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Commentary

Update to the Centers for Disease Control and Prevention and the Healthcare Infection Control Practices Advisory Committee Guideline for the Prevention of Surgical Site Infection (2017): A summary, review, and strategies for implementation

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Surgical site infections remain a common cause of morbidity, mortality, and increased length of stay and cost amongst hospitalized patients in the United States. This article summarizes the evidence used to inform the Centers for Disease Control and Prevention and the Healthcare Infection Control Practices Advisory Committee Guideline for the Prevention of Surgical Site Infection (2017), and highlights key updates and new recommendations. We also present specific suggestions for how infection preventionists can play a central role in guideline implementation by translating these recommendations into evidence-based policies and practices in their facility.

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Despite recent advances in infection prevention efforts, surgical site infections (SSIs) remain a common cause of morbidity, mortality, and increased length of stay and cost amongst hospitalized patients.¹ The Centers for Disease Control and Prevention (CDC) health care-associated infection (HAI) prevalence survey estimated that there were almost 160,000 SSIs amongst inpatients during 2011 in the United States, making SSI the most common HAI.² One study found that patients with an SSI were twice as likely to die, 60% more likely to spend time in an intensive care unit, and 5 times more likely to be readmitted to a hospital when compared with other patients undergoing surgery who did not have an SSI.³ SSIs are also responsible for substantial additional hospital expenses, with the average cost per infection ranging from approximately \$5,000-\$13,000.⁴ Overall, it is estimated that SSIs account for \$3.5-\$10 billion annually in health care expenditures based on the consumer price index.⁵ Research also suggests that approximately 55% of SSIs may be preventable with appropriate implementation of evidence-based strategies.⁴

GUIDELINE DEVELOPMENT

The CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) recently published an update to their guidelines for prevention of SSI.⁵ These guidelines are not comprehensive, as stated by the authors, and prevention strategies from the 1999 guidelines still apply; however, the updated document provides recommendations for SSI prevention based on new evidence since the prior publication.⁶ The previous version of the guidelines (1999)⁶ was mostly informed by expert opinion, whereas the updated guidelines (2017)⁵ are evidence-based and were developed based on a systematic review of more than 5,000 studies published between 1998 and 2014. The CDC HICPAC adopted the Grading of Recommendations, Assessment, Development, and Evaluation approach⁷ to systematically evaluate the evidence used to inform the guidelines. As shown in [Table 1](#), recommendations are categorized as either IA, IB, IC, II, or No recommendation/unresolved. A IA categorization means that it is a strong recommendation supported by high- to moderate-quality evidence suggesting net clinical benefits or harms, whereas a II categorization means that it is a weak recommendation supported by any-quality evidence suggesting a tradeoff between clinical benefits and harms. The aim of this report is to highlight key updates and new recommendations from the CDC Guideline for the Prevention of Surgical Site Infection (2017)⁵ and to present them in the perspective of infection preventionists (IPs)

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Table 1
Categorization scheme for recommendations from the Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection (2017)*

Category	Rationale
IA	A strong recommendation supported by high- to moderate-quality evidence, suggesting net clinical benefits or harms
IB	A strong recommendation supported by low-quality evidence suggesting net clinical benefits or harms; or an accepted practice supported by low to very low-quality evidence
IC	A strong recommendation required by state or federal regulation
II	A weak recommendation supported by any quality evidence suggesting a tradeoff between clinical benefits and harms
No recommendation/ unresolved	An unresolved issue for which there is either low- to very-low-quality evidence with uncertain trade-offs between benefits and harms or no published evidence on outcomes deemed critical to weighing the risks and benefits of a given intervention

*Adapted from reference 7.

Table 2
Summary of updated, key recommendations from Centers For Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection (2017)

Recommendation	Strength of evidence*
Parenteral antimicrobial prophylaxis	
Administer antimicrobial agents only when indicated based on published guidelines	Category IB
Time administration such that bactericidal concentration is established in serum and tissues at initial incision	
For caesarean sections, administer the appropriate agent before skin incision (vs at cord clamping)	Category IA
Nonparenteral antimicrobial prophylaxis	
Consider use of triclosan-coated sutures	Category II
Glycemic control	
Implement perioperative glycemic control using blood glucose target levels <200 mg/dL in patients with and without diabetes	Category IA
Normothermia	
Maintain perioperative normothermia	Category IA
Oxygenation	
Administer increased fraction of inspired oxygen intraoperatively and in the immediate postoperative period following extubation for all patients with normal pulmonary function undergoing general anesthesia with endotracheal intubation	Category IA
Antiseptic prophylaxis	
Instruct patients to perform full body shower or bath the night before surgery (with either soap or an antiseptic agent)	Category IB
Intraoperative skin preparation should be performed with an antiseptic agent containing alcohol unless contraindicated	Category IA
Consider intraoperative irrigation of deep or subcutaneous tissues with aqueous iodophor solution	Category II

*Adapted from reference 7.

Table 3
Strategies determined to be unnecessary in the prevention of surgical site infections

Strategy	Strength of evidence
Antimicrobial prophylaxis after surgical closure (clean and clean-contaminated procedures)	Category IA
Topical antimicrobial agents applied to the surgical incision	Category IB
Autologous, platelet-rich plasma	Category II
Antimicrobial sealant following intraoperative skin preparation	Category II
Plastic adhesive drapes for antisepsis	Category II
Withholding transfusion of necessary blood products (question posed for patients undergoing prosthetic joint arthroplasty)	Category IB

with an emphasis on how IPs can promote the adoption of these evidence-based policies and practices into routine practice.

IMPLEMENTATION SCIENCE

Implementation science is defined as “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice.”⁸ As described by Saint et al,^{9,10} there are 3 main components that influence a decision to adopt and implement an infection prevention policy, practice, or guideline recommendation: practice characteristics (including cost, evidence, and usability), the organization (including leadership, personnel, and resources), and the environmental context (including public reporting and pay-for-performance). This conceptual framework is informative, but Pronovost et al¹¹ went 1 step further to develop an action-oriented model. Their strategy for translating evidence into practice includes summarizing the evidence, identifying local barriers to implementation, measuring performance, and ensuring all patients receive the interventions by engaging, educating, executing, and evaluating.¹¹ For each new recommendation to prevent SSI, the suggestions provided here for guideline implementation are rooted in these theories of implementation science.

RECOMMENDATIONS

The CDC Guideline for the Prevention of Surgical Site Infection 2017⁵ covers 14 main domains, including a new section on prosthetic joint arthroplasty. An overview of new or changed recommendations and their corresponding levels of evidence are shown in [Tables 2 and 3](#). It should also be noted that 25 of the 42 statements assessed were classified as “No recommendation/unresolved issue,” suggesting that more high-quality research in this area is necessary. It is important to recognize that this does not necessarily mean a recommendation from the prior guideline has no merit or should be discontinued. Key recommendations and the evidence used to inform each statement are summarized in the section below. We also highlight what is new, what is missing, and how the specific recommendations in the updated CDC guideline⁵ relate to existing guidelines endorsed by other organizations and associations ([Table 4](#)).

PARENTERAL ANTIMICROBIAL PROPHYLAXIS

Antimicrobial prophylaxis is an important strategy in SSI prevention. When indicated, a single dose of an appropriate antimicrobial agent should be administered before the initial

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