Supplementary Online Content


eAppendix. Imputation Procedure

This supplementary material has been provided by the authors to give readers additional information about their work.
eAppendix. Imputation Procedure

To account for the hierarchical structure of the data (patients nested within hospitals), we performed multiple imputation using a dataset that included patient variables (age, gender, mechanism of injury, initial systolic blood pressure, initial pulse rate, initial respiratory rate, GCS score motor component, AIS post-dot values for each body region and mortality) and hospital level variables (type of center and center level) as well as variables representing the interaction between each of these variables and those representing each of the 270 treating hospitals. This approach led to an increase in the total number of variables to >24,000 and increased the number of variables with missingness from >7,300.

Standard imputation packages cannot be used when a large number of covariates are included. To overcome this issue, we used the fully conditional specification method to perform this imputation.1 We imputed continuous and binary variables using regularized least squares and regularized logistic regression respectively, using software implementations optimized for high-dimensional data.2 To account for error in predicting the missing values, the final imputed value was selected from a probability distribution based on the regression method used to impute each missing value. For binary variables, we chose the final imputed value from a Bernoulli distribution, with probability equal to the predicted value generated by logistic regression. For continuous predictors, we computed a prediction interval around the predicted value. We then generated the final imputed value randomly from a normal distribution around the predicted value, with the standard deviation equal to the prediction interval. These methods for choosing the missing values from their respective distributions are a standard practice for imputation.3
References


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