

The Cost of Pediatric ACL Reconstruction: A Narrative Review

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Objective: Analyze current published literature to establish the costs associated with performing ACL reconstruction in the pediatric population.

Design: Narrative Review

Main Outcome Measure: Cost of performing ACL reconstruction in pediatric patients.

Results and Conclusion: The mean estimate cost for pediatric ACL reconstruction is \$29,590 but varied by hospital type and US region. Nonetheless, there is a scarcity of literature that reports cost for this procedure in the pediatric population.

Efforts to improve price transparency and increase access to information on pediatric healthcare costs may help families make more informed decisions about their child's care.

Level of Evidence: IV; Review

Keywords: Anterior cruciate ligament, ACL tear, ACL reconstruction, Pediatrics, Sports Medicine, Cost, Value, Business

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INTRODUCTION

Anterior cruciate ligament (ACL) injuries are becoming increasingly common among the pediatric population.¹⁻³ These injuries often require surgical intervention in order to restore normal joint stability and function.^{4,5} However, the costs associated with pediatric ACL reconstruction can be substantial and may pose a financial burden. Price availability has been a consistent challenge for pediatric orthopaedic procedures, with studies showing only about 40% of state-based websites distinguish between prices for pediatric care.⁶⁻⁸

The cost of pediatric ACL reconstruction can lead to delayed or deferred surgical intervention, as families may struggle to afford the procedure. In addition to financial constraints, other factors such as lack of insurance coverage, limited access to healthcare services, and socioeconomic disparities can also pose barriers.⁹ For instance, studies have shown that in comparison to children with private insurance, those with Medicaid have greater difficulties accessing

orthopaedic care.^{10,11} Delay of operative management in pediatric and adolescent populations can result in further damage to the joint, such as meniscal tears and chondral injuries requiring additional surgical intervention, and ultimately increase the overall cost of care.¹² Nonetheless, the available information regarding the cost of these procedures remains scarce. The purpose of this review is to examine the current literature on cost analysis and effectiveness of pediatric ACL reconstruction, including direct and indirect costs, and to identify potential areas for cost reduction.

Cost of ACL Reconstruction:

In the United States, the average cost of ACL reconstruction ranges from \$13,000 to \$25,000 depending on the location and type of facility.^{13,14} A recent study by Lee et al. (2022) showed a mean estimate of \$29,590 for pediatric ACL reconstruction, including hospital, surgeon, and anesthesia fees. Top-ranked hospitals had higher costs than non-ranked hospitals (\$34,901 vs. \$25,207, $p=0.07$).⁶ However, this price varied significantly by US region.

Direct Costs:

Direct costs of ACL reconstruction refer to the expenses directly related to the surgical procedure, including preoperative testing, anesthesia, surgical supplies, and hospitalization.¹⁵ The cost of ACL reconstruction varies widely depending on the surgical technique used, the type of graft material used, and the healthcare facility where the surgery is performed. Hamstring autograft has traditionally been the most common graft source for ACL reconstruction in the pediatric population followed by bone-patellar tendon-bone graft (BTB). Prior literature reported a lower mean direct cost for hamstring vs BTB autograft ACL reconstruction (\$5,375 vs \$5,582).¹⁶ Furthermore, another study found that hybrid ACL grafts, that combine hamstring autograft with cadaveric allografts, demonstrated incremental cost savings (-\$2765) compared with the traditional hamstring graft, due to reduced revision rate.¹⁷ However, many of the current studies

reporting cost effectiveness may be not representative of the pediatric populations, as reviews included mostly young to middle-aged persons.

Indirect Costs:

Indirect costs associated with pediatric ACL reconstruction extend beyond the initial surgical intervention, and can include expenses related to quality of life, rehabilitation, and return-to-play (RTP) protocols.¹⁸ A recent study by DeFrancesco et al (2020) showed that while the cost of an RTP program was approximately \$1,700 more than the standard rehabilitation protocol, the risk of ACL graft rupture after completing the RTP program was reduced by 25%, deeming these programs cost effective.¹⁹ These costs may be more difficult to quantify but can be substantial. For instance, children who experience ACL injuries may require ongoing physical therapy and rehabilitation. Additionally, the psychological impact of an injury can be significant, with children potentially experiencing anxiety and depression related to limitations in daily activities, socialization, and sports participation.²⁰ The cost of addressing these issues may be significant.

Potential Areas for Cost Reduction:

While the costs of pediatric ACL reconstruction may be substantial, there are potential areas for mitigation of costs. One potential area for cost reduction is the use of outpatient surgery centers instead of hospitals for ACL reconstruction. Outpatient surgery centers typically have lower overhead costs than hospitals and can perform the same procedures at a lower cost.²¹ A recent study determined that pediatric orthopaedic procedures can be performed safely in freestanding ambulatory surgery centers. This finding was due to multiple factors including dedicated surgical teams, single-purpose ORs, and strict preoperative screening criteria.²² This study also concluded rates of surgical complications, and 30-day readmission were lower than those reported for outpatient procedures performed in the hospital setting. Lowering costs through using ambulatory surgical centers for ACL reconstruction surgery may increase access to appropriate

surgical care, without increasing the inherent risks associated with surgery.

Future Research:

Despite the increasing incidence of pediatric ACL injuries and the increased costs associated with ACL reconstruction in this population, there are still significant gaps in the literature regarding the cost of pediatric ACL injuries. This may be overshadowed by ongoing debates on the appropriate timing of surgery, graft material, and rehabilitation protocols following surgery. Further research is needed to develop evidence-based guidelines for the management of pediatric ACL injuries.

CONCLUSION

Pediatric ACL reconstruction can be associated with substantial direct and indirect costs. However, the available literature on costs for pediatric sports medicine procedures is limited. With the rise in pediatric ACL injuries and reconstruction procedures, studies that evaluate the cost-effectiveness of different management strategies for pediatric ACL injuries are warranted to better inform clinical decision-making and optimize patient outcomes.

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