

Challenges and Management of Surgical Site Occurrences

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Summary

Postoperative complications such as surgical site infections, dehiscence, seromas, and hematomas prolong wound care and impose significant cost increases to patients and healthcare providers. Clinicians aiming to reduce the incidence of these complications should be aware of risk factors associated with surgical type, procedures used, patient characteristics, and postoperative care. Today, improved guidelines and general practices for managing surgical incisions have reduced the incidence of complications to historic lows. In addition to these standard care options, advanced wound care approaches have been extensively studied and exist as options for clinicians to provide adjunctive postoperative support and facilitate wound healing. These systems include advanced wound dressings and closed-incision negative-pressure therapy. Advanced wound care is not appropriate in all settings, and healthcare providers must assess each case for specific needs to be addressed by the available incision management plans. Emerging therapies that are intended to improve the continuum of postoperative care should continue to be evaluated in controlled clinical trials to determine their effectiveness under different circumstances and to support the creation of more robust guidelines for their use.

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Introduction

Postoperative complications following the 45 million operations performed each year in the United States result in substantial morbidity and costs.¹ Common complications include surgical site infections (SSIs), dehiscences, and development of seromas or hematomas. These complications delay hospital discharge, prolong wound care, and lead to the need for additional invasive procedures. The increased morbidity and costs associated with complications motivate healthcare providers to be vigilant in recognizing risk factors arising from patient comorbidities or circumstances of surgery. Current clinical research continues to provide evidence for new techniques that aim at reducing the incidence of these complications.

COMMON SURGICAL SITE OCCURRENCES.

Among postoperative complications, SSIs are one of the most prevalent, accounting for 21.8% of the $\approx 721,800$ healthcare-associated infections reported annually.² Each incident increases the average hospital stay by 9.6 days at an additional cost of \$38,656, which results in over \$10 billion in direct and indirect costs annually.³ In addition to a monetary cost, the presence of an SSI is associated with the occurrence of other complications and a higher 30-day mortality rate.⁴ Common risk factors associated with SSI are listed in Table 1. Dehiscence of a closed surgical wound is often preceded by the presence of an SSI,^{6,7} with some medical researchers reporting dehiscence and SSI as interchangeable. However, the exact relationship between SSI and dehiscence is difficult to determine due to the lack of reliable standardized data and discrepant recording methodologies.⁸ Another common surgical site complication is the formation of seromas or hematomas at the incision site, typically when an anatomical space has been created. In either case, both can increase tension at the incision, making these sites more prone to infection.⁹

Table NO 1.

Patient-related Risk Factors	Incision-related Risk Factors
<ul style="list-style-type: none"> • Diabetes mellitus • ASA score ≥ 3 • Advanced age • Obesity • Active tobacco use • Hypoalbuminemia • Corticosteroid usage • Active alcoholism • Male sex • Chronic renal insufficiency • Chronic obstructive pulmonary disease • Hematoma 	<ul style="list-style-type: none"> • High-tension incision • Repeated incisions • Extensive undermining • Traumatized soft tissue • Edema • Contamination • Emergency procedure • Mechanically unfavorable site • Prolonged operation time • Postsurgical radiation • Radiation therapy

SURGERY-SPECIFIC RISK FACTORS.

Risks of surgery have been related to various factors including the location, type, and surgical duration. Patients receiving emergency surgery or complex operations have a higher than average risk of experiencing SSIs.⁴ Increased duration of operations is also associated with elevated number of surgical site occurrences. Among surgery types, specific procedures can also hold higher risk of SSI than others (Table 2). The rate of SSI within 30 days of surgery ranges 3%–4% for integumentary, musculoskeletal, respiratory, and oral surgeries, while the rate is slightly higher (4%–5%) for surgical resolution of vascular abnormalities.⁴ Abdominal surgeries have the highest 30-day rate of SSIs, at over 6%. Hernia repair overall maintains a low 30-day SSI rate of 55 years of age, wound infection, emergency surgery, and steroid use.^{6,13}

MANAGEMENT OF SURGICAL SITE OCCURRENCES.

Common practices for managing postoperative incisions typically include placement of a nonadherent or silver-impregnated material on the incision, followed by sterile gauze or abdominal pads.¹⁴ Incidence of surgical complications has been reduced by improvement in operating room ventilation, instrument sterilization procedures, maximum barrier protection requirements, and the use of prophylactic antibiotics. Preoperative cleaning of the surgical site with antiseptic solutions is another common practice with the intention of reducing SSIs; however, multiple meta-analyses have found sparse evidence demonstrating any benefit against SSI incidence.^{15,16}

ADVANCED WOUND CARE.

In addition to the first-line treatment practices, there have been attempts by medical researchers to identify other advanced wound care strategies that might reduce the risk of postoperative complications. One approach includes the application of antimicrobial advanced wound dressings (AWDs) over the closed incision. In a single-center retrospective review of 903 patients with total joint arthroplasty, a silver-releasing, cellulose-based antimicrobial AWD was more effective than conventional dressings in reducing the incidence of periprosthetic joint infections.¹⁷ In a prospective, randomized controlled trial (RCT) of a different silver-eluting antimicrobial AWD used postoperatively in patients after lower extremity arterial reconstruction, intervention with AWD failed to show a significant benefit reducing wound complications.¹⁸ Another technology that has been used to enhance postsurgery wound healing is closed-incision negative-pressure therapy (ciNPT), which creates a closed wound environment and applies negative pressure using a foam dressing. High-quality studies have also reported benefits of ciNPT in postoperative complications. An RCT involving 102 patients with groin incisions found that those treated with ciNPT had a significantly shorter mean duration of hospital stay compared (6 days) with a control group (9 days).¹⁹ A second RCT of 100 patients with 129 groin incisions reported that patients treated with ciNPT exhibited a significant reduction in 30-day wound infections (2.3% versus 17.5%, respectively) and revision surgeries (1.7% versus 14.1%, respectively) compared to patients who received standard care.²⁰

Table No 2.

General	Plastic	Orthopedic	Vascular	Cardiovascular	Obstetrics/ Gynecology
<ul style="list-style-type: none"> • Open general • Open colorectal • Open urology • Incisional hernia repair 	<ul style="list-style-type: none"> • Postbariatric abdominoplasty • Breast reconstruction • Big soft tissue defects (necrotizing fasciitis) • High-tension incision • Soilage risk • Repeat incisions 	<ul style="list-style-type: none"> • Open reduction and internal fixation of fractures: acetabulum, pilon, calcaneous, tibial plateau • Fasciotomy • Above knee amputation • Below knee amputation 	<ul style="list-style-type: none"> • Above knee amputation • Below knee amputation • Synthetic graft implantations 	<ul style="list-style-type: none"> • Sternotomy • Groin infections 	<ul style="list-style-type: none"> • Open surgery • Midline vertical incision • Abdominal hysterectomy

In an RCT investigating postcesarean wound morbidity in 82 patients, patients treated with ciNPT had fewer surgical site occurrences (5.1%) than a control group receiving standard care (16.3%). Patients with ciNPT also experienced reduced incisional pressure (54.3% versus 91.3%, respectively).²¹ A 2015 meta-analysis of 8 controlled studies involving a total of 1,277 patients found that ciNPT provided a significant reduction in SSI risk. However, there was no significant impact of ciNPT on risk of dehiscence and hematoma.²² In a retrospective analysis of 138 revision hip and knee operations comparing a silver-releasing, cellulose-based AWD to ciNPT, the ciNPT group exhibited a significantly reduced number of complications in general, and SSIs specifically.²³ It is important to note that not all surgical incisions may benefit from ciNPT. In an RCT following 81 patients at high risk of surgical site complications with multiple comorbidities after lower extremity and abdominal surgery, there was no significant difference in SSI or dehiscence between patient groups treated with dry dressings compared to those receiving ciNPT.²⁴ Therefore, attention should be paid to specific characteristics of the patient and surgery procedure to determine whether the patient would benefit from ciNPT. ciNPT has been rapidly introduced into clinical medicine, and we are still learning which patients will best benefit from this, and trying to better understand the mechanisms of action. Surgeons have proposed a number of mechanisms of action such as relieving tension along the incision, altering the blood flow to the wound, changing the kinetics of lymphangiogenesis, and reducing fluid and infectious materials. The molecular basis for each of these mechanisms continues to be developed.

CONCLUSIONS.

Surgical site occurrences pose a substantial threat to patient health and can result in costly or invasive interventions, making use of adequate prevention practices a necessity. Healthcare practitioners should assess the patient's risk of postoperative complications by taking into account patient comorbidities, the quality of the surgical site, and the characteristics of the operation itself. Although standard protocols have improved to reduce incidence of surgical site complications, emerging advanced wound care technologies may provide additional benefit in select circumstances. These new therapies must continue to be evaluated to better define their appropriate use and determine improved protocols for decreasing complication risk.

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