Factors Predicting Surgical Site Infection following Foot and Ankle Surgery: A Retrospective Study

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INTRODUCTION:

Surgical site infection (SSI) following foot and ankle surgery is a complication that has significant negative effects on patient health and quality of life and the resultant treatments have an additional financial burden to the healthcare system. Because rates of infection in foot and ankle surgeries tend to be higher than those of other sites, a number of studies have investigated factors that seemingly predispose to surgical site infections. The ability to quantify a patient's preoperative risk of developing a surgical site infection has become an important tool with regard to clinical decision making and frequently guides preoperative planning in orthopaedic surgery. The purpose of this study is to create a risk severity score using data from two attending foot and ankle surgeons at a single institution.

METHODS:

A retrospective chart review was conducted on consecutive patients who underwent foot and ankle surgery between 2010 and 2019 at a single academic institution. Demographic variables such as age, gender, BMI, ambulatory surgery status, tobacco use, diabetes, admitting diagnosis, and ASA score were recorded. Relevant surgical details including length of surgery, procedure type, surgeon, antibiotic delivery time, type of antibiotic, and dose of antibiotic were analyzed. The primary outcome of interest was irrigation and debridement (I&D) procedure within 90 days postoperatively. Descriptive statistics of differences in patient characteristics between those who underwent an I&D and those who did not were examined with chi-square tests and Student t-tests. Significant variables based on simple regression analysis were included in a multiple logistic regression model with a forward stepwise procedure for variable selection. Odds ratios were determined for significant variables by multiple regression and factored into the final risk severity score.

RESULTS:

Thirty-six (1.2%) I&Ds were performed out of 2,979 procedures on 2,607 unique patients. The average age at surgery was 48.8±16.5 years and 57.1% were female. Mean BMI was 28.2±6.1. The average time between antibiotics delivery and incision was 9.2±18.0 minutes and the mean length of surgery was 75.1±50.4 minutes (median 64 minutes). In total, 66.2% of patients were non-smokers, 21.6% were former smokers, and 12.2% were current smokers. A total of 122 (4.1%) patients received prophylactic antibiotics but did not subsequently undergo an I&D. Predictors of I&D by univariable regression were male gender (p=0.034), non-ambulatory surgery (p=0.017), tobacco use (p=0.032), diabetes (p<0.001), time between antibiotics and tourniquet (p=0.014), time between antibiotics and incision (p=0.001), and length of surgery (p<0.001). Using multiple logistic regression, current tobacco use, diabetes, and longer operative times were the only significant predictors of I&D within 90 days postoperatively. Former smokers did not have significantly different odds of I&D compared to never smokers (p=0.635).

A risk severity score was developed using current tobacco use, diabetes, and length of surgery greater than 60 minutes. Each significant risk factor represents 1 point on the risk severity score. A subject with a severity score of 0 (no risk factors) has 0.458% chance of I&D within 90 days. A severity score of 1 represents a 1.225% chance, score of 2 has 3.236% chance, and a score of 3 (all risk factors) has 8.272% chance of I&D within 90 days.

DISCUSSION AND CONCLUSION:

Surgical site infection following foot and ankle surgery can have a major impact on the patient and financial burden on the healthcare system. Current tobacco use, diabetes, and length of surgery were significant predictors of I&D within 90 days following foot and ankle surgery at a single academic institution. A risk severity score was developed which may help inform preoperative patient guidance and operative planning. Future research should focus on the validation of this risk severity score at multiple institutions.

Figure 1

Candidate Risk Factors	
Patient Characteristics	Age, gender, height, weight, BMI, clinical diagnosis, diagnosis acuity, American Society of Anesthesiologists' (ASA) classification of physical status, tobacco use, diabetes, diabetic level of control
Surgical Factors	Surgery length, procedure, surgeon, ambulatory surgery, type of antibiotic, dose of antibiotic, time of antibiotic, tourniquet use, time of tourniquet inflation
Outcomes	
Primary Outcome	Irrigation and debridement (I&D) within 90 days of surgery
Secondary Outcome	Use of prophylactic antibiotics
Predictive Factors by Multiple Logistic Regression	
	Odds Ratios [95% CI], p value
Tobacco use (never vs. current)	3.245 [1.343, 7.840], p=0.009
Diabetes	4.910 [2.010, 11.997], p=0.009
Length of surgery (for each minute increase)	1.008 [1.003, 1.013], p=0.003