

Infection Control in the Operating Room



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KEYWORDS

- Infection control • Surgical site infection (SSI) • Operating room
- Anesthesia provider • Hand hygiene

KEY POINTS

- Surgical site infections (SSIs) occur in 160,000 to 300,000 patients per year, at a rate of 2% to 5%.
- SSIs increase postoperative hospitalization stay and the likelihood of postoperative mortality by a factor of 2- to 11-fold.
- The estimated financial impact of SSIs on the health care system ranges from \$3.5 to \$45.0 billion annually.
- Anesthesia providers have the potential to increase the patient's risk for developing an SSI.
- The use of antibiotics, attention to patient normothermia, and sound hand hygiene have been shown to decrease the rate of postoperative SSI.

INTRODUCTION

The incidence of nosocomial infections, or hospital-acquired infections (HAIs), continues to increase, despite heightened awareness of the issue and attempts to limit its occurrence. In the United States, an estimated 722,000 HAIs occurred in 2011, with a resultant 9.6% mortality rate.¹ It has been proposed that between 4% and 10% of hospitalized patients in the United States will acquire a nosocomial infection, particularly after entry into operating room (OR) or intensive care environments.^{1,2} Between 2011 and 2012, an estimated 53,700 of these HAIs were surgical site infections (SSIs).¹ SSIs are now considered to be the most common and costly HAI, adding approximately 7 to 11 days to the expected postsurgical hospital stay and increasing perioperative morbidity and mortality. The health care expenditures associated with the occurrence of SSIs are roughly projected to be between \$3.5 and \$45.0 billion annually.^{3,4} Although the problem of SSIs seems to be rampant and gaining momentum, an estimated 40% to 60% of these infections may actually be preventable.⁴

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Bearing these disconcerting facts in mind, it has been widely recognized that the OR milieu may be a key contributor to the development of HAIs, particularly with regard to SSIs. Although the genesis of these infections may be multifactorial, 2 key themes have emerged: (1) human-controlled vector transmission of pathogens, and (2) physical factors such as the presence of a multitude of surfaces in the OR setting which may be difficult to cleanse because of inherent texture or location. Areas such as those found on the anesthesia workstation may harbor considerable infective material, both visible and occult.⁵⁻⁷ This fact is further compounded by the finding that anesthetist hand hygiene practices are largely inadequate.^{2,6-9}

Overall, the hospital environment is a breeding ground for various types of bacteria, with a magnified effect in the intensive care units and the operating suites. In a study conducted in 2008 by Al-Hamad and Maxwell,¹⁰ frequently touched surfaces found in the hospital setting were tested for the presence of resident microbial agents. Bed frames, telephones, and computer keyboards were among the items that yielded the highest total viable bacterial counts. Although the pathogen subtypes were varied, these cultures often included the dangerous methicillin-resistant *Staphylococcus aureus* (MRSA).¹⁰⁻¹³

After a systematic review of the current literature, and drawing from circumstantial experiences of this certified registered nurse anesthetist (CRNA) author within the OR setting, the issues listed in **Box 1** may increase the incidence of nosocomial infection emanating specifically from the perioperative period. **Fig. 1**, adapted from Thiele and colleagues,²³ aptly depicts the interface between infectious agents and their various vectors and routes to the patient in the operating room.

It follows reason that the frequent use of keyboards for electronic intraoperative charting by the anesthesia provider may further aggravate an already grim situation with respect to the escalating rate of nosocomial infection.^{7,16,19} With the increasing use of electronic medical records (EMRs) in ORs nationwide, the latent risk of contamination of related equipment exists during the course of a procedure, with subsequent transmission to the patient.^{2,7,11-13,19} Specifically, the anesthetist may contaminate the computer keyboard and mouse during use with gloved (or bare) hands while simultaneously administering patient care and documenting intraoperative events, through the inadvertent transfer of blood and pathogens from the patient to equipment. For example, contact with the patient's mouth occurs during intubation, transferring oral flora onto the provider's hands. Likewise, insertion of intravenous catheters or invasive monitors may cause soiling of the anesthetist's gloves with blood or related body fluids. Although the usual practice is to remove soiled gloves after each procedure and replace with a clean pair, this may not always occur. Because of the rapid pace of the induction sequence and the occasional need to respond quickly to untoward events during the course of other procedures, the CRNA, student registered nurse anesthetist, anesthesiologist, or resident may unknowingly transfer infective pathogens onto the anesthesia workstation and the EMR-human interface while wearing contaminated gloves. Furthermore, equipment contained in anesthesia cart drawers may be inadvertently contaminated if the anesthesia provider attempts to quickly retrieve items while wearing soiled gloves.

Disinfection of keyboards between patients is difficult because of the inherent multi-surfaced nature of these devices. Despite the presence of a washable vinyl or rubber covering that typically encapsulates the various computer keyboards found in the OR, significant microbial contamination with MRSA and variants may potentially be left behind, particularly in the spaces between keys, even after careful decontamination with bleach or alcohol-containing wipes.^{2,11-14}

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