Multifaceted intervention associated with modest decrease in surgical site infections

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Implementation of a pre-surgical intervention that included screening for the bacteria *Staphylococcus aureus*, treating patients who were positive for this bacteria, and the administration of antibiotics based on these culture results was associated with a modest reduction in *S. aureus* surgical site infections, according to a study in the June 2 issue of *JAMA*.

S. aureus carriage increases the risk of *S. aureus* surgical site infections (SSIs). The risk for these infections may be decreased by screening patients for nasal carriage of *S. aureus* and decolonizing carriers during the preoperative period. In addition, perioperative prevention with agents such as the antibiotic vancomycin may reduce rates of methicillin-resistant *S. aureus* (MRSA) SSIs. Previous studies suggested that a bundled intervention was associated with lower rates of *S. aureus* SSIs among patients having cardiac or orthopedic operations, according to background information in the article.

Loreen A. Herwaldt, M.D., of the University of Iowa Carver College of Medicine, Iowa City, and colleagues evaluated whether the implementation of an evidence-based bundle is associated with a lower risk of *S. aureus* SSIs in patients undergoing cardiac operations or hip or knee replacement or reconstruction. Twenty hospitals in 9 U.S. states participated in this study; rates of SSIs were collected for a median of 39 months during the pre-intervention period and a median of 21 months during the intervention period.

Patients whose preoperative nasal screens were positive for MRSA or

methicillin-susceptible *S. aureus* (MSSA) were asked to apply the antibiotic mupirocin intranasally twice daily for up to 5 days and to bathe daily with chlorhexidine-gluconate (CHG; an antimicrobial agent) for up to 5 days before their operations. MRSA carriers received the antibiotics vancomycin and cefazolin or cefuroxime for perioperative prophylaxis; all others received cefazolin or cefuroxime. Patients who were MRSA-negative and MSSA-negative bathed with CHG the night before and morning of their operations. Patients were treated as MRSA-positive if screening results were unknown.

After a 3-month phase-in period, bundle adherence remained constant at 83 percent (full adherence, 39 percent; partial adherence, 44 percent). The complex (deep incisional or organ space) *S. aureus* SSI rates decreased significantly among patients in the fully adherent group compared with the pre-intervention period, but rates did not decrease significantly in the partially adherent or nonadherent group.

Overall, 101 complex *S. aureus* SSIs occurred after 28,218 operations during the pre-intervention period and 29 occurred after 14,316 operations during the intervention period (average rate per 10,000 operations, 36 for pre-intervention period vs 21 for intervention period). The rates of complex *S. aureus* SSIs decreased for hip or knee arthroplasties (difference per 10,000 operations, -17) and for cardiac operations (difference per 10,000 operations, -6).

"Even though the baseline rate of complex *S. aureus* SSI was low (0.36 per 10,000 operations), the full adherence rate was only 39 percent, and hospitals had implemented some bundle elements before the study began, rates of complex *S. aureus* SSIs decreased significantly," the researchers write. "Given that approximately 400,000 cardiac operations and 1 million total joint arthroplasties are performed in the United States each year, numerous *S. aureus* SSIs, which can have catastrophic consequences, may be preventable. Moreover, 1 SSI adds from $13,000

to $100,000 to the cost of health care. Thus, implementation of this bundle might reduce patient morbidity and the costs of care substantially."

In an accompanying editorial, Preeti N. Malani, M.D., M.S.J., of the University of Michigan Health System, Ann Arbor, and Associate Editor, *JAMA*, writes that although this study is a noteworthy addition to a growing body of high-quality infection prevention trials, many questions remain.

"Although *S. aureus* remains the principal pathogen in terms of prevalence and associated morbidity, many other organisms also cause SSIs. As such, decolonization of MSSA and MRSA can be only one aspect of SSI prevention. Although the current findings demonstrate a decrease in *S. aureus* SSIs, the authors did not find a decrease in gram-negative SSIs or complex SSIs caused by any pathogen. This finding might reflect the overall low rate of infection, but also is a poignant reminder that additional strategies are still needed."

"Public reporting and nonpayment for preventable complications (including some SSIs) have intensified efforts to eliminate infections—'to get to zero.' The low-hanging fruit for SSI prevention has been picked and incremental decreases are unlikely to come from simple interventions. Although getting to zero is unlikely to be achievable, efforts that move closer to this elusive goal hold tremendous value for clinicians, hospitals, payers, and, most importantly, patients."

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