*National Imaging Associates, Inc.	
Clinical guidelines: **SHOULDER ARTHROPLASTY**	**Original Date: August 2016**
CPT Codes:** - **Total/Reverse Shoulder Arthroplasty or Resurfacing: 23472** - **Partial Shoulder Arthroplasty/Hemiarthroplasty: 23470** - **Revision Shoulder Arthroplasty: 23473, 23474** *See UM Matrix for allowable billed groupings and additional covered codes*	**Last Revised Date: December~~May~~ 2023**
Guideline Number: NIA_CG_317	**Implementation Date: July~~anuary~~ 2024**

Table of Contents

GENERAL INFORMATION

It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.

STATEMENT

Purpose

This guideline addresses elective, non-emergent shoulder arthroplasty (shoulder replacement) procedures, including total shoulder arthroplasty, reverse shoulder arthroplasty, resurfacing arthroplasty, partial shoulder replacement or hemiarthroplasty, and revision arthroplasty procedures.

Scope

Arthroplasty procedures are reserved for end stage arthritis of the shoulder joint, including functional loss of motion, pain, and disability. The choice of arthroplasty is dependent upon surgeon philosophy, experience, and skill. Successful outcome, regardless of procedure, is more likely with high volume (> 20 per year) shoulder specialists.

General Requirements

Elective surgery of the shoulder may be considered if the following general criteria are met:

- Clinical correlation of individual's subjective complaints with objective exam findings and/or imaging (when applicable)
- Individual has limited function (age-appropriate activities of active daily livings (ADLs), occupational, or athletic)
- Individual does not have an active local or systemic infection
- Individual does not have active, untreated drug dependency (including but not limited to narcotics, opioids, muscle relaxants) unless engaged in treatment
- Individual has good oral hygiene and does not have major dental work scheduled or anticipated (ideally within one year of joint replacement;~~),~~ due to increased post-surgical infection risk)
- ~~Recommendations for elective total shoulder or reverse shoulder arthroplasty should only be considered after the individual has~~ had ~~been optimized preoperative optimization for surgery and the individual's overall medical condition demonstrates no uncontrolled co-morbidities~~ Individual is medically stable and optimized for surgery, and any treatable comorbidities are adequately medically managed such as diabetes, nicotine addiction, or an excessively high BMI. There should also be a shared decision between the patient and physician to proceed with a total joint replacement when

~~comorbidies~~comorbidities exist ~~–~~as it pertains to the added risk of complications. [1, 2, 3]~~1-5~~

Clinical notes should address:

- Symptom onset, duration, and severity
- Loss of function and/or limitations
- Type and duration of non-operative management modalities

Non-operative management, when required, will be specified within the clinical indications below and may include one or more of the following:

- Physical therapy or properly instructed home exercise program
- Rest or activity modification
- Application of heat or ice
- Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics
- Corticosteroid injections

INDICATIONS

Total Shoulder Arthroplasty (TSA)

Total Shoulder Arthroplasty may be necessary when **ALL** of the following criteria are met: [4, 5, 6]~~6-8~~~~:~~

- Evidence of painful osteoarthritis or inflammatory, non-infectious arthritis (e.g., rheumatoid) with functional limitations such as ~~activities of daily living~~ADLs, employment~~,~~ or ~~simple~~ recreation
- Complete or near-complete loss of joint space* on axillary or AP X-rays (internal rotation and/or external rotation)*

  ***NOTE**: In those with bone-on-bone articulation on axillary or true AP X-rays, non-operative treatment is not required

  NOTE: MRI should not be the primary imaging study to determine the extent of disease
- Failure of at least 12 weeks of non-operative treatment that includes at least ONE of the following:
  - Physical therapy or properly instructed home exercise program
  - Rest or activity modification
  - Application of heat or ice
  - Pharmacologic treatment (oral/topical NSAIDS, acetaminophen, analgesics)
  - Corticosteroid injections
- Functional and intact rotator cuff and deltoid (adequate abduction strength); confirmed by physical examination, MRI, or CT scan
- **NO** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8]~~9-12~~
- **NO** prior arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10]~~13, 14~~

Contraindications

- Neurological disease resulting in complex regional pain syndrome (CRPS or its variants), Charcot arthropathy, or loss of deltoid or rotator cuff function
- Active infection or any infection within 12 weeks of surgery:
    - History of prior shoulder joint infection without documentation ~~-~~that indolent infection has been eliminated (individual has been off antibiotics for a minimum of 6 weeks). Evidence of resolved infection should include laboratory work (serologies, including CBC with differential, ESR (erythrocyte sedimentation rate), CRP (C-reactive protein), with or without blood cultures, soft tissue biopsy cultures, or synovial fluid aspiration (cultures, gram stain, cell count, differential, crystals). Cultures should be for aerobic and anaerobic bacteria (AFB, fungal), with special attention to the possibility of *Cutibacterium acnes* (*C. acnes*) formerly *Propionibacterium acnes* (*P. acnes*). [3, 11]~~, 15, 16~~
- Poor dental hygiene (e.g., tooth extraction should be performed prior to arthroplasty). Major dental work within 2 years after a joint replacement **MAY** lead to seeding of the implant and possible revision surgery. If possible, all dental work must be completed prior to shoulder arthroplasty as these procedures increase risk for infection~~.~~
- **ANY** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8]~~9-12~~
- Arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10]~~13, 14~~

Hemiarthroplasty

Hemiarthroplasty may be necessary when **the** following criteria are met: [4, 5]

- Acute 3 or 4-part fracture of the proximal humerus~~17~~

  OR

- Individual meets all of the criteria for a Total Shoulder Arthroplasty, as detailed above, or has a vascular necrosis or osteonecrosis of the humeral head without advanced glenoid disease
- **NO** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8]~~9, 18~~
- **NO** prior arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10]~~13, 14~~

Contraindications

- **ANY** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8]~~9-12~~
- Arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10]~~13, 14~~
- Neurologic disease resulting in CRPS or Charcot shoulder
- Active infection within 12 weeks of surgery [12]

Reverse Total Shoulder Arthroplasty (RTSA)

For the treatment of arthritis, irreparable rotator cuff tears or proximal humeral fractures: [13, 14]

Arthritis

RTSA may be indicated for the treatment of arthritis when **ALL** of the following criteria are met[18]: [13]

- Evidence of painful osteoarthritis or inflammatory, non-infectious arthritis (e.g., rheumatoid) with functional limitations (such as activities of daily living or employment or simple recreation)
- Complete or near-complete loss of joint space on axillary or AP x-rays (internal rotation and/or external rotation) **OR** radiographic evidence of advanced glenoid bone loss or excessive retroversion[19]*

  *In those with bone-on-bone articulation on axillary or true AP X-rays, non-operative treatment is not required.

  NOTE: MRI should not be the primary imaging study to determine the extent of disease

- Non-repairable massive tears involving at least two tendons, substantial partial, OR focal full thickness rotator cuff tear with significant rotator cuff dysfunction (weakness, impingement signs on exam) **AND** intact deltoid
- Requests for reverse TSA for advanced glenohumeral arthritis with an intact rotator cuff will be reviewed on a case-by-case basis [15, 16, 17][20-23]
- Failure of **at least 12** weeks of non-operative treatment that includes **at least ONE** of the following:
  - Physical therapy or properly instructed home exercise program
  - Rest or activity modification
  - Application of heat or ice
  - Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics
  - Corticosteroid injections
- Age > 60; requests for RTSA in individuals < 60 will be reviewed on a case-by-case basis*
- **NO** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8][9-12]
- **NO** prior arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10][13, 14]

***NOTE**: RTSA has been found to be a reliable operation in younger individuals with improvement in pain, range of motion and strength, without a large number of early failures. [13, 18, 19][24-27]

Contraindications [13]

- **ANY** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8][9-12]
- Active infection within 12 weeks of surgery

- Neurologic disease resulting in CRPS or Charcot shoulder
- Arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10][13, 14]

Proximal Humeral Fractures

RTSA may be indicated for the treatment of fractures when **ALL** of the following criteria are met:

- Acute 2, 3, or 4-part fractures of proximal humerus with or without concomitant tuberosity as evidence by radiographic findings **OR** painful malunion of proximal humerus fracture with rotator cuff dysfunction (weakness, impingement signs on exam) [13] [19]
- Age > 60; requests for RTSA in individuals < 60 will be reviewed on a case-by-case basis.

Rotator Cuff Tears

RTSA may be indicated for the treatment of irreparable rotator cuff tears in the absence of arthritis when **ALL** of the following criteria are met:

- Non-repairable massive rotator cuff tear **AND** intact deltoid AND inability to actively elevate the arm above the level of the shoulder (90 degrees) (i.e., pseudoparalysis); **OR** history of previous failed rotator cuff repair with severe pain and functional disability [13, 20][28, 29]
- Failure of **at least 12** weeks of attempted physical therapy or properly instructed home exercise program unless there is worsening of symptoms
- Age > 60; requests for RTSA in individuals < 60 will be reviewed on a case-by-case basis
- **NO** arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10][13, 14]
- **NO** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8][9-12]

Contraindications

- **ANY** cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8][9-12]
- Active infection within 12 weeks of surgery
- Neurologic disease resulting in CRPS or Charcot shoulder
- Arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10][13, 14]

NOTE: RTSA is a reasonable surgical option for irreparable rotator cuff repair without arthritis. However, caution should be exercised when offering RTSA to individuals without pseudoparalysis because they can have a higher complication and dissatisfaction rate [21, 22] [28]

Revision Arthroplasty

(See contraindications*)

Conversion of a Hemiarthroplasty to a Total Shoulder Arthroplasty

May be necessary when **ALL** of the following criteria are met: [23]

- Evidence of a prior hemiarthroplasty
- Persistent pain and functional loss
- Negative infection evaluation (including CRP, ESR, CBC, with or without negative aspiration) [24, 25]~~30-33~~ **OR** documentation of mechanical failure, or component failure/malposition
- Clinical and radiographic evidence of intact rotator cuff (or repairable rotator cuff tear), including **ONE** of the following two options;
    - Radiographic evidence of failed humeral component, including aseptic loosening or periprosthetic fracture (documentation should include radiolucencies around cemented or uncemented components) **OR**
    - Clinical and radiographic evidence of glenoid articular cartilage disease (including progressive arthritis)

Conversion of a Hemiarthroplasty to a Reverse Shoulder Arthroplasty

May be necessary when **ALL** of the following criteria are met:

- Evidence of a prior hemiarthroplasty
- Persistent pain and functional loss
- Negative infection evaluation (including CRP, ESR, CBC, with or without negative aspiration) [24, 25]~~30-33~~ **OR** documentation of mechanical failure, or component failure/malposition
- Intact deltoid and intact axillary nerve
- Age > 60; requests for individuals < 60 will be reviewed on a case-by-case basis
- Evidence of pseudoparalysis (inability to elevate arm) **OR** severe pain with elevation

Revision of a Total Shoulder Arthroplasty to Another Total Shoulder Arthroplasty

May be necessary when **ALL** of the following criteria are met; [26, 27]~~7~~

- Evidence of prior total shoulder arthroplasty
- Persistent pain and functional loss
- Negative infection evaluation (including CRP, ESR, CBC, with or without negative aspiration) [24, 25]~~30-33~~ **OR** documentation of mechanical failure, or component failure/malposition
- Clinical and radiographic evidence of intact rotator cuff (or repairable rotator cuff tear)
- Radiographic evidence of failed humeral and/or glenoid component, including aseptic loosening or periprosthetic fracture [28]~~34~~

Revision of a Total Shoulder Arthroplasty to a Reverse Shoulder Arthroplasty

May be necessary when **ALL** of the following criteria are met; [29]

- Evidence of prior total shoulder arthroplasty

- Persistent pain and functional loss
- Negative infection evaluation (including CRP, ESR, CBC, with or without negative aspiration) [24, 25][30-33] **OR** documentation of mechanical failure, or component failure/malposition
- Intact deltoid function
- Age > 60 (requests in individuals < 60 will be reviewed on a case-by-case basis)
- Evidence of pseudoparalysis (inability to elevate arm) **OR** severe pain with elevation

Revision of a Reverse Shoulder Arthroplasty to Another Reverse Shoulder Arthroplasty

May be necessary when **ALL** of the following criteria are met[35]: [15]

- All cases should be reviewed on a case-by-case basis and include the following:
    - Evidence of prior reverse shoulder arthroplasty
    - Persistent pain and functional loss
    - Negative infection evaluation (including CRP, ESR, CBC, with or without negative aspiration) [24, 25][30-33] **OR** documentation of mechanical failure, or component failure/malposition
    - Radiographic evidence of failed humeral and/or glenoid component, including aseptic loosening or periprosthetic fracture
    - Intact deltoid

Revision of a Total Shoulder or Reverse Shoulder Arthroplasty to a Hemiarthroplasty

May be necessary when **ALL** of the following criteria are met [30, 31][36]

- All cases should be reviewed on a case-by-case basis and include the following:
    - Evidence of prior total shoulder or reverse shoulder arthroplasty
    - Persistent pain and functional loss
    - Negative infection evaluation (including CRP, ESR, CBC, with or without negative aspiration) [24, 25][30-33] **OR** documentation of mechanical failure (anterior or superior migration), or component failure
    - Radiographic evidence of failed humeral and/or glenoid component, including aseptic loosening or periprosthetic fracture
    - Intact deltoid and intact axillary nerve
    - Insufficient glenoid bone to support a revision glenoid component

***Contraindications for Revision Arthroplasty**

- Active or recent history of infection
- Neurogenic pain syndrome
- Acromial fracture **OR** overly thin acromion from prior subacromial decompression

- Severe osteoporosis as evidenced by radiographic osteopenia, osteomalacia or severe osteoporosis on DXA scan
- Non-functioning deltoid or axillary nerve injury/palsy
- ANY~~NO~~ arthroscopic surgery of the shoulder within 12 weeks of surgery [9, 10]~~13, 14~~
- ANY~~NO~~ cortisone injection into the joint within 12 weeks of surgery [7, 3, 6, 8]~~9 12~~

BACKGROUND

Shoulder Arthroplasty

Total, Partial & Revision Shoulder Replacement

~~This guideline addresses elective, non-emergent shoulder arthroplasty (shoulder replacement) procedures, including total shoulder arthroplasty, reverse shoulder arthroplasty, resurfacing arthroplasty, partial shoulder replacement or hemiarthroplasty, and revision arthroplasty procedures.~~

~~Arthroplasty describes the surgical replacement and reconstruction of a joint with implanted devices when the joint has been damaged by an arthritic or traumatic process.~~

~~In both a total shoulder replacement and a reverse shoulder replacement, the damaged joint surfaces (humeral head and glenoid) are removed and replaced with prosthetic components, with the goal of reducing pain and improving joint function. In a reverse shoulder procedure, the ball and socket feature of the joint is reversed, allowing for added rotator cuff support.~~

~~In the event the shoulder joint cannot support a glenoid prosthesis, a hemiarthroplasty, or partial joint replacement may be performed to replace the humeral head with a prosthesis.~~

~~In some cases, the shoulder prosthesis may wear out or loosen. If loosening is painful, a second surgery, such as a revision may be necessary. In this procedure, some, or all of the components of the original replacement prosthesis are removed and replaced with new ones.~~

~~OVERVIEW~~

Total Shoulder Arthroplasty (TSA)

The replacement of the glenohumeral joint is called a shoulder arthroplasty. It can be either a ~~total shoulder arthroplasty (~~TSA~~),~~ where both the glenoid and humerus are replaced, a partial arthroplasty of the humerus only (hemiarthroplasty~~) [HA])~~, or a partial resurfacing of the humerus (humeral head resurfacing ~~[HHR, HR]~~).

~~In general, these arthroplasty procedures are reserved for end stage arthritis of the shoulder joint, including functional loss of motion, pain, and disability. The choice of arthroplasty is~~

~~dependent upon surgeon philosophy, experience, and skill. Successful outcome, regardless of procedure, is more likely with high volume (> 20 per year) shoulder specialists. Revision shoulder arthroplasty is most commonly required because of technical problems encountered at the time of surgery, such as insertion of the wrong size components, improper technique, and poor surgical exposure.~~

Reverse Total Shoulder Arthroplasty (RTSA)

This ~~shoulder surgery~~ involves placing the ball on the glenoid side (glenosphere and baseplate) of the joint and the socket on the humeral side. It works by moving the center of joint rotation medial and downward and increasing deltoid tension to facilitate active abduction and elevation of the arm. [32] ~~37~~

The original purpose of a RTSA was to allow basic function of a pseudoparalytic shoulder from a non-repairable chronic rotator cuff tear with arthropathy (or arthritis) in an inactive person over age 65. ~~Complication rates have steadily decreased as surgeons become more familiar with this procedure and technical advances have been made.~~ Indications have expanded to include younger individuals, malunions, nonunions, failed arthroplasty, and irreparable cuff tears.

Age and Shoulder Arthroplasty

~~In general, t~~The more severe the disease, the more loss of motion and glenoid erosion will exist and the more likely a TSA will be required, regardless of age. ~~However, i~~If surgery is delayed too long, it can be exceedingly difficult to insert the glenoid component for a TSA due to posterior glenoid erosion. For optimal TSA success, only one replacement should be attempted during an individual's lifetime.

Additional research is necessary to support an accurate age range for each type of shoulder arthroplasty~~.~~ . At this time, an individual's age is a relative indication for surgery and ultimately relies on surgeon's judgment and patient presentation.~~6~~

TSA can be done at any age, but in general, to minimize complications, consideration should be given to the following~~38~~: [33]

- Age < 55: Hemiarthroplasty can be considered due to the likelihood that these individuals will need the joint converted to a total shoulder arthroplasty. However, primary TSA outperforms HA for implant survival and patient satisfaction at short term follow up for individuals younger than 50 [34]~~39~~
- Age 55-65: Depending on an individual's anatomy and desired activity level, TSA, resurfacing (HHR), or reverse total shoulder arthroplasty (RTSA) may be indicated. Overall low revision rates and high implant survivorship are reported in the current literature in individuals under age 65 undergoing TSA. Results of HA have been shown to be inferior to TSA, and conversion of HA to TSA yields less optimal result than a primary TSA [35, 36]~~38~~

- Age > 65: TSA or RTSA is typically the best surgical option for individuals over the age of 65 [37]

Revision Arthroplasty [38]

There are six primary indications for revision shoulder arthroplasty [39]:

(1) Conversion of a hemiarthroplasty to a total shoulder arthroplasty
(2) Conversion of a hemiarthroplasty to a reverse shoulder arthroplasty
(3) Revision of a total shoulder arthroplasty to another total shoulder arthroplasty
(4) Revision of a total shoulder arthroplasty to a reverse shoulder arthroplasty
(5) Revision of a reverse total shoulder arthroplasty to another reverse shoulder arthroplasty
(6) Revision of a total shoulder or reverse shoulder arthroplasty to a hemiarthroplasty.

~~**NOTE**: Historically, this procedure was coded as the removal of hardware and total shoulder arthroplasty. CPT introduced shoulder revision procedure codes in January 2013.~~

POLICY HISTORY

Date	Summary
December 2023	• No content changes • Added table of contents • Reduced Background section • Updated references
May 2023	• Added statement that non-operative treatment is not required in those with X-rays showing bone-on-bone articulation • Additional references to contraindications for cortisone injections within 12 weeks of an arthroplasty. • Added no cortisone injections or arthroscopic surgery within 12 weeks of surgery for a revision arthroplasty
May 2022	Updated references **Added:** • Arthroscopic surgery within 12 weeks of an arthroplasty as a contraindication for surgery. • RTSA request with intact rotator cuff to be reviewed on a case-by-case basis • Replaced patient is medically stable statement (general requirements) with individual is optimized with no uncontrolled co-morbidities statement • Added "or" after, "acute 3 or 4-part fracture of the proximal humerus" (Hemiarthroplasty) **Revised:** • Criterion with ages 65 to 60 for consistency (case-by-case review) • "no injection" statements to "no cortisone injection~~"~~," and "any injection statements" to "any cortisone injection" • Infection contraindication from 3 months to 12 weeks • Non-repairable massive *tears involving at least two tendons* (RTSA arthritis) **Clarified:** • Clarification of contraindications for RSTA performed for rotator cuff tears • F~~f~~unctional and intact rotator cuff and deltoid is confirmed by physical examination, MRI, *or* CT scan. • Chronic regional pain syndrome Replaced "patient" with "individual" where appropriate

References

[1] I. L. Leeds, J. K. Canner, F. Gani, P. M. Meyers, E. R. Haut, J. E. Efron and F. M. Johnston, "Increased Healthcare Utilization for Medical Comorbidities Prior to Surgery Improves Postoperative Outcomes," *Ann Surg,* vol. 271, no. 1, pp. 114-121, 2020.

[2] H.-G. Seok, J.-J. Park and S.-G. Park, "Risk Factors for Periprosthetic Joint Infection after Shoulder Arthroplasty: Systematic Review and Meta-Analysis," *J Clin Med,* vol. 11, no. 14, p. 4245, July 21 2022.

[3] A. R. Markes, J. . Bigham, C. B. Ma, J. J. Lyengar and B. T. Feeley, "Preventing and Treating Infection in Reverse Total Shoulder Arthroplasty," *Curr Rev Musculoskelet Med,* vol. 16, no. 8, pp. 371-380, 2023.

[4] G. S. Athwal, J. M. Wiater and S. J. Fischer, "Shoulder Joint Replacement," September 2021. [Online]. Available: https://www.orthoinfo.org/en/treatment/shoulder-joint-replacement/. [Accessed 27 September 2023].

[5] L. Mattei, S. . Mortera, C. Arrigoni and F. Castoldi, "Shoulder Joint Replacement," *Shoulder Joint Replacement,* vol. 3, no. 2, pp. 72-77, 3 November 2015.

[6] H. Razmjou, M. Christakis, D. Nam, D. Drosdowech, U. Sheth, A. Wainwright and R. Richards, "Assessing Appropriateness for Shoulder Arthroplasty Using a Shared Decision-Making Process," *J Shoulder Elb Arthroplast,* vol. 7, 29 March 2023.

[7] M. Stadecker, A. Gu, P. Ramamurti, S. C. Fassihi, C. Wei, A. R. Agarwal, P. Bovonratwet and U. Srikumaran, "Risk of revision based on timing of corticosteroid injection prior to shoulder arthroplasty," *Bone Joint J,* Vols. 104-B, no. 5, pp. 620-626, 2022.

[8] B. C. Werner, J. M. Cancienne, M. T. Burrus, J. W. Griffin, F. W. Gwathmey and S. F. Brokmeier, "The timing of elective shoulder surgery after shoulder injection affects postoperative infection risk in Medicare patients," *J Shoulder Elbow Surg,* vol. 25, no. 3, pp. 390-397, 2016.

[9] A. T. Malik, J. Morris, J. Y. Bishop, A. S. Neviaser, S. N. Khan and G. L. Cvetanovich, "Undergoing an Arthroscopic Procedure Prior to Shoulder Arthroplasty is Associated With Greater Risk of Prosthetic Joint Infection," *Arthroscopy,* vol. 37, no. 6, pp. 1748-1754, 2021.

[10] J. Wright-Chisem, J. M. Apostolakos, J. S. Dines, D. M. Dines, L. V. Gulotta, S. A. Taylor and B. C. Werner, "The impact of prior ipsilateral arthroscopy on infection rates after shoulder arthroplasty," *The impact of prior ipsilateral arthroscopy on infection rates after shoulder arthroplasty,* vol. 30, no. 7, pp. 1596-1602, 2021.

[11] M. J. Elston, J. P. Dupaiz, M. I. Opanova and R. E. Atkinson, "Cutibacterium acnes (formerly Proprionibacterium acnes) and Shoulder Surgery," *Hawaii J Health Soc Welf,* vol. 78, no. 11 Suppl 2, pp. 3-5, 2019.

[12] J. S. Somerson, P. Sander, K. Bohsali, R. Tibbetts, C. A. Rockwood Jr and M. A. Wirth, "What Factors are Associated With Clinically Important Improvement After Shoulder

Hemiarthroplasty for Cuff Tear Arthropathy?," *What Factors are Associated With Clinically Important Improvement After Shoulder Hemiarthroplasty for Cuff Tear Arthropathy?,* vol. 474, no. 12, pp. 2682-2688, 2016.

[13] F. Familiari, J. Rojas, M. N. Doral, G. Huri and E. G. McFarland, "Reverse total shoulder arthroplasty," *Reverse total shoulder arthroplasty,* pp. 58-69, 28 February 2018.

[14] S. Hermena and M. Rednam, "Reverse Shoulder Arthroplasty," 1 October 2022. [Online]. Available: https://www.ncbi.nlm.nih.gov/books/NBK574545/. [Accessed 4 October 2023].

[15] J. J. Heifner, A. D. Kumar and E. R. Wagner, "Glenohumeral osteoarthritis with intact rotator cuff treated with reverse shoulder arthroplasty: a systematic review," *J Shoulder Elbow Surg,* vol. 30, no. 12, pp. 2895-2903, 2021.

[16] H. . Kim, C.-H. Kim, M. Kim, W. Lee, I.-H. Jeon, K. W. Lee and K. H. Koh, "Is reverse total shoulder arthroplasty (rTSA) more advantageous than anatomic TSA (aTSA) for osteoarthritis with intact cuff tendon? A systematic review and meta-analysis.," *J Orthop Traumatol,* vol. 23, no. 1, January 6 2022.

[17] E. M. Nazzal , R. P. Reddy, M. Como, A. Rai, J. J. Greiner , M. A. Fox and A. Lin, "Reverse shoulder arthroplasty with preservation of the rotator cuff for primary glenohumeral osteoarthritis has similar outcomes to anatomic total shoulder arthroplasty and reverse shoulder arthroplasty for cuff arthropathy.," *J Shoulder Elbow Surg,* vol. 32, no. 6S, pp. S60-S68, 2023.

[18] B. T. Goldenberg, B. T. Samuelsen, J. D. Spratt , G. J. Dornan and P. J. Millett, "Complications and implant survivorship following primary reverse total shoulder arthroplasty in patients younger than 65 years: a systematic review," *Complications and implant survivorship following primary reverse total shoulder arthroplasty in patients younger than 65 years: a systematic review,* vol. 29, no. 8, pp. 1703-1711, 2020.

[19] R. J. Otto, R. E. Clark and M. A. Frankle, "Reverse shoulder arthroplasty in patients younger than 55 years: 2- to 12-year follow-up," *J Shoulder Elbow Surg,* vol. 26, no. 5, pp. 792-797, 2017.

[20] S. Weber and J. Chahal, "Management of Rotator Cuff Injuries," *J Am Acad Orthop Surg,* vol. 28, no. 5, pp. e193-e201, 2020.

[21] M. S. Virk, G. P. Nicholson and A. A. Romeo, "Irreparable Rotator Cuff Tears Without Arthritis Treated With Reverse Total Shoulder Arthroplasty," *Open Orthop J,* vol. 10, pp. 296-308, 21 July 2016.

[22] J. G. Monir, C. Tams, T. W. Wright, M. Parsons, J. J. King and B. S. Schoch, "Preoperative factors associated with loss of range of motion after reverse shoulder arthroplasty," *J Shoulder Elbow Surg,* vol. 30, no. 10, pp. e621-e628, 2021.

[23] R. M. Carroll, R. Izquierdo, M. . Vazquez, T. A. Blaine, W. N. Levine and L. U. Bigliani, "Conversion of painful hemiarthroplasty to total shoulder arthroplasty: Long-term results," *Conversion of painful hemiarthroplasty to total shoulder arthroplasty: Long-term results,* vol. 13, no. 6, pp. 599-603, 2004.

[24] A. Hecker, A. Jungwirth-Weinberger, M. R. Bauer, T. Tondelli, I. Uckay and K. Wieser, "Hecker A, Jungwirth-Weinberger A, Bauer MR, Tondelli T, Uçkay I, Wieser K. The accuracy of joint aspiration for the diagnosis of shoulder infections. J Shoulder Elbow Surg. Mar 2020;29(3):516-520. doi:10.1016/j.jse.2019.07.016," *Hecker A, Jungwirth-Weinberger A, Bauer MR, Tondelli T, Uçkay I, Wieser K. The accuracy of joint aspiration for the diagnosis of shoulder infections. J Shoulder Elbow Surg. Mar 2020;29(3):516-520. doi:10.1016/j.jse.2019.07.016,* vol. 29, no. 3, pp. 516-520, 2020.

[25] B. Fink and F. Sevelda, "Periprosthetic Joint Infection of Shoulder Arthroplasties:," *Biomed Res Int,* 2017.

[26] N. Bonnevialle, B. Melis, L. Neyton, L. Favard, D. Mole, G. Walch and P. Boileau, "https://doi.org/10.1016/j.jse.2004.03.016," *https://doi.org/10.1016/j.jse.2004.03.016,* vol. 22, no. 6, pp. 745-751, 2013.

[27] W. R. Aibinder, B. Schoch, C. Schleck, J. W. Sperling and R. H. Cofield, "Revisions for aseptic glenoid component loosening after anatomic shoulder arthroplasty," *J Shoulder Elbow Surg,* vol. 26, no. 3, pp. 443-449, 2017.

[28] L. E. Streck, C. Gaal, F. Gohlke, M. Rudert and K. List, "Does radiolucency really predict loose components in revision shoulder arthroplasty?," *Skeletal Radiol,* vol. 52, no. 9, pp. 1759-1765, 2023.

[29] R. S. Otte, A. J. Naylor, K. N. Blanchard, J. M. Cancienne, W. . Chan, A. A. Romeo, G. E. Garrigues and G. P. Nicholson, "Salvage reverse total shoulder arthroplasty for failed anatomic total shoulder arthroplasty: a cohort analysis," *J Shoulder Elbow Surg,* vol. 29, pp. S134-S138, 2020.

[30] P. Kriechling, O. . Andronic and K. Wieser, "Hemiarthroplasty as a salvage treatment for failed reverse total shoulder arthroplasty," *JSES Int,* vol. 5, no. 6, pp. 1055-1061, September 4 2021.

[31] K. J. Khoo, R. J. McLaughlin, B. . Sharareh, K. Jurgensmeier, A. J. Whitson, F. A. Matsen 3rd and J. E. Hsu, "Revision of total shoulder arthroplasty to hemiarthroplasty: results at mean 5-year follow-up," *J Shoulder Elbow Surg,* vol. 32, no. 4, pp. e160-e167, 2023.

[32] C. P. Roche, "Reverse Shoulder Arthroplasty Biomechanics," *J Funct Morphol Kinesiol,* vol. 7, no. 1, 19 January 2022.

[33] T. Li, A. H. Duey, C. A. White, A. . Pujari, A. V. Patel, B. Zaidat, C. S. Williams, A. Williams, C. M. Cirino, D. Shukla, B. O. Parsons, E. L. Flatow and P. J. Cagle, "Evaluating the effects of age on the long-term functional outcomes following anatomic total shoulder arthroplasty," *Clin Shoulder Elb,* vol. 26, no. 3, pp. 231-237, 2023.

[34] J. K. Eichinger, L. R. Miller, T. Hartshorn, X. Li, J. J. Warner and L. D. Higgins, "Evaluation of satisfaction and durability after hemiarthroplasty and total shoulder arthroplasty in a cohort of patients aged 50 years or younger: an analysis of discordance of patient satisfaction and implant survival," *J Shoulder Elbow Surg,* vol. 25, no. 5, pp. 772-780, 2016.

[35] T. A. Roberson, J. C. Bentley, J. T. Griscom, M. J. Kissenberth, S. J. Tolan, R. J. Hawkins and J. M. Tokish, "Outcomes of total shoulder arthroplasty in patients younger than 65 years: a systematic review," *J Shoulder Elbow Surg,* vol. 26, no. 7, pp. 1298-1306, 2017.

[36] H. Fonte , T. Amorim-Barbosa, S. Diniz, L. Barros, J. Ramos and R. Claro, "Shoulder Arthroplasty Options for Glenohumeral Osteoarthritis in Young and Active Patients (<60 Years Old): A Systematic Review," *J Shoulder Elb Arthroplast,* vol. 6, 23 March 2022.

[37] O. A. Anakwenze, T. Yehyawi, M. T. Dillon, E. Paxton, R. Navarro and A. Singh, "Effect of Age on Outcomes of Shoulder Arthroplasty," *Perm J,* vol. 21, 2017.

[38] F. Mauch and J. Huth, "Revision of anatomic shoulder arthroplasty," *Revision of anatomic shoulder arthroplasty,* vol. 52, no. 2, pp. 137-143, 2023.

[39] K. X. Farley, J. M. Wilson, A. Kumar, M. B. Gottschalk, C. Daly, J. Sanchez-Sotelo and E. R. Wagner, "Prevalence of Shoulder Arthroplasty in the United States and the Increasing Burden of Revision Shoulder Arthroplasty," *JB JS Open Access,* vol. 6, no. 3, 14 July 2021.

[40] A. R. Jensen, J. Tangtiphaiboontana, E. Marigi, K. E. Mallett, J. W. Sperling and J. Sanchez-Sotelo, "Anatomic total shoulder arthroplasty for primary glenohumeral osteoarthritis is associated with excellent outcomes and low revision rates in the elderly," *J Shoulder Elbow Surg,* vol. 30, no. 7S, pp. S131-S139, 2021.

~~***REFERENCES***~~

~~1. Forlizzi JM, Puzzitiello RN, Hart PA, Churchill R, Jawa A, Kirsch JM. Predictors of poor and excellent outcomes after reverse total shoulder arthroplasty. *J Shoulder Elbow Surg*. Feb 2022;31(2):294-301. doi:10.1016/j.jse.2021.07.009~~

~~2. Lu Y, Cohn MR, Baker J, et al. Preoperative Opioid Use Predicts Postoperative Opioid Use and Inferior Clinically Notable Outcomes After Total Shoulder Arthroplasty. *J Am Acad Orthop Surg*. Jan 15 2022;30(2):e242-e251. doi:10.5435/jaaos-d-21-00319~~

~~3. Wilson JM, Farley KX, Gottschalk MB, Daly CA, Wagner ER. Preoperative opioid use is an independent risk factor for complication, revision, and increased health care utilization following primary total shoulder arthroplasty. *J Shoulder Elbow Surg*. May 2021;30(5):1025-1033. doi:10.1016/j.jse.2020.08.007~~

~~4. Schwartz AM, Farley KX, Boden SH, et al. The use of tobacco is a modifiable risk factor for poor outcomes and readmissions after shoulder arthroplasty. *Bone Joint J*. Nov 2020;102-b(11):1549-1554. doi:10.1302/0301-620x.102b11.Bjj-2020-0599.R1~~

~~5. Ottesen TD, Hsiang WR, Malpani R, et al. Underweight Patients Are the Greatest Risk Body Mass Index Group for 30-Day Perioperative Adverse Events After Total Shoulder Arthroplasty. *J Am Acad Orthop Surg*. Feb 1 2021;29(3):e132-e142. doi:10.5435/jaaos-d-20-00049~~

~~6. Bhat SB, Lazarus M, Getz C, Williams GR, Jr., Namdari S. Economic Decision Model Suggests Total Shoulder Arthroplasty is Superior to Hemiarthroplasty in Young Patients with End-stage Shoulder Arthritis. *Clin Orthop Relat Res*. Nov 2016;474(11):2482-2492. doi:10.1007/s11999-016-4991-0~~

7. Izquierdo R, Voloshin I, Edwards S, et al. Treatment of glenohumeral osteoarthritis. *J Am Acad Orthop Surg*. Jun 2010;18(6):375-82. doi:10.5435/00124635-201006000-00010
8. Tashjian RZ, Hung M, Keener JD, et al. Determining the minimal clinically important difference for the American Shoulder and Elbow Surgeons score, Simple Shoulder Test, and visual analog scale (VAS) measuring pain after shoulder arthroplasty. *J Shoulder Elbow Surg*. Jan 2017;26(1):144-148. doi:10.1016/j.jse.2016.06.007
9. Werner BC, Cancienne JM, Burrus MT, Griffin JW, Gwathmey FW, Brockmeier SF. The timing of elective shoulder surgery after shoulder injection affects postoperative infection risk in Medicare patients. *J Shoulder Elbow Surg*. Mar 2016;25(3):390-7. doi:10.1016/j.jse.2015.08.039
10. Stadecker M, Gu A, Ramamurti P, et al. Risk of revision based on timing of corticosteroid injection prior to shoulder arthroplasty. *Bone Joint J*. May 2022;104-b(5):620-626. doi:10.1302/0301-620x.104b5.Bjj-2021-0024.R3
11. Yaghmour KM, Loumpardias GA, Elbahi A, et al. Intra-articular steroid injections in large joint arthritis: A survey of current practice. *Musculoskeletal Care*. Jun 2022;20(2):349-353. doi:10.1002/msc.1596
12. Contreras ES, Frantz TL, Bishop JY, Cvetanovich GL. Periprosthetic Infection After Reverse Shoulder Arthroplasty: a Review. *Curr Rev Musculoskelet Med*. Dec 2020;13(6):757-768. doi:10.1007/s12178-020-09670-8
13. Malik AT, Morris J, Bishop JY, Neviaser AS, Khan SN, Cvetanovich GL. Undergoing an Arthroscopic Procedure Prior to Shoulder Arthroplasty is Associated With Greater Risk of Prosthetic Joint Infection. *Arthroscopy*. Jun 2021;37(6):1748-1754.e1. doi:10.1016/j.arthro.2021.01.013
14. Wright-Chisem J, Apostolakos JM, Dines JS, et al. The impact of prior ipsilateral arthroscopy on infection rates after shoulder arthroplasty. *J Shoulder Elbow Surg*. Jul 2021;30(7):1596-1602. doi:10.1016/j.jse.2020.09.019
15. Frangiamore SJ, Saleh A, Grosso MJ, et al. Early Versus Late Culture Growth of Propionibacterium acnes in Revision Shoulder Arthroplasty. *J Bone Joint Surg Am*. Jul 15 2015;97(14):1149-58. doi:10.2106/jbjs.N.00881
16. Holmes S, Pena Diaz AM, Athwal GS, Faber KJ, O'Gorman DB. Neer Award 2017: A rapid method for detecting Propionibacterium acnes in surgical biopsy specimens from the shoulder. *J Shoulder Elbow Surg*. Feb 2017;26(2):179-185. doi:10.1016/j.jse.2016.10.001
17. Shukla DR, McAnany S, Kim J, Overley S, Parsons BO. Hemiarthroplasty versus reverse shoulder arthroplasty for treatment of proximal humeral fractures: a meta-analysis. *J Shoulder Elbow Surg*. Feb 2016;25(2):330-40. doi:10.1016/j.jse.2015.08.030
18. Somerson JS, Sander P, Bohsali K, Tibbetts R, Rockwood CA, Jr., Wirth MA. What Factors are Associated With Clinically Important Improvement After Shoulder Hemiarthroplasty for Cuff Tear Arthropathy? *Clin Orthop Relat Res*. Dec 2016;474(12):2682-2688. doi:10.1007/s11999-016-5037-3
19. Hyun YS, Huri G, Garbis NG, McFarland EG. Uncommon indications for reverse total shoulder arthroplasty. *Clin Orthop Surg*. Dec 2013;5(4):243-55. doi:10.4055/cios.2013.5.4.243

20. Heifner JJ, Kumar AD, Wagner ER. Glenohumeral osteoarthritis with intact rotator cuff treated with reverse shoulder arthroplasty: a systematic review. *J Shoulder Elbow Surg*. Dec 2021;30(12):2895-2903. doi:10.1016/j.jse.2021.06.010
21. Haritinian EG, Belgaid V, Lino T, Nové-Josserand L. Reverse versus anatomical shoulder arthroplasty in patients with intact rotator cuff. *Int Orthop*. Nov 2020;44(11):2395-2405. doi:10.1007/s00264-020-04754-z
22. Kim H, Kim CH, Kim M, et al. Is reverse total shoulder arthroplasty (rTSA) more advantageous than anatomic TSA (aTSA) for osteoarthritis with intact cuff tendon? A systematic review and meta-analysis. *J Orthop Traumatol*. Jan 6 2022;23(1):3. doi:10.1186/s10195-022-00625-y
23. Wright MA, Keener JD, Chamberlain AM. Comparison of Clinical Outcomes After Anatomic Total Shoulder Arthroplasty and Reverse Shoulder Arthroplasty in Patients 70 Years and Older With Glenohumeral Osteoarthritis and an Intact Rotator Cuff. *J Am Acad Orthop Surg*. Mar 1 2020;28(5):e222-e229. doi:10.5435/jaaos-d-19-00166
24. Goldenberg BT, Samuelsen BT, Spratt JD, Dornan GJ, Millett PJ. Complications and implant survivorship following primary reverse total shoulder arthroplasty in patients younger than 65 years: a systematic review. *J Shoulder Elbow Surg*. Aug 2020;29(8):1703-1711. doi:10.1016/j.jse.2020.02.004
25. Otto RJ, Clark RE, Frankle MA. Reverse shoulder arthroplasty in patients younger than 55 years: 2- to 12-year follow-up. *J Shoulder Elbow Surg*. May 2017;26(5):792-797. doi:10.1016/j.jse.2016.09.051
26. Samuelsen BT, Wagner ER, Houdek MT, et al. Primary reverse shoulder arthroplasty in patients aged 65 years or younger. *J Shoulder Elbow Surg*. Jan 2017;26(1):e13-e17. doi:10.1016/j.jse.2016.05.026
27. Monir JG, Abeyewardene D, King JJ, Wright TW, Schoch BS. Reverse shoulder arthroplasty in patients younger than 65 years, minimum 5-year follow-up. *J Shoulder Elbow Surg*. Jun 2020;29(6):e215-e221. doi:10.1016/j.jse.2019.10.028
28. Virk MS, Nicholson GP, Romeo AA. Irreparable Rotator Cuff Tears Without Arthritis Treated With Reverse Total Shoulder Arthroplasty. *Open Orthop J*. 2016;10:296-308. doi:10.2174/1874325001610010296
29. Weber S, Chahal J. Management of Rotator Cuff Injuries. *J Am Acad Orthop Surg*. Mar 1 2020;28(5):e193-e201. doi:10.5435/jaaos-d-19-00463
30. Green AA, Garrigues GE. Shoulder periprosthetic joint infection: the current state of the art. *J Shoulder Elbow Surg*. Jun 2019;28(6s):S2. doi:10.1016/j.jse.2019.05.003
31. Hecker A, Jungwirth-Weinberger A, Bauer MR, Tondelli T, Uçkay I, Wieser K. The accuracy of joint aspiration for the diagnosis of shoulder infections. *J Shoulder Elbow Surg*. Mar 2020;29(3):516-520. doi:10.1016/j.jse.2019.07.016
32. Paxton ES, Green A, Krueger VS. Periprosthetic Infections of the Shoulder: Diagnosis and Management. *J Am Acad Orthop Surg*. Nov 1 2019;27(21):e935-e944. doi:10.5435/jaaos-d-18-00232
33. Simha S, Shields EJW, Wiater JM. Periprosthetic Infections of the Shoulder. *JBJS Rev*. Sep 2018;6(9):e6. doi:10.2106/jbjs.Rvw.17.00191

34. Mallo GC, Burton L, Coats-Thomas M, Daniels SD, Sinz NJ, Warner JJ. Assessment of painful total shoulder arthroplasty using computed tomography arthrography. *J Shoulder Elbow Surg*. Oct 2015;24(10):1507-11. doi:10.1016/j.jse.2015.06.027
35. Cheung E, Willis M, Walker M, Clark R, Frankle MA. Complications in reverse total shoulder arthroplasty. *J Am Acad Orthop Surg*. Jul 2011;19(7):439-49.
36. Gamradt SC, Gelber J, Zhang AL. Shoulder function and pain level after revision of failed reverse shoulder replacement to hemiarthroplasty. *Int J Shoulder Surg*. Apr 2012;6(2):29-35. doi:10.4103/0973-6042.96991
37. Lorenzetti AJ, Stone GP, Simon P, Frankle MA. Biomechanics of Reverse Shoulder Arthroplasty: Current Concepts. *Instr Course Lect*. 2016;65:127-43.
38. Roberson TA, Bentley JC, Griscom JT, et al. Outcomes of total shoulder arthroplasty in patients younger than 65 years: a systematic review. *J Shoulder Elbow Surg*. Jul 2017;26(7):1298-1306. doi:10.1016/j.jse.2016.12.069
39. Eichinger JK, Miller LR, Hartshorn T, Li X, Warner JJ, Higgins LD. Evaluation of satisfaction and durability after hemiarthroplasty and total shoulder arthroplasty in a cohort of patients aged 50 years or younger: an analysis of discordance of patient satisfaction and implant survival. *J Shoulder Elbow Surg*. May 2016;25(5):772-80. doi:10.1016/j.jse.2015.09.028

Reviewed / Approved by NIA Clinical Guideline Committee

Disclaimer: *National Imaging Associates, Inc. (NIA) authorization policies do not constitute medical advice and are not intended to govern or otherwise influence the practice of medicine. These policies are not meant to supplant your normal procedures, evaluation, diagnosis, treatment and/or care plans for your patients. Your professional judgement must be exercised and followed in all respects with regard to the treatment and care of your patients. These policies apply to all Evolent Health LLC subsidiaries including, but not limited to, National Imaging Associates ("NIA"). The policies constitute only the reimbursement and coverage guidelines of NIA. Coverage for services varies for individual members in accordance with the terms and conditions of applicable Certificates of Coverage, Summary Plan Descriptions, or contracts with governing regulatory agencies. NIA reserves the right to review and update the guidelines at its sole discretion. Notice of such changes, if necessary, shall be provided in accordance with the terms and conditions of provider agreements and any applicable laws or regulations.*