



The 65th ASH Annual Meeting Abstracts

POSTER ABSTRACTS

634.MYELOPROLIFERATIVE SYNDROMES: CLINICAL AND EPIDEMIOLOGICAL

Machine Learning to Predict Risk of Venous Thromboembolism Among Patients with Myeloproliferative Neoplasms in the Intensive Care Unit

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INTRODUCTION

Myeloproliferative neoplasms (MPN) increase the risk of venous thromboembolism (VTE) and constitute important thrombotic risk factors. VTE risk is especially high if these patients require the intensive care unit (ICU). Precise and user-friendly diagnostic tools that incorporate complex interactions between clinical data and laboratory results to predict VTE among patients with MPN in the ICU are lacking. We hypothesize that machine-learning algorithms could be used to predict VTE and guide thromboprophylaxis in this population.

METHODS

This was an observational, retrospective study using routine clinical practice data from MIMIC-IV, a freely accessible electronic health record database. We analyzed patients with an MPN diagnosis who were admitted to the ICU. ICD-9 and ICD-10 codes were utilized to identify incident VTE events during ICU stay (I82X, 453X). Descriptive statistics were reported for all variables of interest. Various machine-learning models were utilized to predict the incident VTE as the outcome variable. Patients who had expired as discharge dispositions were excluded. Models accounted for demographic characteristics, laboratory results, comorbidity burden, and other domains. Model performance was evaluated by comparing the accuracy and Area Under the Receiver Operating Characteristic Curve (AUROC) values.

RESULTS

We analyzed 378 cases that met the inclusion criteria. Among these, 160 (42.3%) were female. The majority were White (65.9%), and 151 (39.9%) had Medicare insurance. The median [Q1, Q3] age of the sample was 64.0 [52.2, 76.8] years. VTE occurred in 27 patients (7.1% incidence). ICU mortality was reported in 26 (6.9%) cases. The proportion of ER admissions was 48.1% among those cases who had VTE and 47.6% among those who didn't have VTE in the ICU ($p > 0.05$). Patients who developed VTE were more likely males (66.7% vs. 33.3%), but there was no difference in age (median age 61 vs. 64 years; $p > 0.05$). The machine learning model results showed that the Naive Bayes classifier performed best in predicting VTE in the ICU among patients with MPNs, with an AUROC value of 84.36%, followed by the deep learning model, with an AUROC value of 68.3%. The deep learning model showed that the top ten variables associated with VTE by feature importance were oxygen saturation, length of stay, blood urea nitrogen, other insurance type, anion gap, respiratory rate, bicarbonate, pressure of oxygen, pH value, and race other than White.

CONCLUSION

Predicting VTE in the ICU among patients with MPNs may be achieved by machine learning methods. The deep learning algorithm outperformed other models in terms of discrimination and calibration. If validated and applied in clinical practice, these methods may optimize thromboprophylaxis strategies. Future research is needed to test this model in more extensive clinical settings.

Disclosures No relevant conflicts of interest to declare.

Figure 1. SHAP values showing the impact on model output

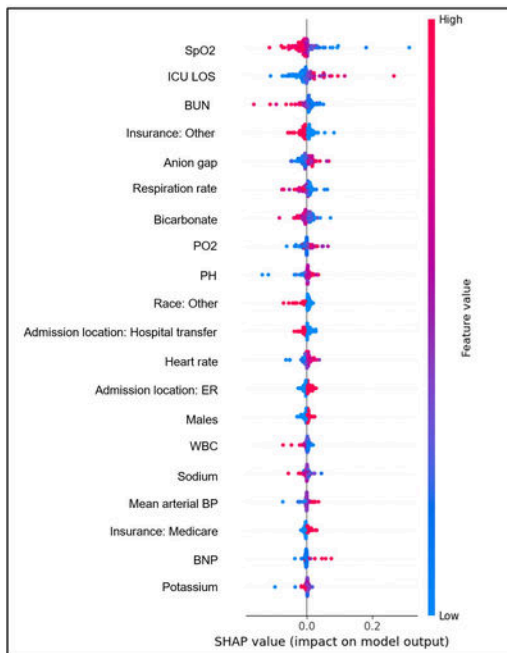


Figure 2. AUROC from the Naive Bayes classifier model predicting VT among patients with MPNs

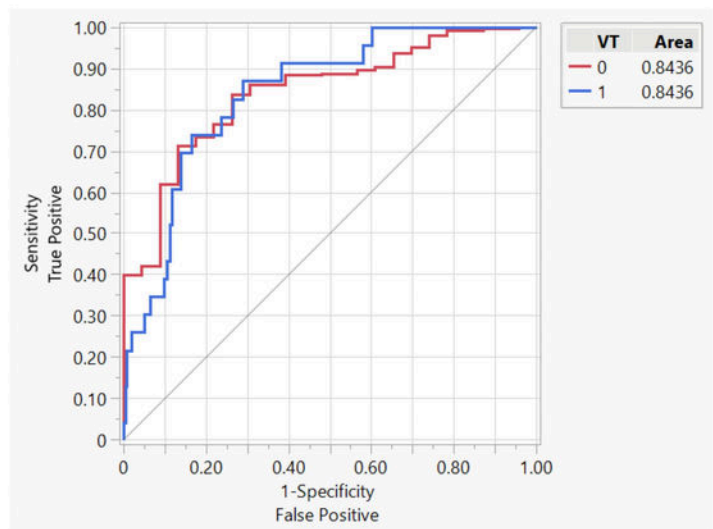


Figure 1

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