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### **A machine-learning based risk score for prediction of mechanical ventilation in children admitted with dengue shock syndrome**

#### **Abstract:**

Patients with severe dengue who develop severe respiratory failure requiring mechanical ventilation (MV) support have significantly increased mortality rates. This study aimed to develop a robust machine learning-based risk score to predict the need for MV in children with dengue shock syndrome (DSS) who developed acute respiratory failure. This single-institution retrospective study was conducted at a tertiary pediatric hospital in Vietnam between 2013 and 2022. The primary outcome was severe respiratory failure requiring MV in the children with DSS. Key covariables were predetermined by the LASSO method, and further analyzed using supervised models, including Logistic Regression (LR), Random Forest (RF), Support Vector Machine (SVM), k-Nearest Neighbor (KNN), and eXtreme Gradient Boosting (XGBoost). Shapley Additive Explanations (SHAP) analysis was used to assess feature contribution. A total of 1,278 patients were included, and 170 patients (13.3%) with DSS required mechanical ventilation. A significantly higher fatality rate was observed in the MV group than that in the non-MV group (22.4% vs. 0.1%). The RF and SVM models showed the highest model discrimination. The SHAP model explained insightfully the nine significant predictors. Internal validation of the predictive model showed high consistency between the predicted and observed data, with a good slope calibration in training (test) sets 1.0 (0.934), and a low Brier score of 0.04. Complete-case analysis was used to construct a risk score to estimate the need for MV in hospitalized children with DSS. This risk scoring system is a valuable tool for clinicians, aiding in the bedside management of patients with dengue shock syndrome at hospital admission.

#### **Biography**

**Thanh Nguyen Tat**, a senior clinical researcher from the Woolcock Institute of Medical Research, Vietnam. He is a Co-chief investigator in the Dengue project, "Advanced Dengue Prognosis and Treatment" in Vietnam. He has published approximately 30 articles and served as an editorial board member of several journals.