SHORT REPORT

# What really affects surgical site infection rates in general surgery in a developing country?

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**Summary**
*Aim:* To assess the risk factors for surgical site infection and the effects of selected infection control measures on surgical site infection rates in a general surgery unit.
*Methods:* Surgical site infection rates and adherence to infection control measures were observed in a general surgery unit.
*Results:* In multivariate analysis, male gender, a high American Society of Anesthesiologists (ASA) score, malignancy, transfusion, open surgery, and contaminated and dirty operations were found to be statistically significant risk factors for surgical site infection. Among infection control measures, only the avoidance of preoperative hair removal and a longer AMP duration had protective effects on SSI.
*Conclusion:* The most important risk factor influencing surgical site infection in general surgery was found to be the contamination level of the wound.

## Introduction

Surgical site infections (SSIs) are the most prevalent nosocomial infections in surgical clinics. SSIs have high morbidity and mortality rates, and they

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result in high hospital costs [1]. Due to multiple risk factors related to the patient, the procedure and the hospital environment, a systematic approach is needed for the prevention of SSI [2].

The aim of this study is to assess the risk factors for SSI and the effect of infection control measures on SSI rates in a general surgery unit in a developing country.

## Materials and methods

### Study setting

The study was carried out in the General Surgery Unit (GSU) at Erciyes University Hospital in Turkey. The Infection Control Committee (ICC) and trained Infection Control nurses have conducted active, prospective and patient-based SSI surveillance since May 2005. The findings are reported to the surgeons monthly to remind them of infection control measures. Local guidelines for surgical antimicrobial prophylaxis (AMP) and infection control measures were implemented in 2005. Under the local guidelines, AMP is recommended in accordance with the international clinical practice guidelines for AMP [3].

The study was performed from January to December 2011. Gall bladder (CHOL), colon (COLO), bile duct, liver or pancreatic (BILI), gastric (GAST) and small bowel (SB) surgeries were investigated daily. For each surgery, patient demographics (e.g., age, gender, obesity, underlying diseases-malignancy, hepatic failure, trauma, chronic obstructive pulmonary disease, diabetes mellitus, heart failure, renal failure, hypertension, transfusion, preoperative length of hospitalization, and cigarette use), previous use of antibiotics and corticosteroids, information about the operation (e.g., type of surgery, wound classification, laparoscopic surgery), the American Society of Anesthesiologists (ASA) score, the basic surgical site risk index category (RIC), anemia, hypoalbuminemia, infection control measures, SSI rates and length of postoperative hospitalization were recorded. RIC was originally designed as a scoring system based on 3 variables: the ASA score, the length of the operation, and the surgical wound classification. Points are given for ASA scores $\geq 3$, lengths of operations $\geq 180$ min, and contaminated (class 3) or dirty (class 4) surgical wounds. SSI was diagnosed by our infection control team based on definitions stated in the guidelines issued by the Centers for Disease Control and Prevention (CDC)/NHSN system. The clinical endpoint of the study was the development of SSI. The criteria for the diagnosis of SSI included an infection that occurred within 30 days after an operation and at least one of the following: (1) purulent discharge from the incision or from a drain placed into the organ/space; (2) organisms isolated from the culture of fluid or tissue from the incision or the organ/space; (3) an open wound with signs and symptoms of infection; and (4) an abscess or other evidence of infection found on examination of the incision or the organ/space [4]. No post discharge surveillance was performed.

### Infection control measures

Adherence to basic, modifiable and strongly recommended infection control measures was observed. These measures included (1) maintaining perioperative blood glucose levels of less than 200 mg/dL, (2) avoiding hair removal except when hair could interfere with an operation or, when hair removal is necessary, removing it with clippers, (3) using appropriate antimicrobials for AMP (recommended under local guidelines), (4) conducting AMP for the appropriate time (and discontinuing the prophylaxis within 24 h after the procedure), and (5) requiring a chlorhexidine bath before the operation [2].

### Statistical analysis

The resulting database was analyzed in SPSS version 16.0 (SPSS Inc., Chicago, Illinois). Univariate analysis of categorical variables was performed using Fisher's exact or Pearson $\chi^2$ tests. Normally distributed continuous variables were analyzed using a $t$-test. Kruskal—Wallis one-way analysis of variance was used for comparing more than two samples that are independent, or not related. Results with $P < 0.05$ were considered to be statistically significant.

### Results

During the study period, a total of 800 patients were enrolled in the study. The median patient age was 58 (range 16—94) and 405 (50.6%) of the patients were male. Of the enrolled patients, 220 (27.5%) had CHOL, 232 (29%) had COLO, 137 (17.1%) had GAST, 86 (10.8%) had SB and 125 (15.6%) had BILI surgeries. Seventy-one (8.9%) operations were urgent, whereas 729 (91.1%) were elective operations. According to the wound classification, 348 (43.5%) were clean-contaminated, 332 (41.5%)