AAOS
American Academy of Orthopaedic Surgeons

Management of Surgical Site Infections Systematic Literature Review

Peer Review and Public Commentary Report

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Management of Postoperative Surgical Site Infections Evidence-Based Guideline

Overview of Peer Review and Public Commentary

The reviews and comments related to this clinical practice guideline are reprinted in this document and posted on the AAOS website. All peer reviewers and public commenters are required to disclose their conflict of interests. Names are removed from the forms of reviewers who requested that they remain anonymous; however, their COI disclosures still accompany their response.

Peer Review

AAOS contacted 13 organizations with content expertise to review a draft of the clinical practice guideline during the two-week peer review period in January, 2018.

- Seven individuals provided comments via the electronic structured peer review form. No reviewers asked to remain anonymous.
- All seven reviews were on behalf of a society.
- The work group considered all comments and made some modifications when they were consistent with the evidence.

Public Comment

The new draft was then circulated for a two-week public comment period ending on April 4th, 2018.

- AAOS received two comments.
- If warranted and based on evidence, the guideline draft s modified by the work group members in response to the public comments.

Peer Reviewer Key

Each peer reviewer was assigned a number (see below). All responses in this document are listed by the assigned peer reviewer's number.

Table 1. Peer Reviewer Key

Reviewer Number	Name of Reviewer (Required)	What is the name of the society that you are representing?
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)
2	Catherine Roberts, MD	American College of Radiology (ACR)
3	Derek Papp, MD	Arthroscopy Association of North America (AANA)
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association (OTA)
5	Adolph J. Yates, Jr., MD	American Association of Hip and Knee Surgeons (AAHKS)
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)

Peer Reviewer Demographics

Reviewer #	Name of Reviewer (Required)	Primary Specialty	Work Setting	What is the name of the society that you are representing?
1	Michael Glotzbecker, MD	Pediatric Orthopaedics	Academic Practice	Pediatric Orthopaedic Society of North America (POSNA)
2	Catherine Roberts, MD	Radiology	Private Group or Practice	American College of Radiology (ACR)
3	Derek Papp, MD	Sports Medicine	Clinical Hospital	Arthroscopy Association of North America (AANA)
4	Jaimo Ahn, MD, PhD	Trauma	Academic Practice	Orthopaedic Trauma Association (OTA)
5	Adolph J. Yates, Jr., MD	Total Joint	Academic Practice	American Association of Hip and Knee Surgeons (AAHKS)
6	Carlos A. Higuera Rueda, MD	Total Joint	Academic Practice	Musculoskeletal Infection Society (MSIS)
7	Jaimee Haan, PT, CWS	Physical Therapy	Clinical Hospital	American Physical Therapy Association (APTA)

Peer Reviewers' Disclosure Information

All peer reviewers are required to disclose any possible conflicts that would bias their review via a series of 10 questions (see Table 2). For any positive responses to the questions (i.e. "Yes"), the reviewer was asked to provide details on their possible conflict.

Table 2. Disclosure Question Key

Disclosure Question	Disclosure Question Details
A	A) Do you or a member of your immediate family receive royalties for any pharmaceutical, biomaterial or orthopaedic product or device?
B	B) Within the past twelve months, have you or a member of your immediate family served on the speakers bureau or have you been paid an honorarium to present by any pharmaceutical, biomaterial or orthopaedic product or device company?
C	C) Are you or a member of your immediate family a PAID EMPLOYEE for any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?
D	D) Are you or a member of your immediate family a PAID CONSULTANT for any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?
E	E) Are you or a member of your immediate family an UNPAID CONSULTANT for any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?
F	F) Do you or a member of your immediate family own stock or stock options in any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier (excluding mutual funds)
G	G) Do you or a member of your immediate family receive research or institutional support as a principal investigator from any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?
H	H) Do you or a member of your immediate family receive any other financial or material support from any pharmaceutical, biomaterial or orthopaedic device and equipment company or supplier?
I	I) Do you or a member of your immediate family receive any royalties, financial or material support from any medical and/or orthopaedic publishers?
J	J) Do you or a member of your immediate family serve on the editorial or governing board of any medical and/or orthopaedic publication?

Table 3. Peer Reviewer's Disclosure Information

Reviewer #	Name of Reviewer (Required)	Please list your AAOS Customer # below (Required):	A	B	C	D	E	F	G	H	I	J
1	Michael Glotzbecker, MD	536365										
2	Catherine Roberts, MD	1200207										
3	Derek Papp, MD	536344										
4	Jaimo Ahn, MD, PhD	424178										
5	Adolph J. Yates, Jr., MD	21959										
6	Carlos A. Higuera Rueda, MD	536839										
7	Jaimee Haan, PT, CWS		No	No	No	No	No	No	No	No	No	No

Peer Reviewer Responses to Structured Peer Review Form Questions

All peer reviewers are asked 17 structured peer review questions which have been adapted from the Appraisal of Guidelines for Research and Evaluation (AGREE) II Criteria*. Their responses to these questions are listed on the next few pages.

Table 5. Peer Reviewer Responses to Structured Peer Review Questions 1-4

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	1. The overall objective(s) of the guideline is (are) specifically described.	2. The health question(s) covered by the guideline is (are) specifically described.	3. The guideline's target audience is clearly described.	4. The guideline development group includes individuals from all the relevant professional groups.
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)	Strongly Agree	Strongly Agree	Strongly Agree	Neutral
2	Catherine Roberts, MD	American College of Radiology (ACR)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
3	Derek Papp, MD	Arthroscopy Association of North America (AANA)	Strongly Agree	Agree	Strongly Agree	Strongly Agree
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association (OTA)	Agree	Strongly Agree	Strongly Agree	Agree
5	Adolph J. Yates, Jr., MD	American Association of Hip and Knee Surgeons (AAHKS)	Neutral	Neutral	Neutral	Neutral
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)	Agree	Agree	Strongly Agree	Agree
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)	Strongly Agree	Strongly Agree	Strongly Agree	Neutral

Table 6. Peer Reviewer Responses to Structured Peer Review Questions 5-8

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	5. There is an explicit link between the recommendations and the supporting evidence.	6. Given the nature of the topic and the data, all clinically important outcomes are considered.	7. The patients to whom this guideline is meant to apply are specifically described.	8. The criteria used to select articles for inclusion are appropriate.
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
2	Catherine Roberts, MD	American College of Radiology (ACR)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
3	Derek Papp, MD	Arthroscopy Association of North America (AANA)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association (OTA)	Agree	Agree	Agree	Agree
5	Adolph J. Yates, Jr., MD	American Association of Hip and Knee Surgeons (AAHKS)	Disagree	Disagree	Disagree	Disagree
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)	Agree	Agree	Agree	Neutral
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)	Strongly Agree	Disagree	Strongly Agree	Strongly Agree

Table 7. Peer Reviewer Responses to Structured Peer Review Questions 9-12

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	9. The reasons why some studies were excluded are clearly described.	10. All important studies that met the article inclusion criteria are included.	11. The validity of the studies is appropriately appraised.	12. The methods are described in such a way as to be reproducible.
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)	Strongly Agree	Neutral	Strongly Agree	Strongly Agree
2	Catherine Roberts, MD	American College of Radiology	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
3	Derek Papp, MD	Arthroscopy Association of North America	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association	Agree	Agree	Agree	Neutral
5	Adolph J. Yates, Jr., MD	AAHKS	Disagree	Disagree	Neutral	Neutral
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)	Agree	Agree	Neutral	Agree
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)	Strongly Agree	Agree	Agree	Agree

Table 8. Peer Reviewer Responses to Structured Peer Review Questions 13-17

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	13. The statistical methods are appropriate to the material and the objectives of this guideline.	14. Important parameters (e.g., setting, study population, study design) that could affect study results are systematically addressed.	15. Health benefits, side effects, and risks are adequately addressed.	16. The writing style is appropriate for health care professionals.	17. The grades assigned to each recommendation are appropriate.
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
2	Catherine Roberts, MD	American College of Radiology	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
3	Derek Papp, MD	Arthroscopy Association of North America	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association	Agree	Agree	Agree	Agree	Agree
5	Adolph J. Yates, Jr., MD	AAHKS	Neutral	Disagree	Disagree	Disagree	Disagree
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)	Neutral	Agree	Agree	Agree	Neutral
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)	Agree	Strongly Agree	Strongly Agree	Agree	Agree

Peer Reviewers' Recommendation for Use of this Guideline in Clinical Practice

Would you recommend these guidelines for use in clinical practice?

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Would you recommend these guidelines for use in clinical practice? (Required)
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)	Recommend
2	Catherine Roberts, MD	American College of Radiology	Strongly Recommend
3	Derek Papp, MD	Arthroscopy Association of North America	Recommend
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association	Recommend
5	Adolph J. Yates, Jr., MD	AAHKS	Would Not Recommend
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)	Unsure
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)	Recommend

Peer Reviewer Detailed Responses

Reviewer #1, Michael Glotzbecker, MD

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
1	Michael Glotzbecker, MD	Pediatric Orthopaedic Society of North America (POSNA)	A. This represents an impressive amount of work on a difficult topic. The group has done a great job synthesizing a significant amount of information and summarizing it in a structured manner. There are a number of typos which I am sure will be reviewed with the final copy of the document B. In summarizing the statements, there are a few statements/recommendations that are useful statements across all orthopedic procedures, and some are specific to hip/knee procedures. I wonder if separating these and grouping them together would be useful. C. Some things that maybe should be acknowledged/recognized. The CDC definition that is used by this report is appropriate (SSI within 3 months of index procedure). However, over the time period studied in this systematic review, the CDC definition changed from an infection within 1 year of index procedure to less than 3 months. Therefore, the articles studied likely represent a group of patients that have mixed definitions of SSI (i.e. some of the studies included likely have patients diagnosed between 3 months and 12 months of index procedure). D. Also, there is a clear dominance of literature surrounding the management of infections in knee and hip arthroplasty. I think that this is clear when you review the details of the systematic review and the number of patients, but it might be useful as a disclaimer at the summary report to quantify how many studies were included that were from hip/knee arthroplasty vs other orthopedic procedures. Understanding this bias or at least quantifying it might be useful for those that read the summary statement. E. The title of the document is "management of postoperative surgical site infections." Therefore, the assumption is that the goal of the document is to make recommendations for patients that are diagnosed with a SSI and how to manage them (diagnose, treat). The final recommendations include defining SSI risk factors. The question is whether the search strategy was designed to adequately capture all studies that examined preoperative risk factors. If so that is useful information, but the title of the document may be changed...to prevention and management of SSI. However, I would be concerned that the search strategy did not adequately look for all risk factors for SSI as this was not the initial goal of the

			document. In looking at the PICO questions in the appendix, the relevant PICO question is "In those diagnosed with SSI, are there modifiable risk factors associated with optimal outcome." However, the summary of evidence around SSI risk factors in the document describes risk factors for infection, not necessarily risk factors for infection that influence treatment/management success. Therefore, if the search strategy was exhaustive in looking at risk factors, then the PICO question and title of the document should be different. If the search strategy was not exhaustive for SSI risk factors, as it was not the goal of the document, then you may need to consider removal of the risk factor section. Understanding this is difficult as 140 of the articles assessed risk factors, but only a few could be included that were of adequate strength to assess management. F. In the companion statement, I think that most of the statements made in the absence of evidence are reasonable and probably fit with most people's common sense. However, one of the statements suggests that implants should be removed if safe and possible. I think this is probably the most controversial statement. Ultimately many times orthopaedists and infectious disease MDs argue about removing/retaining implants. I would be a bit concerned that this statement coming from the AAOS without adequate evidence would potentially tip the scale a bit. Although I realize it is unlikely to change, I would be more comfortable with a statement suggesting there is no evidence to support either the retention or removal of implants in the setting of SSI.

Workgroup Response

Dear Michael Glotzbecker, MD

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. Thank you, the typos will be corrected.

B. We appreciate the suggestion.

C. We will clarify the CDC's changing definition of SSI and the impact that may have had on the literature used within this guideline.

D. We will add wording to ensure clarity that most of the quality data comes from the arthroplasty literature and that the remaining literature is sparser.

E. The work group agrees that the PICO questions adequately addressed the search for risk factors. We have removed "Postoperative" and adjusted the title to read "Management of Surgical Site Infections".

F. Thank you for your suggestion. The work group agrees that the consensus statement is clear about removing implants, only if "clinically safe and feasible".

2018 SSI Guideline Work Group

Reviewer #2, Catherine Roberts, MD

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
2	Catherine Roberts, MD	American College of Radiology	A. The overall content of the document makes sound recommendations based on the literature. The copy I received for review had page numbers on the table of contents that were different than in the document.

Workgroup Response

Dear Catherine Roberts, MD,

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. Thank you. We will ensure that the table of contents is updated prior to publication.

2018 SSI Guideline Work Group

Reviewer #3, Derek Papp, MD

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
3	Derek Papp, MD	Arthroscopy Association of North America	A. After line 136: please add appropriate stars/grade. This seems to be the only section that doesn't have that. Would add it for uniformity. B. Lines 485/486: add "for instance" around hip fracture because the sentence is mildly unclear. C. Did not see specific recommendations regarding arthroscopic versus open irrigation and debridement. Might recommend adding a section on this if possible. Even if not strongly supported.

Workgroup Response

Dear Derek Papp, MD,

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. The stars and strength of recommendation will be added.

B. “For instance” will be added”

C. Thank you for your suggestion. We did search the literature for the role and timing of arthroscopy in surgery, but did not find good quality literature to support a recommendation. We did, however, create a consensus recommendation (see companion consensus statements) recommending the use of arthroscopic debridement to treat surgical site infections.

2018 SSI Guideline Work Group

Reviewer #4, Jaimo Ahn, MD, PhD

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
4	Jaimo Ahn, MD, PhD	Orthopaedic Trauma Association	A. From the OTA EBQVS Committee represented by William Obremskey, Clay Spitler, Gudrun Mirick and Jaimo Ahn (submitting) Summary of Recommendations There is a review of DM but without discussion of perioperative hyperglycemia. There is a reference to the Endocrine guidelines with link provided. Please consider addressing perioperative hyperglycemia in non-diabetic patients as a fair amount of data indicate that poor perioperative glucose control increases risk of SSI in general surgery and Orthopaedics (PMID 20595135, 22760385, 24662873, 22588532, 22760385). We recommend adding a section on perioperative hyperglycemia (independent of a diagnosis of diabetes mellitus. Methods P20, starting line 628: Acronym for MCID is wrong (they wrote MCII) and then later referred to it as MCI. It is later used correctly. B. Recommendations Lines 918-1027: Radiography- limited evidence –x-ray is considered a first step-neither rules in nor rules out; please consider listing what radiographic findings are associated with infection-e.g. free air, periosteal reaction etc. C. Line 935-936: Radiolabeled Leukocyte imaging-can be useful but routine use is not justified; did the panel consider TC-99M Bone scan as a rule out tool when obtained >1 yr out or PET utility as rule in or rule out but expensive tool or CT/MRI/Ultrasound as a potential modality to identify soft tissue fluid collections and potentially to guide aspiration/biopsy on a case by case basis. Can there be statements as to when in the course of the infection work up these studies would be obtained. AAOS clinical guidelines should encourage the responsible use of expensive tests. D. Clinical Exam in Diagnosis Lines 1139-1160: In the first study included (Pons et al Infected total hip arthroplasty--the value of intraoperative histology Int Orthop. 1999;23(1):34-6.), the methodology may be flawed. In this paper the authors consider a currently or previously painful joint a positive finding to be diagnostic of infection. While pain can certainly be present there are many other reasons why joints hurt. While continued pain warrants an infection workup, the presence of pain should not be considered diagnostic of infection. The authors also include more classic findings for infection in the history including wound drainage or fever, which

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
			seem more appropriate to be included. The remaining study (Bernard et al Value of preoperative investigations in diagnosing prosthetic joint infection: retrospective cohort study and literature review. Scand J Infect Dis. 2004;36(6-7):410-6.) which included only fever and persistent drainage used more appropriate screening questions might be better for inclusion. Prognosis: although the stated factors have been shown to be associated with infection, is it clear that their reversal actually decreases risk (versus presence being associated with risk)? If not, a comment should be made providing this perspective. E. The section on Risks and Harms for the section on Prognostic (staring P186) is unclear. For instance, for Anemia (L1926), no risk is indicated, whereas it is for Duration of Hospital Stay (L1943). This is inconsistent as decreasing Length of Stay and treating Anemia (eg with blood transfusion) both do have risks. For Obesity (L2004), although the reversal of obesity does not pose a risk, the medical treatment does; although it may become cumbersome to state the specific risks of specific medical treatment, that those risks exists and should be considered should be part of the document. Should L2038 state "risk of CHF and SSI" or "CHF and risk of SSI"? F. For CKD, although the relationship between stage and SSI may not be known, do we know what the threshold of CKD was? G. For Malnutrition (2213), the other 3 articles demonstrated "no significant" difference? Were they underpowered? If they were, should the recommendation become stronger? H. Appendix Line 2807: "N organizations were invited to review"… assume that N is a placeholder for an actual number, but this isn't clear.

Workgroup Response

Dear Jaimo Ahn, MD, PhD,

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. Thank you for your suggestion.

B. The work group considers the lack of data to make a recommendation specific to radiography unacceptable, so developed a consensus that was inclusive of all accepted findings consistent with musculoskeletal infection, without evaluating individual findings or combinations of findings therefore does not feel listing specific findings is valid. The rationale has been revised to read: "However Radiography is widely available and inexpensive relative to other imaging modalities, and the consensus of the workgroup is that radiographs be considered as the initial imaging exam for suspected cases of bone and/or implant infection interpreted in combination by a provider with skill and experience in interpretation of musculoskeletal radiographs to assess any and all radiographic features of infection, or other causes of the patient's symptoms, without commenting on or recommending any single finding or combination of findings."

C. These recommendations are outside the scope of this guideline and are more the topic of an Appropriate Use Criteria.

D. We have added the following statement to the Risk/Harms section: "It should be noted that the absence of pain after treatment does not assure the absence of infection."

E. While we understand the issues of the reviewer concerning anemia and LOS, the literature does not bear out the issue.

F. We did attempt to parse out the threshold of CKD, but it was not possible with the data provided in the literature.

G. The recommendation on malnutrition was upgraded to "moderate" from "limited" to account for varying power within the studies finding no significant correlation between malnutrition and SSI risk.

H. Yes, "N" is a number placeholder for the final publication.

2018 SSI Guideline Work Group

Reviewer #5, Adolph J. Yates, Jr., MD

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
5	Adolph J. Yates, Jr., MD	AAHKS	A. The guideline is focused on certain elements important to the diagnosis and treatment of surgical infections. The truth is that many elements are used concurrently, and the decisions based through a semblance of Bayesian analysis. The coordination of those elements and their relative weights in isolation or in combination is not addressed. Generically, the use of the full versus empty circles in the evidence tables provide little nuance per paper. It is recommended that AAOS explore and consider the use of the GRADE methodology and it's EtD (evidence to decision) tables. This would be especially useful in terms of treatment options in that the needed to treat numbers would help to separate relative risk from absolute. This would have had value in the consensus statements dealing with treatment. B. The use of the terms "rule-in" and "rule-out" does not seem appropriate when the primary audience are surgeons with a firm understanding of terms such as sensitivity, specificity and positive or negative predictive value. C. Some "cutting edge" tools are not addressed at the level of the recommendations. Sonication and the questions of low colony counts are one set of questions. The value of alpha defensin is not addressed at the level of a recommendation. The credibility of using test strips for leukoesterase is not addressed at that level either. All three, however, are in common use. D. As to specific recommendations: The language of the culture recommendation is concerning. Certainly, if there is a positive culture, confirmed on a second specimen, it is the sine qua non of tests for infection. Most negative cultures rule-out infection unless there are strong non-correlating findings and tests (draining wound with purulence, elevated CRP, high ell count,etc.). If there are no other concerning findings, a negative culture is highly likely to be reliable. To say otherwise opens the door to concerning medicolegal risks. This recommendation could be modified with phrases that provide such nuance. CRP is a strong rule-in in the absence of other reasons to have an elevated CRP, viral infections, UTI, pneumonia, etc. can all cause significant elevations in the CRP. The recommendation could be edited by adding a phrase such as, "in the absence of other confounding infections". Length of stay correlates with higher risk of

			mortality (ROM)/ severity of illness (SOI) scores as well as likelihood to be transferred to an SSI. Were these confounding variables included in the pulled literature? There is evidence for more complications, including infections, for very short stays. Moving a hospital stay towards an asymptotic zero-day LOS does not guarantee success. E. Regarding diabetes as a risk factor, it is not the disease, but the level of control that is the issue. Guidelines for HgA1c and CDC recommendations for pre-operative glucose levels below 200 are in existence. If the control papers were separated from those looking at all diabetics generically, would that control have been given a higher level of recommendation? F. The length of antibiotic treatment statement ends up implying the arbitrary number of eight weeks, only because of the one paper that added to this literature. Six weeks is the more commonly accepted time period, and a paper from the Mayo clinic compared 4 weeks versus 6 with the latter being superior. Perhaps the recommendation could read "6-8 weeks"? G. In terms of the consensus statements: There is a growing literature more prevalent in Europe that argues for less harm and equivalent outcomes for retaining well in-grown devices. This is where an evidence to decision table would be valuable, in that the harm incurred could be weighed against benefit There can be significant harm in removing components that leave little reconstructable bone and/or requires extensive osteotomies. To say that there is no harm is contradictory. There is a relatively strong literature for the use of dilute sterile betadine. H. The most important reason for the above opinion is that the guideline does not address the concurrent use of multiple diagnostic tools and or therapeutic options.

Workgroup Response

Dear Adolph J. Yates, Jr., MD

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. You are correct in stating that the diagnostic/treatment elements for SSI are used concurrently, rather than individually. The nature of an evidence review requires the parsing out of diagnostic, prognostic, treatment and rehabilitation modalities to review literature that addresses each procedure on its individual efficacy. By no means are we indicating that these procedures should be used in isolation (and it is assumed that the clinician readership understands this, as well).

   Regarding your suggestion to use the GRADE methodology, the AAOS guideline methodology is built upon the GRADE system and their EtD methodology.

B. Sensitivity and specificity is used to calculate rule in and rule out values (i.e. + and – likelihood ratios). Likelihood ratios are an accepted and useful statistic for guideline developers due to their assessment of the utility of a diagnostic test and the likelihood of the presence of a disease in a patient. The sensitivity and specificity for each included study can be reviewed within the data tables; however, the simplicity of comprehending the ability of a test to rule in or rule out disease makes likelihood ratios the current chosen method for AAOS guidelines.

C. Sonication, alpha defensin and leukocyte esterase were included in the literature reviewed and the work group discussed each of them as referenced in the report While these tools are currently finding their place in clinical practice, there was not sufficient data to support recommendations for or against their use.

   On review of the published data the work group did not find evidence to support a higher recommendation for culture as a rule out test. The need for clinical judgment and individualized patient care decisions as stated in the introduction applies to your point on this recommendation.The work group agrees that clarification improved the recommendation so has edited the wording accordingly.

   Length of stay correlates with higher risk of mortality (ROM)/ severity of illness (SOI) scores as well as likelihood to be transferred to an SSI. There is evidence for more complications, including infections, for very short stays. Moving a hospital stay towards an asymptotic zero-day LOS does not guarantee success. Data on LOS shorter than is prudent and safe were not in the publications that were reviewed so the recommendation was not changed, however, we agree that LOS too short to be medically safe could be a harm so added that to the potential harms

D. The definitions/criteria for diabetes and control were included in the data and discussion and the recommendation has been upgraded to “moderate” due to varying power within the included studies finding no association between diabetes and SSI risk.
E. The recommendation was specific to only conventional vs prolonged antimicrobial duration for retained implants based on 8-week data for the shorter duration. The work group acknowledges common practice and that the IDSA CPG duration in this scenario is 4-6 weeks. The work group also acknowledges that there are no data that compare 6 to 8 weeks so an equivalency statement cannot be made. The recommendation has not been changed but your point about 6-week common practice and IDSA guideline will be added
F. The work group agrees that if it is not safe and feasible to remove a solidly fixed implant, it should not be removed, as written in the Consensus Statement on implant removal and further, agrees there

is potential harm from the recommendation which is that the infection could be unsuccessfully treated if the implant is retained and what may have been determined to be safe and feasible may not be, leading to structural compromise the harms section will be reworded accordingly.

The work group agrees that there is evidence supporting dilute betadine effectiveness for prevention of SSI, the same is not true for treatment of established SSI. The methodology specifically isolates factors to determine their independent effect. As stated in the consensus disclaimer, clinical judgment is expected when applying the recommendations including consideration of multiple concurrent factors and treatments

G. The methodology specifically isolates factors to determine their independent effect. As stated in the consensus disclaimer, clinical judgment is expected when applying the recommendations including consideration of multiple concurrent factors and treatments

2018 SSI Guideline Work Group

Reviewer #6, Carlos A. Higuera Rueda, MD

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
6	Carlos A. Higuera Rueda, MD	Musculoskeletal Infection Society (MSIS)	A. I applaud the effort of the AAOS to do this systematic literature review. Despite the meticulous process and best intentions of the work group, I believe there are certain flaws on the methodology that can affect the recommendations. In some cases such as the one that evaluates the length of antibiotic use, there is simply not enough evidence to make any recommendations at all. B. These recommendations may have a significant impact on practices and reimbursement and therefore must be carefully reviewed. These are the following changes / suggestions I made: Line 110: "use of ESR alone" C. Line 144: I'm concerned about this recommendation in particular, when multiple studies included to analyze such risk factors are clearly underpowered, mainly the ones that have negative results. I suggest excluding the studies with low numbers to avoid the divergent results. This was specifically true for Diabetes, Smoking and Malnutrition. D. Another issue is the combination of the type of surgical interventions in the analysis. It is completely different to have SSI after emergent procedures such fracture care than elective ones. The combination of such procedures or populations limit the validity of the results and recommendations. I suggest having independent analysis for fracture care, elective arthroplasty, spine, etc... E. Line 157: All the studies included for this recommendation where low quality according to the methodology described. Based on such analysis I believe it is not appropriate to have a recommendation at all. Simply state that there is not enough evidence to show a difference in any time of antibiotic treatment. Otherwise, as is, this recommendation may have serious repercussions on reimbursement or coverage of antibiotic treatment after SSI. F. Line 165: I believe it is important to clarify the type of bacteria that caused the SSI. If the recommendation is to be made, then the type of bacteria described on the studies has to be taken into account. I agree that the evidence does not show a benefit of the Rifampin use on ALL SSI, but certainly there is evidence that does on specific types of infection (bacteria).

			G. Line 1070: Please clarify that it was the use of therapeutic antibiotics, not prophylactic (preoperative antibiotics). It is difficult to see the studies (authors) on the table that shows the included studies for the analysis for Diabetes.

Workgroup Response

Dear Carlos A. Higuera Rueda, MD,

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. This recommendation for duration of antimicrobial therapy in the setting of a retained total joint arthroplasty applies only to short term (8 weeks vs long term (3-6mths)) and was based on one high quality study and two low quality studies that were all in agreement. The work group has decided to not change this recommendation. We can use low quality articles to construct recommendations, pending we have more than one low quality article that addresses the same intervention and outcomes.

B. The methodology isolates each factor being studied to determine their independent effect and documents the findings as such throughout. Adding “alone” is consistent with that and will be added.

C. The recommendations for diabetes, malnutrition, and tobacco use has been upgraded to “moderate” due to varying power within the included studies finding no association between diabetes and SSI risk.

D. The work group assumes your comments are not intended to apply to the 5 diagnostic and 3 risk factor recommendations that in the work group’s opinion, they are independent of surgical procedure or local host issues. The two treatment recommendations apply only to the specific clinical scenario cited in the recommendation. The work group agrees that SSI severity and treatment can vary by surgical procedure and local host status but that stratification was not included in this systematic review.

E. The evidence for this recommendation is Moderate from one high quality study and two low quality studies which were all in agreement. The work group stands by the recommendation as written based on the evidence.

F. The recommendation for Rifampin use as a second antimicrobial in the setting of retained implants is specific to staphylococcal infections. The evidence is from one high quality study and low-quality study that agree. We agree with you and the recommendation is written accordingly.

G. Yes “prior antibiotics use” and “antibiotic therapy” mean therapeutic or treatment, not prophylaxis, “antibiotic use” will be changed to “antibiotic therapy”. The table for Diabetes studies will be adjusted for readability; thank you.

2018 SSI Guideline Work Group

Reviewer #7, Jaimee Haan, PT, CWS

Reviewer #	Name of Reviewer (Required)	What is the name of the society that you are representing?	Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline:
7	Jaimee Haan, PT, CWS	American Physical Therapy Association (APTA)	A. The methodology of this guideline is sound and well described in this document. The writing style makes this guideline easy to use. I would consider putting all the written content that a clinician may want to reference in a section of the overall document separated by a border that would allow clinicians to easily use this document as a reference. Currently there is content that would be useful in day to day practice that is separated by tables of data that makes it time consuming to scroll through the document to find the usable content. There is also a significant amount of research that needs to be done to strengthen the guideline in the future. While this guideline highlights the research opportunities throughout the document, it would be nice if research needs were summarized in a specific place within the document so that future researchers could easily reference these recommendations. Question #1: Objectives are specifically described under the "goals and rationale" section. Question #2: The health questions are specifically described as PICO questions in appendix III. Question #3: target audience is clearly described under the "intended users" section. Question #4: Ideally, the guideline development group would have included an infectious disease physician, a plastic surgeon and a wound healing expert. Question #5: The link between the recommendation and the supporting evidence is outlined in the "defining the strength of recommendations" section. Question #6: While irrigation and debridement was considered as well as NPWT, referral to a wound specialist and the use of evidence-based wound management to address post-surgical site infections in the event the infection was limited to the soft tissue was not addressed. Question #7: The patients whom this guideline is meant to apply are described in the "patient population" section. Question #8: Articles chosen are appropriate. Because studies were limited to post-op surgical site research only, there was limited evidence to support the use of adjunctive treatments for surgical site infections. Including related articles that were not specifically post op with the follow-

			up restrictions, more conclusions may have been made regarding adjunctive treatments. With that said, limiting the research to post op surgical site articles with adequate follow-up ensures the evidence can without a doubt be used to make sound clinical decisions. Question #9: Exclusion criteria are clearly described in the study selection criteria section. Question #10: The methodology for the literature review is sound and clearly documented. Question#11: The appraisal methods to determine validity is appropriate and varies by research design with are appropriate and clearly outlined. Question #12: Methods are outlined clearly making this literature review reproducible. Question #13: The statistical methods are appropriate and outlined clearly in the statistical method section. Question#14: The variables were systemically addressed by using the most appropriate appraisal tool based on the parameters that could affect study results. Question#15: Health benefits, side effects and risks are addressed. High, moderate and low risk for surgical site infections is outlined and rationale is given in the Prognostic Indicators for Risk of Surgical Site Infections section. Risks of each intervention are also outlined throughout the document. B. Question #16: The writing style is appropriate; however, by separating the literature review (CPG) and the consensus statement, the documents become less user friendly for clinicians. While the separation makes the development process cleaner, implementation becomes more challenging. Recommend combining documents for dissemination in a way that allows clinicians to reference one "guideline" that clearly outlines recommendations, both those supported by evidence and those that are recommendations based on expert opinion. Question #17: The grades assigned to each recommendation are appropriate and clearly defined in the defining the strength of the recommendations section. Comments on Companion Consensus Statements C. The consensus statement would be more user-friendly if merged with the CPG so that all recommendations both supported by evidence and developed based on expert opinion were in one place for the user. While the PICO question specifically acknowledges wound care as a part of the multi-disciplinary team, the consensus statement recommends use of a multi-

			disciplinary team but does not acknowledge the value input from a wound specialist/physical therapist would add to the care of patients with post op surgical site infections. Because wound care was specifically listed in the PICO question, it begs the questions as to whether wound care was specifically left out of the consensus statement as each of the other professionals and adjunctive treatments were addressed or acknowledged elsewhere in the CPG or consensus statement.

Workgroup Response

Dear Jaimee Haan, PT, CWS,

Thank you for your expert review of the Clinical Practice Guideline on the Postoperative Management of Surgical Site Infection. We will address your comments by guideline section in the order that you listed them.

A. Thank you for your suggestion. We are working on improving the format of the guideline to ensure that is more user-friendly.

B. This is a great suggestion. We will reconsider the separation of the evidence-based recommendations and consensus recommendations.

C. The committee agrees that wound care specialists and physical therapists can add value to the multidisciplinary team wound care was considered in most settings to be in the realm of plastic surgery by committee and not defined otherwise, however when a plastic surgeon is not available or in the uncommon event when other providers that focus their practice on wound care are available wound care is delivered by others than plastic surgeons. While not an intentional omission the committee recognizes that physical therapy is important considering the deconditioning, lost strength and decreased range of motion encountered in many patients with SSI and in many situations that therapy modalities are often implemented to manage edema. The consensus statement was edited accordingly.

2018 SSI Guideline Work Group

Public Commenter Demographics

Name of Reviewer (Required)	BARRY D. BRAUSE, M.D.	Antonia Chen, MD, MBA
Please list your primary specialty (Required):	Infectious Diseases	Total Joint
Please list your work setting (Required):	Clinical Hospital	Academic Practice
May we list you as a peer reviewer in the final guideline...	Yes	Yes
Are you reviewing this guideline as a representative of a...	No	No
Please list your AAOS Customer # below (Required):		617852
A) Do you or a member of your immediate family receive royalties for any pharmaceutical, biomaterial or orthopaedic product or device?	No	
B) Within the past twelve months, have you or a member of your immediate family served on the speakers bureau or have you been paid an honorarium to present by any pharmaceutical, biomaterial or orthopaedic product or device company?	No	
C) Are you or a member of your immediate family a PAID EMPLOYEE for any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?	No	
D) Are you or a member of your immediate family a PAID CONSULTANT for any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?	No	
E) Are you or a member of your immediate family an UNPAID CONSULTANT for any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?	No	
F) Do you or a member of your immediate family own stock or stock options in any pharmaceutical, biomaterial or	No	

Name of Reviewer (Required)	BARRY D. BRAUSE, M.D.	Antonia Chen, MD, MBA
orthopaedic device or equipment company, or supplier (excluding mutual funds)		
G) Do you or a member of your immediate family receive research or institutional support as a principal investigator from any pharmaceutical, biomaterial or orthopaedic device or equipment company, or supplier?	No	
H) Do you or a member of your immediate family receive any other financial or material support from any pharmaceutical, biomaterial or orthopaedic device and equipment company or supplier?	No	
I) Do you or a member of your immediate family receive any royalties, financial or material support from any medical and/or orthopaedic publishers?	No	
J) Do you or a member of your immediate family serve on the editorial or governing board of any medical and/or orthopaedic publication?	No	

Public Comment Responses to Structured Public Comment Form Questions

Name of Reviewer (Required)	BARRY D. BRAUSE, M.D.	Antonia Chen, MD, MBA
1. The overall objective(s) of the guideline is (are) specifically described.	Agree	Agree
2. The health question(s) covered by the guideline is (are) specifically described.	Agree	Agree
3. The guideline's target audience is clearly described.	Agree	Agree
4. The guideline development group includes individuals from all the relevant professional groups.	Agree	Strongly Agree
5. There is an explicit link between the recommendations and the supporting evidence.	Neutral	Agree
6. Given the nature of the topic and the data, all clinically important outcomes are considered.	Disagree	Agree
7. The patients to whom this guideline is meant to apply are specifically described.	Agree	Agree
8. The criteria used to select articles for inclusion are appropriate.	Agree	Agree
9. The reasons why some studies were excluded are clearly described.	Neutral	Agree
10. All important studies that met the article inclusion criteria are included.	Neutral	Agree
11. The validity of the studies is appropriately appraised.	Agree	Agree
12. The methods are described in such a way as to be reproducible.	Neutral	Agree
13. The statistical methods are appropriate to the material and the objectives of this guideline.	Neutral	Agree
14. Important parameters (e.g., setting, study population, study design) that could affect study results are systematically addressed.	Agree	Agree
15. Health benefits, side effects, and risks are adequately addressed.	Disagree	Agree
16. The writing style is appropriate for health care professionals.	Strongly Agree	Agree
17. The grades assigned to each recommendation are appropriate.	Agree	Agree
Would you recommend these guidelines for use in clinical practice?	Recommend	Recommend

Public Comment Open Responses

Name of Reviewer (Required)	BARRY D. BRAUSE, M.D.	Antonia Chen, MD, MBA
Public Comment Open Responses	line 1083 There are known harms associated with implementation of this recommendation Longer courses of high dose antibiotic therapy, such as IV therapy (for 8 weeks compared to 6 weeks), are associated increased serious side effects such as (1) profound neutropenia which can result in systemic sepsis and (2) C. difficile enterocolitis Longer courses of lower dose antibiotic therapy (such as 3-6 months compared to 8 weeks) increase the risk of developing (1) C. difficile enterocolitis and (2) infection due to more resistant bacteria due to suppression of normal skin, g-I and vaginal flora by the antibiotic selected for treatment of the prosthetic joint infection	`For the antibiotic duration recommendation (Page 32, Lines 1055-1083), I disagree with a few aspects. 1. This RCT should be included in the analysis: Frank JM, Kayupov E, Moric M, Segreti J, Hansen E, Hartman C, Okroj K, Belden K, Roslund B, Silibovsky R, Parvizi J, Della Valle CJ; Knee Society Research Group. The Mark Coventry, MD, Award: Oral Antibiotics Reduce Reinfection After Two-Stage Exchange: A Multicenter, Randomized Controlled Trial. Clin Orthop Relat Res. 2017 Jan;475(1):56-61. This study supports the utilization of 3 months of antibiotics when compared to no antibiotics after two-stage exchange. Thus, suggesting 8 weeks of postoperative antibiotics may be inadequate for reducing the infection risk and goes against the comment that "There are no known harms associated with implementation of this recommendation." 2. Secondly, from a provider standpoint, this guideline may limit the ability of obtaining coverage of antibiotic administration in patients with comorbidities and retained infected implants that may preclude surgical management, as these patients may require lifelong antibiotic suppression. 3. Thus, I recommend modifying the recommendation as follows: Moderate evidence supports that, in the setting of retained total joint arthroplasty, antibiotic protocols of 2-6-month duration may reduce the risk of subsequent infection. For Page 32, Line 1096, I would recommend capitalizing the word Staphylococcal and placing it in italics.

Appendix A – Structured Peer Review/Public Comment Form

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The overall objective(s) of the guideline is (are) specifically described.	○	○	○	○	○
2. The health question(s) covered by the guideline is (are) specifically described.	○	○	○	○	○
3. The guideline's target audience is clearly described.	○	○	○	○	○
4. The guideline development group includes individuals from all the relevant professional groups.	○	○	○	○	○
5. There is an explicit link between the recommendations and the supporting evidence.	○	○	○	○	○
6. Given the nature of the topic and the data, all clinically important outcomes are considered.	○	○	○	○	○
7. The patients to whom this guideline is meant to apply are specifically described.	○	○	○	○	○
8. The criteria used to select articles for inclusion are appropriate.	○	○	○	○	○
9. The reasons why some studies were excluded are clearly described.	○	○	○	○	○
10. All important studies that met the article inclusion criteria are included.	○	○	○	○	○
11. The validity of the studies is appropriately appraised.	○	○	○	○	○
12. The methods are described in such a way as to be reproducible.	○	○	○	○	○
13. The statistical methods are appropriate to the material and the objectives of this guideline.	○	○	○	○	○
14. Important parameters (e.g., setting, study population, study design) that could affect study results are systematically addressed.	○	○	○	○	○
15. Health benefits, side effects, and risks are adequately addressed.	○	○	○	○	○
16. The writing style is appropriate for health care professionals.	○	○	○	○	○
17. The grades assigned to each recommendation are appropriate.	○	○	○	○	○

Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline.

Would you recommend these guidelines for use in clinical practice?*

- Strongly Recommend
- Recommend
- Would Not Recommend
- Unsure

Additional Comments: