Do Narcotic Use, Physical Therapy Location, or Payer Type Predict Patient-Reported Outcomes After Anterior Cruciate Ligament Reconstruction?

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Investigation performed at Cleveland Clinic, Cleveland, Ohio, USA

Background: Opioid use and public insurance have been correlated with worse outcomes in a number of orthopaedic surgeries. These factors have not been investigated with anterior cruciate ligament reconstruction (ACLR).

Purpose/Hypothesis: To evaluate if narcotic use, physical therapy location, and insurance type are predictors of patient-reported outcomes after ACLR. It was hypothesized that at 1 year postsurgically, increased postoperative narcotic use would be associated with worse outcomes, physical therapy obtained within the authors' integrated health care system would lead to better outcomes, and public insurance would lead to worse outcomes and athletic activity.

Study Design: Cohort study; Level of evidence, 2.

Methods: All patients undergoing unilateral, primary ACLR between January 2015 and February 2016 at a large health system were enrolled in a standard-of-care prospective cohort. Knee injury and Osteoarthritis Score (KOOS) and the Hospital for Special Surgery Pediatric–Functional Activity Brief Scale (HSS Pedi-FABS) were collected before surgery and at 1 year postoperatively. Concomitant knee pathology was assessed arthroscopically and electronically captured. Patient records were analyzed to determine physical therapy location, insurance status, and narcotic use. Multivariable regression analyses were used to identify significant predictors of the KOOS and HSS Pedi-FABS score.

Results: A total of 258 patients were included in the analysis (mean age, 25.8; 51.2% women). In multivariable regression analysis, narcotic use, physical therapy location, and insurance type were not independent predictors of any KOOS subscales. Public insurance was associated with a lower HSS Pedi-FABS score (–4.551, $P = .047$) in multivariable analysis. Narcotic use or physical therapy location was not associated with the HSS Pedi-FABS score.

Conclusion: Increased narcotic use surrounding surgery, physical therapy location within the authors' health care system, and public versus private insurance were not associated with disease-specific KOOS subscale scores. Patients with public insurance had worse HSS Pedi-FABS activity scores compared with patients with private insurance, but neither narcotic use nor physical therapy location was associated with activity scores. Physical therapy location did not influence outcomes, suggesting that patients be given a choice in the location they received physical therapy (as long as a standardized protocol is followed) to maximize compliance.

Keywords: anterior cruciate ligament reconstruction; opioid use; payer status; KOOS; HSS Pedi-FABS

Anterior cruciate ligament (ACL) injury is one of the most common debilitating injuries among athletes, affecting an estimated 98,000 to 250,000 people each year in the United States. Good short- and long-term success of ACL reconstruction (ACLR) is well-established in the literature.[3,6,32,50] Prior studies have identified numerous pre- and intraoperative factors, such as age, body mass index (BMI), and coincident lateral collateral ligament injury, that predict patient outcomes.[8,12,13,26,49,53] Preoperative narcotic use has been previously identified as a factor increasing postoperative narcotic use in orthopaedic surgery.[4] Preoperative narcotic use has similarly been linked to worse patient-reported outcome measures in spine surgeries.[31] A retrospective database study of patients who underwent ACLR identified that 4.71% of patients were still using opioids at 12 months postsurgically, with preoperative opioid use being associated with prolonged postoperative use.[1] However, no prospectively enrolled cohort study has examined the relationship of patient factors, including insurance type, physical therapy (PT) location, and narcotic use, with patient-reported outcomes after ACLR.

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Postoperative pain control is critical in orthopaedic outcomes given the importance of early and sustained range of motion and activity. However, narcotic use is rising in the United States, with concomitant increases in opioid-related deaths.[10,55] In 2016, there were 42,249 deaths due to opioid overdose, with 17,087 deaths due to prescription opioid overdoses.[22] More than 80% of heroin users were exposed to prescription opioids before heroin initiation.[25] Thus, legal prescriptions for opioids represent many people's first exposure to them, and as a result, there has been increased emphasis on physician stewardship of these medications.

Orthopaedic surgeons were among the top 3 prescribers of opioid analgesics in 2018, calculated by the mean number of opioid prescriptions by prescriber, writing 5.8% of all prescriptions.[19] Preoperative opioid use has been associated with increased postoperative opioid use[4] and worse clinical outcomes in an array of orthopaedic procedures, including joint arthroplasty[40,41,61] and patellofemoral stabilization surgery.[28] Within the context of ACLR, an analysis of a retrospective insurance database showed that preoperative narcotic use was predictive of postoperative narcotic use.[2] Another study in which 100 adolescents were interviewed after ACLR found that 99% of the patients filled their opioid prescriptions, with a mean of 60 pills (5 mg each) per patient and 15.5% of patients continuing to use opioids 1 week after surgery.[51] Factors predicting postoperative opioid abuse after orthopaedic surgery include lower socioeconomic status, prior pain-medication use, high health-seeking behavior, mental health disorders, insomnia, and substance abuse.[43] However, no prospective cohort study has yet determined whether either pre- or postoperative narcotic use is a significant predictor of patient-reported outcomes in ACLR.

PT is a cornerstone of orthopaedic rehabilitation, especially after ACLR.[18,27,58] The effects of variation in PT regimens, however, are difficult to quantify and remain the subject of continued research.[30] Specific components of PT regimens have also been associated with improvement in outcome measures.[59] Variations in PT regimens and delivery systems have prompted orthopaedic surgeons and physical therapists to develop standardized rehabilitation guidelines.[58] Because physical therapists within a health system receive training in standardized, monitored guidelines, it is possible that patients who undergo PT at affiliated sites have improved outcomes compared with those whose PT is conducted at other external PT locations.

Compared with private payer insurance, public payer insurance in the United States has been associated with more severe initial presentation in ACL injury and reduced access to postoperative PT services after ACLR.[44,57] Public insurance has also been associated with differences in patient-reported outcomes and complications in joint arthroplasty.[16,21,36,47] However, the relationship between insurance type and postoperative outcome has not yet been defined in ACLR.

The purpose of this investigation was to determine whether the following are significant predictors of patient-reported outcomes after ACLR: (1) preoperative narcotic use and/or quantity of postoperative narcotic pills, (2) location of PT appointments, and (3) payer type (public vs private).

METHODS

Participants

Patients undergoing primary ACLR at a large academic hospital system between January 2015 and February 2016 were selected from the Orthopaedic Minimal Data Set Episode of Care prospective cohort.[9] This is a standard-of-care prospective cohort in which all surgical patients are enrolled and where their characteristics and patient-reported outcomes are obtained serially. The study was approved by our hospital's institutional review board.

Of the 378 patients initially eligible for the study, 3 were excluded at enrollment because of incomplete enrollment and/or technical failure of the data capture system, and 3 more were excluded because they had bilateral reconstructions. Of the 372 patients who had unilateral ACLR and completed the registration questionnaire at enrollment, 260 completed the 1-year postoperative questionnaire (follow-up, 70%) (Figure 1). Of these patients, 2 were removed as there was missing data during retrospective chart review. In total, 258 patients were included in this study.

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Ethical approval for this study was obtained from Cleveland Clinic Institutional Review Board (study No. 17-554).

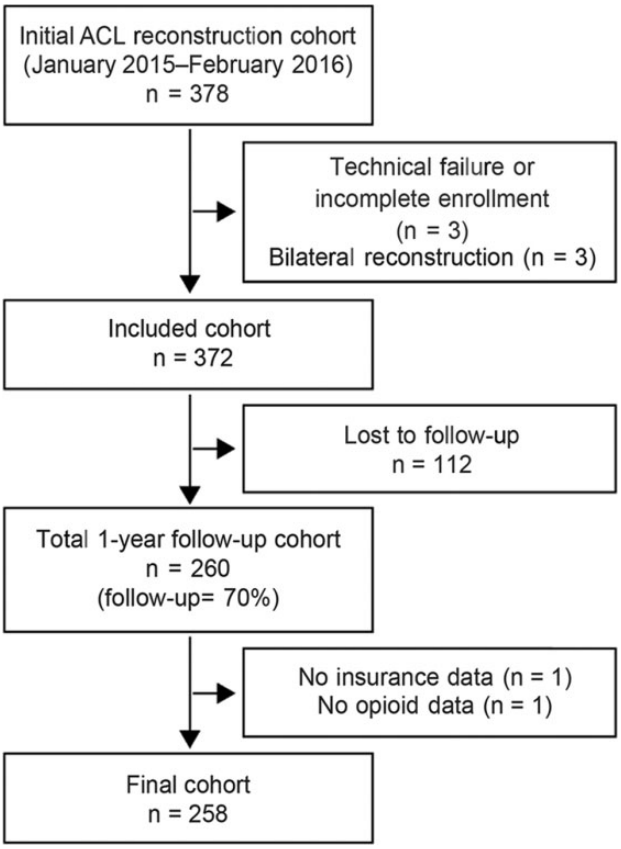

Figure 1. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) diagram for cohort recruitment and 1-year follow-up methodology. ACL, anterior cruciate ligament.

Data Collection

Data were collected from patients before surgery (baseline) and at 1 year after surgery. The 1-year time point was chosen because of the equivalence of Knee injury and Osteoarthritis Outcome Score (KOOS) at 12 and 24 months in a large cohort of patients who had ACLR.[48] Preoperatively, each patient was asked to complete questionnaires that collected their data and mental health status (Veterans RAND 12-Item Health Survey Mental Component Summary [VR-12 MCS]), and they were asked to complete patient-reported outcomes preoperatively and at 1-year follow-up. The following patient-reported outcomes were used: KOOS–Pain, KOOS–Physical Function Short Form (PS), KOOS–Quality of Life (QoL), and Hospital for Special Surgery Pediatric–Functional Activity Brief Scale (HSS Pedi-FABS). Only patients who self-identified as athletes (218 patients at baseline, 192 patients at 1 year) were asked to complete the HSS Pedi-FABS questionnaire.

Patient-Reported Outcome Measures

KOOS measures knee function, with KOOS–Pain measuring pain aspects, KOOS-PS measuring physical functioning of the knee, and KOOS-QoL measuring quality of life, including mental and social aspects of knee function.[45,46] The KOOS is normalized to a 0 to 100 scale, with 0 indicating extreme functional impairment and 100 indicating no impairment.[46] The KOOS has been reported in many studies, such as those performed by the Multicenter Orthopaedic Outcomes Network (MOON) Group,[39] Barenius et al,[5] Möller et al,[38] and Ingelsrud et al.[24] The KOOS was chosen over the International Knee Documentation Committee score because of its decreased need for long-term recall and reporting in separate psychometric domains.[7] HSS Pedi-FABS measures activity on a 0- to 30-point scale, with 0 meaning activity is extremely impaired and 30 meaning activity is not impaired.[14,15]

The HSS Pedi-FABS is considered a superset of the Marx activity rating scale, as HSS Pedi-FABS contains the 4 analogous sections in the Marx scale. HSS Pedi-FABS was chosen for all self-identified athlete patients regardless of age, instead of the Marx scale, which has been reported in several large retrospective trials, including those by the MOON Group,[33,39,56] to mitigate the latter's observed ceiling effect.[37] Additionally, the time periods differ between HSS Pedi-FABS (measuring activity level over the past month) and the Marx activity rating scale (measuring activity level over the past year). Thus, HSS Pedi-FABS is considered more useful for identifying short-term changes in activity level, such as those seen after ACLR.[35] While the HSS Pedi-FABS scale has not been rigorously validated for the adult population, a recent study suggests that it provides similar comparative results with the Marx activity rating scale.[35]

Surgeon Involvement

Directly after each surgery, the operating surgeon was asked to complete a detailed form that documented intraoperative findings. Electronically captured surgeon input data included physical examination and arthroscopic findings, surgical history, type and source of ACL graft, surgical technique, and concomitant knee pathologies and their associated grades. All 8 surgeons (P.S., L.D.F., K.P.S., J.T.R., M.H.J., A.A.M., R.D.P., J.S.W.) in this study were board-certified orthopaedic surgeons who were staff physicians at our institution. Patient care and surgical planning were directed by the operating surgeon. After each index surgery, patients were provided with an information packet that outlined a specific rehabilitation program to provide to their physical therapist at internal and external PT offices.

Review of the Electronic Medical Record

Narcotic data were collected from the electronic medical record (Epic Systems) based on prescription orders during both the pre- and postoperative periods. The preoperative period was defined as the time of diagnosis to the time of surgery, with a maximum duration of 3 months. The postoperative period was defined from the time of surgery to 6 months after. Narcotics prescribed for knee pain related to the patient's ACL pathology were included. All refills of narcotics were collected to estimate the number of narcotic pills actually consumed. Insurance information and PT location were similarly collected from the electronic medical record.

TABLE 1
Predictor Variables (N = 258 Patients)[a]

Variable	Value	Variable	Value
Age, y	25.8 ± 11.8	Prior contralateral ACLR	
Sex		No	242 (93.8)
Female	132 (51.2)	Yes	16 (6.2)
Male	126 (48.8)	Maximum extent of knee OA	
BMI	26.4 ± 5.6	Normal/grade 1 or 2	220 (85.3)
Years of education	13.1 ± 3.7	Grade 3 or 4	38 (14.7)
Smoking status		Preoperative narcotic use	
Never smoker	218 (84.5)	No	236 (91.5)
Former smoker	22 (8.5)	Yes	22 (8.5)
Current smoker	18 (7.0)	No. of postoperative narcotic pills prescribed	78.2 ± 42.2
VR-12 MCS	54.7 ± 9.8	Were all preoperative PT visits internal?	
Baseline outcome scores		No/None	168 (65.1)
KOOS-QoL	38.3 ± 21.0	Yes	90 (34.9)
KOOS–Pain	71.1 ± 18.6	Were all postoperative PT visits internal?	
KOOS-PS	30.3 ± 14.5	No	40 (15.5)
HSS Pedi-FABS[b]	14.0 ± 11.1	Yes	193 (74.8)
Graft source (surgical limb)		None	25 (9.7)
Autograft	233 (90.3)	Insurance category	
Allograft	25 (9.7)	Private	239 (92.6)
		Public	19 (7.4)

[a]Data are presented as mean ± SD or number of patients (%). ACLR, anterior cruciate ligament reconstruction; BMI, body mass index; HSS Pedi-FABS, Hospital for Special Surgery Pediatric–Functional Activity Brief Scale; KOOS, Knee injury and Osteoarthritis Outcome Score; MCS, Mental Component Summary; OA, osteoarthritis; PS, Physical Function Short Form; PT, physical therapy; QoL, Quality of Life; VR-12, Veterans RAND 12-Item Health Survey.
[b]n = 218 patients.

Statistical Methods

Continuous variables were summarized using means ± SDs, while categorical factors were summarized with frequencies and percentages. Initially, univariate associations between key predictors (sex, smoking status, graft source, prior contralateral ACLR, maximum osteoarthritis [OA] grade, if preoperative narcotics were prescribed, PT location, insurance payer, BMI, number of postoperative pills prescribed, years of education, age, baseline outcome scores, and VR-12 MCS) and the 4 outcome variables (KOOS–Pain, KOOS-PS, KOOS-QoL, and HSS Pedi-FABS) were assessed using analysis of variance models for categorical factors and Pearson correlations for continuous measures.

Multicollinearity among predictors was assessed using variance inflation factors and condition indices; variance inflation factors >10 and condition indices >30 are generally used to identify strong multicollinearity.[29] Because no strong multicollinearity was observed, all predictors were included in the multivariable models. Multicollinearity was also assessed by removing factors associated with the outcome in the multivariable models 1 at a time and refitting the multivariable model. Refitting the models did not lead to any variables changing in significance.

Our primary multivariable models were based on linear regression. These models were used to evaluate whether narcotic use, PT location, and insurance type evaluated with known risk factors for patient-reported outcomes were predictors. Residual patterns were assessed and potential ceiling effects were tested. Initial models included restricted cubic splines for continuous measures to allow for nonlinear effects. No significant nonlinear effects were observed, so the splines were removed to maintain an events per variable ratio of 10:1. Two sensitivity analyses were performed. The first used a censored regression (Tobit) model to account for possible censoring of responses at the extremes of the distribution, while the second used proportional odds logistic regression models to categorically evaluate the endpoints. Both sensitivity analyses agreed with the multivariable models. The chi-square test was used for 2 × 2 contingency table analyses.

A power analysis was performed using a beta value of 0.8 and a minimal clinically important difference (MCID) of 8 for KOOS outcomes and a clinically derived minimal change of 2 for HSS Pedi-FABS.[45] The study was adequately powered to detect meaningful differences for all KOOS measures and HSS Pedi-FABS at the predetermined MCID values. For linear and censored regression models, mean effects with 95% CIs and *P* values are presented. Data management and initial summaries were performed using SAS software (Version 9.4; SAS Institute). Multivariate models were fit using R software (Version 3.3). A significance level of .05 was assumed for all tests.

RESULTS

Study Population

Table 1 lists the predictor variables for the patients used in our study, along with the baseline patient-reported outcome

TABLE 2
Patient-Reported Outcome Measures at Baseline and 1-Year Follow-Up[a]

	Baseline		1-Year Follow-Up	
Outcome Measure	n	Score (Mean ± SD)	n	Score (Mean ± SD)
KOOS-QoL	258	38.3 ± 21.0	258	71.8 ± 21.4
KOOS–Pain	258	71.1 ± 18.6	258	89.2 ± 13.1
KOOS-PS	258	68.6 ± 14.6	258	86.9 ± 12.1
HSS Pedi-FABS	218	14.0 ± 11.1	192	17.3 ± 9.3

[a]HSS Pedi-FABS, Hospital for Special Surgery Pediatric–Functional Activity Brief Scale; KOOS, Knee injury and Osteoarthritis Outcome Score; PS, Physical Function Short Form; QoL, Quality of Life.

scores. The mean (± SD) age of patients was 25.8 ± 11.8 years, and 51.2% were women. An autograft reconstruction was used in 90.3% of patients, with the rest receiving an allograft tendon. A total of 6.2% of patients had a previous contralateral ACLR, and 14.7% had grade 3 or 4 articular cartilage knee pathologies. Patients were prescribed a mean of 78.2 ± 42.2 narcotic pills during the postoperative period. The majority of the cohort carried private insurance (92.6% of patients), lacked preoperative PT (65.1% of patients), and utilized our health system for postoperative PT (74.8% of patients). Of the patients who were covered by publicly funded insurance, all but 3 were covered under Medicaid.

Table 2 shows the patient-reported outcome questionnaires at initial enrollment and the 1-year follow-up. Of the 218 patients in the initial cohort who self-identified as athletes and subsequently answered questions pertaining to HSS Pedi-FABS, 26 did not self-identify as an athlete at the 1-year follow-up, resulting in 192 patients with completed HSS Pedi-FABS measures at 1 year. A 2 × 2 contingency table analysis demonstrated no difference in athlete status between those on public versus private insurance ($P = .83$).

KOOS-QoL

In the multivariable model, only VR-12 MCS ($P = .009$) and baseline KOOS-QoL ($P < .001$) remained statistically significant. Every incremental increase in VR-12 MCS led to an increase of 0.346 points for the 1-year KOOS-QoL, and every point increase in the baseline KOOS-QoL measure led to an increase of 0.266 points for the 1-year KOOS-QoL. Narcotic use, PT location, and insurance type were not independent predictors of 1-year KOOS-QoL.

KOOS–Pain

In multivariable analysis, age ($\beta = –0.335$; $P < .001$), VR-12 MCS ($\beta = 0.218$; $P = .005$), baseline KOOS–Pain ($\beta = 0.249$; $P < .001$), and age × education interaction ($\beta = 0.060$; $P = .001$) were all statistically significant for 1-year KOOS–Pain. Specifically, age was negatively associated with 1-year KOOS–Pain at follow-up, indicating that older patients had lower scores, but this effect was attenuated among those with greater education. Narcotic use, PT location, and insurance type were not independent predictors of 1-year KOOS–Pain.

KOOS-PS

In the multivariable analysis, age ($\beta = 0.256$; $P = .004$), baseline KOOS-PS ($\beta = 0.309$; $P < .001$), VR-12 MCS ($\beta = –0.259$; $P < .001$), and age × education interactions ($\beta = –0.069$; $P < .001$) remained significant. As above, older age was associated with worse (higher) scores, but this impact was weakened among those with higher education levels. When performing backward elimination to determine multicollinearity between postoperative narcotic use and other variables included in the multivariable model, we noticed that removing age and the age × education interaction has a large impact on the estimate of postoperative narcotic use (after age and age × education were removed, the multivariable estimate for postoperative narcotics was $\beta = 0.032$ with a P value of .058). Narcotic use, PT location, and insurance type were not independent predictors of 1-year KOOS-PS.

HSS Pedi-FABS

In the multivariable analysis, insurance type (public compared with private, –4.551; $P = .047$), BMI ($\beta = –0.421$; $P = .009$), education ($\beta = –0.722$; $P < .001$), and baseline HSS Pedi-FABS scores ($\beta = 0.140$; $P = .011$) were statistically significant predictors of 1-year HSS Pedi-FABS scores (Table 3). Importantly, those with public insurance, after controlling for other factors, had a lower HSS Pedi-FABS score (a mean of 4.551 points lower) at the 1-year follow-up. Narcotic use, PT location, and insurance type were not independent predictors of 1-year HSS Pedi-FABS. There was no significant difference between patients with no postoperative PT location recorded, patients with all internal PT appointments, and patients with all external PT appointments (the reference level for the multivariable testing of PT location). Subsequent analysis utilizing the Marx activity score–specific questions of HSS Pedi-FABS demonstrated similar significance values to the outcomes for HSS Pedi-FABS, although public insurance was no longer below the predefined significance threshold, with $P = .077$.

DISCUSSION

The most important findings of our study were that, according to multivariable modeling, narcotic use, PT location, and insurance type were not independent risk factors for KOOS subscales. However, for athletic activity, public insurance type was a significant risk factor for worse HSS Pedi-FABS scores. A summary of all risk factors that were found to be statistically significant predictors of KOOS and HSS Pedi-FABS scores is shown in Table 4.

As narcotic use was not associated with KOOS subscale scores or HSS Pedi-FABS scores, patients should be switched to an analgesic with less addictive potential as soon as their pain levels permit. Previous studies have identified ways to decrease opioid use after orthopaedic surgery, such as through acetominophen[52,60] or parecoxib[11,23,34]

administration. With opioid-related deaths increasing[17] and documented negative effects of opioids after surgery,[20] providers should attempt to use a multimodal pain-management strategy to reduce opioid addiction burden on patients.

PT location, coded as all within our institution's network or all outside our network, was not significantly associated with a difference in patient-reported outcomes. Our study was powered to detect a change at least as great as the MCID for the KOOS outcome measures, suggesting that PT location is not a variable that orthopaedic surgeons should focus on when determining treatment plans for patients who have undergone ACLR. All patients who underwent ACLR at our institution receive an informational packet on proper ACL rehabilitation, which includes instructions on exercises similar to those performed in PT.[58] As such, patients whose PT was completed outside of our institution's network received the same protocol as those within our network. PT location is not significantly associated with outcomes, so patients should receive care where it is most convenient for them as long as a standardized protocol is given. Having a standardized ACL therapy program is likely more important than location of therapy.

Insurance payer is only significantly associated with athletic activity as measured by the HSS Pedi-FABS score. Multivariable analysis of HSS Pedi-FABS showed that those with publicly funded insurance scored 4.5 points lower than patients with private insurance after adjustment for all other factors. Insurance type is highly correlated with socioeconomic status as Medicaid is offered as an insurance to those who cannot afford private coverage. It is interesting that this study found a significant effect of insurance on HSS Pedi-FABS after correcting for other known indicators of socioeconomic status. Privately insured patients have previously been shown to have fewer complications[54] and decreased resource utilization[42] after arthroplasty. Patients with public insurance have more severe presentations as compared with those with private insurance.[57] We show that even after controlling for severity and socioeconomic status, patients with public insurance have worse patient-reported outcomes.

We acknowledge several limitations of this study. The 70% follow-up we had in our study could introduce confounders based on selection bias. However, our response rate was still high compared with other orthopaedic cohort studies, and we used multivariable methodology to decrease this bias. Our study duration of 1 year demonstrates only short-term outcomes. Narcotic use was indicated by the number of narcotic pills prescribed to patients, not the number of pills the patient had actually taken. Finally, we are unable to account for differences in unsupervised PT; we did not track whether or how frequently patients performed exercises as instructed. One of our outcome measures, HSS Pedi-FABS, does not have a validated MCID. Thus, conclusions drawn using this outcome measure should be tempered. Of the outcome measures included, HSS Pedi-FABS and KOOS-PS have the most relevant construct to assess outcomes after ACLR; other outcome measures introduce the possibility of bias from miscalculation of outcome.

TABLE 3
Multivariable Linear Model for HSS Pedi-FABS[a]

Factor	Estimate (95% CI)	*P* Value
Intercept	38.969 (28.831 to 49.108)	**<.001**
Male sex	0.332 (–2.235 to 2.898)	.8
Smoker: former	–2.811 (–7.613 to 1.991)	.25
Smoker: current	0.679 (–5.575 to 6.933)	.83
Graft source: allograft	–4.777 (–10.525 to 0.971)	.10
Prior contralateral ACLR	3.112 (–1.959 to 8.182)	.23
Maximum extent of OA: grade 3 or 4	–0.662 (–5.024 to 3.701)	.76
Preoperative narcotic use	–2.188 (–6.022 to 1.646)	.26
All preop PT visits, internal	1.186 (–1.384 to 3.756)	.36
All postoperative PT visits, internal	–2.339 (–5.686 to 1.009)	.17
No postoperative PT visits recorded	–1.823 (–6.598 to 2.951)	.45
Insurance: public	–4.551 (–9.039 to –0.062)	**.047**
Age	–0.114 (–0.291 to 0.063)	.20
BMI	–0.421 (–0.735 to –0.107)	**.009**
Years of education	–0.722 (–1.124 to –0.320)	**<.001**
VR-12 MCS	0.024 (–0.095 to 0.143)	.69
Baseline HSS Pedi-FABS	0.140 (0.032 to 0.248)	**.011**
Postop narcotics, quantity	–0.011 (–0.040 to 0.019)	.47
Age × education	0.023 (–0.006 to 0.053)	.12

[a]Bolded *P* values indicate statistical significance ($P < .05$). ACLR, anterior cruciate ligament reconstruction; BMI, body mass index; HSS Pedi-FABS, Hospital for Special Surgery Pediatric – Functional Activity Brief Scale; MCS, Mental Component Summary; OA, osteoarthritis; postop, postoperative; PT, physical therapy; VR-12, Veterans RAND 12-Item Health Survey.

TABLE 4
Summary of Significant Predictors for Each Multivariable Model Outcome[a]

	Outcome			
	KOOS-QoL	KOOS–Pain	KOOS-PS	HSS Pedi-FABS
Predictor	VR-12 MCS Baseline KOOS-QoL	Age VR-12 MCS Baseline KOOS–Pain Age × education	Age VR-12 MCS Baseline KOOS-PS Age × education	Insurance type BMI Education Baseline HSS Pedi-FABS

[a]BMI, body mass index; HSS Pedi-FABS, Hospital for Special Surgery Pediatric–Functional Activity Brief Scale; KOOS, Knee injury and Osteoarthritis Outcome Score; MCS, Mental Component Summary; PS, Physical Function Short Form; QoL, Quality of Life; VR-12, Veterans RAND 12-Item Health Survey.

Finally, 26 patients who self-identified as athletes at the time of the index surgery no longer self-identified at the 1-year mark, introducing an important source of bias.

CONCLUSION

In a prospectively enrolled cohort of patients who had ACLR, we identified that preoperative narcotic usage, postoperative narcotic usage, and PT location did not significantly affect outcome measures at 1 year after surgery in a multivariable analysis. Insurance type was a significant predictor in a multivariate model for HSS Pedi-FABS, with patients receiving public funding for insurance having lower athletic activity. While opioids do not influence outcomes, surgeons should be aware of the national stigma against opioid use and approach pain in a multimodal fashion to maximize patient comfort while minimizing addiction potential. Surgeons should be aware that PT location does not influence outcomes and should thus prescribe PT to be most convenient for the patient. Last, surgeons should be more cognizant of the insurance status of their patient to ensure that those with public funding are functionally improving at an appropriate rate.

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