Comparing ACL Reconstruction Postoperative Outcomes in Medicaid versus Private Insurance Patients: Is There a Difference?

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Objectives: There has been growing evidence that insurance status is a major indicator of postoperative outcomes, which has been extensively reported in orthopedic procedures such as shoulder and knee arthroplasty. Patients with Medicaid public insurance had increased complications, longer lengths of stay, and increased costs compared with patients who had private insurance when controlling for demographic characteristics. Our study compared the outcomes of patients with Medicaid insurance with those patients with private commercial insurance who have undergone anterior cruciate ligament (ACL) reconstruction. We hypothesized that patients with Medicaid insurance coverage would have worse patient-reported outcomes and complication rates in comparison with a matched cohort of patients with private insurance.

Methods: Our departmental registry was queried for all patients who underwent primary arthroscopically assisted ACL reconstruction by 10 surgeons in the practice between January 2018 and June 2022 and were at least 2 years out from their surgery. Eligible patients in the matched cohort model were contacted via telephone for consent to participate in this study and questioned about their pain level, return to sport, physical therapy compliance, and any incidence of retear rates or additional procedures in their ipsilateral or contralateral knee. Patients were then compared across insurance types based on Lysholm knee score, as well as the other patient-reported outcomes.

Results: A total of 189 ACL reconstructions were screened during the study period. Fifteen private insurance and 15 Medicaid patients responded to the telephone call and consented to the study. Comparison of the clinical outcomes within the insurance cohorts revealed that there were no significant differences in Lysholm knee scores, pain scores, revision rate, and return to sport. The only significant difference observed was that Medicaid patients had a greater physical therapy compliance rate. Multivariate linear regression analysis revealed that males had the highest odds ratio associated with higher Lysholm scores, but there was no significance observed with any factor.

Conclusions: Although Medicaid patients did have greater physical therapy attendance, this did not improve their postoperative outcomes, which may suggest that Medicaid status may affect physical therapy effectiveness and can be a confounding variable related to other health disparities. Because the multivariate linear regression analysis did not show any associated factors with poorer postoperative outcomes, this may imply that some demographic factors or insurance status may not be contraindications to ACL reconstruction. Despite the lack of significance, males had a greater likelihood of achieving acceptable Lysholm knee scores based on the multivariate analysis.

Key Words: ACL reconstruction, insurance status, Medicaid, postoperative outcomes, private insurance

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Social determinants of health have been known to influence healthcare access, management, and clinical outcomes.[1,2] Evidence has been building that insurance status is a major indicator of postoperative outcomes, which has been extensively reported with orthopedic procedures such as shoulder and knee arthroplasty in which insurance status has affected patient morbidity and mortality.[3–6] Specifically, patients covered by Medicaid had significantly higher rates of postoperative arthroplasty complications along with longer lengths of stay and increased costs compared with patients who had private insurance when controlling for demographic characteristics.[3–6]

Although there have been numerous studies investigating the effect of insurance status on arthroplasty procedures, few studies exist investigating the impact of patient insurance on anterior cruciate ligament (ACL) reconstruction outcome scores and prognosis.[7,8] As ACL reconstructions rise in incidence over all age groups, it is important to discern the relationship between patient insurance and postoperative outcomesbecause there is currently a gap in the literature regarding this topic.[9]

As such, the purpose of this study was to investigate whether patients insured through Medicaid exhibited differences in Lysholm knee scores, patient-reported outcomes (PROs), and complication or reinjury rates after ACL reconstruction compared with patients insured by private insurance.

Key Points

- Comparison of the clinical outcomes within the insurance cohorts revealed that there were no significant differences in Lysholm knee scores, pain scores, revision rate, and return to sport.
- Medicaid patients had greater physical therapy compliance as opposed to patients with private insurance despite the fact there were no improved clinical outcomes.
- Insurance status may affect physical therapy effectiveness. It can be a confounding variable that hinders a popular belief of high physical therapy compliance associated with better postoperative outcomes and may be related to other disparities in social determinants of health.

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TABLE 1. Demographics of insurance cohorts

	Private (n = 15)	Medicaid (n = 15)	*P*
Age, y	34.67 ± 11.76	28.71 ± 16.99	0.76
BMI, kg/m^2	29.63 ± 7.41	27.05 ± 10.03	0.60
Sex, male:female	9:6	3:12	0.03*

BMI, body mass index.

Asterisks demonstrate statistical significance, as is standard in all scientific research.

We hypothesized that patients with Medicaid insurance coverage undergoing ACL reconstruction would have poorer Lysholm knee scores, PROs, and complication rates in comparison with a matched cohort of patients with private insurance.

METHODS

Institutional review board approval was obtained from our institution before the initiation of this study. Our prospectively collected departmental registry was queried for all patients who underwent primary arthroscopically assisted ACL reconstruction by 10 surgeons in the practice between January 2018 and June 2022. It is noted that only patients who were at least 2 years out from their surgery were included in the screening.

A matching cohort model was used to control for confounding variables by selecting an equal number of patients who had either private insurance or Medicaid with similar demographics, if possible. BlueCross BlueShield was the main private insurance carrier used in this matched cohort model because it was the most common insurance used overall. Our exclusion criteria included any patients undergoing non-ACL surgeries, revision procedures, and concurrent ligamentous procedures. Eligible patients in the matched cohort model were contacted via telephone by the approved medical student on the study (F.N.), who asked for their consent to participate in this study and questions about their pain level, return to sport, physical therapy compliance, and any incidence of retear rates or additional procedures in their ipsilateral or contralateral knee. Patients were then asked to participate in a Lysholm knee score survey over the telephone. If the patients were unable to do the Lysholm knee score survey over the telephone, then they were e-mailed a Health Insurance Portability and Accountability Act of 1996 compliant Google Form (Google, Mountain View, CA) that included the survey.

For all respondent and consented patients, the electronic medical record was reviewed to collect patient demographics, including age, sex, body mass index (BMI), surgical diagnosis, surgical procedure, date of surgery, and relevant contact information. Patients were stratified according to their insurance status at the time of surgery: private insurance versus Medicaid. The primary outcome that was measured was Lysholm knee scores along with PROs. Secondary outcomes included reinjury and additional surgery on ipsilateral or contralateral knee.

Descriptive statistics were calculated and presented where applicable using SPSS version 29 (IBM SPSS Statistics, Armonk, NY). A two-sample independent *t* test was used to compare the two insurance cohorts for all quantitative variables including Lysholm knee scores and PROs. The χ^2 test was used to determine significant differences in categorical variables, such as sex ratios, retear/revision rates, return to sport, and physical therapy compliance. Multinomial logistic regression models were used to assess demographic factors and insurance type predictive of Lysholm knee scores and return to sport following surgery.

RESULTS

A total of 189 patients with ACL reconstruction were screened during the study period, 23.8% (n = 45/189) of whom were patients with private insurance and 21.2% (n = 40/189) of whom were insured through Medicaid. A total of 15 private insurance patients and 15 Medicaid patients responded to the telephone calls and consented to the study. This demonstrated a 33% compliance rate of PRO data within the private insurance group and a 37.5% compliance rate of PRO data within the Medicaid group. Of these patients, only 10 private insurance and 10 Medicaid patients agreed to participate in the survey (approximately 67% compliance).

Private and Medicaid insurance cohorts were demographically matched before analysis. Post hoc statistical analysis revealed no significant differences in age and BMI between the two cohorts (Table 1). The combined mean age of the patients in both cohorts was approximately 32 years (34.67 ± 11.76 vs 28.71 ± 16.99, $P = 0.76$), whereas the mean BMI was 28 kg/m^2 (29.63 ± 7.41 vs 27.05 ± 10.03, $P = 0.60$). There were nine male and six female patients in the private insurance cohort versus three male and 12 female patients in the Medicaid cohort (9:6 vs 3:12, $P = 0.03$).

Comparison of the clinical outcomes within the insurance cohorts (Table 2) revealed that there were no significant differences in Lysholm knee scores (70 ± 32.56 vs 69.70 ± 32.43, $P = 0.95$), pain scores (3 ± 3.30 vs 3.31 ± 3.48, $P = 0.67$), retear rate (27% vs 6.67%, $P = 0.14$), revision rate (13% vs 20%, $P = 0.62$), return to sport ratio (11:3 vs 10:3, $P = 0.92$), and return to sport duration (221 ± 101.37 vs 316.89 ± 225.35, $P = 0.18$). The only significant difference was the physical therapy compliance rate for which Medicaid patients demonstrated perfect compliance (73% vs 100%, $P = 0.03$).

Multivariate linear regression analysis (Table 3) for factors predictive of acceptable Lysholm knee scores (defined as ≥65) revealed that there was no factor associated with higher Lysholm knee scores despite sex having an outlying high odds ratio (8.247).[10] Similarly, multivariate linear regression analysis

TABLE 2. Clinical outcomes within insurance cohorts

	Private (n = 15)	Medicaid (n = 15)	*P*
Lysholm knee score	70 ± 32.56	69.70 ± 32.43	0.95
Pain score	3 ± 3.30	3.31 ± 3.48	0.67
Retear rate, %	27	6.67	0.14
Revision rate, %	13	20	0.62
Return to sport, yes:no	11:3	10:3	0.92
Return to sport duration, d	221 ± 101.37	316.89 ± 225.35	0.18
Physical therapy compliance rate, %	73	100	0.03*

TABLE 3. Multivariate regression analysis for significant associations with Lysholm knee scores and return to sport

	OR	*P*
Good Lysholm knee scores		
Age, y	0.981	0.71
BMI, kg/m^2	1.045	0.59
Sex, ref = female	8.247	0.23
Insurance type, ref = Medicaid	0.174	0.18
Return to sport		
Age, y	0.974	0.65
BMI, kg/m^2	0.827	0.45
Sex, ref = female	1.306	0.87
Insurance type, ref = Medicaid	1.460	0.79

BMI, body mass index.

for factors predictive of return to sport revealed no factor associated with the likelihood to return to sport.

DISCUSSION

The most important finding observed in this study was that Medicaid patients do not demonstrate lower Lysholm knee scores postoperatively than patients with private insurance, with no significant differences in PROs. Furthermore, there are no significant differences in ACL retear rates, revision rates, and return to sport between the two insurance cohorts. These findings go against our original hypothesis that Medicaid patients would face proper postoperative outcomes as described in other studies. It was found, however, that Medicaid patients attended more physical therapy sessions with a perfect compliance rate. This finding is noteworthy as it goes against previous studies that showed that Medicaid patients had a lower physical therapy compliance rate due to lack of access to care.[11,12]

Despite higher physical therapy compliance in Medicaid patients, this was not effective enough to improve postoperative functional knee scores, PROs, complication rates, and return to sport. In other words, insurance status may affect physical therapy effectiveness and can be a confounding variable that hinders the popular belief of high physical therapy compliance being associated with better postoperative outcomes.[13] Physical therapy effectiveness also may be related to other disparities in social determinants of health that Medicaid patients face that could not be measured in this study, such as environmental hazards, reduced access to healthy food, and financial burdens. Further analysis is required to investigate other social determinants of health and their impact on postoperative outcomes that were measured in this study.

This study also demonstrated that there were no demographic factors that were associated with acceptable Lysholm knee scores and greater likelihood of return to sport. This may imply that age and BMI do not affect outcomes after ACL reconstruction, which may indicate that these factors are not contraindications to surgery. Furthermore, this analysis demonstrates and corroborates previous findings that insurance status is not significantly associated with higher Lysholm knee scores and likelihood of returning to sport. It is important to note, however, that the only odds ratio that was an outlier in the analysis was sex, where males had a much greater likelihood than females of achieving acceptable Lysholm knee scores postoperatively. Despite the lack of statistical significance, this relationship is well described in other studies in which men have been shown to have greater postoperative outcomes than women after ACL reconstruction.[14,15] This relationship requires further analysis with a larger patient population and sample size.

There are a few limitations in our study. First, we were unable to determine other social determinants of health, such as education, employment, support system, or any other factor that could affect patient health. Furthermore, we did not investigate any relationships between factors such as preoperative knee function, prior surgeries, comorbidities, drug use, and family history on postoperative ACL reconstruction outcomes. Next, the male-to-female ratios were significantly different between insurance cohorts, creating an uneven disparity of the majority sex in each cohort (predominantly males in the private cohort and females in the Medicaid cohort). This could be a confounding variable that could skew findings because sex differences could affect recovery, function, and symptoms in ACL reconstruction.[16] Finally, our study relied on contacting eligible patients via telephone, which resulted in a low compliance rate and sample size for both insurance cohorts in our analysis. The low sample size was a significant limitation that led to insignificant differences between the cohorts with large standard deviations. Contacting patients over the telephone also potentially led to response bias in the outcomes and surveys despite a small minority of the patients completing the survey online.

CONCLUSIONS

We found no significant differences in the Lysholm knee scores, PROs, complication rates, and return to sport between Medicaid and private insurance patients after ACL reconstruction. Although Medicaid patients did have a higher rate of physical therapy attendance, this did not improve their postoperative outcomes, which may suggest that Medicaid status may affect physical therapy effectiveness and can be a confounding variable related to other health disparities. Although there were no significant variables associated with acceptable Lysholm knee score and a greater likelihood to return to sport, males had the highest outlying odds ratio of having acceptable Lysholm knee scores. Further analysis is required to confirm these findings, however, and to demonstrate significant postoperative outcome differences between the two insurance cohorts, including more measured social determinants of health and a larger patient size.

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