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Surgical site infections in veterinary obstetrical procedures– a short communication

Abstract

Surgical site infections (SSIs) following veterinary obstetrical and gynecologic procedures present substantial clinical and economic burdens across species. This narrative review synthesizes published literature on SSI epidemiology, clinical manifestations, and prevention strategies in companion and large animals. Documented SSI incidence ranges from 3–6% for all surgical procedures, 1.7% for minimally invasive procedures, and 15.8% for orthopedic surgeries. In bovine abdominal surgeries, incidence ranges from 4.4–10.5%, with infected dairy cows facing a 4.8-fold higher culling risk. Pathogens commonly associated with SSIs include *Staphylococcus aureus*, *Staphylococcus pseudintermedius*, and *Escherichia coli*, along with other Gram-negative aerobes and anaerobes. Clinical manifestations range from localized inflammation to systemic infection with species-specific presentations. Effective prevention requires multimodal approach: incorporating preoperative skin preparation, timely antibiotic administration, and evidence-based surgical techniques. This review highlights critical knowledge gaps in SSI prevention for veterinary reproductive surgery and summarizes current evidence that may inform clinical decision-making.

Keywords: obstetrics, perioperative, surgical site infections, wound complication

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Introduction

Surgical site infections represent a significant complication in veterinary gynecological and obstetrical procedures, with incidence rates and consequences varying across species. In small animals, SSI incidence varies by procedure type: 3–6% for all surgical procedures, 1.7% for minimally invasive procedures, and 15.8% for orthopedic surgeries, with risk stratification dependent on procedural factors and patient comorbidities.[1,2] In contrast, bovine abdominal surgeries report higher SSI rates (4.4–10.5%),[3] with profound economic implications due to associated culling risks.[4,5] For instance, cows developing SSIs post-cesarean section face a 4.8-fold increase in culling odds,[6] compounded by reduced fertility and longevity compared to uncomplicated normal parturition.[7]

Emergency field interventions in large animals, such as ruminant cesarean sections performed under non-sterile conditions, further elevate SSI risks,[5] directly impacting herd productivity and welfare.[8] Beyond clinical outcomes, SSIs carry medicolegal consequences; a French retrospective analysis identified obstetrical procedures as the basis for 70% of veterinary litigations, with uterine suture failure (40%), hemorrhage (20%), and peritonitis (10%) as predominant complications.[9] Strict adherence to aseptic techniques and evidence-based surgical protocols remains critical to mitigating SSI-related sequelae, including wound dehiscence, abscessation, and systemic infections.[10]

The objective of this narrative review is to synthesize available evidence on the incidence, clinical manifestations, pathogen profiles, and species-specific prevention strategies for SSIs in veterinary obstetrical and gynecologic procedures, with the aim of informing clinical practice and identifying priorities for future research.

Clinical manifestations and impact

Clinical presentation

Surgical site infections demonstrate a spectrum of clinical presentations ranging from superficial infections to deep organ-space involvement. Characteristic manifestations include localized erythema, swelling, delayed wound healing, abscess formation, and systemic signs such as pyrexia.[11] In canine patients, retroperitoneal abscesses following ovariohysterectomy typically present with fever and marked abdominal pain.[12,13] Bovine cases exhibit distinct clinical profiles, with retroperitoneal abscesses secondary to paralumbar fossa laparotomy most commonly manifesting as rumen hypomotility, anorexia, and systemic inflammatory responses.[8]

Risk factors

Procedural duration significantly impacts SSI risk across species. For instance, extended surgical time (>2 hours) in equine celiotomy procedures correlates with increased infection rates,[14] while bovine cesarean sections demonstrate higher calf mortality with prolonged operative periods.[6] These complications not only intensify patient morbidity but also impose substantial economic burdens through increased treatment costs and potential loss of productive animals.[2,15]

Microbiological profiles and implication of empiric therapy

Microbiological investigations reveal distinct pathogen profiles among species. Canine SSIs predominantly yield *Staphylococcus pseudintermedius* and *S. aureus* isolates, with biofilm-producing strains demonstrating enhanced virulence.[16] The emergence of methicillin-resistant *S. pseudintermedius* (MRSP) presents particular therapeutic challenges due to its multidrug resistance patterns.[17] Consequently, for canine reproductive surgeries, empiric antibiotics should provide coverage against Gram-positive cocci, with vancomycin or linezolid reserved for confirmed MRSP cases based on culture and susceptibility testing.[18]

Ruminant infections frequently involve Gram-negative aerobes (*Escherichia coli*) and anaerobic organisms, with *Trueperella pyogenes* - a commensal of bovine skin and mucosal surfaces - representing a significant opportunistic pathogen.[5,19] Polymicrobial isolates typically indicate environmental contamination of surgical

sites or instrumentation,[7] while canine uterine surgeries commonly yield *S. aureus* and *E. coli*, supporting the use of combination therapy (e.g., amoxicillin-clavulanate or a first-generation cephalosporin with an aminoglycoside) while awaiting culture and susceptibility results.[12,20]

Prevention strategies

General Principles

Emergency surgical procedures are associated with significantly higher rates of SSIs compared to elective operations, necessitating the implementation of rigorous preoperative protocols. The primary objective of preoperative skin asepsis is to reduce the microbial burden in the surgical field to the lowest possible level and maintain this reduction throughout the procedure, thereby supporting SSI prevention.[21] Hair removal via clipping should be performed less than four hours before surgery to minimize bacterial colonization while avoiding premature skin irritation that could increase infection risk.[22,23]

Optimal skin antisepsis is achieved using either 4% chlorhexidine gluconate or 0.5% chlorhexidine in 70% ethanol, which have demonstrated superior antimicrobial persistence and prolonged residual antibacterial activity compared to aqueous chlorhexidine or alcohol-based solutions alone.[24,25] The recommended scrubbing technique involves concentric circular motions, alternating between clockwise and counterclockwise directions, with fresh gauze used for each successive pass to prevent bacterial reintroduction.[26] In cats, a 2024 study demonstrated that 2% chlorhexidine combined with either 70% ethyl or 70% isopropyl alcohol effectively reduces skin bacterial load, with no significant difference between circular and linear scrub techniques.[27]

Preoperative measures

In companion animals, intravenous antibiotics should be administered 30 to 60 minutes prior to surgical incision to ensure adequate tissue concentrations during the procedure.[28] However, a 2024 scoping review for the European Network for Optimization of Veterinary Antimicrobial Therapy (ENOVAT) guidelines found that evidence for surgical antimicrobial prophylaxis in companion animals is limited, with available studies skewed towards orthopedic stifle surgeries and showing wide variation in protocols and SSI definitions.[29]

For ruminant cesarean sections, comprehensive preoperative measures including surgical site disinfection and appropriate antibiotic prophylaxis are strongly recommended.[5] Lateral recumbency is the preferred positioning for bovine cesarean sections involving heavily contaminated uterine fluids or emphysematous fetuses to minimize abdominal contamination.[30] Uterine exteriorization during the procedure further reduces infection risk, particularly in cases involving emphysematous fetuses.[31,32] The use of a Utrecht suture pattern for uterine closure has been associated with improved subsequent fertility in dams, while shorter surgical duration and cases of maternal-fetal disproportion have been correlated with higher perinatal calf survival rates.[6]

Intraoperative considerations

Maintaining strict aseptic technique throughout the surgical procedure is essential for infection prevention. Surgical duration should be minimized whenever possible, as prolonged procedures consistently correlate with increased infection rates across species. Regular glove changes, especially following contact with contaminated tissues or fluids, help maintain sterility. The use of antimicrobial-coated sutures provides an additional layer of protection against bacterial colonization at the surgical site. Regarding antimicrobial-coated sutures, a 2013 study evaluated triclosan-impregnated suture for incisional closure following tibial plateau leveling osteotomy in dogs; while the study found no significant difference in overall SSI rates compared to standard suture, the authors noted that the low baseline infection rate (4.6%) may have limited the ability to detect a difference.[33,34] However, further investigation with larger studies is warranted before recommending antimicrobial-coated implants for routine use.

Postoperative management

Early recognition and intervention are critical when managing potential SSIs. Broad-spectrum antibiotic therapy should be initiated promptly upon SSI diagnosis, with selection ideally guided by culture and susceptibility results. In small animal practice, silver-impregnated dressings have shown efficacy in disrupting bacterial biofilms and accelerating wound healing processes.[35] A 2024 study on nanocrystalline silver dressings in a rat burn wound model infected with *Candida albicans* found no significant difference in fungal or bacterial growth compared to controls, though the authors noted that silver dressings facilitate wound healing and have broad antimicrobial effects.[36] However, the evidence in veterinary practice remains limited and this should be characterized as an emerging therapy rather than standard of care. For bovine patients, postpartum intrauterine antiseptic lavage may help prevent metritis-associated SSIs, though additional studies are needed to confirm efficacy.[5]

Conclusion

Surgical site infections remain a critical complication in veterinary obstetrical and gynecologic procedures, with significant variations across species. In small animals, SSI incidence ranges from 1.7% for minimally invasive surgeries to 15.8% for orthopedic procedures. Bovine abdominal surgeries carry substantially higher SSI incidence rates (4.4–10.5%). Clinical manifestations range from localized inflammation to systemic infection. Critical preventive measures include preoperative hair clipping, scrub technique, and antimicrobial administration. For bovine cesarean sections, lateral recumbency, uterine exteriorization, and the Utrecht suture pattern are strongly recommended. Evidence for antimicrobial-coated sutures and silver-impregnated dressings remains limited, requiring further investigation. Further research is needed to evaluate emerging therapies and to establish species-specific prevention protocols through standardized surveillance and multicenter collaboration.

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Conflict of interest

The authors declares that there are no conflicts of interest.

References

1. Eugster S, Schawalder P, Gaschen F, et al. A prospective study of postoperative surgical site infections in dogs and cats. *Vet Surg.* 2004;33(5):542–550.
2. Turk R, Singh A, Weese JS. Prospective surgical site infection surveillance in dogs. *Vet Surg.* 2015;44(1):2–8.
3. Vasseur PB, Levy J, Dowd E, et al. Surgical wound infection rates in dogs and cats: data from a teaching hospital. *Vet Surg.* 1988;17(2):60–64.

4. Desrochers A, St-Jean G, Anderson DE, et al. Comparative evaluation of two surgical scrub preparations in cattle. *Vet Surg.* 1996;25(4):336–341.
5. Bourel C, Buczinski S, Desrochers A, et al. Comparison of two surgical site protocols for cattle in a field setting. *Vet Surg.* 2013;42(2):223–228.
6. Lyons NA, Karvountzis S, Knight-Jones TJ. Aspects of bovine caesarean section associated with calf mortality, dam survival and subsequent fertility. *Vet J.* 2013;197(2):342–350.
7. Tenhagen BA, Helmbold A, Heuwieser W. Effect of various degrees of dystocia in dairy cattle on calf viability, milk production, fertility and culling. *J Vet Med A Physiol Pathol Clin Med.* 2007;54(2):98–102.
8. Ferraro S, Desrochers A, Nichols S, et al. Clinical characteristics, treatment, and outcome for cattle that developed retroperitoneal abscesses following paralumbar fossa laparotomy: 32 cases (1995-2017). *J Am Vet Med Assoc.* 2020;256(7):814–821.
9. Mangermartin G. Cesarean section in cattle and the professional liability of the veterinarian. *Bull Group Tech Vet*. 1998:321-325.
10. Desrochers A. General principles of surgery applied to cattle. *Vet Clin North Am Food Anim Pract.* 2005;21(1):1–17.
11. Nichols RL, Florman S. Clinical presentations of soft-tissue infections and surgical site infections. *Clin Infect Dis.* 2001;33(suppl 2):S84–S93.
12. Marvel SJ, MacPhail CM. Retroperitoneal abscesses in seven dogs. *J Am Anim Hosp Assoc.* 2013;49(6):378–384.
13. Huang SH, Lo WO, Lin CM, et al. Retroperitoneal abscess: 7-year experience of 29 cases in a tertiary care center in Taiwan. *Urol Sci.* 2015;26(3):218–221.
14. Wilson DA, Baker GJ, Boero MJ. Complications of celiotomy incisions in horses. *Vet Surg.* 1995;24(6):506–514.
15. Vasseur PB, Paul HA, Enos LR, et al. Infection rates in clean surgical procedures: a comparison of ampicillin prophylaxis vs a placebo. *J Am Vet Med Assoc.* 1985;187(8):825–827.
16. Osland AM, Vestby LK, Fanuelsen H, et al. Clonal diversity and biofilm-forming ability of methicillin-resistant *Staphylococcus pseudintermedius*. *J Antimicrob Chemother.* 2012;67(4):841–848.
17. Perreten V, Kadlec K, Schwarz S, et al. Clonal spread of methicillin-resistant *Staphylococcus pseudintermedius* in Europe and North America: an international multicentre study. *J Antimicrob Chemother.* 2010;65(6):1145–1154.
18. Morris DO, Loeffler A, Davis MF, et al. Recommendations for approaches to meticillin-resistant staphylococcal infections of small animals: diagnosis, therapeutic considerations and preventative measures: clinical consensus guidelines of the World Association for Veterinary Dermatology. *Vet Dermatol.* 2017;28(3):304–e69.
19. Jost BH, Billington SJ. *Arcanobacterium pyogenes*: molecular pathogenesis of an animal opportunist. *Antonie Van Leeuwenhoek.* 2005;88(2):87–102.
20. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft-tissue infections. *Clin Infect Dis.* 2005;41(10):1373–1406.
21. Marchionatti E, Constant C, Steiner A. Preoperative skin asepsis in bovine surgery: an outcome-blinded 3-arm randomized clinical trial under non-sterile operating room conditions. *Front Vet Sci.* 2024;11:1446649. Published 2024 Dec 6
22. Mayhew PD, Freeman L, Kwan T, et al. Comparison of surgical site infection rates in clean and clean-contaminated wounds in dogs and cats after minimally invasive versus open surgery: 179 cases (2007-2008). *J Am Vet Med Assoc.* 2012;240(2):193–198.
23. Curtis ZJ. The role of the theatre veterinary nurse: surgical site preparation. *Vet Nurs J.* 2021;36(9):276–280.
24. Hibbard JS, Mulberry GK, Brady AR. A clinical study comparing the skin antisepsis and safety of ChloraPrep, 70% isopropyl alcohol, and 2% aqueous chlorhexidine. *J Infus Nurs.* 2002;25(4):244–249.
25. Romatowski J. Prevention and control of surgical wound infection. *J Am Vet Med Assoc.* 1989;194(1):107–114.
26. Swales N, Cogan T. Failure to achieve asepsis following surgical skin preparation is influenced by bacterial resistance to chlorhexidine, but not skin preparation technique. *Vet Nurs J.* 2017;32(8):224–227.
27. Nye AK, Thieman Mankin KM. Small animal patient preoperative preparation: a review of common antiseptics, comparison studies, and resistance. *Front Vet Sci.* 2024;11:1374826. Published 2024 Mar 28.
28. Weese JS, Halling KB. Perioperative administration of antimicrobials associated with elective surgery for cranial cruciate ligament rupture in dogs: 83 cases (2003-2005). *J Am Vet Med Assoc.* 2006;229(1):92–95.
29. Sørensen TM, Scahill K, Weese JS, et al. European Network for Optimization of Antimicrobial Therapy (ENOVAT), ESCMID Study Group for Veterinary Microbiology (ESGVM). Efficacy of antimicrobial prophylaxis on the risk of surgical site infections in companion animal surgery: a systematic review and meta-analysis. *J Small Anim Pract.* 2026;67(3):198–211.
30. Kolkman I, De Vliegher S, Hoflack G, et al. Protocol of the caesarean section as performed in daily bovine practice in Belgium. *Reprod Domest Anim.* 2007;42(6):583–589.
31. Newman KD, Anderson DE. Cesarean section in cows. *Vet Clin North Am Food Anim Pract*. 2005;21(1):73–100.
32. Schultz LG, Tyler JW, Moll HD, Constantinescu GM. Surgical approaches for cesarean section in cattle. *Can Vet J.* 2008;49(6):565–568.
33. Wu X, Kubilay NZ, Ren J, et al. Antimicrobial-coated sutures to decrease surgical site infections: a systematic review and meta-analysis. *Eur J Clin Microbiol Infect Dis.* 2017;36(1):19–32.
34. Etter SW, Ragetly GR, Bennett RA, et al. Effect of using triclosan-impregnated suture for incisional closure on surgical site infection and inflammation following tibial plateau leveling osteotomy in dogs. *J Am Vet Med Assoc.* 2013;242(3):355–358.
35. Cao J, Qi J. The antibacterial properties of silver dressings and their application in wound healing. *J Adv Med Sci.* 2024;7(2):7–14.
36. Balaure PC, Adelina-Gabriela N, Anghel D, et al. Role of silver nanoparticles in wound healing: mechanisms, efficacy, and clinical applications. *Inorganics.* 2025;13(12):401.

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