

Perioperative Transmission of Infection - Implications for Anesthesiologists

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Introduction

Given the expanding role of the anesthesiologist as the “total perioperative physician,” the increasing number of invasive procedures performed by anesthesiologists, and the increase in the prevalence of emerging diseases, stringent attention to infection control practices is paramount. This lesson will examine the epidemiology of infectious disease as it applies to anesthesia practice and the perioperative period, and discuss how the anesthesiologist can minimize the bidirectional transmission of infection between patient and physician.

Epidemiology

Approximately 70% of all acute illness can be attributed to infectious agents. Of these, nosocomial infections occur in approximately 5% of patients, increasing the average hospital stay by 4 days and causing approximately 60,000 deaths per year.¹

Transmission of an infectious agent first requires a portal of entry. In terms of anesthesia practice these typically include: the respiratory tract by placement of endotracheal tubes, contamination of equipment, and inhalation of airborne pathogens; the blood stream via direct contact with blood or blood products, or by placement of indwelling catheters, and; the skin and mucous membranes via direct contact with infectious lesions, surgery, and trauma.

In addition to protecting the patient from nosocomial or iatrogenic infection, the anesthesiologist must be cognizant of the risk of acquiring an occupationally transmitted disease from an infected patient. In general, transmission of occupationally acquired infections occurs via: parenteral exposure to infected blood and blood products or bodily fluids via a contaminated needlestick or penetrating injury; mucocutaneous exposure to blood or blood products; the respiratory system via exposure to airborne pathogens, and; direct contact from touching or large droplet spread.

Resistance to infection

Resistance to infection requires that the pathogen is denied a portal of entry. This can be achieved by barrier precautions, attention to aseptic technique, handwashing, and appropriate sterilization of anesthetic equipment. However, if the pathogen does manage to circumvent these barriers, it attempts to colonize and establish an infection. The ability to establish an infection depends on the ability of the pathogen to survive (infectivity), the ability of the host to mount an immune or inflammatory response (antigenicity), and the virulence of the organism (pathogenicity). Resistance to infection requires both non-specific and specific mechanisms.

Non-specific mechanisms include chemical and mechanical barriers e.g., skin, conjunctiva, and mucous membranes together with inflammation and phagocytosis at the site of infection. Specific mechanisms include the activation of humoral (immunoglobulins) and cellular (T lymphocytes) responses.

In a patient with an intact immune system, these responses are usually effective in thwarting the infection. However, in an immunosuppressed individual, the ability to mount an effective defense is compromised such that seemingly innocuous infections can become life-threatening. Anesthesiologists should be aware that the practice of anesthesia may actually contribute to decreased immune function. It is well known, for example that surgery affects antibody production, cytokine activity, and phagocytosis.² Certain anesthetics have also been shown to decrease ciliary activity, bone marrow suppression, and natural killer cell cytotoxicity.³ Furthermore, blood transfusions have been shown to modulate the immune response and increase the risk for tumor recurrence and infection.⁴ Although the ability of these changes to alter clinical outcome (positively or negatively) is difficult to assess, anesthesiologists must be cognizant that their practice may compromise immune function.

Nosocomial infections

There are several factors that predispose the patient to a nosocomial infection. These include, age, trauma, obesity, diabetes, poor nutritional status, and immunosuppression. Of particular concern to the anesthesiologist are nosocomial pneumonias,⁵ percutaneous intravascular infections,⁶ and postoperative wound infections.⁷ Although it is often difficult to implicate anesthesia practice *per se* in the development of nosocomial infections, anesthesiologists must be aware of their potential role in etiology.

In general, the spread of nosocomial infections can be limited by close attention to handwashing, aseptic technique, disinfection/sterilization of anesthetic equipment, preventing drug contamination e.g., propofol, and protecting the immunocompromised patient. Of particular concern in anesthesia practice is the practice of reusing syringes. This is of particular concern given reports of significant transmission of infectious agents by this method.⁸ In one case report at least 52 patients in Oklahoma contracted hepatitis C following reuse of syringes to inject anesthesia drugs into multiple patients.

The infected patient

The practice of anesthesia involves procedures that may promote transmission of occupationally acquired infection. Placement of indwelling catheters, contact with blood, and exposure to mucous membranes provides potential vehicles for transmission. Of particular concern is the acquisition of blood borne viral infections including HIV/AIDS, hepatitis B, C and D, airborne agents including tuberculosis and other highly contagious pathogens such as herpes simplex, varicella-zoster, and cytomegalovirus.

In general, preventing occupational transmission of these agents requires strict compliance with standard precautions⁹ including, handwashing, use of barriers e.g., gloves, masks, eye-shields, prevention of needlestick injuries, and appropriate postexposure prophylaxis. Unfortunately, anesthesiologists are not particularly compliant with standard precaution measures. In one study, only 40% and 80% of anesthesiologists reported complying with standard precautions when anticipating contact with blood or a patient with HIV respectively.¹⁰ Needlesticks are particularly problematic in anesthesia practice and are the greatest cause of occupational blood-

borne transmission. Reducing the potential for sharps injuries requires close attention to standard precautions including avoiding the recapping of needles. In one study, 69.8% of anesthesiologists reported recapping needles on a frequent basis.¹¹ Several engineering controls are currently available that include retractable needles or sheaths, however, their efficacy in reducing needlesticks is yet to be determined.

Summary

Although anesthesiologists have not traditionally invested in infection control, the expanded role of the anesthesiologist as a perioperative physician demands that they now have a greater understanding of the infectious process and how they can serve to decrease the incidence of infection in their patients. Successful perioperative control of infection requires that anesthesiologists apply sound infection control practices and ensure compliance with occupational standards for both the protection of their patients and, indeed, for themselves.

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