



Supplementary Figure 1 Receiver operating characteristic curves. A: DeLong test comparing two models; B: DeLong test comparing random forest model and extreme gradient boosting model; C: DeLong test comparing random forest model and logistic regression model; D: DeLong test comparing logistic regression model and extreme gradient boosting model.

Supplementary Table 1 Cox regression analysis of preoperative data and Actual OHE Status

Variables	Univariate analysis		Multivariate analysis	
	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)
Gender				
Male		1.00 (Reference)		
Female	0.906	0.94 (0.31 ~ 2.85)		
Age				
< 52		1.00 (Reference)		1.00 Reference)
> 52	0.009	4.00 (1.41 ~ 11.37)	0.008	5.11 (1.54 ~ 16.98)
Etiology				
Hepatitis B Virus		1.00 (Reference)		
Hepatitis C Virus	0.998	0.00 (0.00 ~ Inf)		
Alcoholic	0.531	1.52 (0.41 ~ 5.62)		
Other Etiologies	0.086	2.47 (0.88 ~ 6.96)		
Generalized PVT				
no		1.00 (Reference)		
yes	0.702	0.78 (0.23 ~ 2.73)		
Endoscope procedure				
no		1.00 (Reference)		
yes	0.673	0.79 (0.26 ~ 2.41)		
HE				
no		1.00 (Reference)		
yes	0.037	4.91 (1.10 ~ 21.87)		
Ascites				
no		1.00 (Reference)		

Variables	Univariate analysis		Multivariate analysis	
	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)
yes	0.040	8.28 (1.10 ~ 62.29)		
Pre-PPG	0.118	0.94 (0.87 ~ 1.02)		
Pre-PVP	0.550	0.98 (0.91 ~ 1.05)		
Post-PVP	0.559	0.98 (0.90 ~ 1.06)		
Post-PPG	0.055	0.86 (0.73 ~ 1.00)		
TBIL	0.127	1.02 (0.99 ~ 1.04)	0.024	1.03 (1.01 ~ 1.06)
ALB	0.144	0.93 (0.84 ~ 1.03)		
CR	0.122	1.00 (1.00 ~ 1.01)		
ALT	0.542	1.01 (0.98 ~ 1.04)		
prolonged PT	0.360	1.07 (0.93 ~ 1.23)		
INR	0.206	2.73 (0.58 ~ 12.92)		
Na ⁺	0.069	1.01 (1.00 ~ 1.02)	0.003	1.02 (1.01 ~ 1.03)
PLT	0.883	1.00 (0.99 ~ 1.01)		
WBC	0.706	1.02 (0.91 ~ 1.14)		
Actual OHE Status				
No		1.00 (Reference)		1.00 (Reference)
Yes	0.010	4.17 (1.41 ~ 12.30)	0.019	4.03 (1.26 ~ 12.90)

OHE: overt hepatic encephalopathy; HE: Hepatic Encephalopathy; PVT: Portal Vein Thrombosis; PVP: Portal Venous Pressure; PPG: Portal Pressure Gradient; TBIL: Total Bilirubin; ALB: Albumin; CR: Creatinine; ALT: Alanine Aminotransferase; PT: Prothrombin Time; INR: International Normalized Ratio; Na⁺: Serum Sodium Ion; PLT: Platelet Count; WBC: White Blood Cell Count.

Supplementary Table 2 Cox regression analysis of preoperative data and Predicted OHE Value

Variables	Univariate analysis		Multivariate analysis	
	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)
Gender				
Male		1.00 (Reference)		
Female	0.906	0.94 (0.31 ~ 2.85)		
Age				
< 52		1.00 (Reference)		
> 52	0.009	4.00 (1.41 ~ 11.37)	0.033	3.61 (1.11 ~ 11.76)
Etiology				
Hepatitis B Virus				
Hepatitis B Virus		1.00 (Reference)		
Hepatitis C Virus				
Hepatitis C Virus	0.998	0.00 (0.00 ~ Inf)		
Alcoholic				
Alcoholic	0.531	1.52 (0.41 ~ 5.62)		
Other Etiologies				
Other Etiologies	0.086	2.47 (0.88 ~ 6.96)		
Generalized PVT				
no		1.00 (Reference)		
yes	0.702	0.78 (0.23 ~ 2.73)		
Endoscope Procedure				
no		1.00 (Reference)		
yes	0.673	0.79 (0.26 ~ 2.41)		
HE				

Variables	Univariate analysis		Multivariate analysis	
	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)
no		1.00 (Reference)		
yes	0.037	4.91 (1.10 ~ 21.87)		
Ascites				
No		1.00 (Reference)		
yes	0.040	8.28 (1.10 ~ 62.29)		
Pre-PPG	0.118	0.94 (0.87 ~ 1.02)		
Pre-PVP	0.550	0.98 (0.91 ~ 1.05)		
Post-PVP	0.559	0.98 (0.90 ~ 1.06)		
Post-PPG	0.055	0.86 (0.73 ~ 1.00)		
TBIL	0.127	1.02 (0.99 ~ 1.04)		
ALB	0.144	0.93 (0.84 ~ 1.03)		
CR	0.122	1.00 (1.00 ~ 1.01)		
ALT	0.542	1.01 (0.98 ~ 1.04)		
prolonged PT	0.360	1.07 (0.93 ~ 1.23)		
INR	0.206	2.73 (0.58 ~12.92)		
Na+	0.069	1.01 (1.00 ~ 1.02)	0.001	1.02 (1.01 ~ 1.04)
Predicted OHE Value	0.005	46.05 (3.19 ~ 665.75)	0.012	45.26 (2.33 ~ 878.14)
PLT	0.883	1.00 (0.99 ~ 1.01)		
WBC	0.706	1.02 (0.91 ~ 1.14)		

OHE: overt hepatic encephalopathy; HE: Hepatic Encephalopathy; PVT: Portal Vein Thrombosis; PVP: Portal Venous Pressure; PPG: Portal Pressure Gradient; TBIL: Total

Bilirubin; ALB: Albumin; CR: Creatinine; ALT: Alanine Aminotransferase; PT: Prothrombin Time; INR: International Normalized Ratio; Na⁺: Serum Sodium Ion; PLT: Platelet Count; WBC: White Blood Cell Count.

Supplementary Table 3 Cox regression analysis of preoperative data

Variables	Univariate analysis		Multivariate analysis	
	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)
Gender				
Male		1.00 (Reference)		
Female	0.906	0.94 (0.31 ~ 2.85)		
Age				
< 52		1.00 (Reference)		1.00 (Reference)
> 52	0.009	4.00 (1.41 ~ 11.37)	0.005	5.10 (1.63 ~ 15.93)
Etiology				
Hepatitis B Virus		1.00 (Reference)		
Hepatitis C Virus	0.998	0.00 (0.00 ~ Inf)		
Alcoholic	0.531	1.52 (0.41 ~ 5.62)		

Other Etiologies	0.086	2.47 (0.88 ~ 6.96)
Generalized PVT		
no		1.00 (Reference)
yes	0.702	0.78 (0.23 ~ 2.73)
Endoscope Procedure		
no		1.00 (Reference)
yes	0.673	0.79 (0.26 ~ 2.41)
HE		
no		1.00 (Reference)
yes	0.037	4.91 (1.10 ~ 21.87)
Ascites		
no		1.00 (Reference)
yes	0.040	8.28 (1.10 ~ 62.29)
Pre-PPG	0.118	0.94 (0.87 ~ 1.02)

Pre-PVP	0.550	0.98 (0.91 ~ 1.05)		
Post-PVP	0.559	0.98 (0.90 ~ 1.06)		
Post-PPG	0.055	0.86 (0.73 ~ 1.00)		
TBIL	0.127	1.02 (0.99 ~ 1.04)		
ALB	0.144	0.93 (0.84 ~ 1.03)		
CR	0.122	1.00 (1.00 ~ 1.01)		
ALT	0.542	1.01 (0.98 ~ 1.04)		
prolonged PT	0.360	1.07 (0.93 ~ 1.23)		
INR	0.206	2.73 (0.58 ~ 12.92)		
Na+	0.069	1.01 (1.00 ~ 1.02)	0.009	1.02 (1.01 ~ 1.03)
PLT	0.883	1.00 (0.99 ~ 1.01)		
WBC	0.706	1.02 (0.91 ~ 1.14)		

OHE: overt hepatic encephalopathy; HE: Hepatic Encephalopathy; PVT: Portal Vein Thrombosis; PV P: Portal Venous Pressure; PPG: Portal Pressure Gradient; TBIL: Total Bilirubin; ALB: Albumin; CR: Creatinine; ALT: Alanine Aminotransferase; PT:

Prothrombin Time; INR: International Normalized Ratio; Na⁺: Serum Sodium Ion; PLT: Platelet Count; WBC: White Blood Cell Count.

Supplementary Table 4 Multicollinearity Test of preoperative data and Predicted OHE Value

Variable	1/VIF	VIF
Gender	0.594	1.685
Age	0.407	2.456
Etiology	0.509	1.963
Pre-PVP	0.077	13.016
Pre-PPG	0.152	6.568
Post-PVP	0.103	9.721
Post-PPG	0.235	4.249
Generalized PVT	0.398	2.512
Endoscope procedure	0.619	1.615
TBIL	0.444	2.253
ALB	0.537	1.863
CR	0.670	1.493
ALT	0.709	1.411
prolonged PT	0.069	14.561
INR	0.082	12.164

HE	0.593	1.686
Na ⁺	0.583	1.714
PLT	0.383	2.611
WBC	0.556	1.798
Ascites	0.580	1.725
Predicted OHE Value	0.164	6.116

VIF: Variance Inflation Factor; OHE: overt hepatic encephalopathy; HE: Hepatic Encephalopathy; PVT: Portal Vein Thrombosis; PVP: Portal Venous Pressure; PPG: Portal Pressure Gradient; TBIL: Total Bilirubin; ALB: Albumin; CR: Creatinine; ALT: Alanine Aminotransferase; PT: Prothrombin Time; INR: International Normalized Ratio; Na⁺: Serum Sodium Ion; PLT: Platelet Count; WBC: White Blood Cell Count.

Supplementary Table 5 Multicollinearity Test of preoperative data

Variable	1/VIF	VIF
Gender	0.595	1.680
Age	0.587	1.704
Etiology	0.515	1.940
Pre-PVP	0.078	12.893
Pre-PPG	0.153	6.553
Post-PVP	0.103	9.721
Post-PPG	0.245	4.089
Generalized PVT	0.693	1.443

Endoscope procedure	0.660	1.516
TBIL	0.444	2.252
ALB	0.618	1.617
CR	0.736	1.358
ALT	0.749	1.335
prolonged PT	0.069	14.525
INR	0.083	12.060
HE	0.632	1.581
Na ⁺	0.668	1.498
PLT	0.448	2.234
WBC	0.570	1.754
Ascites	0.639	1.565

VIF: Variance Inflation Factor; OHE: overt hepatic encephalopathy; HE: Hepatic Encephalopathy; PVT: Portal Vein Thrombosis; PVP: Portal Venous Pressure; PPG: Portal Pressure Gradient; TBIL: Total Bilirubin; ALB: Albumin; CR: Creatinine; ALT: Alanine Aminotransferase; PT: Prothrombin Time; INR: International Normalized Ratio; Na⁺: Serum Sodium Ion; PLT: Platelet Count; WBC: White Blood Cell Count.

Supplementary Table 6 Performance Metrics for Machine Learning Classifiers

Classifiers	Train	Train	Train	Train	Test	Test	Test	Test
	ACC	SEN	SPE	AUC	ACC	SEN	SPE	AUC
Random	1	1	1	1	0.818	0.3	0.911	0.696
Forest								

XGBoost	1	1	1	1	0.818	0.5	0.875	0.796
Logistic Regression	0.923	0.915	0.930	0.969	0.773	0.8	0.768	0.825

ACC: Accuracy; SEN: Sensitivity; SPE: Specificity; AUC: Area Under the Curve.