We perform risk and reliability adjustments using a two-stage approach. Multivariate logistic regression modeling is employed to account for differences in baseline characteristics and injury severity, thereby allowing for risk adjustment at the patient level. Potential predictors for the outcome of interest are entered into the model. A logit equation is derived based on significant covariates using forward selection. Separate models for each outcome are constructed, and the order of variable entry is determined by the c-index, which measures a parameter's ability to discriminate outcomes. For reliability adjustment, we use a Bayesian random effects model to account for sample size differences between hospitals. Logit equations derived from second-stage models are used to calculate expected outcome risk. Adjusted rates for each hospital are calculated by multiplying the rate ratio of observed to expected events by the overall collaborative rate.

In some instances, specific incidents have missing values for potentially important covariates such as Glasgow Coma Scale (GCS) motor score, systolic blood pressure, and pulse rate. These attributes are identified and managed through the creation of an indicator variable where applicable. The final model and analysis include all the incidents that meet the MTQIP entry criteria for the cohort being examined.

For continuous data exhibiting a right-skewed distribution, such as hospital length of stay, we employ natural log transformation. Multivariate analyses of hospital length of stay, intensive care unit length of stay, and mechanical ventilator days are performed using multiple linear regression, adjusting for significant covariates. After conducting the regression analysis, the generated coefficient from the regression model is exponentiated to determine the percent increase or decrease in length of stay relative to the risk-adjusted mean. Only patients who survived are considered in the analyses of hospital and ICU length of stay to simplify this approach. To be included in the ICU length of stay or mechanical ventilator days' analysis, a patient must have had at least one day of use for the resource being investigated.

Eligible = N - Alive w/o intervention - Dead and monitor withheld for reason

Eligible and no intervention = N - Alive w/o intervention - Alive with intervention - Dead with intervention - Dead and monitor withheld for reason

Timely = Monitor placement or operation ≤ 8 hours after ED arrival