Management of Surgical Site Infections: Evidence-Based Systematic Literature Review

Adopted by the American Academy of Orthopaedic Surgeons (AAOS) Board of Directors
June 9, 2018
The American Academy of Orthopaedic Surgeons
2019 Clinical Practice Guideline
on the Management of Surgical Site Infections

Douglas Lundy, MD; Alexander McLaren, MD; Peter F. Sturm, MD; Sudheer Reddy, MD; Gregory S. Stacy, MD; Gwo-Chin Lee, MD; Hrayr Basmajian, MD; Thomas Fleeter, MD; Paul Anderson, MD; Sandra B. Nelson, MD; Joseph Hsu, MD; Kim Child, MD; Carter Cassidy, MD. **AAOS Staff:** William O. Shaffer, MD; Deborah S. Cummings, PhD; Jayson N. Murray, MA; Mukaram Mohiuddin, MPH; Danielle Schulte, MS; Mary DeMars; Kaitlyn Sevarino, MBA; Anne Woznica, MLIS, AHIP; Peter Shores, MPH
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

© 2019 American Academy of Orthopaedic Surgeons
WHAT IS EVIDENCE-BASED MEDICINE?

Evidence-Based Medicine is a Combination of:

- Individual Clinical Experience
- Best External Evidence
- Patient Values and Expectations
WHAT IS EVIDENCE-BASED MEDICINE?

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
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:

- 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

10804 abstracts reviewed. Search performed on 3/13/17

2463 articles recalled for full text review

230 articles included after full text review and quality analysis

8341 articles excluded from title and abstract review

2233 articles excluded after full text review for not meeting the inclusion criteria or not best available evidence
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
FINAL MEETING

The work group is charged with:

- Review of data summaries
- Final recommendation language
- Rationale and risk/harm construction
- Future research
Management of Surgical Site Infections
Systematic Literature Review Overview

- Based on a systematic review of published studies
- Addresses the management of surgical site infections occurring in patients who have undergone orthopaedic surgery
- Highlights limitations in literature and areas requiring future research
- Trained physicians and surgeons are intended users
Use of Imaging

- Limited evidence supports the use of medical imaging in the diagnostic evaluation of patients with a suspected organ/space (i.e. bone, joint, and implant) surgical site infection.

Strength of Recommendation: Limited ★★★★
Cultures

- Strong evidence supports that synovial fluid and tissue cultures are strong rule-in tests for the diagnosis of infection; negative synovial fluid and tissue cultures do not reliably exclude infection.

Strength of Recommendation: Strong 🟢🟢🟢🟢
C-Reactive Protein

- Strong evidence supports that C-reactive Protein is a strong rule-in and rule-out marker for patients with suspected surgical site infections

Strength of Recommendation: Strong ★★★★★
Erythrocyte Sedimentation Rate

- Limited strength evidence does not support the use of ESR, alone, to rule in and rule out surgical site infections due to conflicting data

Strength of Recommendation: Limited ★★★★☆
Clinical Exam for Diagnosis of Surgical Site Infections

- Moderate strength evidence supports that clinical exam (i.e. pain, drainage, fever) is a moderate to strong rule-in test (i.e. high probability of presence of infection, if test is positive) for patients with suspected surgical site infections, but a weak rule-out test

Strength of Recommendation: Moderate ★★★★☆
Strong Evidence of Factors Associated with Increased Risk of SSI

Strong evidence supports that the following factors are associated with an increased risk of infection:

- Anemia
- Duration of Hospital Stay
- Immunosuppressive Medications
- History of Alcohol Abuse
- Obesity
- Depression
- History of Congestive Heart Failure
- Dementia
- HIV/AIDS

Strength of Recommendation: Strong
Increased Associated Risk of SSI

- Moderate strength evidence supports that patients meeting one or more of the following criteria are at an increased risk of infection after hip and knee arthroplasty:
  - Chronic Kidney Disease
  - Diabetes (conflicting evidence)
  - Tobacco Use/Smoking (conflicting evidence)
  - Malnutrition (conflicting evidence)

Strength of Recommendation: Moderate
Limited Evidence of Increased Associated SSI Risk

- Limited strength evidence supports that patients meeting one or more of the following criteria are at an increased risk of infection after hip and knee arthroplasty:
  - Cancer
  - Hypertension (conflicting evidence)
  - Liver Disease (conflicting evidence)

Strength of Recommendation: Limited
Antibiotic Duration for Management of Surgical Site Infections

- Moderate evidence supports that, in the setting of retained total joint arthroplasty, antibiotic protocols of 8 weeks do not result in significantly different outcomes when compared to protocols of 3 to 6-month duration

Strength of Recommendation: Moderate
Rifampin Use for Management of Surgical Site Infections

- Moderate evidence supports that rifampin, as a second antimicrobial, increases the probability of treatment success for staphylococcal infections in the setting of retained orthopaedic implants

Strength of Recommendation: Moderate ★★★★☆
Adjunctive Treatment

- In the absence of reliable evidence, it is the opinion of the work group that adjunctive treatment is of limited value in the management of surgical site infections

Strength of Recommendation: Consensus
Surgical Timing and Percutaneous Drainage

- In the absence of reliable evidence, it is the opinion of the work group that the definitive strategy to successfully treat surgical site infections is thorough debridement

**Strength of Recommendation: Consensus**
Surgical Timing

- In the absence of reliable evidence, it is the opinion of the work group that irrigation and debridement are the cornerstones of successful management of surgical site infections and timely management is crucial, especially in the setting of orthopaedic implants.

Strength of Recommendation: Consensus
Future Research – Medical Imaging

- Most of the literature exploring the imaging of suspected postoperative infections pertains to patients with prosthetic joints, with cohorts of patients whose imaging examinations occurred months to years following surgery. Furthermore, there is a lack of data regarding the sensitivity and specificity of imaging tests for the diagnosis of infections during the first 90 days following surgery as well as surgical site infections not associated with implants.

Future research exploring the diagnostic value of imaging for surgical site infections in patients with or without orthopaedic implants in the early (<90 days) postoperative period is necessary. This could include comparative studies between various imaging modalities which may further clarify the utility of each modality for the diagnosis of suspected surgical site infection.
Future Research – Cultures

- The majority of studies on the role of culture in the diagnosis of surgical site infection stemmed from studies in periprosthetic infection. Development of optimal culture protocols for surgical site infections other than periprosthetic joint infections are needed. Future research directions may also include advanced non-culture based diagnostic modalities including PCR and next generation sequencing.
Future Research – C-Reactive Protein

- Much of the work on inflammatory markers has been focused upon total joint arthroplasty. Future research should focus on identifying more accurate inflammatory markers, and distinguishing a standardized set of criteria and thresholds to aid in the diagnosis of surgical site infection not only as it pertains to PJI but in other cases of SSI.
Future Research – Erythrocyte Sedimentation Rate

- ESR is of limited utility in the diagnosis of SSI as an isolated test. Future investigations will likely examine the use of ESR in combination with other diagnostic markers.
Future Research – Clinical Exam for the Diagnosis of an SSI

- Clinical factors that can be determined from history and physical exam that identify patients at risk for surgical site need further investigation. The possible linkage of persistent fevers and the wound drainage to surgical site infections are needed. Characterization and development of protocols to manage early poorly healing or inflamed wounds are needed.
Future Research
Factors Associated with an Increased Risk of Infection

- Attempts at identifying the optimal length of stay should be continued. Identify optimal discharge pathways for each individual patient. The correlation with early discharge and rates of readmission needs to be assessed. Understand the relative contribution of comorbidity-severity related to the duration of hospital stay.

- The list of immunosuppressive drugs is expanding rapidly and the research on the effects of these newer drugs is needed. Also, additional information about dosing, discontinuing medication before surgery and additional orthopaedic procedures that might be impacted are also needed. Future trials should examine optimal time for discontinuing immunosuppressive medications prior to surgery.
Future Research
Factors Associated with an Increased Risk of Infection

- Further research is needed on assessment tools to assess the relation of alcohol consumption and surgical risk.

- Future research is needed to assess the role of nutrition in the modification of obesity and the effects of high BMI and BMI-associated comorbidities on the risk surgical site infections.

- Needed to see if treatment of depression alters the association between severity of depression and the risk of wound infections. The precise pathophysiology of this correlation is unknown.

- The correlation between adequate control of CHF and the severity of CHF, and the risk of SSI need to be further investigated.

- Future research should focus on preoperative assessment of patients with dementia.

- Ongoing research in HIV/AIDS infection is needed to optimize surgical care of this patient population.
Future Research
Factors Associated with an Increased Risk of Infection

- Future research should evaluate and correlate the severity of renal disease with precise risk of SSI. Additionally, it should use common terminology for renal disease and stratify by dialysis, transplant, and severity of disease.

- Further studies are needed to identify the relationship between the control of diabetes, Hgb A1C, and the risk of post-operative infection.

- Research is needed to define the exact correlation between the extent and length of time of tobacco use and the risk of SSI. Determine role of smoking cessation and reducing the risk of SSI. Further study is needed to delineate the duration of smoking cessation and its impact on the occurrence of SSI.

- Further research is needed to correlate the severity of malnutrition with the concomitant risk of SSI. Also, research into correcting malnutrition and how long after correction will the risk of SSI be reduced. Better definitions of malnutrition should be established via future research.
Future Research
Factors Associated with an Increased Risk of Infection

- Specific analysis between the types, severity and metastasis of cancer needs to be performed to identify the exact correlation between the type of cancer and risk of post op infection.
- Further research is needed to further delineate the correlation between SSI and hypertension and the preoperative optimization of hypertension and its effect on SSI need to be established.
- Further research is needed to further delineate the correlation between SSI and liver disease and cirrhosis.
Future Research – Antibiotic Duration

As the vast majority of research on antibiotic duration currently centers on the topic of periprosthetic joint infections, future research is needed focusing on other orthopaedic settings, like trauma, pediatrics, and spine. Comparative high-quality studies are needed in order to better delineate the term of antibiotics necessary with implant retention.

Also needed are further studies comparing term of antibiotics vs chronic suppression. In addition, future research is needed on antibiotic treatment and duration as related to implant removal. Furthermore, not much data exists on microbes other than Staphylococcus aureus.
Future Research – Rifampin Use

- Future research is needed to define optimal abx protocols in areas other than joint replacement and organisms other than staph. Very little data exists on the optimal antibiotic regimen in relation to orthopaedic surgical site infection, especially when considering implants outside of joint replacement; in addition, when considering microbes other than Staphylococcus.
This Guideline has been endorsed by the following organizations:
Acknowledgements:

**Guideline Work Group:**
Douglas Lundy, *Co-Chair*
Alexander McLaren, MD, *Co-Chair*
Peter F. Sturm, MD
Sudheer Reddy, MD
Gregory S. Stacy, MD
Gwo-Chin Lee, MD
Hrayr Basmajian, MD
Thomas Fleeter, MD
Paul Anderson, MD
Sandra B. Nelson, MD
Joseph Hsu, MD
Kim Chillag, DO

**AAOS Guidelines Oversight Chair:**
Carter Cassidy, MD

**AAOS Clinical Practice Guidelines Section Leader:**
Gregory Brown, MD, PhD

**AAOS Committee on Evidence-Based Quality and Value Chair:**
Kevin Shea, MD

**AAOS Council on Research and Quality Chair:**
Robert H. Quinn, MD

**Additional Contributing Members:**
Douglas Osmon, MD
Eric Hume, MD
Robert Brophy, MD

**AAOS Staff:**
William Shaffer, MD
Deborah Cummins, PhD
Jayson N. Murray, MA
Mary DeMars
Mukarram Mohiuddin, MPH
Danielle Schulte, MS
Peter Shores, MPH
Anne Woznica, MLS
Kaitlyn Sevarino, MBA
AAOS Systematic Review - Management of Surgical Site Infections

• Chen, Antonia F. MD, MBA; McLaren, Alex C. MD


• doi: 10.5435/JAAOS-D-18-00643

• Case Studies
CASE STUDY - HISTORY

• A 56-year-old man presented to the emergency department with surgical wound dehiscence and purulence. Three weeks before presentation, he underwent exchange of the tibial polyethylene insert of his right posterior cruciate substituting total knee arthroplasty for mechanical failure of the polyethylene post. His index knee replacement was performed for osteoarthritis 3 years previously, at which time he reported delayed wound healing treated with local wound care. His medical history includes a bicuspid aortic valve, chronic hepatitis C, and abdominal aortic aneurysm treated with transvascular stent, alcohol abuse (30 oz/wk), and cigarette smoking (42 pk years) (recommendation 6 and 8). He is not currently on any prescription or over-the-counter medications, has no known allergies or adverse reactions to medications, and is actively working as a landscape surveyor.
CASE STUDY – PHYSICAL EXAMINATION

• The patient's height is 5'8" and weight is 165 pounds (body mass index 25.1 kg/m2), with a temperature of 99°F (recommendation 5), a heart rate of 89 beats per minute, a blood pressure of 131/68, a respiratory rate of 16 breaths per minute, and a blood oxygen saturation of 97% on pulseoximetry.

• Findings in the right lower extremity include 2 × 12 cm dehiscence of the central portion of the surgical wound, surrounded by 2 to 6 cm of cutaneous edema, erythema, and desquamating keratin, with areas of purulence and necrosis in the base and along the margins and supra-lateral swelling (recommendation 5) (Figure 1). He had pain with active motion from 0° to 60° of the right knee (recommendation 5) and painless full range of motion of the hip and ankle. The extensor mechanism was intact, and no motor, sensory, perfusion, or pulse deficits were observed.
Figure 1

Preoperative clinical photograph showing the infected total knee.
CASE STUDY – RADIOGRAPHY

- Findings on radiographs of his right knee (recommendation 1) include joint effusion with no soft-tissue masses and a limited radiolucent zone under the posterior condyle of the femoral component only (Figure 2). No additional medical imaging was performed given the patient's presentation (recommendation 1).
Preoperative radiographs showing the patient's infected total knee: (A) AP and (B) lateral.
CASE STUDY – DIAGNOSIS

• Group on PJI, this patient was infected based on four of five positive minor criteria: (1) elevated serum ESR and CRP, (2) elevated synovial fluid WBC, (3) elevated % synovial PMN, and (4) a single positive culture.2
CASE STUDY – SURGICAL MANAGEMENT

• Following informed discussion with the patient, total synovectomy, implant removal with débridement of the underlying bone and surrounding soft tissues, irrigation and placement of a static treatment-dose (tobramycin 3.6 g/vancomycin 2 g/batch) antimicrobial loaded bone cement spacer was performed (Figure 3). In addition to high-dose local antimicrobial delivery, the spacer filled dead space, provided structural stability preventing tissue sheer, achieved bone-spacer interface stability to prevent bone destruction, and maintained the working space/collateral length for the second stage reconstruction.
CASE STUDY – SURGICAL MANAGEMENT

- Intraoperatively, five tissue cultures were taken from the following anatomic sites: two synovium, one posterior capsule, one femoral intramedullary canal, and one tibial canal. No culture swabs were used (recommendation 2). Purulence in the femoral canal was noted. The cultures were incubated aerobically and anaerobically for 14 days (recommendation 2). Because of the risk for atypical/unusual microorganisms, acid-fast bacilli and fungal cultures were performed on select specimens. Acid-fast bacilli and fungal cultures were negative. All cultures were positive for methicillin-sensitive S. aureus and Peptostreptococcus magnus. Medial gastrocnemius flap was performed to cover the 8 × 16 cm anterior soft-tissue defect on POD 3.
Figure 3

Postoperative radiographs after spacer placement: (A) AP and (B) lateral.
CASE STUDY – POST-DEBRIDELEMENT MANAGEMENT

• Postoperatively, the patient was placed in a knee immobilizer and administered cefazolin 2 g IV every 8 hours for 6 weeks. The gastrocnemius flap healed, and serial serum ESR and CRP levels decreased to 11 mm/hr and 4.4 mg/L, respectively, at 6 weeks post-débridement (recommendation 3 and 4). The patient then underwent a 2-week antibiotic holiday followed by aspiration of the right knee. The posttreatment synovial fluid WBC was 211/mL with 61% neutrophils, and the culture was negative after incubation for 14 days (recommendation 2). The patient underwent reimplantation of his right knee replacement at 10 weeks post-débridement using revision components (Figure 4). Three cultures were taken of soft tissues and the bone adjacent to the spacer during the second stage reimplantation procedure; all were negative at 14 days.
Postoperative radiographs after reimplantation: (A) AP and (B) lateral.

Chen, Antonia F.; McLaren, Alex C.
doi: 10.5435/JAAOS-D-18-00643
CASE STUDY – POST-DEBRIDEMENT MANAGEMENT

• After reimplantation, the patient received 14 days of intravenous cefazolin until the intraoperative cultures were reported sterile and was then transitioned to 3 months of oral antimicrobial therapy (not recommendation 9) on the following regimen: (1) oral rifampin 600 milligrams daily for Staphylococcus infection (not Recommendation 10) and (2) trimethoprim/sulfamethoxazol single strength tablets twice a day. He is now off antimicrobials, 1 year after reimplantation, with no signs of infection.
CASE STUDY – DISCUSSION

• This case highlights several recommendations from the CPG that followed from the Systematic Literature Review on the Management of SSIs. The patient had several independent factors that increased his risk for SSI: alcohol abuse (recommendation 6), cigarette smoking (recommendation 8), and liver disease (hepatitis C) (recommendation 8). Diagnostically, the physical findings were consistent with infection (recommendation 5): pain, soft-tissue appearance. CRP and ESR were both elevated. Recommendation 3 specifically identifies CRP as an independent indicator, whereas ESR needs to be taken in combination with other findings (recommendation 4). During the surgical procedure, tissue biopsies were obtained for culture (recommendation 2) and not swabs, and these cultures were held for a minimum of 14 days (recommendation 2) because of the prolonged incubation times needed to propagate bacteria that have been shed from biofilms.
CASE STUDY – DISCUSSION

• Post-débridement, the patient received a full 6-week course of parenteral pathogen-specific antimicrobials and the prereconstruction aspiration for culture was delayed for 14 days after the antimicrobials were stopped to maximize the culture yield (recommendation 2). Serum CRP (recommendation 3) and ESR (recommendation 4) were monitored to document a decrease from the pre-débridement levels, before reimplantation. The patient was treated with an extended period of oral antimicrobials (14 weeks) after the second stage reimplantation. This regimen duration is not addressed in recommendation 8, which applies only to patients that have retained implants.
CASE STUDY – REFERENCES


Free for both iOS and Android
or at www.orthoguidelines.org

Provides easy access to all AAOS:

- Clinical Practice Guidelines
- Full Guideline PDF’s
- Appropriate Use Criteria
- Case Studies
- Clinician Checklists
- Impactful Statements
- Plain Language Summaries
- Evidence-based Databases
- Evidence-based Methods, Appraisals and Standards
Easier access to AAOS Guidelines:
- 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
### Indication Profile

<table>
<thead>
<tr>
<th>Symptom Severity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Mild Symptoms</td>
<td></td>
</tr>
<tr>
<td>- Moderate Symptoms</td>
<td></td>
</tr>
<tr>
<td>- Severe Symptoms</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>American Society of Anesthesiologists’s (ASA) Status (co-morbidities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ASA 1</td>
</tr>
<tr>
<td>- ASA 2</td>
</tr>
<tr>
<td>- ASA 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identifiable Factors that Negatively Affect Healing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Present</td>
<td></td>
</tr>
<tr>
<td>- Absent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identifiable Factors that Negatively Affect Outcome</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Present</td>
<td></td>
</tr>
<tr>
<td>- Absent</td>
<td></td>
</tr>
</tbody>
</table>

### Procedure Recommendations

- **Repair**
- **Non-Operative**
- **Partial Repair and/or Debridement**
- **Reconstruct**
- **Arthroplasty**

**Teardrop Size and Retraction:** Southern California Orthopaedic Institute (SCOI) Classification (Snyder Classification)

- C1 - Small, complete tear
- C2 - Moderate tear
Published Clinical Practice Guidelines

- Acute Achilles Tendon Rupture
- Anterior Cruciate Ligament Injuries
- Carpal Tunnel Syndrome
- 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
- Periprosthetic Joint Infections of the Hip and Knee
- Prevention of Orthopaedic Implant Infections in Patients Undergoing Dental Procedures
- Rotator Cuff Problems
- 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)

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