Management of Rotator Cuff Injuries: Evidence-Based Clinical Practice Guideline

Adopted by the American Academy of Orthopaedic Surgeons (AAOS) Board of Directors
March 11, 2019
MANAGEMENT OF ROTATOR CUFF INJURIES
CLINICAL PRACTICE GUIDELINE

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Endorsed by:

Please cite this guideline as:

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WHAT IS A CLINICAL PRACTICE GUIDELINE?

Clinical Practice Guideline

A clinical practice guideline is a series of recommendations created to inform clinicians of best practices, based on best available evidence.
GOALS AND RATIONALE OF A CLINICAL PRACTICE GUIDELINE

- Improve treatment based on current best evidence
- Guides qualified physicians through treatment decisions to improve quality and efficiency of care
- Identify areas for future research

CPG recommendations are not meant to be fixed protocols; patients’ needs, local resources, and clinician independent medical judgement must be considered for any specific procedure or treatment.
Evidence-Based Medicine is a combination of:

- Individual Clinical Experience
- Best External Evidence
- Patient Values and Expectations
Evidence-Based Medicine

Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence from clinical care research in the management of individual patients.

Haynes, Sackett et al, 1996 Transferring evidence from research into practice Sacket et al, 1996, BMJ EBM: what it is and isn’t
IOM STANDARDS FOR DEVELOPING TRUSTWORTHY GUIDELINES

- Establish Transparency
- Management of Conflict of Interest
- Guideline Development Group Composition
- Clinical Practice Guideline-Systematic Review Intersection
- Establish Evidence of Foundations for and Rating Strength of Recommendations
- Articulation of Recommendations
- External Review
- Updating
1. Select CPG Topic

2. Assemble Work Group Members (WG)

3. WG formulates PICO questions, set inclusion criteria at Introductory Meeting

4. Literature Review and Appraisal
   AAOS staff methodologists, in conjunction with work group (WG) members, review and appraise literature

5. Final Meeting
   WG meets in-person to:
   - Review quality appraisals and evidence tables
   - Assign grade/rating for each recommendation based on evidence
   - Develop final recommendations
   - Construct risk/harms statements
   - Define future research needs

6. Review Periods
   Peer Review and Public Comment review periods

7. Approval Process

8. Communication, Dissemination, and Implementation
FORMULATING PICOs

“P” = Patient Population

“I” = Intervention or variable of Interest

“C” = Comparison

“O” = Outcome
Work group members define additional exclusion criteria based on PICO question

Standard inclusion criteria include:

- Must study humans
- Must be published in English
- Must be published in or after 1966
- Can not be performed on cadavers
LITERATURE SEARCHES

- Databases used:
  - PubMed
  - EMBASE (Excerpta Medica dataBASE)
  - CINAHL (Cumulative Index of Nursing and Allies Health Literature)
  - Cochrane Central Register of Controlled Trials

- Search using key terms from work group’s PICO questions and inclusion criteria

- Secondary manual search of the bibliographies of all retrieved publications for relevant citations

- Recalled articles evaluated for inclusion based on the study selection criteria
BEST EVIDENCE SYNTHESIS

- Include only highest quality evidence for any given outcome if available.
- If there are fewer than two occurrences of an outcome of this quality, the next lowest quality is considered until at least two occurrences have been acquired.
## STRENGTH OF RECOMMENDATIONS

<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>OVERALL STRENGTH OF EVIDENCE</th>
<th>STRENGTH VISUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRONG</td>
<td>Two or more HIGH Strength Studies with consistent findings</td>
<td>★★★★★</td>
</tr>
<tr>
<td>MODERATE</td>
<td>1 HIGH OR 2 MODERATE strength studies with consistent findings</td>
<td>★★★★☆</td>
</tr>
<tr>
<td>LIMITED</td>
<td>One or more LOW strength studies and/or only 1 MODERATE strength study with consistent findings or evidence from a single, or the evidence is insufficient, or conflicting</td>
<td>★★★☆☆</td>
</tr>
<tr>
<td>CONSENSUS</td>
<td>Expert opinion (no studies) No supporting evidence in the absence of reliable evidence. Work group is making a recommendation based on their clinical opinion</td>
<td>★★☆☆☆</td>
</tr>
</tbody>
</table>
## TRANSLATING RECOMMENDATIONS IN A CPG

<table>
<thead>
<tr>
<th>STRENGTH OF RECOMMENDATION</th>
<th>PATIENT COUNSELING TIME</th>
<th>DECISION AIDS</th>
<th>IMPACT OF FUTURE RESEARCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Least</td>
<td>Least important, unless the evidence supports no difference between two alternative interventions</td>
<td>Not likely to change</td>
</tr>
<tr>
<td>Moderate</td>
<td>Less</td>
<td>Less important</td>
<td>Less likely to change</td>
</tr>
<tr>
<td>Limited</td>
<td>More</td>
<td>More</td>
<td>Possible / Anticipates</td>
</tr>
<tr>
<td>Consensus</td>
<td>Most</td>
<td>Most Important</td>
<td>Impact unknown</td>
</tr>
</tbody>
</table>
ASSESSING QUALITY OF EVIDENCE

• All included studies undergo a quality assessment.

• Each study’s design is evaluated for risk of bias and receives a final quality grade, depending on the number of study design flaws.

• Study quality tables are made available to the work group in the final data report and the final publication of the guideline/SR
RESULTS OF QUALITY ASSESSMENT: STUDY ATTRITION FLOWCHART

9496 abstracts reviewed. Primary search performed on June 26th 2017

8904 articles excluded from title and abstract review

1555 abstracts reviewed. Secondary search performed on June 6th 2018

2115 articles recalled for full text review

1902 articles excluded after full text review for not meeting the a priori inclusion criteria or not best evidence available

213 articles included after full text review and quality analysis
VOTING ON THE RECOMMENDATIONS

• Recommendations and recommendation strengths voted on by work group during final meeting

• Approved and adopted by simple majority (60%) when voting on every recommendation

• If disagreement, further discussion to whether the disagreement could be resolved
# GUIDELINE LANGUAGE STEMS

<table>
<thead>
<tr>
<th>GUIDELINE LANGUAGE STEMS</th>
<th>STRENGTH OF RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong evidence supports that the practitioner should/should not do X, because...</td>
<td>STRONG</td>
</tr>
<tr>
<td>Moderate evidence supports that the practitioner could/could not do X, because...</td>
<td>MODERATE</td>
</tr>
<tr>
<td>Limited evidence supports that the practitioner might/might not do X, because...</td>
<td>LIMITED</td>
</tr>
<tr>
<td>In the absence of reliable evidence, it is in the opinion of this guideline work group that...</td>
<td>CONSENSUS</td>
</tr>
</tbody>
</table>
PEER REVIEW

• Guideline draft sent for peer review to external experts

• Comments and draft of responses reviewed by work group members

• Recommendation changes required a majority vote by work group

• A detailed report of all resulting revisions is published with the guideline document
PUBLIC COMMENT

- Following peer review modifications, CPG undergoes public commentary period

- Comments are solicited from:
  - AAOS Board of Directors
  - AAOS Council on Research and Quality
  - AAOS Committee on Evidence-Based Quality and Value
  - AAOS Board of Councilors
  - AAOS Board of Specialty Societies

- 200 commentators have the opportunity to provide input
The work group is charged with:

- Review of data summaries
- Final recommendation language
- Rationale and risk/harm construction
- Future research
Based on a systematic review of published studies

Addresses the management of rotator cuff tears in adults.

Highlights limitations in literature and areas requiring future research

Trained physicians and surgeons are intended users
MANAGEMENT OF SMALL TO MEDIUM TEARS

- Strong evidence supports that both physical therapy and operative treatment result in significant improvement in patient-reported outcomes for patients with symptomatic small to medium full-thickness rotator cuff tears.

Strength of Recommendation: Strong ⭐⭐⭐⭐
LONG TERM NON-OPERATIVE MANAGEMENT

- Strong evidence supports that patient reported outcomes (PRO) improve with physical therapy in symptomatic patients with full thickness rotator cuff tears. However, the rotator cuff tear size, muscle atrophy, and fatty infiltration may progress over 5 to 10 years with non operative management.

Strength of Recommendation: Strong ★★★★★
OPERATIVE MANAGEMENT

- Moderate evidence supports that healed rotator cuff repairs show improved patient-reported and functional outcomes compared to physical therapy and unhealed rotator cuff repairs.

Strength of Recommendation: Moderate
ACROMIOPLASTY & ROTATOR CUFF REPAIR

- Moderate strength evidence does not support the routine use of acromioplasty as a concomitant treatment as compared to arthroscopic repair alone for patients with small to medium sized full-thickness rotator cuff tears.

Strength of Recommendation: Moderate

★ ★ ★ ★ ★
DISTAL CLAVICLE RESECTION

- Moderate strength evidence supports the use of distal clavicle resection as a concomitant treatment to arthroscopic repair for patients with full-thickness rotator cuff tears and symptomatic acromioclavicular joints.

Strength of Recommendation: Moderate ★★★★☆
DIAGNOSIS (CLINICAL EXAMINATION)

- Strong evidence supports that clinical examination can be useful to diagnose or stratify patients with rotator cuff tears; however, combination of tests will increase diagnostic accuracy.

Strength of Recommendation: Strong ★★★★☆
DIAGNOSIS (IMAGING)

- Strong evidence supports that MRI, MRA, and ultrasound are useful adjuncts to a clinical exam for identifying rotator cuff tears.

Strength of Recommendation: Strong ★★★★★
POST-OP MOBILIZATION TIMING

- Strong evidence suggests similar postoperative clinical and patient-reported outcomes for small to medium sized full-thickness rotator cuff tears between early mobilization and delayed mobilization up to 8 weeks for patients who have undergone arthroscopic rotator cuff repair.

Strength of Recommendation: Strong ★★★★★
CORTICOSTEROID INJECTIONS FOR ROTATOR CUFF TEARS

- Moderate evidence supports the use of a single injection of corticosteroids with local anesthetic for short-term improvement in both pain and function for patients with shoulder pain.

Strength of Recommendation: Moderate 🌟🌟🌟🌟
HYALURONIC ACID INJECTIONS FOR ROTATOR CUFF TEARS

- Limited evidence supports for the possible use of hyaluronic acid injections in the non-operative management of rotator cuff pathology with no tears.

Strength of Recommendation: Limited ⭐⭐⭐⭐⭐
LIMITED evidence does not support the routine use of platelet rich plasma for the treatment of cuff tendonopathy or partial tears.

Strength of Recommendation: Limited ★★★★★
HIGH-GRAND PARTIAL THICKNESS ROTATOR CUFF TEARS

- Strong evidence supports the use of either conversion to full-thickness or transtendinous/in-situ repair in patients that failed conservative management with high-grade partial thickness rotator cuff tears.

Strength of Recommendation: Strong ★★★★★
PROGNOSTIC FACTORS (AGE)

- Strong evidence supports that older age is associated with higher failure rates and poorer patient reported outcomes after rotator cuff repair.

Strength of Recommendation: Strong ★★★★
FUTURE RESEARCH

• Consideration for future research is provided for each recommendation within this document. High quality studies comparing the outcomes of operative and non-treatment of rotator cuff pathology of all types remains a major gap in knowledge. These need to continue out to five years, to fully understand the efficacy of each treatment.

• Future studies should focus more on strengthening the literature for the association between RCTs and factors such as diabetes mellitus, hypertension, cholesterol, smoking and BMI.

• Questions persist regarding the timing of physical therapy after surgery, and the need for formal therapy versus a supervised home program.

• While widely employed in practice, the risks and benefits of corticosteroid injections in patients with rotator cuff tears remain unclear.

• The repair of high-grade partial rotator cuff tears has been widely adopted by the orthopedic community, but there exists minimal evidence to support this choice.
FUTURE RESEARCH

• The risk and expense of orthobiologics in rotator cuff surgery remains difficult to fully assess, even though multiple high quality studies are currently available.

• The use of either allograft or xenograft patches to either augment rotator cuff repair or as a superior capsular reconstruction requires additional high quality studies to prove efficacy.

• Finally, given the opioid epidemic, high-quality studies of multimodal analgesia for rotator cuff surgery would seem to be a matter of public policy.

• Consideration for future research is provided for each recommendation within this document. High-strength, level one studies comparing the outcomes of operative and non-treatment of rotator cuff pathology of all types remains a major gap in knowledge.

• Future studies should focus more on strengthening the literature for the association between RCTs and factors such as diabetes mellitus, hypertension, smoking and BMI.
FUTURE RESEARCH – LONG TERM NON-OPERATIVE MANAGEMENT

- Continued long term comparative studies between physical therapy and surgical repair investigating larger tear sizes with pre-and postoperative advanced imaging studies. It is still unclear what factors influence tear progression and if tear progression advances enough to preclude future repair and subsequent resolution of symptoms.
FUTURE RESEARCH – OPERATIVE MANAGEMENT

- Continued long term comparative studies between physical therapy and surgical repair investigating larger tear sizes with pre-and postoperative advanced imaging studies. The long-term consequences of a persistent rotator cuff tear or a re-tear is currently not known.
FUTURE RESEARCH – ACROMIOPLASTY& ROTATOR CUFF REPAIR

- Continued long term comparative studies between physical therapy and surgical repair investigating larger tear sizes with pre-and postoperative advanced imaging studies. The long-term consequences of a persistent rotator cuff tear or a re-tear is currently not known.
Future research could be performed to elucidate risk factors for reoperation rates in certain groups who did not undergo concomitant procedures.
FUTURE RESEARCH – POST-OP MOBILIZATION TIMING

- This question centers on the timing of post-operative mobilization exercises, defined in the 6 studies reviewed here, as the initiation of supervised physical therapy. Although easy to quantify, a physical therapy visit may not be the measure most indicative of stress on the healing repair. Absolute load and cyclic loading have been identified as factors affecting suture durability in biomechanical studies.
FUTURE RESEARCH – CORTICOSTEROID INJECTIONS

- Further research is recommended to determine the role of corticosteroid injections in the various settings of rotator cuff pathology. Currently there is no high quality studies specifically addressing the role of corticosteroid injections in partial and/or full thickness cuff tears.
FUTURE RESEARCH – HYALURONIC ACID INJECTIONS

- Further research may be conducted to further define the role of hyaluronic acid injections in rotator cuff pathology.
FUTURE RESEARCH – PLATELET RICH PLASMA INJECTION IN PARTIAL-THICKNESS TEARS

- Further research may be conducted to further define the role of PRP injections in rotator cuff pathology. Future studies should standardize the type of PRP formulation utilized or at the very least measure the concentrations of key constituents.
FUTURE RESEARCH – HIGH-GRADE PARTIAL THICKNESS ROTATOR CUFF TEARS

- Additional high quality level one studies with longer follow-up would be useful to establish if the results of these techniques hold up with time. Larger studies might also establish risk of retear with differing techniques.
FUTURE RESEARCH – PROGNOSTIC FACTORS

- **Age:** Degenerative rotator cuff disease is a phenomenon of aging, yet there is great variability in this phenomenon. Future research is needed to distinguish chronological age from physiologic age, and healing will likely improve when age related changes to the rotator cuff are better understood and manipulated.

- **BMI:** Patients with higher BMI generally start with lower scores on patient reported outcome measures. Future research should investigate if this starting point changes with weight loss, and how this affects the improvement in patient reported outcomes after surgery.

- **Patient Expectations:** There is currently very little research on optimal ways to evaluate and influence patient expectation.
FUTURE RESEARCH – PROGNOSTIC FACTORS

- **Comorbidities**: While the number of comorbidities does influence patient reported outcomes after rotator cuff repair surgery, it would be important to understand the risk stratification of specific comorbidities to accurately make recommendations about the expected outcomes.

- **Diabetes**: Future research should determine if adequate control of diabetes will improve patient reported outcomes and improve healing after rotator cuff repair.

- **Worker’s Compensation**: It would be important to know what features (job satisfaction, manual labor job, resiliency, etc.) might predict poorer patient reported outcomes after rotator cuff repair in the population of worker’s compensation patients.
FUTURE RESEARCH – BIOLOGICAL AUGMENTATION WITH PLATELET DERIVED PRODUCTS

- Future studies should standardize the type of PRP formulation utilized or at the very least measure the concentrations of key constituents. Furthermore, larger studies will allow for controlled statistical analyses that consider the effect of confounders such as fixation constructs, marrow venting, size of tears, etc. Consistency in the definition of rotator cuff re-tear is also encouraged.
Future research needs to be performed to evaluate for both PROs and failure rates on imaging and reoperation rates between single row compared to double row repair for larger full thickness rotator cuff tears >3cm in size.
FUTURE RESEARCH – SINGLE-ROW VS DOUBLE-ROW REPAIR RE-TEARS

- Future research should be performed to evaluate for failure rates on imaging and reoperation rates between single row compared to double row repair for full thickness rotator cuff tears. Research also needs to be done to better identify the clinical significance of a partial thickness re-tear after arthroscopic rotator cuff repair.
FUTURE RESEARCH – MARROW STIMULATION

- Future studies should be large enough such that the statistical analyses will allow for consideration of confounders such as fixation constructs, size of tears, etc. Consistency in the definition of a rotator cuff re-tear is also encouraged.
FUTURE RESEARCH – DERMAL ALLOGRAFTS

- Given the risks and costs involved with these devices, high quality studies would be useful to definitively establish the benefits of these device.
FUTURE RESEARCH – XENOGRAFTS

- While the evidence available to recommend for or against xenograft augmentation is mixed, the absence of clear benefit associated with these grafts, and the increased incidence of post-operative reaction coupled with the absence of reports of these reactions with allograft augment would seem to indicate that further research is not warranted at this time on xenografts in their current form.
FUTURE RESEARCH – OPEN VS ARTHROSCOPIC REPAIRS

- Given the conflicting information available regarding improvements in post-operative pain and early recovery with all-arthroscopic repair, further studies are needed in this area to establish benefits of this procedure.
The analysis of this question has exposed the need for future research particular into the pros and cons of each medication, modality, and multimodal program as they are compared to each other. The collective data and indirect comparisons from the high quality articles cited in this recommendation could be used to perform a network meta-analysis, providing valuable information to best guide future management.
FUTURE RESEARCH – PARTIAL ROTATOR CUFF TEAR

- High strength comparative studies between debridement and partial tear repair may further clarify the utility of these two techniques in managing partial rotator cuff tears.
THIS GUIDELINE HAS BEEN ENDORSED
BY THE FOLLOWING ORGANIZATIONS:

AANA | ARTHROSCOPY ASSOCIATION
OF NORTH AMERICA

American Orthopaedic Society
for Sports Medicine

American Society of
Shoulder and Elbow
Therapists
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- Anterior Cruciate Ligament Injuries
- Carpal Tunnel Syndrome
- Diagnosis and Prevention of Periprosthetic Joint Infections
- Distal Radius Fractures
- Glenohumeral Joint Osteoarthritis
- Hip Fractures in the Elderly
- Osteoarthritis of the Hip
- Osteoarthritis of the Knee (Arthroplasty)
- Osteoarthritis of the Knee (Non-Arthroplasty)
- Osteochondritis Dissecans
- Pediatric Developmental Dysplasia of the Hip in infants up to Six Months
- Pediatric Diaphyseal Femur Fractures
- Pediatric Supracondylar Humerus Fractures
- Prevention of Orthopaedic Implant Infections in Patients Undergoing Dental Procedures
- Rotator Cuff Injuries
- Surgical Site Infections
- VTE Disease in Patients Undergoing Elective Hip & Knee Arthroplasty
- Tranexamic Acid in Total Joint Arthroplasty (Endorsement)
- Use of Imaging Prior to Referral to a Musculoskeletal Oncologist (Endorsement)

Management of Surgical Site Infections

- Use of Imaging
  - **☆☆☆** LIMITED EVIDENCE
- Cultures
  - **☆☆☆☆** STRONG EVIDENCE
- C-Reactive Protein
  - **☆☆☆☆** STRONG EVIDENCE
- Erythrocyte Sedimentation Rate

For additional information, please visit http://www.orthoguidelines.org/