

Comparison of a Clinically-Derived Prosthetic Joint Infection (PJI) Risk Model and the NHSN Risk Model

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Introduction: Several PJI risk models have been proposed for both clinical use and for risk-stratification in hospital ratings. One is the National Healthcare Safety Network (NHSN) risk model. The purpose of this study is to compare the prediction of PJI with the THA and TKA specific NHSN risk models and a clinically-derived risk model that includes patient- and surgery-specific risk factors.

Methods: The study population comprised 21941 THA and TKA procedures performed at a large US tertiary care hospital between 1/1/2002 and 12/31/2009. Revision procedures for infections were excluded. Data elements for each of the risk models were ascertained through the institutional joint registry, electronic medical records and administrative records. Medical records of all cases of PJI were reviewed manually. Significant obesity was defined as BMI >40kg/m². Cox proportional hazard regression was used to estimate hazard ratios (HR) for individual risk factors; a robust sandwich covariance estimator was used to correct for within-subject correlation for those with multiple surgeries. Comparison of the NHSN risk models and the clinically-derived PJI risk model focused on discriminative ability as measured by the concordance (c) statistic.

Results: During the 1-year window following surgery, 230 PJI occurred. Of the 7 risk factors included in the NHSN risk model, 5 were significantly associated with the risk of deep PJI infections in univariate analyses. These were history of prior TJA (HR 2.1, 95% CI 1.6, 2.7), ASA score of 4 (HR 6.3, 95% CI 1.9, 20.3), operation time (per hour, HR 1.2, 95% CI 1.1, 1.3), general anesthesia (HR 1.8, 95% CI 1.3, 2.4) and trauma (HR 2.9, 95% CI 2.2, 3.9). Discrimination of the NHSN risk model was good (c-statistic=0.697) and very comparable to that of the clinically-derived risk model. Adding 2 specific risk factors to the NHSN risk model: diabetes (HR 1.8, 95% CI 1.3, 2.3) and significant obesity (HR 2.2, 95% CI 1.6, 3.1), improved the c-statistic from 0.697 to 0.706.

Conclusion: NHSN-identified risk factors perform well in predicting the risk of deep PJI within 1-year of THA or TKA. The model prediction might be improved further with the inclusion of additional factors such as body mass index and diabetes status.