Case Report

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# *Neglected Surgical Site Infection due to Multi-Drug Resistant Acinetobacter baumannii and Klebsiella pneumoniae*

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**ABSTRACT**

***Background:*** *Surgical Site Infection (SSI) is an infection that occurs within 30 days after surgery (90 days if a prosthetic device is used) and falls under the category of Healthcare-Associated Infections (HAIs). The World Health Organization (WHO) identifies ESKAPE pathogens (Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter spp.) as a priority group of bacteria that frequently cause multidrug-resistant (MDR) infections and threaten public health, with high morbidity and mortality. Surgical site infections are also not spared by ESKAPE pathogens; infections caused by these pathogens often lead to severe wound infections and prolonged hospital stays.*

***Results:*** *A case of a 26-year-old male with an incisional surgical site infection (SSI) in the suprapubic area that worsened due to various management errors, prolonging the patient's wound healing, but was successfully managed with a holistic approach by a multidisciplinary team, including nutritional improvement, wound care, and rational antibiotic use, which were crucial for the success of the therapy.*

## INTRODUCTION

Surgical Site Infection (SSI) is an infection occurring at the site of incision or in the operated organ after surgery. Patients undergoing surgery with comorbid conditions and the presence of antimicrobial-resistant pathogens face increased treatment challenges and healthcare costs in managing SSIs [1].

Several risk factors contribute to the occurrence of SSI, which can be classified into intrinsic factors (patient-related risk factors) and perioperative factors related to surgical practices. Patient-related risk factors include obesity, diabetes, immunosuppressive therapy, malnutrition, and smoking. Premature infants are also at higher risk, particularly those undergoing gastrointestinal surgery early in life. Examples of perioperative risk factors include inadequate surgical site preparation, suboptimal skin antiseptic preparation, antimicrobial prophylaxis, and prolonged surgical duration [2].

One of the main treatment modalities for SSI is the use of antibiotics, but irrational antibiotic use has created significant challenges due to the emergence of antimicrobial resistance (AMR). Antimicrobial resistance is a natural phenomenon that occurs when microbes are exposed to antimicrobial agents. Overuse of antibiotics, improper antibiotic selection, inadequate dosing, and poor adherence to treatment guidelines all contribute to the increasing prevalence of antimicrobial resistance. ESKAPE pathogens (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa,* and *Enterobacter spp.*) are among the most common opportunistic pathogens in nosocomial infections. The acronym ESKAPE reflects these organisms' ability to "escape" the lethal action of various antimicrobial agents, leading to significant morbidity and mortality among patients. Infections caused by ESKAPE pathogens should be evaluated using culture to guide appropriate therapy. Nevertheless, the management of SSI should involve a comprehensive approach, including risk factor modification, nutritional support, antibiotic use aligned with antimicrobial stewardship principles, and regular wound care [3].

**CASE PRESENTATION**

A 26-year-old male presented to Tropical and Infectious Diseases Outpatient Clinic of Adam Malik General Hospital, Medan, Indonesia on September 19, 2024, with a post-surgical wound (surgery performed on August 26, 2024) that had not improved after one month of treatment. The wound remained open and was producing pus. The patient had a history of falling from a *pinang* (Betel nut palm) tree two years ago, resulting in an inability to move both legs. However, he still experienced pain when his legs were moved passively. Additionally, he had difficulty controlling urination and routinely used a urinary catheter. His right hand was also injured, with no movement and an inability to grasp objects. The patient had never sought medical care at any health facilities and instead opted for traditional massage therapy to treat the trauma, but no clinical improvement was observed. Most of his daily activities were carried out in bed.

Initially, the patient complained of recurrent, intermittent abdominal pain, primarily on the right side, accompanied by nausea but no vomiting. The patient felt weak and experienced a decreased appetite. He had previously visited the surgical outpatient clinic. He was diagnosed with multiple vesical stones, a proximal right ureteric stone, multiple stones in the right mid-calyx, and moderate right hydronephrosis. Subsequently, an open vesicolithotomy was performed on August 26, 2024. The patient was hospitalized for 4 days post-operation. According to his family, there was no routine wound care during the hospitalization, only dressing at the beginning when surgery is finished, although the type of dressing used is unknown. Complaints of pain, redness, warmth, and pus discharge began after the patient was discharged. He was in a state of anemia and hypoalbuminemia with inadequate food intake.

The patient was advised to have his dressing changed during a follow-up visit to the Urology Outpatient Clinic scheduled three days after discharge. On the first day at home, the wound began to drain pus, but the patient did not return to the clinic immediately. He only came on the third day, where wound care was performed, and oral antibiotics were prescribed: cefadroxil 500 mg twice daily and metronidazole 500 mg three times daily for 7 days. Culture was not performed during this period. The surgical wound had not closed and continued to produce pus.

In the third week (September 19, 2024) since the onset of the surgical site infection (SSI), the patient was referred by the urology surgery team to internal medicine specialist subspecialized in tropical and infectious diseases, who conducted a thorough anamnesis and physical examination. At this point, the culture of the infection site was performed.

Physical examination at the Tropical and Infectious Diseases Outpatient Clinic revealed an open surgical wound in the abdomen with pus discharge upon pressure and pain complaints (Figure 1). A purulent ulcer was also found on the left foot, accompanied by surrounding erythema and edema, although the patient's family was unaware of when it had appeared (Figure 2). Laboratory tests showed hypochromic microcytic anemia (Hb 11.3 g/dL, MCV 80 fL, MCH 24.8 pg), leukocytosis (12,680/µL), thrombocytosis (519,000/µL), and an elevated erythrocyte sedimentation rate (ESR) of 45 mm/h. Other tests, including procalcitonin, kidney function, albumin, and electrolytes, were within normal limits.

**Figure 1.** Suprapubic surgical site infection on day one

**Figure 2.** Skin and Soft Tissue Infection (SSTI) of the right foot (pedis dextra) on day one

Culture performed in the third week of infection (September 19, 2024) revealed the presence of Acinetobacter baumannii and Klebsiella pneumoniae in the pus specimen. Sensitivity test indicated that *Klebsiella pneumoniae* produced Extended-Spectrum Beta-Lactamase (ESBL+), and only meropenem remained sensitive to both pathogens, with a Minimum Inhibitory Concentration (MIC) of 0.5 µg/mL. Unfortunately, no culture was performed on the leg wound. During hospitalization, the patient was diagnosed with the following conditions: surgical site infection due to *Acinetobacter baumannii* and *Klebsiella pneumoniae* (ESBL+) at the suprapubic site, moderate skin and soft tissue infection (SSTI) of the left foot, immobilization due to lumbar fracture, post-vesicolithotomy for multiple bladder stones, post-cystoscopy, open vesicolithotomy for proximal right ureteric stone, multiple right mid-calix stones, moderate right hydronephrosis, neurogenic bladder, and suspected iron deficiency anemia. The patient was advised to be hospitalized following the consultation at the Tropical and Infectious Diseases Outpatient Clinic due to the need for parenteral antibiotics. During the 1-week hospitalization, he received nutritional support totaling 1900 kcal and 81 grams of protein, along with intravenous meropenem (loading dose of 1 g over 1 hour, maintenance dose of 1 g every 8 hours via IV drip over 3 hours). On day 7 of treatment, pain had decreased, and the wound was dry, with no erythema or pus discharge from the surgical site (Figure 3). Although culture was not performed, the SSTI on the left foot also showed clinical improvement, including resolution of pain and the absence of purulent discharge (Figure 4).

**Figure 3.** Suprapubic surgical site infection on day seven

**Figure 4.** SSTI of the right foot (pedis dextra) on day seven

**DISCUSSION**

Surgical site infections (SSIs) are the most common and most costly healthcare-associated infections (HAIs), accounting for 20% of all cases. SSI is associated with prolonged hospital stays and an increased risk of mortality by 2 to 11 times. Although most patients recover from SSI without long-term sequelae, 77% of deaths in patients with SSI are directly related to the infection itself [4].

In this case, several important lessons can be drawn, including deficiencies in both the management of the SSI and in communication between healthcare professionals and the patient. Postoperative symptoms such as fatigue and visible weight loss indicated the patient was in a state of malnutrition, as evidenced by anemia and hypoalbuminemia. Yet, no referral to a nutritionist was made. Several risk factors increase the likelihood of SSI, including age, poor nutritional status, obesity, low albumin levels, diabetes mellitus, smoking, co-infections, use of immunosuppressive or corticosteroid medications, recent surgical procedures, prolonged preoperative hospital stays, and colonization with drug-resistant bacteria. Hypoalbuminemia can be present preoperatively due to chronic illness, impaired hepatic synthesis, or poor nutritional status, and postoperatively due to inflammation, bleeding, or capillary leakage. An albumin level <3.5 g/dL is associated with a 2.5-fold increase in the risk of infection in orthopedic surgery. Hypoalbuminemia has been independently linked to surgical site infections and may impair tissue regeneration and wound healing [5].

The patient and their family were also unaware of the appropriate timing for dressing changes. Ideally, healthcare providers should have educated the patient on wound self-care at home, especially in the presence of active pus drainage. Delays in addressing SSIs prolong the patient's length of stay.

Culture testing for surgical site infections (SSI) was not performed promptly; instead, empirical antibiotics were administered without regular evaluation. As a result, the wound failed to improve, and the risk of antimicrobial resistance increased. Culture should be performed for all types of infections in this case, the pus from the surgical wound. This is also stated in the Clinical Practice Guidelines for surgical site infections at Adam Malik Hospital. Pathogen data from pus cultures at Adam Malik Hospital in 2022 in surgical cases showed that the most common pathogen was *Escherichia coli* (32.1%), followed by *Staphylococcus aureus* (10.7%), *Klebsiella pneumoniae* (9.8%), *Pseudomonas aeruginosa* (7.9%), and *Acinetobacter baumannii* (7.4%). A study by Bonine et al. found, through multivariate analysis, that patients infected with antibiotic-resistant pathogens and who experienced delays in receiving appropriate therapy had worse outcomes than those who received timely treatment. This included a 20% increase in the risk of in-hospital mortality or discharge to another healthcare facility, a 30% reduction in the likelihood of being discharged home, a 50% increase in the duration of antibiotic therapy, a 60% increase in length of stay (LOS), and a 50% increase in total hospital care costs. In this case, the patient's LOS during treatment was 7 days [6].

The patient had not yet stopped smoking, with a Brinkman index of 21 (classified as a light smoker), where the toxic substances in cigarettes can impair the immune system and delay wound healing. Smoking is associated with a significantly increased risk of postoperative wound dehiscence (OR 1.65, 95% CI 1.56–1.75), surgical site infection (OR 1.31, 95% CI 1.28–1.34), reintubation (OR 1.47, 95% CI 1.40–1.54), and in-hospital mortality (OR 1.13, 95% CI 1.07–1.19) compared to non-smokers. Length of hospital stay is also significantly longer in smokers than in non-smokers [7].

The patient was in an immobilized condition, placing them at high risk for developing SSTIs—in this case, an ulcer on the left foot. Due to the family's lack of knowledge about this risk, the exact time of ulcer onset was unknown. During inpatient care, several shortcomings were identified, including the absence of co-management consultation with surgical or dermatologic specialists for wound care and no culture performed for the SSTI. Interdisciplinary collaboration in managing surgical site infections (SSI) is not explicitly outlined in the hospital's Standard Operating Procedures (SOP). However, such collaboration is essential to ensure optimal quality of care, especially considering the hospital's status as a tertiary referral center. The patient received meropenem 1 gram three times daily for 7 days, an antibiotic effective for both the SSI wound and the SSTI on the foot, as evidenced by clinical improvement. The patient also required referral to the physical medicine and rehabilitation department for physiotherapy interventions, such as resistance training and electrical stimulation, to strengthen weakened muscles, prevent further deterioration, and improve muscle tone [8].

Infection control without an adequate management strategy is ineffective and has a limited impact. A comprehensive infection control management strategy must involve a multidisciplinary approach, starting with hospital leadership, including the active role of the Infection Prevention and Control (IPC) Committee. The control of surgical site infections (SSIs) should begin in the preoperative phase, including management of metabolic disorders, smoking cessation, and the application of antiseptics to the surgical site and the surgeon's arms. Intraoperative control involves proper operating room ventilation, sterilization of surgical instruments, and adherence to aseptic techniques. Postoperative infection prevention relies on appropriate wound care. If a postoperative infection occurs, microbiological specimen collection must be performed, followed by targeted therapy based on pathogen profiles and resistance patterns, and proper reporting to the surveillance team [9,10]. During hospitalization, the primary physician responsible for the SSI case should collaborate with relevant specialists/sub-specialists in this case, urologic and dermatologic surgeons. The involvement of nurses, patients, and their families in wound care contributes to improved surgical wound healing. Barriers to adherence to guidelines, policies, and SOPs in risk management are a root cause of suboptimal SSI management. These barriers may include noncompliance, logistical shortages, and ineffective communication. Therefore, improvements in dissemination, education, and logistical support are necessary to enhance quality in the future.

## CONCLUSION

Surgical Site Infections (SSIs) involving ESKAPE group bacteria require specific identification and antibiotic susceptibility testing, given their high rates of resistance. Infection management should not rely solely on antibiotics but rather adopt a holistic approach involving a multidisciplinary team, addressing risk-factor prevention, fluid management, nutritional support, and rational antibiotic use. A thorough understanding of antimicrobial stewardship programs, along with effective communication, information dissemination, and education, is essential to reduce morbidity and mortality rates.

## DECLARATIONS

### Ethics approval

None

### Conflict of interest

The authors declare no conflict of interest.


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