How to Lower Infection Rates in Orthopedic Surgeries

Jennifer Wardlaw, DVM, MS, DACVS
Gateway Veterinary Surgery
St. Louis, MO

The normal incidence of clean surgical wound infections is 0-4.4%. Keeping your hospital and staff under good surveillance will help minimize nosicomial infections. Washing hands between patients, using soap for at least 20 seconds and using care when taking rectal temperatures to clean equipment and hand will help. The main sources of surgical infection come from the OR, the surgical team, instruments, but mostly the patient's endogenous flora.

Antibiotics should be considered for surgeries over two hours, ones with implants, or if there is a break in asepsis. If the animal has been on an appropriate antibiotic for a few days prior to surgery, perioperative antibiotics are not needed. For orthopedic procedures indicating the need for antibiotics, *Staphylococci spp*. are the most common skin flora we encounter. Therefore, most orthopedic surgeons choose cefazolin or similar antibiotics. However, good surgical technique is the best prevention of infection and when a break in aspesis occurs it should be repaired appropriately. Not every patient and every surgery needs antibiotics and the potential downsides or complications should be weighed against the risk with need for perioperative drugs. Typically perioperative antibiotics are given at induction or 30 minutes before the skin incision, then every 90 minutes. The first dose should not be given until cultures are obtained, if they are indicated.

Anesthesia reduces a patient's resistance to infection. Propofol has been associated with higher postoperative infections, and sepsis. It should be used with aseptic technique and promptly disposed of to avoid contamination. Maintaining a patient's blood pressure and body temperature will help their immune system fight infection. Warming tables, circulating water blankets and Bair Huggers should be considered. Bair Hugger's have been shown to grow bacteria in their hoses and may increase wound colonies, although data is conflicting. Most surgeons prefer to turn on the Bair Hugger after the patient is completely draped to avoid this potential issue.

Controlling the surgical environment will limit bacteria significantly. Disinfection of equipment should be routine and frequent. Traffic should be minimized, the door closed and laminar flow should create 15 air exchanges per hour. Laminar flow decreased room bacteria by 61% and wound bacteria by 92%. Proper surgical attire should be fresh scrubs, caps that cover all hair and masks that are soft with pleated fabric. Shoe covers may help with sanitation but are not necessary.

Patient preparation should include getting rid of fleas if present, bathing if dirty (dry completely afterwards), walking outside to eliminate or expressing the bladder. Shaving should be performed while surgical scrubs are protected with a lab coat, in the prep area. The surgical clip should be performed with a 40 blade, against the grain, at least two clipper blades from the proposed incision. Hair should be removed with a vacuum. Care must be taken not to cause razor burn by keeping clipper blades clean, sharp and well lubricated. Clipper cleaning should be performed after every surgical prep case. A rectal purse string should also be considered for pelvic limb procedures.

The surgical site is prepared with a rough prep in the preparation area, and then a final sterile prep in the surgical suite. The skin cannot be sterilized, but the number of bacteria can be significantly reduced. The "ideal" method is elusive but several options exist. Povidone-iodine (PI) is cheap, has a broad spectrum, but will stain fur, and is inactivated by organic debris. Chlorhexidine (Chlorhex) has good activity in organic debris, good residual activity, broad spectrum, low tissue toxicity except mucous membranes and does not stain clothing. Rinsing agents are commonly used but not necessary. 70% Isopropol alcohol is antibacterial, dries quickly but is flammable and may cool the patient. Sterile saline is non-flammable but has not antimicrobial activity.

A 3 minute chlorhex scrub was shown to be equivalent to a 10 minute PI scrub in one study with no difference in infection rates. Another study agreed that both scrubs work, but the Chlorhex with saline had a better residual activity than Chlorhex and alcohol. Alcohol rinse after iodine helps release the iodine activity, but decreases the residual activity as well. If an alcohol rinse is used, the surgical site should then be painted or sprayed with betadine.

The surgical site prep is performed next in the surgical suite. It is ideally performed with sterile gloves, with sterile gauze and prep basin with 'new' surgical scrub. If a rinsing agent is not used, dry gauze can be used to remove the scrub detergent. Good technique should be used for the sterile scrub to not contaminate the surgical site during the scrubbing. It should be noted that one step 70% PI solution was as efficacious as alternating with alcohol and is much simpler. Additionally paint-only or spray-only seems efficacious as well. One study indicated that applying antiseptic with gauze versus sterile gloves did not make a difference as long as the proper agent and contact time were used.

Surgeon prep with surgical scrub offers the same multitude of scrub solutions. PI and chlorhex have the same pros and cons for the surgeon's hands as they did for the patient's leg. However, the World Health Organization and scientific evidence support the use of hydro-alcoholic rubs for presurgical hand scrubs. If your hands are free of gross contamination, these methods are less abrasive and less likely to cause bacterial proliferation on microabrasions from the scrub sponge. Two such solutions are Avagard (1% chlorhax,

61% alcohol) and Sterilium (80% alcohol). Numerous studies compare the two solutions, but both work very well and the choice is surgeon preference.

Strict aseptic technique should be followed once in surgery. Surgeons should stand properly to avoid contamination, surgical supplies should be handled properly, opened properly and their sterility confirmed. Sterile saline for lavage should be poured from a fresh unopened bottle with care to avoid splashing on the instrument tray. Traffic around the room should be minimized. It is everyone's responsibility in the room to monitor for a break in asepsis and make the surgeon aware if such a break occurs. When in doubt, change it out.

Surgical drapes should be resistant to penetration, strike-through and movement. Four quarter drapes are used at the primary layer and may be adhesive or towel clamps applied. Once the foot is captured with sterile vetwrap, a full length patient drape should be used to cover the entire patient. Clamps on the patient drape should not penetrate both layers of drapes. A stockinette or ioban on the incision may be used but are not necessary. However, some sort of sterile water impermeable layer must be applied over the sterile vetwrap due to its porosity. All cables, hoses etc. should be secured with a non-penetrating clamp as well.

Disposable gowns decrease contamination rate. Hemostasis, minimizing tissue trauma, good aseptic technique and speed are all important for the surgeon to be mindful of. Infection rate doubles with every hour of surgery. Braided suture should be kept off the skin during handling. Gloves should be checked regularly for holes and remain tight on the hands and fingertips. Wearing double gloves or orthopedic gloves will decrease the chance of exposed hands. 84% of glove defects occur in procedures over an hour long and individuals were not able to accurately predict a defect. Overall glove defects occurred in 23% of cases and were more likely to occur in orthopedic cases.

Surgical closure can be performed with staples for speed or suture for cost savings. A couple of studies contradict whether staples versus sutures are better for closure on TPLOs and extracapsular surgeries. But notably, one retrospective study showed no increased benefit of antibiotic impregnated suture for preventing infection with TPLOs. This may indicate there is not a need for these more expensive sutures in clean procedures.

After surgery patients should have their bladder expressed or emptied to avoid eliminating on the surgical site, body temperature should be brought back to normal. Clean bedding with spill resistant water bowls should be maintained throughout the hospital stay. Postsurgical site infections in dogs and cats can be minimized with these proactive precautionary steps.