Supplementary materials

Supplementary Table 1 Transparent reporting of a multivariable prediction model for individual prognosis or diagnosis - artificial intelligence checklist for the machine learning prediction model development and validation study

Section	Item	Checklist item	Location
Title and Abstract	1	Identify the study as developing and/or validating a multivariable prediction model, the target population, and the outcome to be predicted	Title, Abstract
Title and Abstract	2	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions	Abstract
Introduction	3a	Explain the medical context and rationale for developing or validating the multivariable prediction model	Introduction, ¶1-3
Introduction	3b	Specify the objectives, including whether the study describes the development or validation of the model or both	Introduction, ¶4
Methods	4a	Describe the study design or source of data, separately for the development and validation datasets	Methods, Study design
Methods	4b	Specify the key study dates, including start of accrual, end of accrual, and end of follow-up	Methods, Study design
Methods	5a	Specify key elements of the study setting including number and location of centers	Methods, Study design
Methods	5b	Describe eligibility criteria for participants	Methods, Study design
Methods	5c	Give details of treatments received, if relevant	Methods, Study design
Methods	6a	Clearly define the outcome that is predicted by the	Methods,

		prediction model	Outcome
Methods	6b	Report any actions to blind assessment of the outcome to be predicted	N/A
Methods	7a	Clearly define all predictors used in developing the multivariable prediction model	Methods, Variables
Methods	7b	Report any actions to blind assessment of predictors for the outcome and other predictors	N/A
Methods	8	Explain how the study size was arrived at	Methods, Study design
Methods	9	Describe how predictors were handled in the analyses	Methods, Data preprocessing
Methods	10a	Describe how missing data were handled for predictors and outcome	Methods, Data preprocessing
Methods	10b	Specify type of model, all model-building procedures, and method for internal validation	Methods, Model construction
Methods	10c	For validation, describe how predictions were calculated	Methods, Model construction
Methods	10d	Specify all measures used to assess model performance and how they were calculated	Methods, Model construction
Results	13a	Describe the flow of participants through the study	Results, Figure 1
Results	13b	Describe the characteristics of the participants	Results, Table 1
Results	14a	Specify the number of participants and outcome events in each analysis	Results, Table 1
Results	15a	Present the full prediction model to allow	Online

		predictions for individuals	calculator
Results	16	Report performance measures for the prediction model	Results, Tables 2-4, Figures 2-5
Discussion	18	Discuss any limitations of the study	Discussion, ¶8-9
Discussion	19a	Give an overall interpretation of the results	Conclusion
Discussion	19b	Discuss implications for practice	Discussion
Other	20	Provide information about the availability of supplementary resources	Methods, Online calculator
Other	21	Give the source of funding and the role of the funders	N/A
AI-specific	AI-1	Describe the AI/ML method used and justify its selection	Methods, Model construction
AI-specific	AI-2	Report hyperparameter tuning methodology	Methods, Model construction
AI-specific	AI-3	Provide model interpretability/explainability analysis	Results, SHAP analysis, Figure 4

AI: Artificial intelligence; ML: Machine learning; SHAP: SHapley Additive exPlanations; N/A: Not applicable.

Supplementary material

Code availability and online prediction tool

The complete code for data preprocessing, feature engineering, model development, and evaluation is publicly available at: GitHub Repository: https://github.com/[AUTHOR]/evb-mortality-prediction

The machine learning model has been deployed as an interactive web-based clinical prediction tool: Online Calculator: https://huggingface.co/spaces/mmrech/evb-br

The calculator accepts the 36 clinical, laboratory, and imaging variables described in the Methods section and returns the predicted 1-year mortality probability based on the Random Forest model.

Supplementary material

Random forest model architecture and hyperparameter configuration

The final Random Forest model was configured with the following optimized hyperparameters after grid search cross-validation:

- Number of trees (n_estimators): 200
- Maximum depth (max_depth): 10
- Minimum samples to split (min_samples_split): 5
- Minimum samples per leaf (min_samples_leaf): 2
- Maximum features per split (max_features): 'sqrt'

Bootstrap sampling was enabled with 1000 iterations for internal validation. Feature importance was assessed using mean decrease in impurity (Gini importance) and validated with SHAP (SHapley Additive exPlanations) values for model interpretability.