral nerve block; pregnancy; inability to comply with follow-up.

Randomization and Allocation Concealment

Participants were randomized using a computer-generated random number sequence. Allocation was concealed using sequentially numbered, sealed opaque envelopes opened on the day of surgery after enrollment. Patients were assigned to either DC (same-day discharge) or IP (overnight admission).

Surgical Technique and Perioperative Care

All procedures were performed arthroscopically by senior orthopedic surgeons using a standardized technique. Primary single-bundle ACL reconstruction was performed using a quadrupled hamstring tendon autograft (semitendinosus ± gracilis), with standardized femoral and tibial tunnel placement and fixation methods per institutional protocol. Any minor meniscal procedures (partial meniscectomy or repair) were recorded.

A standardized perioperative analgesic protocol was implemented for both groups. Regional anesthesia and multimodal analgesia were used, consisting of spinal anesthesia with sedation and an ultrasound-guided adductor canal block when not contraindicated. Postoperatively, scheduled paracetamol and a non-steroidal anti-inflammatory drug were administered, with oral tramadol provided as rescue analgesia.

Discharge Pathways and Criteria

Day-Care (DC) Group: Participants were discharged on the same day of surgery after meeting predefined criteria: stable vital signs; controlled pain on oral medication (VAS acceptable for discharge per protocol); ability to tolerate oral intake without persistent vomiting; successful voiding; physiotherapy clearance for ambulation with crutches; and understanding of home care instructions and emergency contact procedures.

In-Patient (IP) Group: Participants were admitted overnight and discharged the following day after meeting the same mobilization and symptom-control criteria, in addition to routine inpatient monitoring.

Outcomes and Measurement Tools

Primary Outcomes:

1. Postoperative pain measured using a 10-cm visual analogue scale (VAS; 0=no pain, 10=worst pain) at 6 hours, 24 hours, and 48 hours after surgery.
2. Patient satisfaction assessed at postoperative day 7 using a satisfaction VAS (0=not satisfied at all, 100=extremely satisfied), reflecting overall satisfaction with care and recovery experience.

Secondary Outcomes: rescue opioid requirement within 48 hours (number of tramadol doses/tablets), postoperative nausea and vomiting within 24 hours, unplanned postoperative contacts (phone calls or unscheduled visits), wound-related concerns, and readmission within 7 days.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. Institutional Ethics Committee approval was obtained prior to recruitment (IEC/ORTHO/2024/219). Written informed consent was obtained from all participants, and confidentiality was maintained using de-identified data coding.

Statistical Analysis

Data were analyzed using SPSS version 26. Continuous variables were summarized as mean ± standard deviation or median (interquartile range) as appropriate. Categorical variables were summarized as frequencies and percentages. Between-group comparisons were performed using independent-samples t-tests (or Mann–Whitney U tests for non-normal data) for continuous variables and chi-square or Fisher's exact tests for categorical variables. Pain over time was additionally evaluated using a mixed-effects model including time, group, and group×time interaction terms. A two-tailed p value <0.05 was considered statistically significant

RESULTS

Narrative Summary of Findings

Thirty participants were randomized (15 DC, 15 IP), and all completed pain assessments through 48 hours and satisfaction assessment at day 7. No protocol deviations requiring cross-over occurred. Baseline demographic and preoperative characteristics were balanced, with a young cohort (mean age 26.9 years), predominantly male, and low comorbidity (ASA I–II).

Early postoperative pain demonstrated the expected decline from 6 to 48 hours in both groups. The day-care group reported numerically higher pain at 6 hours, but the difference was not statistically significant; by 24 and 48 hours, pain scores converged, with clinically similar trajectories. Mixed-effects analysis did not demonstrate a significant group×time interaction, indicating that pain improvement over time did not differ meaningfully by discharge setting.

Patient satisfaction at one week was higher in the day-care group, with an 8–9 point mean advantage on a 0–100 scale. Participants frequently cited comfort at home, family support, and perceived efficiency of care during informal debriefing; conversely, in-patient participants more commonly described sleep disruption and reduced privacy as detractors.

Importantly, higher satisfaction in the day-care pathway was not accompanied by increased early adverse events: PONV, rescue opioid use, and unplanned contacts were comparable, and no readmissions occurred

Table 1. Baseline Characteristics of Participants (N=30)

Characteristic	Day-Care (n=15)	In-Patient (n=15)	p value
Age (years), mean ± SD	26.4 ± 5.1	27.3 ± 5.8	0.64
Male sex, n (%)	11 (73.3)	10 (66.7)	0.69
BMI (kg/m²), mean ± SD	24.1 ± 2.6	24.6 ± 2.9	0.62
Time from injury (months), median [IQR]	6 [4–10]	7 [4–11]	0.78
ASA I, n (%)	12 (80.0)	11 (73.3)	0.67
Associated meniscal procedure, n (%)	4 (26.7)	5 (33.3)	0.70

Interpretation

Baseline comparability was strong across demographic, clinical, and perioperative risk markers. Both cohorts were young, low-comorbidity adults typical of elective primary ACLR populations, with similar BMI and injury chronicity. The proportion requiring minor concomitant meniscal procedures was balanced, reducing the likelihood that differential intra-articular pain generators biased early pain results. This balance supported attribution of postoperative differences primarily to discharge setting and pathway experience rather than case-mix variation.

Table 2. Perioperative and Discharge Pathway Outcomes

Variable	Day-Care (n=15)	In-Patient (n=15)	p value
Duration of surgery (min), mean ± SD	78 ± 14	81 ± 16	0.61
Adductor canal block performed, n (%)	15 (100)	15 (100)	—
Time to first ambulation (hours), mean ± SD	6.9 ± 1.2	8.1 ± 1.4	0.02
Length of stay (hours), median [IQR]	10 [9–12]	30 [26–34]	<0.001
Met discharge criteria on day of surgery, n (%)	15 (100)	4 (26.7)	<0.001

Interpretation

Operative factors were intentionally standardized and remained similar, suggesting that downstream outcomes were driven by pathway design rather than procedural heterogeneity. Day-care participants ambulated earlier, aligning with discharge-focused physiotherapy and expectation setting. As expected, length of stay differed markedly, confirming practical separation of the two care models. Importantly, universal success in meeting same-day discharge criteria in the day-care group indicated feasibility within a structured protocol and appropriate patient selection.

Table 3. Postoperative Pain and Analgesic Use

Outcome	Day-Care (n=15)	In-Patient (n=15)	p value
VAS pain at 6 h, mean ± SD	5.2 ± 1.3	4.6 ± 1.4	0.18
VAS pain at 24 h, mean ± SD	3.4 ± 1.1	3.6 ± 1.2	0.62
VAS pain at 48 h, mean ± SD	2.1 ± 0.9	2.3 ± 1.0	0.55
Rescue tramadol tablets (0–48 h), median [IQR]	2 [1–3]	2 [1–3]	0.94
PONV within 24 h, n (%)	3 (20.0)	4 (26.7)	0.67

Interpretation

Pain declined predictably over 48 hours in both groups, with no statistically or clinically meaningful divergence beyond a small, non-significant early difference at 6 hours. Similar rescue opioid requirements support the conclusion that day-care discharge did not shift analgesic burden to patients in a way that translated into greater opioid use. Comparable PONV rates further indicate that early postoperative symptom control was not compromised by the day-care approach under standardized anesthesia and multimodal analgesia.

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Table 4. Satisfaction and Early Safety Outcomes (Up To Day 7)

Outcome	Day-Care (n=15)	In-Patient (n=15)	p value
Satisfaction VAS at day 7 (0–100), mean ± SD	88.1 ± 7.6	79.4 ± 9.8	0.016
Unplanned phone contact, n (%)	2 (13.3)	1 (6.7)	0.54
Unplanned ER visit, n (%)	0 (0)	0 (0)	—
Readmission within 7 days, n (%)	0 (0)	0 (0)	—
Wound concern requiring review, n (%)	1 (6.7)	1 (6.7)	1.00

Interpretation

Satisfaction was meaningfully higher after day-care ACLR, a pattern consistent with patient preference for recovery at home when symptom control is adequate. The modest increase in phone contacts in the day-care cohort did not translate into emergency utilization or readmission, suggesting manageable informational needs rather than clinical instability. Equal wound-related review rates reinforce that early surgical safety signals were not adversely affected by day-care discharge in this selected population

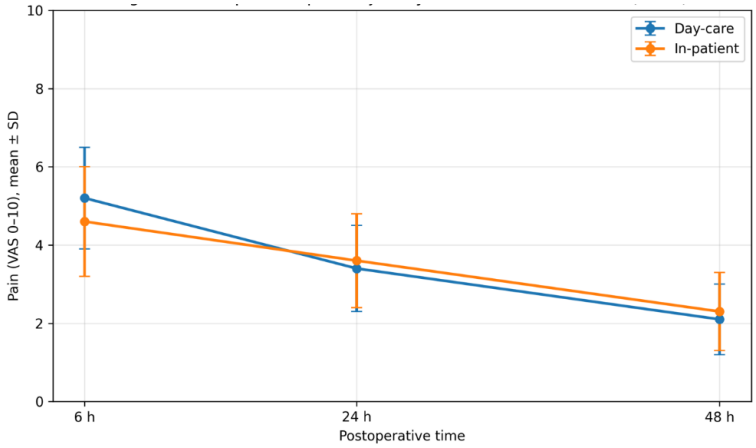

Figure 1. Postoperative Pain Trajectory after ACL Reconstruction (N=30)

Interpretation

Both groups demonstrated a progressive decline in pain from 6 to 48 hours, indicating expected early recovery after arthroscopic ACL reconstruction under multimodal analgesia. Although day-care patients showed a slightly higher mean pain score at 6 hours, the difference was not statistically significant and did not persist. By 24 and 48 hours, pain levels were closely aligned between groups, supporting the conclusion that same-day discharge did not adversely influence short-term pain experience when standardized analgesic protocols and discharge criteria were followed

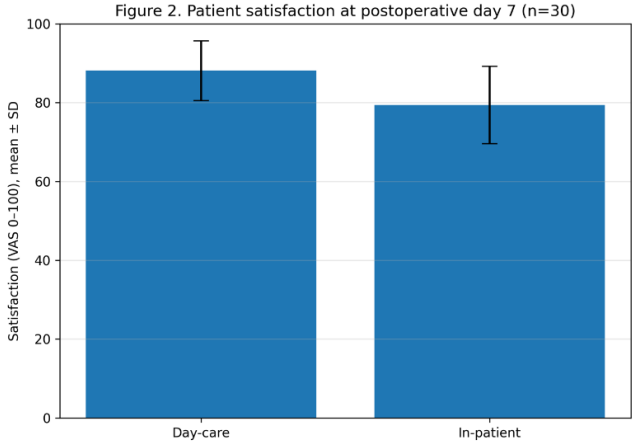

Figure 2. Patient Satisfaction at Postoperative Day 7 Following ACL Reconstruction (N=30)

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DISCUSSION

In this randomized cohort of 30 patients undergoing primary arthroscopic ACL reconstruction, day-care discharge produced pain trajectories that were clinically comparable to in-patient admission through 48 hours, while demonstrating higher satisfaction at postoperative day 7. These findings reinforce the growing position that discharge setting, by itself, is not the dominant determinant of early recovery; rather, outcomes are shaped by the quality and reliability of perioperative analgesia, mobilization readiness, and discharge preparedness.

Our pain results are consistent with randomized evidence showing non-inferior pain and functional outcomes when ACL reconstruction is performed in an outpatient model. Valkering et al. reported an equivalence randomized trial in which inpatient and outpatient ACLR achieved comparable pain experience and functional outcomes over follow-up, supporting the interpretation that early postoperative symptoms can be effectively managed without overnight stay when protocols are standardized [10]. Similarly, Krywulak et al. found that postoperative pain and nausea were not worse in outpatients, despite significantly higher patient satisfaction—an outcome pattern closely paralleling our study [9]. On a broader evidentiary level, a systematic review in *The Knee* concluded that inpatient and outpatient ACLR are generally similar with respect to safety and clinical outcomes, although outcome heterogeneity and variable definitions of "outpatient" limit direct comparability across studies [11].

The satisfaction advantage observed in the day-care group likely reflects multiple interacting drivers. First, recovery at home can offer improved sleep quality, privacy, and a sense of control—factors that may not be captured by pain scores alone yet strongly influence overall experience. Second, day-care pathways typically incorporate explicit expectation setting and structured discharge education, which can lower uncertainty and improve confidence. In support of the "pathway effect," Ilo et al. demonstrated that implementing a dedicated multidisciplinary perioperative pathway improved day-case discharge rates with high satisfaction, indicating that the system design around surgery is central to patient experience [12]. Our results suggest that when pain control is adequate, the perceived benefits of home recovery translate into measurably higher satisfaction within the first postoperative week.

Analgesia strategy remains pivotal in making day-care ACLR workable. Contemporary evidence indicates that adductor canal block can improve immediate postoperative pain without necessarily changing longer-term opioid consumption beyond the early window, aligning with our observation of similar rescue opioid use across groups [13]. This supports an interpretation that the day-care group's non-significant early pain elevation at 6 hours (if present) may reflect early block dynamics and discharge timing rather than sustained inadequacy of analgesia. From an implementation perspective, protocols that combine regional anesthesia, scheduled non-opioid agents, early physiotherapy, and clear rescue plans are likely to minimize unplanned utilization and preserve satisfaction.

Safety considerations are essential when advocating same-day discharge pathways. Large database analyses have explored short-term postoperative complications associated with inpatient admission versus outpatient ACLR. Patel et al., using NSQIP data, compared short-term complications between inpatient and outpatient ACLR and emphasized careful patient selection and monitoring of early adverse events [14]. Separately, systematic synthesis efforts have highlighted that although readmission after ACLR is generally uncommon, reported rates vary substantially across settings and patient profiles, emphasizing the importance of pathway governance and risk stratification [15]. Notably, recent work has also cautioned that inconsistent definitions (same-day discharge vs short-stay "outpatient") can influence apparent complication and readmission differences; standardization of outpatient categories has been explicitly recommended to improve interpretability [16]. Our study's strict operational definition—same-day discharge versus overnight admission—reduces this ambiguity and strengthens the clinical relevance of the comparison.

This study has limitations. The sample size (n=30) restricts power for detecting uncommon complications and limits subgroup analyses (e.g., meniscal procedures, pain sensitivity, or psychosocial predictors). Satisfaction was assessed using a single global VAS rather than a multidimensional validated satisfaction instrument, which may reduce granularity. Additionally, the follow-up focused on early outcomes; longer-term functional recovery, rehabilitation adherence, and cost-effectiveness were not evaluated. Future

studies should use larger multicenter cohorts, standardized outpatient definitions, validated satisfaction tools, and longer follow-up to clarify whether early satisfaction advantages translate into improved rehabilitation engagement and patient-reported outcomes.

CONCLUSION

In this prospective randomized study of 30 adults undergoing primary arthroscopic ACL reconstruction, day-care discharge produced early postoperative pain outcomes comparable to in-patient admission while achieving significantly higher patient satisfaction at one week, without increased early adverse events or readmissions. These data support implementation of structured day-care ACLR pathways for appropriately selected patients, emphasizing standardized anesthesia, multimodal analgesia, early mobilization, and clear discharge education. Larger studies should evaluate pathway scalability, cost-effectiveness, and longer-term functional outcomes to refine discharge criteria and optimize patient-centered recovery.

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