Management of Glenohumeral Joint Osteoarthritis
Evidence-Based Clinical Practice Guideline

Adopted by the American Academy of Orthopaedic Surgeons (AAOS) Board of Directors
March 23, 2020
The American Academy of Orthopaedic Surgeons
2020 Management of Glenohumeral Joint Osteoarthritis
Evidence-Based Clinical Practice Guideline

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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.

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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*
WHAT IS EVIDENCE-BASED MEDICINE?

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 GUIDELINE

- 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. Formulate Work Group (WG):
   Representatives from AAOS/BOS/BOC/Other Organizations as appropriate
   WG members may have no relevant FCOI

3. Seek Input on Question Topics:
   From patients, AAOS members, Key Informant Panel (a panel of content experts precluded from WG participation due to FCOI).

4. In-Person Intro Meeting:
   Formulate PICO Questions, Set Inclusion Criteria (Completed by WG)

5. Literature Search and Review:
   Conduct systematic literature search, appraise quality of studies (staff); WG members review included literature for their assigned recommendations

6. In-Person Final Meeting:
   Develop Final Recommendations; Review quality appraisals and evidence tables. Assign a grade/rating for each based on evidence (WG). Completed both prior to and during final in-person meeting.

7. Review Period:
   (3 weeks)
   Nominated Specialty Society Representatives, AAOS BOD, AAOS CORQ, AAOS EBQV, AAOS BOC and BOS, Key Informant Panel

8. Response to Review and Revisions:
   Chairs and AAOS Staff review and respond to review; revise the draft as needed; any revisions to recommendation language requires WG approval

9. Approval Process:
   The final CPG is reviewed and approved by the WG, EBQV, CORQ, and the AAOS Board of Directors

10. Communication, Dissemination, and Implementation
FORMULATING PICOs

“P” = Patient Population

“I” = Intervention or variable of Interest

“C” = Comparison

“O” = Outcome
INCLUSION/EXCLUSION CRITERIA

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

Work group members define additional exclusion criteria based on PICO question
LITERATURE SEARCHES

• Databases used:
  • MEDLINE
  • EMBASE (Excerpta Medica dataBASE)
  • 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
RESULTS OF QUALITY ASSESSMENT: STUDY ATTRITION FLOWCHART

3,315 abstracts reviewed. Final search performed on June 7, 2019

965 articles recalled for full text review

2,350 articles excluded from title and abstract review

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

69 articles included after full text review and quality analysis
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.
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.
<table>
<thead>
<tr>
<th>STRENGTH</th>
<th>OVERALL STRENGTH OF EVIDENCE</th>
<th>OVERALL STRENGTH OF EVIDENCE</th>
<th>STRENGTH VISUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRONG</td>
<td>STRONG</td>
<td>Two or more HIGH Strength Studies with consistent findings for recommending for or against the intervention*</td>
<td>🟢🌟🌟🌟🌟</td>
</tr>
<tr>
<td>MODERATE</td>
<td>MODERATE OR STRONG</td>
<td>Evidence from two or more MODERATE quality studies with consistent findings, or evidence from a single HIGH quality study for recommending for or against the intervention*</td>
<td>🟢🌟🌟🌟🌟</td>
</tr>
<tr>
<td>LIMITED</td>
<td>LIMITED, MODERATE OR STRONG</td>
<td>Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention*</td>
<td>🟢🌟🌟🌟🌟</td>
</tr>
<tr>
<td>CONSENSUS</td>
<td>NO RELIABLE EVIDENCE</td>
<td>In the absence of reliable evidence, the guideline work group is making a recommendation based on their clinical Opinion*</td>
<td>🟢🌟🌟🌟🌟</td>
</tr>
</tbody>
</table>

*Recommendation strength can be upgraded or downgraded based on the application of the EtD framework.
Incorporating the GRADE Evidence to Decision Framework into Recommendation Strengths

- Benefits and Harms
- Certainty of Evidence
- Outcome Importance
- Cost Effectiveness
- Acceptability and Feasibility
WORDING THE FINAL RECOMMENDATIONS

<table>
<thead>
<tr>
<th>GUIDELINE LANGUAGE</th>
<th>STRENGTH OF RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>In patients with [condition], X is recommended for...</td>
<td>STRONG</td>
</tr>
<tr>
<td>In patients with [condition], X is suggested for...</td>
<td>MODERATE</td>
</tr>
<tr>
<td>In patients with [condition], X is an option for...</td>
<td>LIMITED</td>
</tr>
<tr>
<td>In the absence of reliable evidence, it is the opinion of this guideline work group that...</td>
<td>CONSENSUS</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>
FINAL MEETING

The work group is charged with:

- Review of data summaries
- Final recommendation language
- Rationale and risk/harm construction
- Future research
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
REVIEW PERIOD

- Specialty societies are solicited for nominations of reviewers approximately six weeks prior to final meeting.
- CPG is also provided to:
  - 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 into each CPG.
- Recommendation changes required a majority vote by work group.
- A detailed report of all resulting revisions is published with the guideline document.
Clinical Practice Guideline for the Management of Glenohumeral Joint Osteoarthritis

- Based on a systematic review of published studies
- Addresses the management of patients with glenohumeral joint osteoarthritis
- Is not intended to address management of glenohumeral joint arthritis from etiologies other than osteoarthritis
- Highlights limitations in literature and areas requiring future research.
- Created as a tool for physicians, surgeons and other health care professionals that care for patients with glenohumeral joint osteoarthritis.

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HYALURONIC ACID

- Strong evidence supports that there is no benefit to the use of hyaluronic acid in the treatment of glenohumeral joint osteoarthritis

Strength of Recommendation: Strong ★★★★★
**PROGNOSTIC FACTORS (BMI)**

- Strong evidence suggests that obese patients with glenohumeral osteoarthritis do not experience an increase in the rate of early post-operative complications

**Strength of Recommendation: Strong**

⭐⭐⭐⭐⭐
PROGNOSTIC FACTORS (GENDER/SEX)

- Strong evidence suggests that gender/sex is not associated with better or worse post-operative outcomes

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

- Strong evidence suggests that patients with glenohumeral joint osteoarthritis who have more comorbidities experience higher rates of early post-arthroplasty complications

Strength of Recommendation: Strong ★★★★★
TOTAL SHOULDER ARTHROPLASTY

- Strong evidence suggests that anatomic total shoulder arthroplasty demonstrates more favorable function and pain relief in the short- to mid-term follow-up when compared to hemiarthroplasty for the treatment of glenohumeral osteoarthritis.

Strength of Recommendation: Strong ★★★★★
GLENOID COMPONENT – PEGGED OR KEELED

- Strong evidence supports that the clinician may utilize pegged or keeled glenoid components in patients with glenohumeral joint osteoarthritis and a well-functioning rotator cuff. Pegged components demonstrate less radiolucent lines, but the effect on clinical outcomes and survivorship are unclear.

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

- Moderate evidence supports that older age at the time of surgery is associated with lower revision rates

Strength of Recommendation: Moderate  ★★★★☆
PROGNOSTIC FACTORS (SMOKING)

- Moderate evidence suggests that smoking is associated with inferior post-operative outcomes

Strength of Recommendation: Moderate

★★★★★
PROGNOSTIC FACTORS (PRE-OPERATIVE FUNCTION)

- Moderate quality evidence suggests that, while both higher and lower pre-operative functioning patients with glenohumeral joint osteoarthritis will likely experience improvement following arthroplasty, patients with higher pre-operative function may experience less functional improvement

Strength of Recommendation: Moderate ★★★★☆
PROGNOSTIC FACTORS (DEPRESSION)

- Moderate evidence suggests that depression is associated with inferior post-operative outcomes in patients with glenohumeral joint osteoarthritis undergoing arthroplasty

Strength of Recommendation: Moderate ★★★★☆
GLENOID COMPONENT – METAL BACKED CEMENTLESS

- Moderate evidence supports that surgeons not use metal-backed glenoid components.

Strength of Recommendation: Moderate ★★★★☆
TOTAL SHOULDER ARTHROPLASTY – SUBSCAPULARIS PEEL, LESSER TUBEROSITY OSTEOTOMY, TENOTOMY

- Moderate quality evidence supports that surgeons can utilize subscapularis peel, lesser tuberosity osteotomy, or tenotomy when performing shoulder arthroplasty

Strength of Recommendation: Moderate ⭐⭐⭐⭐
HEMIARTHROPLASTY - STEMS

- Limited evidence supports that clinicians may utilize stemmed, stemless or resurfacing prosthesis for patients with glenohumeral joint osteoarthritis undergoing total or hemi-arthroplasty

Strength of Recommendation: Limited  ★★★☆☆
PRE-OPERATIVE PHYSICAL THERAPY

• In the absence of reliable evidence, it is the opinion of the work group that physical therapy may benefit select patients with glenohumeral joint osteoarthritis

Strength of Recommendation: Consensus
POST-OPERATIVE PHYSICAL THERAPY

• In the absence of reliable evidence, it is the opinion of the work group that clinicians may prescribe physical therapy in patients following shoulder arthroplasty.

Strength of Recommendation: Consensus
INJECTABLE BIOLOGICS

- In the absence of reliable evidence, it is the opinion of the work group that injectable biologics, such as stem cells or platelet rich plasma, cannot be recommended in the treatment of glenohumeral osteoarthritis

Strength of Recommendation: Consensus 🟢🟢🟢🟢
ALTERNATIVE NON-SURGICAL TREATMENTS

• In the absence of reliable evidence, the work group cannot recommend for or against the use of the following:
  
  • Acupuncture
  • Dry Needling
  • Cannabis
  • Cannabidiol (CBD) Oil
  • Capsaicin
  
  • Shark Cartilage
  • Glucosamine and Chondroitin
  • Cupping
  • Transcutaneous Electrical Nerve Stimulation (TENS)

Strength of Recommendation: Consensus
OPIOID PAIN MEDICATION

- In the absence of reliable evidence, it is the opinion of the work group that opioids not be prescribed as routine and long-term pain management of glenohumeral osteoarthritis

Strength of Recommendation: Consensus
NON-PROSTHETIC SURGICAL OPTIONS

• In the absence of reliable evidence, it is the opinion of the work that non-prosthetic surgical options may or may not provide short-term benefit for patients with glenohumeral joint osteoarthritis

Strength of Recommendation: Consensus 🌟 🌟 🌟 🌟
RADIOGRAPHS

• In the absence of reliable evidence, it is the opinion of the work that patients with glenohumeral osteoarthritis undergoing arthroplasty should be imaged with axillary and true AP (Grashev view) radiographs, with advanced imaging performed at the discretion of the clinician.

Strength of Recommendation: Consensus ★★★★★
ANATOMIC OR REVERSE TOTAL SHOULDER ARTHROPLASTY

• In the absence of reliable evidence, it is the opinion of the work group that clinicians may use either anatomic total shoulder arthroplasty (TSA) or reverse TSA for the treatment of glenohumeral joint osteoarthritis in select patients with excessive glenoid bone loss and/or rotator cuff dysfunction

Strength of Recommendation: Consensus ★★★★☆
GLENOID COMPONENTS – POLYETHYLENE-METAL OR ALL POLYETHYLENE

• In the absence of reliable evidence, it is the opinion of the work group that clinicians may use polyethylene-metal hybrid glenoid components or all polyethylene components during total shoulder arthroplasty for treatment of glenohumeral joint osteoarthritis

Strength of Recommendation: Consensus ⭐⭐⭐⭐
BICEP TENODESIS AND TENOTOMY

• In the absence of reliable evidence, it is the opinion of the work group that clinicians may consider concomitant bicep tenodesis or tenotomy during shoulder arthroplasty

Strength of Recommendation: Consensus
TRANEXAMIC ACID

- In the absence of reliable evidence, it is the opinion of the work group that utilization of tranexamic acid during shoulder arthroplasty may result in reduced blood loss and reduced risk of blood transfusion

Strength of Recommendation: Consensus ★★★★☆
SUPRASPINATUS TEARS

• In the absence of reliable evidence, it is the opinion of the work group that for patients with small isolated, repairable supraspinatus tears, clinicians can perform anatomic total shoulder arthroplasty (TSA)

Strength of Recommendation: Consensus ★★★★★
DISCHARGE

- In the absence of reliable evidence, it is the opinion of the work group that same day discharge is an option after shoulder arthroplasty in select patients

Strength of Recommendation: Consensus ★★★★★
CRYOTHERAPY

• In the absence of reliable evidence, it is the opinion of the work group that either continuous cryotherapy or cold packs can be used following shoulder arthroplasty

Strength of Recommendation: Consensus  ★★★★★
MULTIMODAL PAIN MANAGEMENT

• In the absence of reliable evidence, it is the opinion of the work group that multimodal pain management strategies or non-opioid individual modalities can provide added benefit for postoperative pain management following shoulder arthroplasty

Strength of Recommendation: Consensus 🌟🌟🌟🌟
FUTURE RESEARCH

• Risk factors for implant survivorship of total shoulder arthroplasty need further investigation with high-quality, well-designed studies that have long term follow-up. Numerous factors have been found to contribute to implant failure such as stability of glenoid fixation, preservation of glenoid subchondral bone, severity of eccentric glenoid wear, excessive glenoid retroversion, proper surgical technique, and magnitude of posterior humeral head subluxation. Unfortunately, the current literature does not provide enough high-quality evidence to develop definitive treatment recommendations to direct implant selection (i.e. anatomic total shoulder arthroplasty, hemiarthroplasty, reverse total shoulder arthroplasty).

• Areas in need of additional high-quality research include the efficacy of physical therapy and other non-surgical treatment modalities as an alternative to arthroplasty, and preoperative physical therapy (prior to shoulder arthroplasty). If and how home based versus formal outpatient physical therapy impacts clinical outcome is also of interest, as is the impact of preoperative narcotic use. There are many areas of intervention that are commonly used in the management of glenohumeral joint osteoarthritis with little to no evidence-based data to support their use.

• Preoperative surgical planning using thin slice (<1mm cuts) 3-D CT scan with planning software has become an area that has gained significant popularity. Yet to date, there is no supporting evidence that the use of these advanced imaging modalities and software has an impact on clinical and functional outcomes, complication rates or implant survivorship. High quality well designed multicenter prospective cohort studies and randomized trials are needed to provide evidence to the impact of this technology.

• The availability of more advanced imaging has been accompanied by an increasing understanding of the surgical challenges created by significant posterior glenoid bone loss. Concomitantly, surgeons have expanded the indications for the use of reverse total shoulder arthroplasty in glenohumeral osteoarthritis with complex glenoid wear even in the presence of an intact rotator cuff. To date there have been no high-quality studies demonstrating improved clinical outcome, and/or implant survivorship, when reverse total shoulder arthroplasty as opposed to anatomic total shoulder arthroplasty in these challenging situations. Well-designed prospective cohort or randomized trials are needed to support evidence-based recommendations.
FUTURE RESEARCH – PROGNOSTIC FACTORS

- **BMI** - While early postoperative complication rates have not been demonstrated to be increased in obese patients undergoing shoulder arthroplasty for glenohumeral arthritis, the effect of BMI on other factors such as long-term complications (e.g., late infection, prosthetic loosening, dislocation, rotator cuff tear) and pain and functional outcomes remain to be demonstrated in high quality studies.

- **GENDER/SEX** - Future studies should continue to evaluate post-operative outcomes for TSA in osteoarthritis, with one of the variables examined to include gender/sex-based differences. There has been a movement towards gender/sex specific implants. Current data would suggest this may not be needed in the shoulder given the similar outcomes, future studies could further assess this.

- **COMORBIDITIES** - Future research is needed to better clarify these risk factors and to determine if outcomes following shoulder arthroplasty can be more accurately predicted.

- **AGE** - Further prospective studies are needed to determine the effect of age on survivorship after shoulder arthroplasty in not only the setting of hemiarthroplasty but total and reverse shoulder arthroplasty.
FUTURE RESEARCH – PROGNOSTIC FACTORS

• **SMOKING** - Future high-quality studies are required to compare the early and late complications associated with shoulder arthroplasty in smokers versus non-smokers.

• **PRE-OPERATIVE FUNCTION** - Further study is needed in this area of clinical outcomes after shoulder arthroplasty to help advance our understanding of this ceiling effect of higher functioning patients with glenohumeral joint osteoarthritis.

• **DEPRESSION** - Further prospective studies on the diagnosis of depression and its effect on patients undergoing shoulder arthroplasty are needed. The study cited here examined depression as a discrete variable but was not able to distinguish between severity of depression and its effect on outcomes measures. Also, further work should evaluate whether the treatment of depression might affect the outcomes for these patients to determine if there is an ability to modify/improve outcomes if patients’ depression is treated appropriately.
Additional research is needed to determine long term follow-up of the outcomes of shoulder arthroplasty. Currently, the studies which have met inclusion criteria for this document as well as that are available are at best medium-term follow-up. Although there are case series in the literature with >10-year follow-up this is not sufficient to make evidence-based decisions regarding treatment. It is important to understand the long-term outcomes, survivorship as well as consequences of failure from issues such as glenoid failure (i.e. bone loss, erosion, implant loosening), rotator cuff pathology, humeral implant failure or stress shielding.
PEGGED OR KEELED - Most important future research is high quality investigation with either prospective randomized trials or prospective cohort studies to establish long term (>10 year) follow-up of these implants is critical to determine survivorship/failure rates, clinical and functional outcomes.

• METAL BACKED CEMENTLESS - Future studies are needed to develop and design new glenoid implants if metal backed cementless implant concept is to be pursued with a goal of improving the survivorship of the glenoid.
FUTURE RESEARCH – TOTAL SHOULDER ARTHROPLASTY – SUBSCAPULARIS PEEL, LESSER TUBEROSITY OSTEOTOMY, TENOTOMY

• Current studies report follow up at 12- and 24-months post-op. Future studies should investigate longer term comparison of the three surgical techniques.
FUTURE RESEARCH – HEMIARTHROPLASTY STEMS

- High quality studies with long term follow up (>10 years) directly comparing stemmed, stemless, and humeral resurfacing for both hemiarthroplasty as well as anatomic total shoulder arthroplasty are needed to determine if one implant type provides better outcome, pain relief, and survivorship.
FUTURE RESEARCH – PHYSICAL THERAPY

• **PRE-OPERATIVE** - The efficacy of formal physical therapy for GJO needs to be studied in a more systematic fashion with long term follow up.

• **POST-OPERATIVE** - Future studies should evaluate the effect of physical therapy on outcomes following shoulder arthroplasty. A comparison of post-operative exercise protocols, number and timing of physical therapy visits, and method of delivery of physical therapy (physical therapist, physician, video) should be performed.
FUTURE RESEARCH – INJECTABLE BIOLOGICS / ALTERNATIVE NON-SURGICAL TREATMENTS

• **INJECTABLE BIOLOGICS** - High-quality studies are needed in the use of biologics for the treatment of glenohumeral osteoarthritis.

• **ALTERNATIVE NON-SURGICAL TREATMENTS** - Randomized controlled trials comparing complementary and alternative medicines to accepted medications and/or control group (placebo) would provide helpful data substantiating non-inferiority. Potential barriers to comparative studies include, but are not limited to, state and federal laws and regulations, funding, and heterogeneity of study design (i.e. number of treatment arms, dosages and durations of treatment, power analysis, patient reported outcomes).
FUTURE RESEARCH – OPIOID PAIN MEDICATION

- Future research is required to determine the best pain management regimens for those with glenohumeral joint osteoarthritis who have yet to undergo surgery.
FUTURE RESEARCH – NON-PROSTHETIC SURGICAL OPTIONS

• Future studies are needed to provide strong high-quality evidence to support the use of these surgical techniques.
FUTURE RESEARCH – RADIOGRAPHS

• High quality evidence is needed to evaluate if improved clinical outcomes are associated with more accurate arthroplasty component positioning.
FUTURE RESEARCH – CEMENTED STEMS

• Well-designed high-quality studies are needed to provide data to support an evidence-based guideline regarding cement and cementless humeral stems for shoulder arthroplasty with long term follow-up. These studies should focus on long term patient reported outcomes as well as humeral related complications.
FUTURE RESEARCH – ANATOMIC OR REVERSE TOTAL SHOULDER ARTHROPLASTY

• There is a need for future high-quality prospective cohort and/or randomized clinical trials comparing the outcomes, survivorship, and complications associated with anatomic and reverse total shoulder arthroplasty. The results of these investigations will provide evidence-based recommendations as to which patients would be more appropriate for each implant type.
FUTURE RESEARCH – GLENOID COMPONENTS – POLYETHYLENE-METAL OR ALL POLYETHYLENE

• Future high quality comparative long-term outcomes studies need to be performed to determine the impact of hybrid glenoid fixation on implant survivorship. This data can provide guidance as to which patients should be indicated for the use of hybrid glenoid components during anatomic total shoulder arthroplasty. Additionally, can follow the influence of glenoid deformity as well as rotator cuff pathology on outcomes and implant survivorship.
FUTURE RESEARCH – BICEP AND TENOTOMY

• High quality evidence is needed to evaluate if improved clinical outcomes are associated with biceps tenodesis or tenotomy at the time of shoulder arthroplasty.
FUTURE RESEARCH – TRANEXAMIC ACID

- Further study is needed to determine the optimal dosing and route of administration of TXA. The studies that have been performed to date have included varying drug doses and frequency and have also differed in mode of administration (intravenous or topical). Additionally, the majority of the studies have pooled together both anatomic and reverse shoulder arthroplasty and more data is needed to determine its efficacy in each alone. Additionally, while there is no evidence of increased complication to date, including any increased risk of thromboembolic phenomenon, future studies on the safety of TXA use in shoulder surgery is needed.
FUTURE RESEARCH – SUPRASPINATUS TEARS

- Future high-quality studies are necessary to directly compare patients with GJO with an intact rotator cuff versus those with repairable small (< 1 cm) supraspinatus tendon tears when performing anatomic total shoulder arthroplasty with respect to patient reported outcomes, complications, and revision rates.
FUTURE RESEARCH – DISCHARGE

• Further research is needed to determine those patients who are the best candidates for same day discharge following shoulder arthroplasty, as well as to better understand which patients are most at risk for emergency room visit or readmission/hospitalization following outpatient shoulder arthroplasty.
FUTURE RESEARCH – CRYOTHERAPY

• More high-quality evidence is needed focusing on the effectiveness of cold therapy units in patients who receive anatomic shoulder arthroplasty for osteoarthritis.
FUTURE RESEARCH – MULTIMODAL PAIN MANAGEMENT

• Future high-quality studies may focus on multimodal pain management after elective shoulder arthroplasty.
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- Evidence-based Databases
- Evidence-based Methods, Appraisals and Standards
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- Sort Alphabetically by Topic
- Sort Recommendations by Strength
  - (Strong, Moderate, Limited, Consensus)
- Sort by Stage of Care
- Search Across all CPGs via a Single Keyword Search

Easier Access to Individual Recommendations:
- View recommendations via shortened titles
- Access to full recommendation & rationale
- Links to references (PubMed)
Search across all CPG and AUC Via a Single Keyword Search
References provided for each recommendation


Links to PubMed
### Appropriate Use Criteria Tool

#### Indication Profile

**Symptom Severity**
- [ ] Mild Symptoms
- [ ] Moderate Symptoms
- [ ] Severe Symptoms

**American Society of Anesthesiologist's (ASA) Status (co-morbidities)**
- [ ] ASA 1
- [ ] ASA 2
- [ ] ASA 3

**Identifiable Factors that Negatively Affect Healing**
- [ ] Present
- [ ] Absent

**Identifiable Factors that Negatively Affect Outcome**
- [ ] Present
- [ ] Absent

**Tear Size and Retraction: Southern California Orthopaedic Institute (SCOI) Classification (Snyder Classification)**
- [ ] C1: Small, complete tear
- [ ] C2: Moderate tear

#### Procedure Recommendations

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PUBLISHED CLINICAL PRACTICE GUIDELINES

- Acute Achilles Tendon Rupture
- Acute Compartment Syndrome
- 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
- Limb Salvage or Early Amputation
- 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
- Psychosocial Factors Influencing Trauma Recovery
- 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)

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