

Development and Validation of a Point-of-Care Clinical Risk Score to Predict Surgical Site Infection following Total Knee or Hip Arthroplasty

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INTRODUCTION: Surgical site infections (SSIs) after total knee or hip arthroplasty (TKA or THA) are associated with increased healthcare costs and patient morbidity. Predictive analytics using large databases can be used to develop prediction tools to aid surgeons in identifying patients at higher risk for SSI to optimize incisional management strategies. The purpose of this study was to develop and validate an SSI risk-assessment score for patients undergoing primary or revision TKA or THA surgery.

METHODS: The 2019 Medicare Healthcare Database of TKA and THA surgery patients (n=455,758; 3,066 SSIs) was used to create an SSI risk scoring system using mixed effects logistic regression modeling. Full and reduced multilevel logistic regression models were developed using patient and surgery predictors. The full model used 40 and the reduced used 15 predictors. The resulting risk score was the sum of points assigned to 15 predictors.

RESULTS: The reduced model showed equally good discriminatory capability (C-statistic = 0.82) and better fit of the model (Pearson Chi-square/degrees of freedom [DF] = 0.85, consistent Akaike's information criterion [CAIC]=33,525) compared to the full model (C-statistic = 0.82; Pearson Chi-square/DF =0.85, CAIC=33,653). The reduced model risk scoring system included the following: TKA/THA type (0-9 points), congestive heart failure (4), peripheral vascular disease (2), dementia (4), rheumatic disease (3), renal disease (2), hypertension (3), obesity (6), diabetes (1), alcohol disorder (4), blood disorder (8), nicotine dependence (4), primary bone cancer (20), reaction to prosthesis or implant (3), and urgent/emergency surgery (3). A final risk score was validated using a 1,000-surgery random hold-out sample (C-statistic = 0.82).

DISCUSSION AND CONCLUSION: The SSI risk score, composed of clinical information readily obtainable from a patient's hospital chart, could serve as a strong preoperative prediction tool for SSI post TKA or THA surgery.

