

**Supplementary Table 1 Clinicopathological characteristics of patients with primary hepatic carcinoma**

Variables	Overall (N=505)
Age (%), year	
> 60	349 (69.1)
≤60	156 (30.9)
Sex (%)	
Male	340 (67.3)
Female	165 (32.7)
BMI (%)	
≤18.5	67 (13.3)
18.5 ~ 23.9	175 (34.7)
24 ~ 27.9	144 (28.5)
≥28	119 (23.6)
Smoking (%)	
Yes	177 (35.0)

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No	328 (65.0)
Drinking (%)	
Yes	156 (30.9)
No	349 (69.1)
History of hepatitisB (%)	
Yes	192 (38.0)
No	313 (62.0)
History of hepatitisC (%)	
Yes	179 (35.4)
No	326 (64.6)
Hypertension (%)	
Yes	167 (33.1)
No	338 (66.9)
Diabetes (%)	
Yes	171 (33.9)
No	334 (66.1)

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Cirrhosis (%)	
Yes	244 (48.3)
No	261 (51.7)
Child_Pugh (%)	
A	355 (70.3)
B	150 (29.7)
AFP (%),ug/L	
≤100	295 (58.4)
> 100	210 (41.6)
HBV_DNA (%)	
Negative	339 (67.1)
Positive	166 (32.9)
Tumor_size (%),cm	
≤4	286 (56.6)
> 4	219 (43.4)

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Treatment (%)	
Laparoscopic	140 (27.7)
Open	365 (72.3)
LNM (%)	
Yes	156 (30.9)
No	349 (69.1)
Energy (median [IQR])	4.49 [2.86, 5.98]
Contrast (median [IQR])	349.00 [317.00, 384.00]
Correlation (median [IQR])	16.40 [12.45, 20.09]
SOS (median [IQR])	0.88 [0.71, 1.07]
IND (median [IQR])	1.49 [1.17, 1.87]
MES (median [IQR])	2.72 [1.95, 3.47]
SUV (median [IQR])	20.70 [16.00, 25.50]
SUE (median [IQR])	21.80 [16.40, 27.00]
Entropy (median [IQR])	0.84 [0.62, 1.07]
DIV (median [IQR])	313.00 [207.00, 402.00]

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DIE (median [IQR])

234.00 [188.00, 274.00]

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Abbreviations: IQR: inter-quartile range; BMI: body mass index; LNM: lymph node metastasis; SOS: sum of squares; IND: inverse difference; MES: mean sum; SUV: sum variance; SUE: sum entropy; DIV: difference variance; DIE: difference entropy.

**Supplementary Table 2 Multivariate logistic regression analysis model for predictors of pulmonary infection after liver resection**

Variables	OR	Univariable	P-value	OR	Multivariable	P-value
Age,year						
> 60	Reference					
≤60	1.51	0.92-2.43	0.101			
Sex						
Male	Reference					
Female	1.06	0.65-1.73	0.82			
BMI,kg/m <sup>2</sup>						
≤18.5	Reference					
18.5 ~ 23.9	0.69	0.34-1.42	0.312			
24 ~ 27.9	0.81	0.38-1.65	0.539			
≥28	0.76	0.36-1.64	0.489			
Smoking						
Yes	Reference					

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No	0.84	0.52-1.36,	0.479
Drinking			
Yes	Reference		
No	1.04	0.63-1.72	0.885
History of hepatitisB			
Yes	Reference		
No	0.78	0.49-1.24	0.295
History of hepatitisC			
Yes	Reference		
No	0.97	0.60-1.57,	0.898
Hypertension			
Yes	Reference		
No	0.91	0.56-1.48	0.695
Diabetes			
Yes	Reference		
No	0.95	0.58-1.54	0.826

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Cirrhosis					
Yes	Reference				
No	1.15	0.72-1.84	0.546		
Child Pugh					
A	Reference				
B	1.61	0.99-2.61,	0.055	0.55-100.8	0.076
AFP, ug/L					
≤100	Reference				
> 100	2	1.25-3.20	0.004	0.04-4.28	0.028
HBV DNA					
Negative	Reference				
Positive	1.11	0.68-1.82	0.663		
Tumor size,cm					
≤4	Reference				
> 4	2.93	1.81-4.76	<.001	0.28-33.49	<.001

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Treatment						
Laparoscopic	Reference					
Open	0.92	0.55-1.54	0.759			
LNM						
Yes	Reference					
No	1.19	0.71-1.99	0.511			
Energy	2.71	1.69-2.94	<0.001	2.71	1.69-2.94	<0.001
Contrast	0.89	0.86-0.91	<0.001	0.89	0.86-0.91	<0.001
Correlation	0.96	0.91-1.02	0.006			
SOS	1.14	0.78-1.54	<0.001	1.23	0.72-1.49	<0.001
IND	2.17	1.09-2.79	<0.001	2.06	0.91-2.37	<0.001
MES	0.89	0.56-1.26	<0.001	1.04	0.82-1.35	<0.001
SUV	4.87	2.27-7.15	<0.001	3.91	2.01-5.49	<0.001
SUE	5.37	0.52-6.16	<0.001	4.86	1.03-7.11	<0.001
Entropy	1.18	0.78-2.14	<0.001	1.24	0.83-2.79	<0.001
DIV	0.78	0.32-1.58	0.543			

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DIE	1.29	1.02-2.17	0.726
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Abbreviations: IQR: inter-quartile range; BMI: body mass index; LNM: lymph node metastasis; SOS: sum of squares; IND: inverse difference; MES: mean sum; SUV: sum variance; SUE: sum entropy; DIV: difference variance; DIE: difference entropy.

**Supplementary Table 3 Weight value of candidate variables for predicting pulmonary infection based on RFM algorithm**

Variables	%IncMSE	IncNodePurity
Age	-2.45E-21	5.63E-06
Sex	3.26E-23	7.12E-16
BMI	1.000500375	5.82E-05
Smoking	1.72E-35	8.06E-16
Drinking	1.000500375	3.26E-16
History of hepatitisB	1.000500375	0.000783428
History of hepatitisC	1.000500375	0.000611514
Hypertension	-1.27E-21	3.84E-16
Diabetes	9.96E-37	3.85E-16
Cirrhosis	1.76E-36	2.45E-15
Child Pugh	-1.000500375	0.00232467
AFP	-2.003504252	0.012708614
HBV DNA	2.47E-21	6.64E-16
Tumor size	-0.412462483	0.028029941
Treatment	3.47E-37	3.94E-16

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LNМ	1.40E-35	3.93E-16
Energy	10.96976849	2.025089188
Contrast	8.47396591	1.140790344
Correlation	-2.00335511	0.016095604
SOS	17.21026768	13.74869534
IND	25.40152852	24.15559497
MES	15.58232261	9.544114695
SUV	11.78166099	5.294503845
SUE	15.19217494	10.98837038
Entropy	10.49792356	4.022855081
DIV	-1.414508469	0.009173818
DIE	1.324680407	0.001620467

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**Supplementary Table 4 Weight distribution of hidden layer variables based on ANNM algorithm**

<b>Variables</b>	<b>Weight</b>
Intercept.to.1layhid1	1.70E+00
Energy.to.1layhid1	-2.83E-01
Contrast.to.1layhid1	4.90E-01
SOS.to.1layhid1	2.85E-01
IND.to.1layhid1	-1.28E-01
MES.to.1layhid1	4.84E-01
SUV.to.1layhid1	4.80E-01
SUE.to.1layhid1	-1.16E+00
Entropy.to.1layhid1	2.08E+00
Intercept.to.1layhid2	9.85E-02
Energy.to.1layhid2	2.57E-01
Contrast.to.1layhid2	-9.94E-02
SOS.to.1layhid2	1.36E+00
IND.to.1layhid2	2.81E-01

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MES.to.1layhid2	1.33E+00
SUV.to.1layhid2	3.28E-01
SUE.to.1layhid2	3.22E-01
Entropy.to.1layhid2	1.39E+00
Intercept.to.1layhid3	-2.23E-01
Energy.to.1layhid3	1.40E+00
Contrast.to.1layhid3	1.09E+00
SOS.to.1layhid3	-3.51E-01
IND.to.1layhid3	9.57E-01
MES.to.1layhid3	4.35E-02
SUV.to.1layhid3	-6.01E-01
SUE.to.1layhid3	-5.78E-01
Entropy.to.1layhid3	-1.13E-01
Intercept.to.1layhid4	-2.68E-01
Energy.to.1layhid4	6.98E-01
Contrast.to.1layhid4	5.18E-02

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SOS.to.1layhid4	1.34E+00
IND.to.1layhid4	-1.55E+00
MES.to.1layhid4	1.04E+00
SUV.to.1layhid4	1.16E+00
SUE.to.1layhid4	4.89E-01
Entropy.to.1layhid4	2.93E-01
Intercept.to.1layhid5	1.20E+00
Energy.to.1layhid5	7.28E-01
Contrast.to.1layhid5	-1.65E-02
SOS.to.1layhid5	-1.72E+00
IND.to.1layhid5	3.59E-01
MES.to.1layhid5	-2.35E-01
SUV.to.1layhid5	-2.34E-01
SUE.to.1layhid5	-2.76E-01
Entropy.to.1layhid5	-6.22E-02
Intercept.to.1layhid6	-4.51E-01

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Energy.to.1layhid6	3.05E-01
Contrast.to.1layhid6	-2.55E-02
SOS.to.1layhid6	-3.53E-01
IND.to.1layhid6	-1.82E-01
MES.to.1layhid6	1.02E+00
SUV.to.1layhid6	-1.31E+00
SUE.to.1layhid6	4.38E-01
Entropy.to.1layhid6	-8.43E-01
Intercept.to.2layhid1	9.33E-01
1layhid1.to.2layhid1	-2.61E+00
1layhid2.to.2layhid1	3.87E+00
1layhid3.to.2layhid1	-4.23E-01
1layhid4.to.2layhid1	6.38E-01
1layhid5.to.2layhid1	4.11E+00
1layhid6.to.2layhid1	-1.49E+00
Intercept.to.2layhid2	7.80E-01

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1layhid1.to.2layhid2	-4.40E-01
1layhid2.to.2layhid2	2.89E+00
1layhid3.to.2layhid2	6.03E-01
1layhid4.to.2layhid2	2.35E-01
1layhid5.to.2layhid2	8.55E-01
1layhid6.to.2layhid2	3.39E+00
Intercept.to.2layhid3	2.92E-01
1layhid1.to.2layhid3	4.38E-01
1layhid2.to.2layhid3	-8.83E-01
1layhid3.to.2layhid3	-6.11E-01
1layhid4.to.2layhid3	-1.48E+00
1layhid5.to.2layhid3	-3.54E+00
1layhid6.to.2layhid3	3.40E-01
Intercept.to.2layhid4	1.48E+00
1layhid1.to.2layhid4	-7.17E-01
1layhid2.to.2layhid4	-4.08E-01

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1layhid3.to.2layhid4	-2.32E-01
1layhid4.to.2layhid4	1.63E+00
1layhid5.to.2layhid4	1.71E-01
1layhid6.to.2layhid4	-1.94E-01
Intercept.to.2layhid5	-1.02E+00
1layhid1.to.2layhid5	-1.28E+00
1layhid2.to.2layhid5	1.54E+00
1layhid3.to.2layhid5	-5.57E-01
1layhid4.to.2layhid5	8.50E-01
1layhid5.to.2layhid5	-6.95E-01
1layhid6.to.2layhid5	-1.77E+00
Intercept.to.2layhid6	-7.91E-01
1layhid1.to.2layhid6	-3.04E-02
1layhid2.to.2layhid6	2.07E+00
1layhid3.to.2layhid6	1.11E+00
1layhid4.to.2layhid6	-1.24E+00

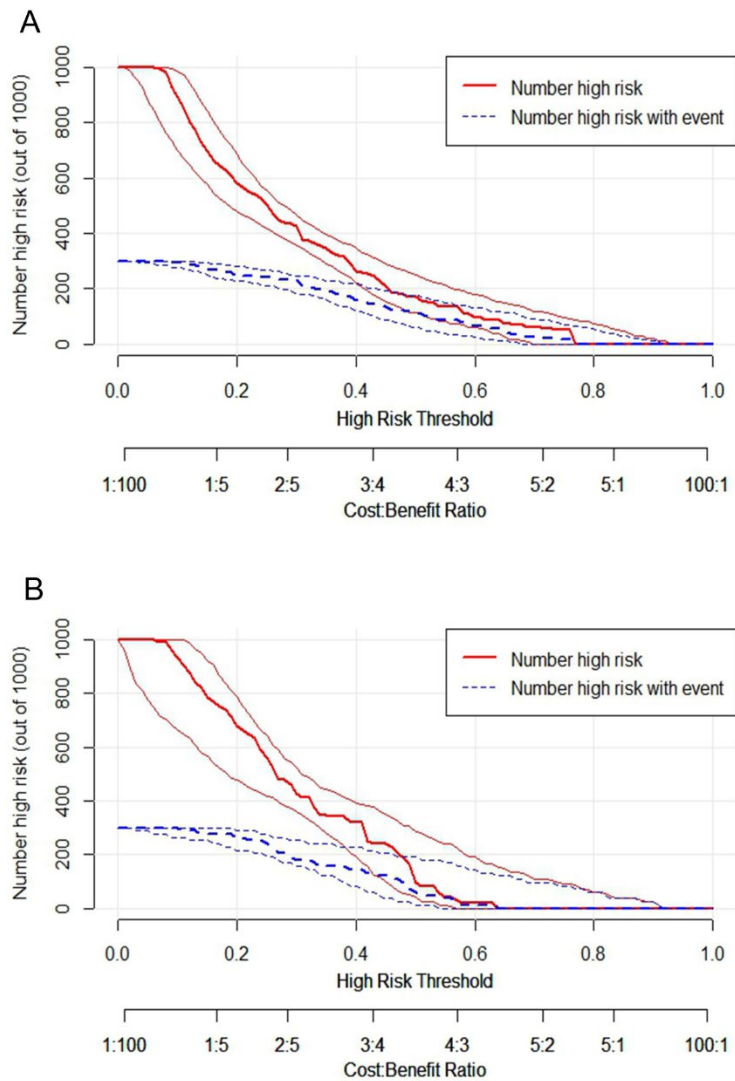
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1layhid5.to.2layhid6	-1.87E+00
1layhid6.to.2layhid6	-1.35E+00
Intercept.to.1	1.64E-01
2layhid1.to.1	-1.37E-02
2layhid2.to.1	5.35E-01
2layhid3.to.1	2.47E+00
2layhid4.to.1	4.30E-01
2layhid5.to.1	-5.44E-01
2layhid6.to.1	-1.42E+00
Intercept.to.0	-1.17E+00
2layhid1.to.0	1.03E+00
2layhid2.to.0	1.19E+00
2layhid3.to.0	-3.82E-01
2layhid4.to.0	1.89E-01
2layhid5.to.0	-2.74E-02
2layhid6.to.0	-7.72E-02

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**Supplementary Figure 1 Prediction performance of RFM model *via* CIC. A. Training set. B. Validation set. Notes. The blue line predicts the probability of pulmonary infection, and the black line shows the possibility that the patient is at high risk of pulmonary infection.**