Reusable Sterile Medical Devices Reduce Cost Without Compromising Outcomes in Arthroscopic Rotator Cuff Repair: A Cost-Effectiveness Analysis

Victor J Cardona-Pérez[1], Elyette M Lugo, Alberto R Rivera, Amit Jain, Seyedeh Zahra Mousavi, Umasuthan Srikumaran
[1]Orthopaedic Surgery

INTRODUCTION:

Arthroscopic rotator cuff repair (ARCR) has become increasingly prevalent over the past decades. Like many arthroscopic procedures, this surgery employs disposable or reusable sterile medical devices (SMDs). Traditionally, it has relied heavily on one-time-use cannulas and suture anchor handles. Although these eliminate the need for complex reprocessing, they contribute substantially to operating room waste. As concerns over global warming, human health, and ecological sustainability have intensified, there has been a growing push towards waste-reduction strategies in the operating room. Reusable SMDs, despite being energy-intensive to sterilize, have the potential to compete with disposables in terms of cost when instrument trays are consistently used at high capacity. This not only reduces operating room waste but also provides a cost-effective alternative. In the current era of value-based healthcare, establishing cost-effectiveness is more pressing than ever. This study aims to assess the financial impact of reusable versus disposable equipment in arthroscopic rotator cuff repair, focusing on average cost comparisons in primary ARCR and revision ARCR due to rotator cuff retears.

METHODS:

A decision-analytic model was used to simulate a hypothetical adult undergoing primary arthroscopic rotator cuff repair performed with either single-use or reusable instruments. Probabilities of revision surgery for failed rotator cuff repair, 2025-adjusted costs, and health-utility weights were drawn from published literature and institutional procurement data from a single tertiary center. Base-case outputs were 2-year costs and quality-adjusted life years (QALY). Probabilistic sensitivity analysis was used to evaluate model uncertainty and calculate the mean incremental costs, effectiveness, and net monetary benefits. One-way sensitivity analysis identified variables with the most significant impact on the model.

RESULTS:

At a willingness to pay threshold of $50,000 per QALY, the reusable instrument strategy yielded an absolute net monetary benefit of $62,126, versus $56,950 for disposables, an incremental gain of $5,176 per patient. Sensitivity analysis favored reusables in 95.7% of iterations. One-way sensitivity analysis revealed that the QALY decrement associated with revision surgery and the purchase and sterilization costs of reusable instruments had a significant influence on the cost-utility results.

DISCUSSION AND CONCLUSION:

This study modeled the cost-utility of reusable versus disposable sterile medical devices in arthroscopic rotator cuff repair, assuming equivalent clinical outcomes between the two approaches. All differences in value were attributed to variations in cost and resource use. The results showed that reusable instruments were economically dominant, offering the same health benefits (1.67 QALYs) at a 20% lower cost compared to disposable sets, with a net monetary benefit of $5,176 per patient. Monte Carlo simulations confirmed cost-effectiveness in 95.7% of cases, and sensitivity analyses supported the robustness of the findings even under extreme assumptions. While reusable instruments are often seen as more sustainable, their environmental advantage depends on optimal sterilization practices, tray utilization, and end-of-life management. When implemented efficiently, they not only reduce procurement and disposal costs but also minimize resource use and waste, enhancing both economic and ecological value. In conclusion, reusable SMDs represent a cost-effective and environmentally favorable alternative to disposable devices in ARCR without compromising patient outcomes, provided they are used at high utilization rates. To improve generalizability, future studies should include cost data from diverse healthcare systems and settings.