

A Predictive Score for Determining Risk of Surgical Site Infection After Orthopaedic Trauma Surgery

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Purpose: The ability to reliably predict infection risk for fracture surgery could alter management strategies, present opportunity for more effective preventive measures, and stimulate further research. We hypothesized that factors predictive of postoperative infection following fracture fixation could be determined and used to create a clinically useful score that would predict the risk of infection at the time of initial treatment.

Methods: A retrospective review at a single Level I trauma center yielded 308 deep surgical site infections per Centers for Disease Control and Prevention (CDC) guidelines between 2006 and 2015. A control group of 594 fracture fixation surgeries was created by random sampling and application of exclusion/inclusion criteria to 53,760 orthopaedic trauma surgeries. We collected data on 20 factors previously theorized to be associated with postoperative infection. Bivariate and multiple logistic regression analyses were used to build a prediction model with predictors chosen through a forward selection process. We used 10-fold cross-validation 10 times to validate the model, which was then used to create a composite score reflecting the risk of postoperative infection.

Results: The final postoperative infection prediction model consisted of 7 independent predictors including (1) male, (2) diabetes/end-stage renal disease, (3) HIV (human immunodeficiency virus)/hepatitis C, (4) fracture region, (5) open fracture, (6) ISS (<15, ≥15, unknown), and (7) methicillin-resistant *Staphylococcus aureus* (MRSA) nasal swab testing (not tested, negative, positive). Derived from the final model, the composite score ranges from 0 (lowest risk) to 22 (greatest risk). In our dataset, scores ranged from 0 to 17 with the corresponding scores for 25th, 50th, and 75th percentiles being 4, 6, and 8, respectfully. The risk strata were well correlated with the observed proportion of postoperative infection, and when adjusted for oversampling, resulted in a percent risk of infection of 2% for ≤4 points, 5% for 5-6 points, 11% for 7-8 points, 24% for 9-10 points, and 65% for ≥11 points.

Conclusion: The proposed acute postoperative infection prediction model appears to be able to determine which patients have fractures at higher risk of infection and can even provide an estimate of the percent risk of infection prior to fixation. Previous authors have attempted to create risk models for select types of fractures but this larger more encompassing work accounts for all fracture types and is based on a larger sample size.