

Overview of Recent Issues and Advances in Infection Prevention



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In March 2016, the Centers for Disease Control and Prevention published the latest update of the National and State Healthcare-Associated Infections Progress Report, which reflected 2014 health care–associated infection (HAI) data submitted to the National Healthcare Safety Network.¹ The report highlights some of the recent advancements in HAI reduction in the United States and serves as a reference on the progress at the national and state level. Two of the HAIs discussed in the report are colon and abdominal hysterectomy surgical site infections (SSIs), the two surgeries mandated for reporting to the Centers for Medicare & Medicaid Services Inpatient Quality Reporting Program. Between 2008 and 2014, there was a 2% reduction in SSIs after colon surgery and a 17% reduction in SSIs after abdominal hysterectomy.¹ Although these reductions are promising, there is more work to be done.

CONTAMINATION AND PATIENT RISK

Many quality improvement and infection prevention programs have implemented surgical bundles, addressing preoperative, intraoperative, and postoperative interventions to reduce SSI risk. Bundles are created based on current literature, guidelines, national recommendations, and regulatory standards. It requires multidisciplinary teamwork to evaluate current practices and processes as well as commitment to address and change practice gaps. Data on SSIs from the National Healthcare Safety Network should be the driving force for perioperative professionals to prioritize goals, objectives, and action plans. Colon SSIs should be a priority when determining interventions to reduce intraoperative contamination and address the unique risk factors in this patient population. Several bundled approaches to reduce colon SSIs have been published and outline the multiple factors that place these patients at high risk.^{2,3}

From an infection prevention perspective, the surgical suite is a unique environment that requires detailed attention to infection prevention practices. The care involves cleaning

procedures, disinfection and sterilization processes, proper use of antiseptics, aseptic technique, equipment processing, care of surgical instruments, adherence to appropriate surgical attire, storage of sterile supplies, and use of innovative decontamination technologies. Focus on the environment has substantially increased because studies show air and environmental surfaces are sources for cross-contamination and cluster outbreaks.^{4,5}

Failed disinfection and sterilization processes have caused numerous outbreaks related to contaminated endoscopes and instruments.^{6,7} There have been multiple incidents of carbapenem-resistant Enterobacteriaceae infections occurring in patients undergoing endoscopic retrograde cholangiopancreatography in the United States.⁸ In 2015, widely publicized outbreaks engaged infection preventionists, endoscopy practitioners, OR personnel, and sterile processing staff members to work to improve cleaning, disinfection, and sterilization processes.

Outbreaks of nontuberculous *Mycobacterium* associated with heater-cooler units used in cardiac surgery have been another recent area of focus. In these outbreaks, heater-cooler units released *Mycobacterium chimaera* into the air and surrounding OR environment, which subsequently contaminated the surgical incision.⁹ After these outbreaks, both the Centers for Disease Control and Prevention and equipment manufacturers recommended routine equipment culturing as a means to monitor proper cleaning and disinfection of this equipment. The infections after duodenoscopy and the *M chimaera* outbreaks illustrate the risks that a patient undergoes during surgery related to the maintenance of the environment and equipment. They also illustrate the need for strong teamwork between infection preventionists and surgical staff members.

EMERGING TRENDS AND TECHNOLOGIES

New environmental decontamination technologies have emerged that may help address the infection risks associated

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with the surgical environment. Researchers are evaluating the efficacy of ultraviolet light and hydrogen peroxide vapor for disinfection as a supplement to manual cleaning, which can potentially disinfect surfaces in a short period of time.^{10,11} In addition to improving the cleaning of the OR environment, there may be the potential to incorporate antimicrobial surfaces into the OR environment. One 2013 study showed a reduction of HAIs in an intensive care unit when using copper surfaces for high-touch objects (eg, bed rails, IV poles), which can kill 99.9% of microorganisms within two hours of contact. This type of surface could be evaluated for use in the OR.¹² Antimicrobial sprays that adhere to surfaces and provide continuous disinfection may be another option. A 2015 study found that a quaternary ammonium and trichloromelamine spray maintained reduction in colony-forming units for five days after application to OR surfaces ($P = .0162$).¹³ Another study found that an antimicrobial isopropyl alcohol/organofunctional silane solution reduced microbes on OR surfaces ($P < .001$).¹⁴

Other technology to consider for use in the OR includes a new battery-operated vacuum surgical clipper that captures up to 98% of hair during clipping. It eliminates the need for tape to collect clipped hair and reduces air and environmental contamination.¹⁵ Finally, a new surgical irrigation system has emerged, using 0.05% chlorhexidine gluconate (CHG) to replace antimicrobial irrigants such as vancomycin, cefazolin, or bacitracin. Limited data support the use of antibiotic irrigation during surgery to reduce SSIs.^{16,17} However, antiseptics (eg, CHG, povidone-iodine) may be options to use in irrigation without increasing the risk of antibiotic resistance that arises from the overuse of antibiotic irrigation.^{17,18} Although some studies have found diluted povidone-iodine to be an effective antiseptic irrigant,^{18,19} 0.05% CHG is currently the only antiseptic approved for wound irrigation by the US Food and Drug Administration, and studies have found it to be effective against a broad spectrum of microbes.^{17,20}

SCREENING, UNIVERSAL DECOLONIZATION, AND NASAL ANTISEPTICS

Preoperative screening for *Staphylococcus aureus*, both sensitive and resistant strains, has been shown to reduce SSIs in high-risk surgeries such as orthopedics.²¹ *Staphylococcus aureus* is the second most prevalent SSI pathogen in acute care hospitals (behind *Escherichia coli*), according to 2016 data from the National Healthcare Safety Network.²² A rapid diagnosis of infectious diseases can be achieved during presurgical screening, providing results in just a few hours.²³ This helps

perioperative team members determine which patients may be colonized with methicillin-resistant *S aureus* and may need adjustment of their antibiotic prophylaxis or the initiation of contact precautions.

Preoperative bathing the night before and the morning of surgery is intended to reduce microbial colonization of the skin before antiseptic skin prepping. Chlorhexidine gluconate is commonly used for this practice. However, studies have shown that for preoperative bathing protocols to be effective, surgical team members must provide clear patient instructions and patient empowerment, such as by using a reminder system (eg, text, e-mail, phone call).^{24,25} Additional research is needed to confirm the most effective preoperative bathing practices, including the most effective product (ie, soap or antiseptic), timing, and number of baths or showers.²⁶

Another approach is to perform the decolonization of surgical patients in the preoperative unit. Rather than distribute bottles of CHG or CHG washcloths to patients during the preadmission screening process, this involves the patient or nurse cleansing the surgical site immediately before surgery.²⁷ Iodophor-based nasal antiseptics can also be applied just before surgery. A few recent decolonization studies have demonstrated a reduction in SSIs when using the nasal iodophor product.^{28,29} Nasal mupirocin is another product that can be used for nasal decolonization; however, it is generally applied by the patient over several days leading up to surgery, so its efficacy depends on patient compliance.²⁸ The desired outcome for these preoperative practices is to effectively decolonize the skin and nasal passages before the skin is incised.

HIGH RELIABILITY ORGANIZATIONS

The implementation of standards, recommendations, changes in practice, and innovative technologies requires not only teamwork but also clear leadership. One strategy that health care leaders are using is the adoption of high reliability principles. High reliability organizations value sensitivity to operations, enhanced communication skills, alertness to near misses, commitment to resiliency, and the use of experts in the department to handle new situations.³⁰

A lack of effective communication and teamwork can result in patient harm in the perioperative environment, including sentinel events and adverse patient outcomes.³¹ The high reliability concept helps to enhance communication by hardwiring certain behaviors, such as reporting deviations from accepted practice and processes. A program called TeamSTEPPS (Team Strategies and Tools to Enhance

Performance and Patient Safety)³² provides leaders with one approach to support high reliability principles. The program offers tools and techniques that can be used to create a transparent culture of safety with effective communication. The ultimate goal is to improve work relationships and optimize patient outcomes.

CONCLUSION

Infection prevention strategies must be enforced consistently and monitored to achieve a clean and infection-free environment. There are many new challenges in perioperative nursing related to infection prevention and control. Meticulous attention to cleaning, disinfection, and sterilization are the most important measures and must be hardwired to change behaviors and produce high reliability. Standardization of SSI prevention practices, adherence to recommended surgical attire, and the exploration of innovative surgical and environmental technologies should be part of a team process. Collaboration among surgeons, anesthesia care providers, nurses, surgical technicians, and ancillary staff members creates a culture of safety that can protect the patient from developing a SSI. ●

Editor's note: *TeamSTEPPS* is a registered trademark of the US Department of Defense, Falls Church, VA, and the US Department of Health and Human Services, Bethesda, MD.

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