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Review

Economic Considerations in Rotator Cuff Disease: A Narrative Overview of Global Literature

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Abstract: Arthroscopic shoulder surgery has become a gold standard for treating various shoulder pathologies including rotator cuff tears with major benefits including its minimally invasive nature, reduced postoperative pain and enhanced recovery. The cost of these procedures can however be a significant burden on patients especially in developing countries like Pakistan. This article aims to provide a comprehensive cost analysis of arthroscopic shoulder surgery examining direct and indirect costs associated with these procedures and comparing it with alternative treatment options.

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Introduction:

Shoulder pathologies of the rotator cuff are commonly presented in the orthopaedic departments of health facilities in Pakistan and its burden is significant encompassing its high prevalence rates. Several meta-analysis and systematic reviews show the high incidence of rotator cuff disorders with a reported incidence of approximately 20.7% in a population based study showing the common nature of these injuries particularly in those over 60 years of age [1]. Patients with rotator cuff tears may also have various co morbidities such as diabetes and hypertension which emphasises the need to factor in the cost of treatment and management of these conditions when considering surgical treatment of shoulder disease [2]. Smoking is another factor being linked to an increased prevalence of rotator cuff pathology complicating overall treatment outcomes and cost management strategies [2,3].

An additional layer of complexity is introduced when evaluating shoulder injuries on work productivity. Mishra et al showed that shoulder pain led to significant absenteeism and therefore loss of productivity and income[4].

Economic implications of rotator cuff related healthcare costs.

The economic implications of healthcare costs can be substantial involving both direct and indirect costs. Shoulder arthroscopic procedures impose a significant burden on the healthcare system with early surgical interventions demonstrating cost effectiveness compared to delayed treatment. Increasing awareness of socioeconomic disparities impacting healthcare costs is imperative for optimising management strategies.

The economic burden associated with rotator cuff injuries is multifaceted comprising of both direct healthcare cost and costs related to productivity losses. Parikh et al conducted a retrospective review from a large database that identified 102,448 patients with rotator cuff tears revealing average total costs of $32,110 post diagnosis for full thickness rotator cuff tears and $27,017 for partial thickness for every patient. It was noted that 40% of the annual healthcare usage stemmed from rotator cuff tear related issues, with productivity losses averaging $5,843 for partial-thickness and $5,770 for full thickness tears following surgical intervention [2].

There was comprehensive evaluation done by Bolam et al. in New Zealand and they concluded that traumatic rotator cuff injuries resulted in over NZ $ 960 million in claims driven by vocational

support (49.8%) and surgery (26.3%). This study highlighted significant disparities in costs and treatment approaches across different socioeconomic and demographic groups, suggesting potential inequality in access to healthcare [3]. This may help to highlight similar disparities in developing countries like Pakistan.
There are several advantages in surgical management of rotator cuff tears including cost savings. Mather et al. conducted a Markov analysis that estimated a lifetime societal savings of approximately $3.44 billion from the 250,000 annual rotator cuff repairs undertaken in the US primarily benefitting patients under the age of 61 years[5].

The significance of social determinants of health disparities (SDHDs) in influencing rotator cuff repair outcomes was elucidated by Patel and Mannava. They documented that patients facing socioeconomic hardships had increased complications and healthcare costs , indicating that SDHDs must be methodologically addressed to enhance treatment efficacy and outcome [6]. This theme was further emphasized by Raso et al. who investigated the role of SDHDs in surgical repair for rotator cuff tears. Their finding indicated that disadvantaged groups were subject to elevated risks of post-operative complications, leading to higher surgical costs stemming from additional medical interventions and follow up procedures[7].
Comparing surgical options, Makhni et al. scrutinised the cost-effectiveness of reverse total shoulder arthroplasty against arthroscopic rotator cuff repair and concluded that the latter was associated with lower costs while providing superior clinical outcomes for patients with large and massive tears. The analysis advocates for initial management through arthroscopy that may lead to less financial strain on healthcare systems[8].

What is the disease burden associated with shoulder pathology in Pakistan?

Rotator cuff tears impose a significant disease burden in Pakistan particularly among diabetic patients who are predisposed to adhesive capsulitis, highlighting the necessity for comprehensive management strategies to address shoulder pathologies within this population The evidence surrounding the disease burden of rotator cuff tears in Pakistan particularly in relation to conditions such as adhesive capsulitis is linked to documented findings in the literature. This singular study reviewed, was conducted by Butt et al. provided some insight into the prevalence of adhesive capsulitis among a cohort of type 2 diabetes mellitus patients [9]. In this cross-sectional study, 430 patients were assessed revealing 61 having adhesive capsulitis (14.2%) which is a prevalent complication in this demographic cohort, which may arise following rotator cuff injuries. Although the study primarily focused on adhesive capsulitis, the findings imply a broader implication of evaluating the spectrum of shoulder disorders including rotator cuff tears given the overlapping pathophysiology and demographic factors involved. The high incidence of adhesive capsulitis within this population necessitates the need to look for a link between chronic diabetes and shoulder disorders. This study highlighted a predominance of patients with poor diabetic control in up to 74.9% which as a factor may exacerbate the musculoskeletal complications including rotator cuff tears. The lack of statistically significant associations across gender, age, occupation and diabetes duration in this study indicates that adhesive capsulitis can manifest independently of these variables.
While the evidence presented is useful, it reflects a relatively narrow scope emphasizing the need for a multifaceted research approach to work out precisely how rotator cuff tears contribute to the overall disease burden in Pakistan.

Economic implications of non-operative treatment for shoulder injuries.

The economic implications of non-operative treatment for shoulder injuries are significant, particularly when comparing the costs of surgical interventions against conservative management options, primarily physiotherapy. A systematic review by Edwards et al emphasized increasing incidence and detection of rotator cuff tears, particularly in the aging population and the consequential economic burden that surgical treatment entails[10]
A recent study highlighted the varied success rates of exercise therapy in managing rotator cuff related conditions. The review indicates that patients who engage in exercise-based rehabilitation exhibit substantial improvements in pain and function with greater overall satisfaction and reducing the need for surgical options[11].
Angileri et al. conducted a meta-analysis comparing non-operative and operative

interventions for chronic calcific tendonitis and concluded that although both treatments yield clinically significant outcomes, non-operative treatments such as extracorporeal shockwave lithotripsy were useful in many patients emphasizing the cost effectiveness of nonoperative strategies. The non-operative interventions exhibited a positive mean difference in visual analog scale scored for pain, indicating a clinically meaningful reduction[12].

Holmgren et al emphasized that a specific exercise strategy significantly reduced the need for surgery with only 20% opting for surgery in the intervention group compared to 63% in the control group [13]. This highlights the cost-effectiveness of a targeted exercise regimen, promoting better patient outcomes and reducing healthcare costs associated with surgical interventions.

Long term effectiveness and sustainability of outcomes linked with exercises have been economically evaluated. Riera et al. did a literature review showing that physiotherapy has a broad acceptance and implementation rates among practitioners, enhancing its economic feasibility as a frontline treatment[14].

Despite these promising results, definitive conclusions cannot be drawn due to the paucity of high quality of scientific evidence, emphasizing the need for further research to definitively establish the effectiveness and thus the cost-effectiveness of various non-operative strategies in the management of rotator cuff injuries.

Comparison of non-operative management of rotator cuff tears compared to surgical intervention.

The cost effectiveness of nonoperative management of rotator cuff tears generally aligns favourably against surgical intervention, with current evidence suggesting minimal differences in pain and functional outcomes between the methods over a yearlong follow up.

A Cochrane review by Karjalainen et al analysed nine randomised control trials with a combined cohort of 1,007 participants and the findings showed no substantial improvement in post-operative pain (mean score of 1.6 with non-operative versus 0.87 with surgery) or functional outcomes at the 12 month mark, with low certainty evidence suggesting surgery may not yield clinically meaningful benefits concerning pain and shoulder function when compared with non-operative treatment[15].

In a comparative meta-analysis investigating chronic calcific tendonitis Angileri et al. found both nonoperative (ultrasound guided needling) and operative treatments yield effective results, further complicating the narrative of direct surgical intervention necessity. The study showed a marked improvement in pain scores: -4.83 for ultrasound guided needling compared to -4.65 for surgical interventions [12]. This indicates that a strategic focus on evolving nonoperative techniques could match or exceed traditional surgical outcomes at considerably lower costs, thus shifting the treatment paradigm.

Notably, studies indicate that the financial burden associated with surgical interventions (e.g. arthroscopic procedures) is escalating. The research by Thorpe et al. highlighting trends in healthcare expenses associated with rotator cuff surgery in Western Australia, which exhibited 273.7% price increase for arthroscopic subacromial decompression from 2001 to 2013 [16]. This data consolidates the argument for prioritising nonoperative measures as initial treatment avenues to mitigate rising healthcare costs without compromising patient outcomes.

It is however, essential to emphasize the limitations in the current scientific literature. Many of the trials assessed demonstrated biased risks due to methodological concerns, such as unclear randomisation processes and lack of blinding. Furthermore, the demographics primarily represent ageing populations with specific types of tears, limiting generalizability to younger patients of those with traumatic tears.

How does the cost of single-row rotator cuff repair compare to double-row techniques?

The cost effectiveness of single-row versus double-row rotator cuff repair techniques shows biomechanical advantages, however, their higher costs do not translate into significantly better clinical outcomes, particularly in small to medium sized teras. In contrast, single-row repairs may represent a more economically viable option without a marked loss in functional recovery.

The comparative analysis of costs between single-row and double-row rotator cuff repairs is robustly explored in the literature. Notably, a systematic review by Ponugoti et al emphasises that while biomechanical superiority is often cited for double-row repair methods, studies fail to consistently demonstrate that these advantages lead to significantly improved functional

outcomes or lower re tear rates when compared to single-row techniques, particularly for smaller tears [17].

Analysis of clinical outcomes reported by Papalia et al. indicates that double-row repairs exhibit higher biomechanical properties, which is increasingly relevant for larger tears (over 3 cm) but offer no statistically significant advantage in clinical outcomes across all tear sizes. The occasional improvement in healing rates with double row techniques is counterbalanced with higher costs and the complexity of the procedure, leading to challenges in universal application [18].

Furthermore, Chalmers et al. conducted a study examining cost factors and outcomes across various surgical techniques, concluding that single row repairs are associated with increased direct costs but essentially neutral outcomes in terms of recovery metrics like the Simple Shoulder Test and American Shoulder and Elbow (ASES) scores compared to double row repairs [19].

A metanalysis done by Rossi et al. has sown that while doble row repairs demonstrated lower rates of failure in the short term, most studies were limited to relatively short follow ups, complicating long term outcome interpretations [20]. This disjoint between initial success and long term efficacy is further elucidated by Papalia et al. who suggest that higher initial stability often seen in double row repairs does not guarantee sustained functional successes or lower retear rates over time [18].

Rajagopalan et al. proposed an innovative cost-effective model, the ArthroCuff system, which presents an alternative to anchor-based double row repair, suggesting that simpler techniques can effectively reduce costs without compromising surgical outcomes [21]. This aligns with studies indicating that single row repair techniques can be easier and less costly, potentially maintaining adequate functional recovery, especially in the context of more economically constrained healthcare environments.

Baums et al. reinforced this argument by stating that the decision to utilize double row repairs shoulder be strictly based on tear size and patient-specific factors, emphasizing the need for targeted surgical planning based on the individuals' anatomical and functional needs rather than a default preference for double row repair technique due to perceived advantages [22].

Although the consensus within the literature suggests that while biomechanical metrics may favour double row repair, the cumulative evidence does not definitely recommend one technique over the other in practical and critical scenarios.

How does the progression of rotator cuff injuries impact long term economic outcomes?

The progression of rotator cuff injuries significantly affect the long-term economic outcomes, increased need of surgical interventions and the economic viability of advanced treatment options as well as rehabilitation strategies.

The economic burden associated with rotator cuff injuries is substantial, not just in direct medical costs but also in patient quality and life as well as productivity losses and demonstrates an increased rate of approximately 5 to 10% in the general population with older adults being particularly affected [24]. There was a systematic review evaluating the cost effectiveness of supervised versus unsupervised rehab limitation for rotator cuff repair. Their analysis of four randomized controlled trials involving 132 patients showed that there was no significant difference in visual analog score or retail rates between the two rehab protocols however supervised rehab was associated with higher costs emphasizing an economic dilemma in optimizing post operative care [25].

There are financial implications when rotator cuff injuries are associated with comorbid conditions including osteoporosis. Patients with osteoporosis and rotator cuff tears exhibited distinct clinical characteristics and metabolic imbalances suggesting a need for tailored treatment approach that accounts for underlying physiological deficiencies [26].

Discussion:

Shoulder conditions, including rotator cuff tears, shoulder impingement and adhesive capsulitis represent a significant economic burden worldwide. The incidence of these conditions is rising, leading to increased healthcare costs, lost productivity and reduced quality of life for affected individuals. The total economic burden associated with shoulder disorders include direct (medical treatments, surgical interventions) and indirect costs (lost wages, decreased productivity).

In the United States, for example, the annual costs

associated with shoulder conditions are estimated to reach billions of dollars, accounting for both direct and indirect economic impacts. Similarly, countries in Europe report high healthcare expenditures related to shoulder surgeries and rehabilitation. The burden is not limited to developed nations; low- and middle-income countries, including Pakistan, are also facing rising incidences of shoulder conditions due to factors such as aging populations, increased participation in sports and lifestyle changes.

Pakistan, like many countries, is grappling with the economic implications of shoulder conditions in an already financially compromised healthcare system which necessitates a need for effective management strategies to alleviate this burden. Research conducted in other parts of the world provides valuable insights that can be leveraged to improve healthcare policies and practices in Pakistan.

Studies from countries with advanced healthcare systems have identified effective interventions, such as physical therapy protocols and minimally invasive surgical techniques, that significantly reduce recovery times and overall costs. By adopting these evidence-based practices, musculoskeletal practitioners in Pakistan can enhance patient outcomes while minimizing expenditures.

Establishing collaborations with international research institutions can facilitate knowledge transfer and innovation in shoulder care. By participating in global studies, Pakistani researchers can contribute to and benefit from findings that may help tailor solutions specific to local needs particularly in lower middle-income countries. Learning from the healthcare models of other countries can guide policy reforms in Pakistan improving whilst maintaining the high standards of clinical care.

Conclusion:

The economic burden of shoulder conditions is a pressing issue that requires a multifaceted approach. By leveraging research and best practices from around the world, healthcare system and policy makers in Pakistan can develop effective management strategies that not only reduce the economic impact of these conditions but also improve the quality of care for its citizens.

References:

1. Yamamoto A, Takagishi K, Osawa T, Yanagawa T, Nakajima D, Shitara H, et al. Prevalence and risk factors of a rotator cuff tear in the general population. J Shoulder Elbow Surg. 2010 Jan;19(1):116–20.
2. Parikh N, Martinez DJ, Winer I, Costa L, Dua D, Trueman P. Direct and indirect economic burden associated with rotator cuff tears and repairs in the US. Curr Med Res Opin. 2021;37(7):1199–211.
3. Bolam SM, Konar S, Gamble G, Paine SJ, Dalbeth N, Monk AP. Ethnicity, sex, and socioeconomic disparities in the treatment of traumatic rotator cuff injuries in Aotearoa/New Zealand. J Shoulder Elbow Surg. 2023;32(1):121–32.
4. Mishra S, Avinash G, Kundu MG, Verma J, Sheth A, Dutta A. Work-related musculoskeletal disorders among various occupational workers in India: a systematic review and meta-analysis. J Occup Health. 2024 Jan 4;67(1):uiae077.
5. Mather RC, Koenig L, Acevedo D, Dall TM, Gallo P, Romeo A. The societal and economic value of rotator cuff repair. J Bone Jt Surg Am. 2013;95(22):1993–2000.
6. Patel UJ, Mannava S. Social Determinants of Health Influence the Success of Shoulder Rotator Cuff Repair Outcomes. Arthroscopy. 2023;39(3):680–1.
7. Raso J, Kamalapathy P, Cuthbert AS, Althoff A, Ramamurti P, Werner BC. Social Determinants of Health Disparities Are Associated With Increased Costs, Revisions, and Infection in Patients Undergoing Arthroscopic Rotator Cuff Repair. Arthroscopy. 2023;39(3):673–9.
8. Makhni EC, Swart E, Steinhaus ME, Mather RC, Levine WN, Bach BR. Cost-Effectiveness of Reverse Total Shoulder Arthroplasty Versus Arthroscopic Rotator Cuff Repair. Arthroscopy. 2016;32(9):1771–80.
9. Butt NI, Ghoauri MSA, Waris U, Sabeh D, Qaisar F, Imran A. Prevalence of Adhesive Capsulitis in Patients With Type 2 Diabetes Mellitus. Cureus. 2024;16(10):e70675.
10. Edwards P, Ebert J, Joss B, Bhabra G, Ackland T, Wang A. Exercise Rehabilitation in the Non-Operative Management of Rotator Cuff Tears. Int J Sports Phys Ther. 2016;11(2):279–301.
11. Cooper K, Alexander L, Brandie D,

Brown VT, Greig L, Harrison I. Exercise therapy for tendinopathy. Health Technol Assess. 2023;27(24):1–389.

12. Angileri HS, Gohal C, Comeau-Gauthier M, Owen MM, Shanmugaraj A, Terry MA, et al. Chronic calcific tendonitis of the rotator cuff: a systematic review and meta-analysis of randomized controlled trials comparing operative and nonoperative interventions. J Shoulder Elbow Surg. 2023 Aug;32(8):1746–60.

13. Holmgren T, Björnsson Hallgren H, Öberg B, Adolfsson L, Johansson K. Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study. BMJ. 2012 Feb 20;344:e787.

14. Riera J, Smythe A, Malliaras P. French physiotherapy management of rotator cuff related shoulder pain: An observational study. Musculoskeletal Care. 2021 Dec;19(4):484–94.

15. Karjalainen TV, Jain NB, Heikkinen J, Johnston RV, Page CM, Buchbinder R. Surgery for rotator cuff tears. Cochrane Musculoskeletal Group, editor. Cochrane Database Syst Rev [Internet]. 2019 Dec 9 [cited 2026 Feb 7]; Available from: https://doi.wiley.com/10.1002/14651858.CD013502

16. Thorpe A, Hurworth M, O'Sullivan P, Mitchell T, Smith A. Rising trends in surgery for rotator cuff disease in Western Australia. ANZ J Surg. 2016 Oct;86(10):801–4.

17. Ponugoti N, Raghu A, Colaco HB, Magill H. Single-row versus double-row repair techniques for rotator cuff tears. JSES Int. 2022;6(1):70–8.

18. Papalia R, Franceschi F, Vasta S, Zampogna B, Maffulli N, Denaro V. Single- and double-row repair for rotator cuff tears. Med Sport Sci. 2012;57:122–41.

19. Chalmers PN, Granger E, Nelson R, Yoo M, Tashjian RZ. Factors Affecting Cost, Outcomes, and Tendon Healing After Arthroscopic Rotator Cuff Repair. Arthroscopy. 2018;34(5):1393–400.

20. Rossi LA, Rodeo SA, Chahla J, Ranalletta M. Current Concepts in Rotator Cuff Repair Techniques. Orthop J Sports Med. 2019;7(9):2325967119868674.

21. Rajagopalan S, Bellal Sridharan R, Ravi N. Arthroscopic Transosseous Implant-Less Rotator Cuff Repair. Arthrosc Tech. 2022;11(5):e833–9.

22. Baums MH, Kostuj T, Klinger HM, Papalia R. Rotator cuff repair: single- vs double-row. Orthopade. 2016;45(2):118–24.

23. Sambandam SN, Khanna V, Gul A, Mounasamy V. Rotator cuff tears: An evidence based approach. World J Orthop. 2015;6(11):902–18.

24. Zaid MB, Young NM, Pedoia V, Feeley BT, Ma CB, Lansdown DA. Radiographic shoulder parameters and outcomes following rotator cuff repair. Shoulder Elb. 2021;13(4):371–9.

25. Longo UG, Berton A, Risi Ambrogioni L, Lo Presti D, Carnevale A, Candela V. Cost-Effectiveness of Supervised versus Unsupervised Rehabilitation for Rotator-Cuff Repair. Int J Environ Res Public Health. 2020;17(8):2852.

26. Liu G, Li W, Zhang L, Zhou C, Cong R. The role of vitamin D on rotator cuff tear with osteoporosis. Front Endocrinol. 2022;13:1017835.