Overview:
Arthroplasty describes the surgical replacement or reconstruction of a joint with implanted devices when the joint has been damaged by an arthritic or traumatic process. This guideline outlines the clinical indications for shoulder arthroplasty procedures: total, partial/unicompartmental, reverse shoulder, and revision arthroplasty.

This guideline is structured with clinical indications outlined for each of the following applications:

I. Total Shoulder Arthroplasty (TSA)
II. Hemi-Arthroplasty
III. Reverse Arthroplasty (RTSA)
IV. Revision Arthroplasty

Initial Clinical Reviewers (ICRs) and Physician Clinical Reviewers (PCRs) must be able to apply criteria based on individual needs and based on an assessment of the local delivery system.

Clinical Notes
Total shoulder arthroplasty (TSA) is the most predictable of the arthroplasty procedures and is the “gold standard” but is dependent upon patient age. Stemmed hemiarthroplasty is most often used by non-specialist surgeons and has less successful outcomes. Resurfacing is an option for younger, more active and high demand patients but is only performed in high volume by very few surgeons in the US. It has good longevity with proper patient selection. Stemmed hemiarthroplasty may be accompanied by non-prosthetic glenoid arthroplasty. This involves contouring the glenoid fossa to allow for more anatomical congruity between humeral head and the glenoid and, thus, more anatomical kinematics and shoulder function without the risk of a prosthetic glenoid implant (“ream and run” glenoid or meniscal allograft transposition). It is a technically demanding procedure and requires increased skill, expertise and experience. Biological resurfacing of the glenoid may be considered but generally has fallen out of favor due to high failure rates over mid-term follow-up. Biological resurfacing of the glenoid should be a case-by-case analysis.
CLINICAL INDICATIONS

1. 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. The most significant factor to a patient’s revision surgery is due to incorrect technique (the device was the wrong size or not inserted correctly or poor surgical exposure).

1) **Total Arthroplasty may be necessary when the following criteria are met:**
   a) Evidence of painful osteoarthritis OR
   b) Inflammatory, non-infectious arthritis (e.g. rheumatoid) with functional limitations (such as activities of daily living or employment or simple recreation) AND
   c) Complete or near-complete loss of joint space on axillary and AP x-rays (internal rotation and/or external rotation); AND
   d) 12 weeks of non-operative treatment* have failed to improve symptoms; AND
   e) Adequate bone stock (sufficient bone available to place a glenoid component. Requires either a good axillary x-ray, or either a CT or MRI) to support chosen device; AND
   f) Functional and intact rotator cuff and deltoid; AND
   g) No injection into the joint within 3 months of surgery.

2) **NOTES**
   a) In general, the more severe the disease, the more loss of motion and more glenoid erosion will exist and the more likely TSA will be required, regardless of age. However, if patients wait too long, it can be impossible to place the glenoid component (due to posterior glenoid erosion) in a TSA and outcomes are even worse for HA. For best patient outcomes, only one total shoulder arthroplasty should be performed in patient’s lifetime.

   b) Additional research is necessary to support an accurate age range for each type of shoulder arthroplasty. At this time, patient age is a relative indication for surgery and ultimately relies on surgeon’s judgment and patient presentation. TSA can be done at any age, but in general, to minimize complications (future need of a TSA revision) and improve quality of life:

   i) Age <55 : Hemiarthroplasty maybe the best surgical option due to the likelihood these patients will need the joint converted to a total shoulder
arthroplasty (and revising a total shoulder arthroplasty is much more complex and in some cases cannot be successfully performed)

ii) Age 55-65: Surgery depends on patient anatomy and activity desires (TSA or resurfacing (HHR), although inexperienced surgeons may choose stemmed hemiarthroplasty (HA) as it is technically less demanding)

iii) Age > 65: (generally TSA is best).

3) **Non-operative Treatment Options:**
   
a) At least 3 months of non-operative care that has failed to improve symptoms. Non-operative care should include at least two or more of the following:
   
i) Rest or activity modifications/limitations;
   
ii) Physical therapy modalities;
   
iii) Supervised home exercise;
   
iv) Pharmacologic treatment: oral/topical NSAIDS, acetaminophen, analgesics;
   
v) Corticosteroid injections

4) **CONTRAINDICATIONS**
   
a) Neurological disease resulting in chronic pain syndrome (CRPS or its variants) or loss of deltoid or rotator cuff function.
   
b) Active or recent (within 6 months of surgery) infection. History of prior shoulder joint infection without proof that indolent infection has been eliminated (patient has been off antibiotics for a minimum of 6 weeks) via laboratory work (serologies, including CBC with differential, ESR (erythrocyte sedimentation rate), CRP (C-reactive protein), with or without blood cultures, and synovial fluid aspiration (cultures, gram stain, cell count, differential, crystals)). Cultures must be for aerobic and anaerobic bacteria (AFB, fungal). Cultures must be held for minimum 30 days (especially to rule out propionobacterium acnes).
   
c) Nuclear scans, advanced imaging and often aspiration or soft tissue/bone biopsy (note: recent studies suggest only intra-operative tissue cultures are reliable indicators of joint contamination/infection and IF occult infection is a concern (after prior procedures), biopsies should be taken, delayed placement of the arthroplasty should be strongly considered after antibiotic spacer placement, and appropriate antibiotic management commenced once confirmed.
   
d) Poor dental hygiene (e.g. tooth extraction should be performed prior to arthroplasty). Major dental work within 2 year 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. Following surgery, patients should receive antibiotics for routine dental check-ups for a minimum of two years.
   
e) Any injection into the joint within 3 months of surgery.
II. **INDICATIONS FOR HEMI-ARTHROPLASTY**

1) Hemiarthroplasty may be necessary when the following criteria are met:
   a) Patient meets all of the criteria within TSA; OR
   b) Patient with avascular necrosis of the humeral head without advanced glenoid disease (Kellgren-Lawrence grade 1 or 2), stemmed hemiarthroplasty is often a better option to avoid the risks inherent with the glenoid component; AND
   c) No injection into the joint within 3 months of surgery;

2) **Kellgren-Lawrence Grading System:**
   a) Grade 0: No radiographic features of osteoarthritis
   b) Grade I: Possible joint space narrowing and osteophyte formation
   c) Grade II: Definite osteophyte formation with possible joint space narrowing
   d) Grade III: Moderate multiple osteophytes, definite narrowing of joint space, some sclerosis and possible deformity of bone contour
   e) Grade IV: Large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone contour

3) **CONTRAINDICATIONS**
   a) Any injection into the joint within 3 months of surgery.

III. **REVERSE ARTHROPLASTY (RTSA)**

   This is a device that places the ball on the glenoid side (glenosphere and baseplate) and the socket on the humeral side. It has been used in Europe for decades but recently was approved for use in the US. It has specific indications which are changing constantly as more experience is gained with this concept.

   The original purpose of a RTSA was to allow basic function of a pseudoparalytic shoulder from a chronic rotator cuff tear with arthropathy (or arthritis) in an inactive person over age 65. Because it is associated with a high complication rate (10-50% in primary procedures and as high as 70% in revisions), it should be used with careful consideration. Salvage after failed RTSA is difficult with poor outcomes.

   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.

1) **INDICATIONS FOR REVERSE ARTHORPLASTY:**
   Reverse total shoulder arthroplasty is currently indicated for patients greater than 65 years of age (age is a relative indication) with rotator cuff tear arthropathy, pseudoparalysis, adequate bone stock, no evidence of excessive prior acromioplasty and a functional deltoid.

2) **Treatment of Arthritic Shoulder:**
a) Non-repairable massive (> 2 tendons) rotator cuff tear AND intact deltoid, AND inability to actively elevate the arm above the level of the shoulder (90 degrees) (i.e. nonfunctional cuff tear arthropathy); AND
b) Age > 65: Case-by-case review for patients ages less than 65 years; AND
c) Failure of conservative treatment for greater than 3 months (formal PT for deltoid retraining and minimum of 1 steroid injection; AND
d) Patient must be compliant with instructions and understand long-term activity is limited to basic ADLS; AND
e) IF patient meets criteria but can raise the arm above shoulder level, a stemmed or resurfacing extended articular surface resurfacing device (EAS) (CTA head) may be a better option (i.e. FUNCTIONAL cuff tear arthropathy). This is also an option in those < 60 years old; AND
f) No injection into the joint within 3 months of surgery;

3) CONTRAINDICATIONS
   a) Any injection into the joint within 3 months of surgery.

4) Treatment of fracture or failure TSA:
   a) Acute 3-4 part fractures of proximal humerus with or without concomitant tuberosity as evidence by radiographic findings; AND
   b) Age >65.

IV. REVISION ARTHROPLASTY

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

1) There are two primary reasons for shoulder revision procedures:
   a) conversion of a previous hemiarthroplasty to a total shoulder and treatment of a failed total or
   b) hemiarthroplasty (due to failure of the glenoid).

2) Treatment of failed Total Shoulder Arthroplasty:
   a) Failure of TSA as a result of subsequent non-repairable RCT as evidence by loss of ability to raise the arm; AND
   b) Large to massive non-repairable (stage 3-4 atrophy) RCT on imaging (CT arthrogram); AND
   c) Severe suprascapular neuropathy with associated rotator cuff dysfunction.

3) Revision total shoulder arthroplasty may be necessary when the following are met:
   a) Evidence of a prior total shoulder arthroplasty
   b) Clinical and radiographic evidence of a failed glenoid or humeral component or both (evidence includes radiolucencies around cemented or uncemented glenoid and/or humeral components indicating osteolysis/loosening / instability)
c) Periprosthetic humeral or scapular fracture

d) Persistent pain, loss of function, ADLs

e) Failure of non-surgical treatment OR the possibility of delay may make a revision more complicated with increased risk of peri-operative or post-operative complications

f) Infected prior arthroplasty (as a single- or two-stage procedure, as indicated based on infection chronicity)

g) Negative work up for infection including CRP ESR white count, plus/minus aspiration arthrogram.

4) CONTRAINDICATIONS

a) Prior hemiarthroplasty: in this situation, a hemiarthroplasty removal code and total shoulder arthroplasty code or reverse total shoulder arthroplasty code should be used

b) Insufficient glenoid and/or humeral bone to support a revision component

c) Active or recent history of infection

d) Neurogenic pain syndrome

e) Acromial fracture OR overly thin acromion from prior subacromial decompression

f) Severe osteoporosis as evidenced by radiographic osteopenia, osteomalacia or severe osteoporosis on Dexe scan

g) Non-functioning deltoid or axillary nerve injury / palsy.

V. ADDITIONAL INFORMATION:

1) IMAGING

Nearly all shoulder problems can be diagnosed with adequate history/physical exam AND proper plain radiographic series (typically 4 views, TRUE AP-internal rotation, TRUE AP-external rotation, scapular Y (outlet view), axillary).

Advanced imaging should only be considered when evaluating for a SUSPECTED surgical problem determined from the above. It should not be used to “search” for pathology as MRI and CT (with or without arthrogram) scans often demonstrate asymptomatic abnormalities that are present with increasing frequency with advancing age.

MRI may over-estimate clinically important pathology in many cases yet can miss other treatable conditions and is very dependent on the imaging center and the physician reading the study. Highly trained, high volume Orthopedic shoulder surgeons may interpret studies more accurately than radiologists given their ability to correlate history and physical exam findings with prior experience in surgery when pathology can be confirmed and compared to imaging. CT scan with 3-D reconstructions provide better data on glenoid anatomy and should be considered prior to any primary arthroplasty.
VI. REFERENCES


