
COMMENTARY & PERSPECTIVE

Repair of Symptomatic Rotator Cuff Tears After Failed Nonoperative Treatment Is Cost-Effective

Commentary on an article by Richard C. Mather III, MD, et al.: "The Societal and Economic Value of Rotator Cuff Repair"

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Analysis of the value that we provide to our patients and society through surgical procedures is becoming increasingly important as health-care costs rise and our population ages. Current rates of utilization of costly surgical procedures may not be sustainable in the face of limited financial resources, so it is imperative that we conduct high-quality studies to determine which interventions are cost-effective. Rotator cuff tears are among the most common musculoskeletal injuries, affecting both young adults and elderly patients, making rotator cuff repair an excellent subject for a cost-effectiveness analysis.

In this edition of *The Journal of Bone and Joint Surgery*, Mather et al. calculated the value to society of operative treatment of rotator cuff tears compared with nonoperative treatment. Their base case was a symptomatic tear that was unresponsive to six weeks of nonoperative treatment. A Markov decision model was constructed, which is a well-established methodology in cost-effectiveness research that allows hypothetical patients to cycle between health states, in this case on the basis of probabilities derived from the literature and from expert opinion. The authors found that rotator cuff repair is a cost-effective intervention for all patients in all age ranges. In fact, when indirect costs, such as probability of employment, household income, missed work days, and disability payments, are included in the calculation, there is a net savings to society as a result of rotator cuff repair in patients under the age of sixty-one years. In the youngest age group (thirty to thirty-nine years old), this savings was substantial at \$77,662 per patient; however, in the oldest age group (seventy to seventy-nine years old), there was a net loss of \$11,997 per repair. In this Markov model, the cycle length was one year and the model cycled until patient death, so it is not surprising that surgical treatment is most cost-effective and has the greatest savings to society in the youngest patient group because younger patients have a longer life expectancy, allowing the benefit of surgery to persist for a greater total number of years and for more productive, working years. The literature lacks information on how long the benefit of surgical repair of rotator cuff repairs lasts in young patients, so the authors built their model on the assumption that the generally favorable outcome of surgery is indefinite as long as a symptomatic retear does not occur. They estimated the rate of retear at 2% annually, which was based on expert opinion that this rate would be the same as the rate of rotator cuff tears in the general population.

As is the case with all cost-effectiveness studies, the strength of the conclusions is dependent on the quality of the existing literature because the probabilities that are used to construct the Markov model are taken from previously published studies and/or expert opinion. This type of research highlights the deficiencies in the literature on rotator cuff injuries. For example, the authors were forced to use expert opinion to estimate the rate of return rotator cuff repairs becoming symptomatic and the long-term retear rates of healed rotator cuff repairs, because the existing literature is insufficient in these areas to use actual data. For some variables, small alterations in the values chosen for the model can have substantial effects on the conclusions of the study; however, for others, a large change may have no effect at all on the outcome. The authors performed extensive one, two, and three-way sensitivity analyses for all variables, which allowed them to see which variables were most influential on the conclusions. In these analyses, the authors found that the variables that were most influential on total societal cost were success rates, initial cost of operative and nonoperative treatment, and the durability of the repair. Interestingly, threshold analysis showed that the overall most influential variable on cost-effectiveness was the response to nonoperative treatment. If nonoperative treatment is effective >88% of the time, then rotator cuff repair would no longer be cost-effective according to this model.

One limitation of this study, which was appropriately recognized by the authors, is that patients in the nonoperative treatment arm of the Markov model were not allowed to cross over to the rotator cuff repair arm even if nonoperative treatment was unsuccessful, which would be an unusual scenario in clinical practice. Because those who fail nonoperative treatment are assumed to remain persistently symptomatic until death, which is a health state with a lower utility, this could potentially adversely affect the effectiveness of the nonoperative arm.

It is important to realize that, although rotator cuff repair was shown to be cost-effective for all age groups, not all patients with rotator cuff tears should be treated with surgery. This investigation looks only at symptomatic tears, so no conclusions can be

drawn from this study on whether repair of asymptomatic tears is cost-effective. Recent literature offers some support for non-surgical treatment of symptomatic rotator cuff tears in the short term, and there is also literature documenting the rate of tear progression and symptom development in the longer term for nonoperatively treated tears¹⁻³. The patients who improve with nonoperative treatment or those who experience symptomatic retears after surgery would ideally be initially treated nonoperatively, since there is not a net benefit from surgery. The trick is identifying these patients early in the disease process, which should be a focus of future research efforts.

This study is important because it shows that rotator cuff repair is a cost-effective intervention in all age groups for patients with symptomatic rotator cuff tears that are not responsive to initial nonoperative treatment. Not only is rotator cuff repair cost-effective for all age groups, but when indirect costs such as probability of employment, household income, missed work days, and disability payments are factored into the calculation, it actually produces cost savings to society for patients under sixty-one years old. This means that, although surgery has its own inherent costs to government and private payers, patients, and employers, these are actually less than the net monetary benefit to society for these patients. As an increasing focus on cost-containment penetrates medical decision making, research such as this study, showing the true value of surgical procedures to society, becomes even more important to our field.

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