Supplementary Data

Iwase S, Nakada TA, Shimada T, Oami T, Shimazui T, Takahashi N, Yamabe J, Yamao Y, Kawakami E

Prediction algorithm for ICU mortality and length of stay using machine learning

Supplemental Table.1 Input variables

Baseline characteristics	Age, gender, height, weight, blood type (ABO and Rh), department, diagnosis, cardiac arrest resuscitation, admission route, medical emergency team call, transport method, admission time, APACHE II comorbidities (acquired immunodeficiency syndrome, acute myeloid leukemia/multiple myeloma, heart failure, lymphoma, respiratory failure, cancer metastasis, liver failure, cirrhosis, immunosuppressed status, and dialysis), FIM score, and body restraint
Blood tests	Complete blood count (WBC, RBC, HGB, HCT, MCV, MCH, MCHC, platelet, Seg, Eo, Ba, monocyte, and lymphocyte), biochemistry (TP, Alb, AST, ALT, LDH, ALP, GGT, T-BIL, D-BIL, AMY, CPK, UN, CRE, UA, Na, K, Cl, Ca, and CRP), coagulation (PT-SEC, PT-PER, and PT-INR), and blood gas analysis (pH, PCO_2, PO_2, O_2Hb, SO_2, SO_2 (c), THb, HHb, THb (c), Hct, MetHb, COHb, HCO3-, cBase (B), cBase (Ecf), AG, Na^+, K^+, Cl^-, Ca^{++}, lactate, and glucose)
Physiologic measurements	Heart rate, pulse rate, blood pressure (noninvasive systolic/diastolic and invasive systolic/mean/diastolic), respiratory rate (impedance and count), oxygen saturation, body temperature, and end-tidal carbon dioxide

APACHE, acute physiology and chronic health evaluation; FIM score, functional independence measure score; WBC, white blood cell; RBC, red blood cell; HGB, hemoglobin; HCT, hematocrit; MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; Seg, segmented neutrophil; Eo, eosinophil; Ba, basophil; TP, total protein; Alb, albumin; AST, aspartate aminotransferase; ALT, alanine aminotransferase; LDH, lactate dehydrogenase; ALP, alkaline phosphatase; GGT, gamma-glutamyltransferase; T-Bil; total bilirubin; D-Bil, direct bilirubin; AMY, amylase; CPK, creatine phosphokinase; UN, urea nitrogen; CRE, creatinine; UA, uric acid; CRP, C-reactive protein; PT-SEC, prothrombin time (in seconds); PT-PER, prothrombin time (%); PT-INR, prothrombin time (international normalized ratio); O_2Hb, oxyhemoglobin; SO_2, oxygen saturation; SO_2 (c), calculated oxygen saturation; THb, total hemoglobin; HHb, deoxyhemoglobin; THb (c), calculated total hemoglobin; Hct, hematocrit; MetHb, methemoglobin; COHb, carboxyhemoglobin; cBase (B), actual base excess; cBase (Ecf), standard base excess; AG, anion gap

Supplemental Table.2 Predictive accuracy for intensive care unit mortality in the training set

Model	AUC
Random Forest	0.989
XGBoost	0.993
Neural Network	0.955

All predictions for mortality using machine learning were highly accurate.

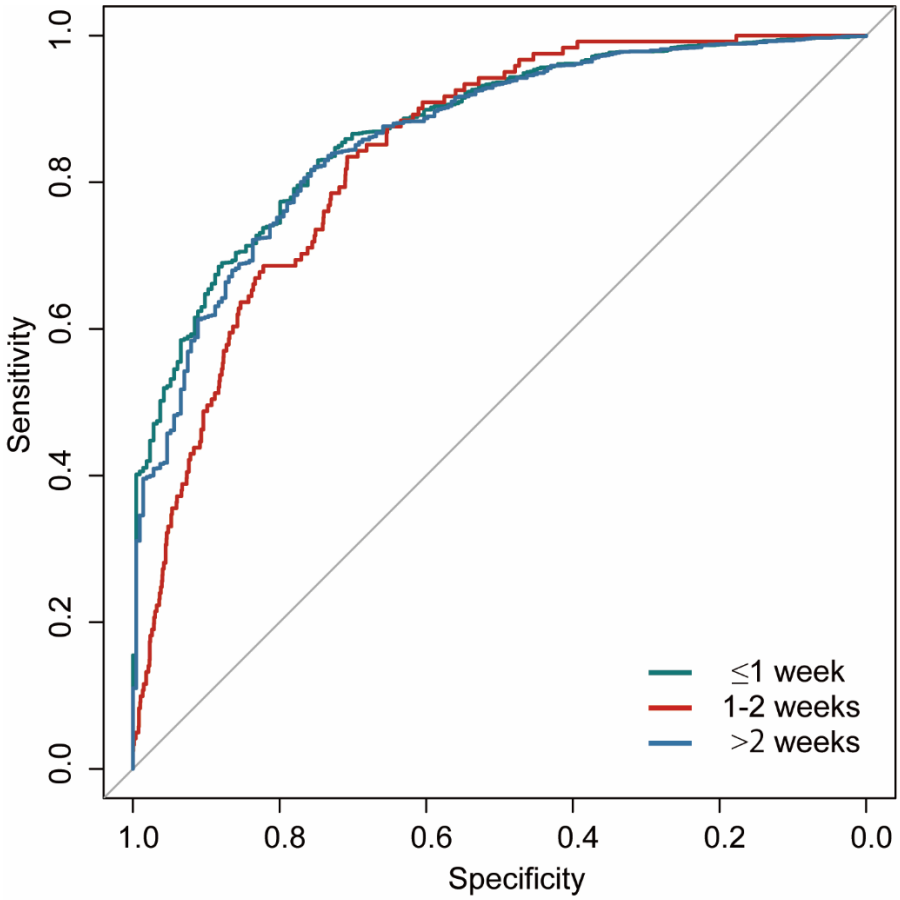
AUC, area under the curve

Supplemental Table.3 Predictive accuracy for short or long intensive care unit stay in the training set

Model	AUC (short/long)
Random Forest	0.848/0.987
XGBoost	0.989/0.995
Neural Network	0.907/0.959

Short, within one week; long, more than two weeks

Supplemental Fig.1 Predictive accuracy of ordinalForest for the length of intensive care unit stay



Outcome variables	AUC
Length of ICU stay	
≤1 week	0.872
1-2 weeks	0.839
>2 weeks	0.863

ROC curves and AUCs for the length of ICU stay were derived from ordinalForest. ROC, receiver operating characteristic; AUC, area under the curve; ICU, intensive care unit