

Supplementary Table 1 Baseline demographic and radiomics of patients with colorectal cancer

Variables	Training set			P-value	Testing set			P-value
	Overall(N=274)	SLM(N=38)	Non-SLM(N=236)		Overall(N=118)	SLM(N=10)	Non-SLM(N=108)	
Age (%), year								
≥60	154 (56.2)	24 (63.2)	130 (55.1)	0.45	61 (51.7)	7 (70.0)	54 (50.0)	0.379
< 60	120 (43.8)	14 (36.8)	106 (44.9)		57 (48.3)	3 (30.0)	54 (50.0)	
Sex (%)								
Male	136 (49.6)	19 (50.0)	117 (49.6)	1	58 (49.2)	7 (70.0)	51 (47.2)	0.295
Female	138 (50.4)	19 (50.0)	119 (50.4)		60 (50.8)	3 (30.0)	57 (52.8)	
BMI (%),kg/m ²								
≤18.5	69 (25.2)	9 (23.7)	60 (25.4)	0.54	32 (27.1)	2 (20.0)	30 (27.8)	0.191

18.5 ~ 23.9	68 (24.8)	13 (34.2)	55 (23.3)		21 (17.8)	0 (0.0)	21 (19.4)	
24 ~ 27.9	69 (25.2)	8 (21.1)	61 (25.8)		35 (29.7)	3 (30.0)	32 (29.6)	
≥28	68 (24.8)	8 (21.1)	60 (25.4)		30 (25.4)	5 (50.0)	25 (23.1)	
Smoking (%)								
Yes	141 (51.5)	14 (36.8)	127 (53.8)	0.07 7	60 (50.8)	4 (40.0)	56 (51.9)	0.69 9
No	133 (48.5)	24 (63.2)	109 (46.2)		58 (49.2)	6 (60.0)	52 (48.1)	
Drinking (%)								
Yes	153 (55.8)	18 (47.4)	135 (57.2)	0.33 9	69 (58.5)	6 (60.0)	63 (58.3)	1
No	121 (44.2)	20 (52.6)	101 (42.8)		49 (41.5)	4 (40.0)	45 (41.7)	
Intestinal polyp (%)								
Yes	125 (45.6)	14 (36.8)	111 (47.0)	0.32	55 (46.6)	6 (60.0)	49 (45.4)	0.57 8

No	149 (54.4)	24 (63.2)	125 (53.0)		63 (53.4)	4 (40.0)	59 (54.6)	
AST (%),U/L								
< 40	142 (51.8)	19 (50.0)	123 (52.1)	0.94 6	61 (51.7)	6 (60.0)	55 (50.9)	0.82 7
≥40	132 (48.2)	19 (50.0)	113 (47.9)		57 (48.3)	4 (40.0)	53 (49.1)	
ALT (%),U/L								
< 50	127 (46.4)	16 (42.1)	111 (47.0)	0.69 6	52 (44.1)	5 (50.0)	47 (43.5)	0.95 1
≥50	147 (53.6)	22 (57.9)	125 (53.0)		66 (55.9)	5 (50.0)	61 (56.5)	
Hypertension (%)								
Yes	133 (48.5)	21 (55.3)	112 (47.5)	0.47 2	47 (39.8)	2 (20.0)	45 (41.7)	0.31 7
No	141 (51.5)	17 (44.7)	124 (52.5)		71 (60.2)	8 (80.0)	63 (58.3)	
Diabetes (%)								
Yes	128 (46.7)	17 (44.7)	111 (47.0)	0.93	55 (46.6)	5 (50.0)	50 (46.3)	1

Yes	143 (52.2)	22 (57.9)	121 (51.3)	0.55 9	60 (50.8)	4 (40.0)	56 (51.9)	0.69 9
No	131 (47.8)	16 (42.1)	115 (48.7)		58 (49.2)	6 (60.0)	52 (48.1)	
Tumor type (%)								
Adenocarcinoma	147 (53.6)	27 (71.1)	120 (50.8)	0.03 2	64 (54.2)	4 (40.0)	60 (55.6)	0.54
Mucinous adenocarcinoma	127 (46.4)	11 (28.9)	116 (49.2)		54 (45.8)	6 (60.0)	48 (44.4)	
Tumor_size (%) ,cm								
< 5	145 (52.9)	19 (50.0)	126 (53.4)	0.83 1	59 (50.0)	5 (50.0)	54 (50.0)	1
≥5	129 (47.1)	19 (50.0)	110 (46.6)		59 (50.0)	5 (50.0)	54 (50.0)	
NI(%)								
Yes	122 (44.5)	21 (55.3)	101 (42.8)	0.20 8	58 (49.2)	4 (40.0)	54 (50.0)	0.78 4

No	152 (55.5)	17 (44.7)	135 (57.2)		60 (50.8)	6 (60.0)	54 (50.0)	
VI (%)								
Yes	97 (35.4)	30 (78.9)	67 (28.4)	<0.001	37 (31.4)	8 (80.0)	29 (26.9)	0.002
No	177 (64.6)	8 (21.1)	169 (71.6)		81 (68.6)	2 (20.0)	79 (73.1)	
Energy (median [IQR])	3.94 [2.56, 5.77]	8.90 [6.78, 10.52]	3.50 [2.27, 4.97]	<0.001	3.86 [2.59, 5.20]	9.23 [8.59, 9.81]	3.50 [2.47, 4.86]	<0.001
SOS (median [IQR])	0.87 [0.69, 1.06]	2.56 [1.94, 2.87]	0.83 [0.67, 0.98]	<0.001	0.89 [0.70, 1.03]	1.48 [1.38, 1.92]	0.84 [0.68, 0.99]	<0.001
IND (median [IQR])	1.46 [1.17, 1.82]	3.63 [3.13, 4.16]	1.38 [1.14, 1.62]	<0.001	1.48 [1.14, 1.75]	3.75 [3.19, 4.00]	1.42 [1.12, 1.65]	<0.001
MES (median [IQR])	2.70 [1.90, 3.34]	5.00 [4.44, 6.21]	2.53 [1.71, 3.11]	<0.001	2.96 [2.09, 3.38]	5.86 [5.46, 6.14]	2.88 [2.03, 3.26]	<0.001
SUV (median [IQR])	20.90 [16.00, 25.50]	56.75 [38.60, 70.92]	19.80 [15.20, 23.42]	<0.001	20.80 [16.50, 24.77]	48.25 [45.20, 72.30]	20.25 [16.28, 23.63]	<0.001

SUE	(median [IQR])	22.55 [27.60]	[17.80, 48.50]	[38.50, 21.25]	[16.90, 25.90]	<0.0	20.60 [26.45]	[15.90, 43.85]	[39.47, 45.92]	19.85 [25.42]	[15.75, <0.0]	<0.0
DIV	(median [IQR])	86.50 [107.00]	[66.00, 335.00]	[197.75, 79.50]	[63.00, 100.25]	<0.0	89.00 [105.75]	[71.00, 347.50]	[256.75, 419.00]	87.00 [102.00]	[68.75, <0.0]	<0.0
Contrast	(median [IQR])	291.00 [307.00]	[273.00, 292.50]	[271.50, 290.50]	[273.00, 307.00]	0.68	293.50 [313.00]	[280.25, 301.00]	[282.25, 311.00]	293.00 [313.25]	[279.75, 0.89]	0.89
Correlation	(median [IQR])	16.31 [19.41]	[12.30, 16.64]	[12.48, 16.22]	[12.01, 19.24]	0.37	15.53 [18.75]	[11.84, 15.29]	[11.62, 16.48]	15.53 [18.84]	[11.86, 0.43]	0.43
Entropy	(median [IQR])	2.23 [2.69]	[1.61, 2.08]	[1.62, 2.26]	[1.60, 2.72]	0.52	2.12 [2.56]	[1.65, 1.89]	[1.67, 2.22]	2.12 [2.58]	[1.64, 0.39]	0.39
DIE	(median [IQR])	229.00 [271.75]	[188.25, 241.50]	[196.25, 228.00]	[187.50, 270.00]	0.16	236.00 [283.75]	[188.00, 231.50]	[168.50, 267.25]	236.00 [285.00]	[189.50, 0.43]	0.43

Abbreviations: IQR: inter-quartile range; BMI: body mass index; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; CEA: carcinoembryonic antigen; CA199: Carbohydrate antigen199; AFP: Alpha-fetoprotein; NI: Neural infiltration; VI: Vascular invasion; 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 SLM

Variables	OR	Univariable	P-value	OR	Multivariable	P-value
Age,year						
> 60	Reference					
≤60	1.01	0.88-1.14	0.115			
Sex						
Male	Reference					
Female	1.25	1.06-1.44	0.082			
Smoking						
Yes	Reference					
No	0.76	0.57-0.95	0.136			
Drinking						
Yes	Reference					
No	1.27	0.58-1.96	0.247			
Hypertension						
Yes	Reference					

No	0.87	0.48-2.62	0.158			
Diabetes						
Yes	Reference					
No	0.78	0.51-2.53	0.263			
CEA (%),ng/ml						
Normal	Reference					
Abnormal	1.49	0.32-2.65	0.175			
AFP, ug/L						
≤100	Reference					
> 100	1.93	0.77-3.09	0.037	1.74	0.58-2.90	0.058
CA199 (%),U/ml						
Normal	Reference					
Abnormal	1.24	0.67-1.81	0.063			
Tumor size,cm						
< 5	Reference					

≥5	2.46	1.30-3.64	<.001	1.99	0.82-3.19	<.001
Intestinal polyp (%)						
Yes	Reference					
No	0.75	0.18-1.32	0.389			
NI						
Yes	Reference					
No	0.89	0.32-1.46	0.227			
VI						
Yes	Reference					
No	1.37	0.80-1.94	0.096			
Energy	2.15	1.58-2.72	<0.001	2.35	1.78-2.92	<0.001
Contrast	0.74	0.17-1.31	0.055			
Correlation	0.68	0.11-1.25	0.064			
SOS	1.27	0.70-1.84	<0.001	1.29	0.72-1.86	<0.001
IND	2.21	1.64-2.78	<0.001	2.16	1.59-2.73	<0.001
MES	0.78	0.21-1.35	0.087			

SUV	2.87	1.30-3.44	<0.001	2.91	1.33-3.48	<0.001
SUE	2.37	1.80-2.95	<0.001	2.86	2.27-3.43	<0.001
Entropy	1.17	0.60-1.74	0.225			
DIV	0.93	0.16-1.70	<0.001	0.89	0.12-1.66	<0.001
DIE	1.41	0.64-2.18	0.126			

Abbreviations: CEA: carcinoembryonic antigen; CA199: Carbohydrate antigen199; AFP: Alpha-fetoprotein; NI: Neural infiltration; VI: Vascular invasion; 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 SLM based on RFM algorithm

Variables	%IncMSE	IncNodePurity
Age	-1.000500375	0.003026257
Sex	3.91E-36	9.18E-16
BMI	0.126573641	1.38E-15
Smoking	-1.88566757	0.00142519
Drinking	-0.029650563	0.001450266
Intestinal_polyp	-0.641519863	0.000212372
AST	1.000500375	9.69E-16
ALT	1.07E-35	1.01E-15
Hypertension	-2.04E-23	1.16E-15
Diabetes	-1.41E-36	9.33E-16
CEA	-1.000500375	0.000921136
CA199	-0.496689882	9.77E-16
AFP	1.415551322	1.13E-15
HbsAg	-3.22E-21	0.003393055
Tumor_type	0.582794909	0.002139625
Tumor_size	0.57755641	9.60E-16
NI	6.13E-21	9.92E-16
VI	0.396397657	0.128078376
Energy	8.009080344	1.828583123
SOS	11.75137821	4.787299424
IND	16.9405353	8.815638154
MES	16.56355632	8.597954158
SUV	7.953512299	2.337858539
SUE	15.92622662	8.124889891

DIV	15.42576522	7.327924421
Contrast	-0.084051804	0.013270791
Correlation	-2.002213366	0.004836708
Entropy	1.112657425	0.003573189
DIE	0.393488619	0.014934

Abbreviations: BMI: body mass index; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; CEA: carcinoembryonic antigen; CA199: Carbohydrate antigen199; AFP: Alpha-fetoprotein; NI: Neural infiltration; VI: Vascular invasion; SOS: sum of squares; IND: inverse difference; MES: mean sum; SUV: sum variance; SUE: sum entropy; DIV: difference variance; DIE: difference entropy.

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

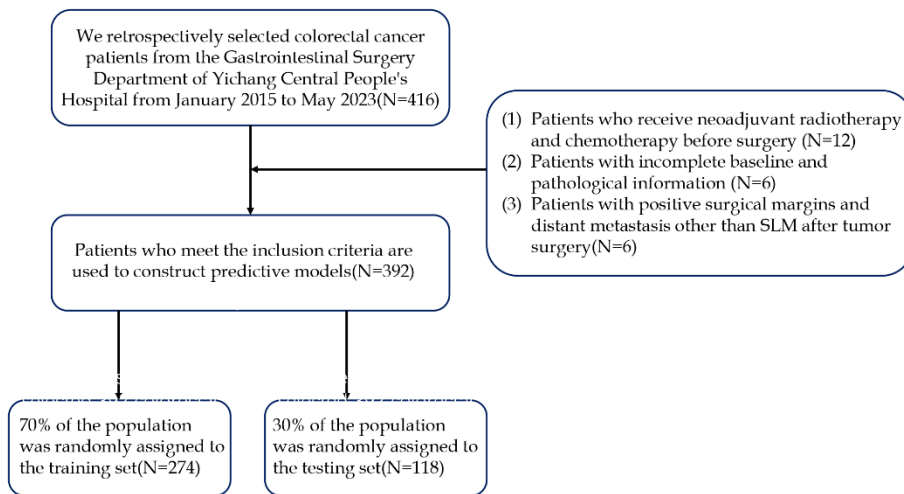
Variables	Weight
Intercept.to.1layhid1	4.543991598
Energy.to.1layhid1	0.328021305
SOS.to.1layhid1	-1.038142296
IND.to.1layhid1	-1.07095951
MES.to.1layhid1	0.477147796
SUV.to.1layhid1	-0.636865173
SUE.to.1layhid1	-0.339891242
DIV.to.1layhid1	0.056720327
Intercept.to.1layhid2	-12.62530209
Energy.to.1layhid2	-0.293752561
SOS.to.1layhid2	-1.180775847
IND.to.1layhid2	-0.256060257
MES.to.1layhid2	-1.525491209

SUV.to.1layhid2	-0.492746967
SUE.to.1layhid2	-1.008424555
DIV.to.1layhid2	0.301536698
Intercept.to.1layhid3	-0.51449485
Energy.to.1layhid3	-0.691298864
SOS.to.1layhid3	0.166205041
IND.to.1layhid3	0.327379304
MES.to.1layhid3	1.58826335
SUV.to.1layhid3	0.39703536
SUE.to.1layhid3	-0.816045344
DIV.to.1layhid3	1.316420666
Intercept.to.1layhid4	1.739936187
Energy.to.1layhid4	-0.001691602
SOS.to.1layhid4	1.540105677
IND.to.1layhid4	-0.055919621
MES.to.1layhid4	0.611684649
SUV.to.1layhid4	1.23844535
SUE.to.1layhid4	1.554612307
DIV.to.1layhid4	-0.44793059
Intercept.to.1layhid5	-10.05969007
Energy.to.1layhid5	-0.226849904
SOS.to.1layhid5	-0.419104111
IND.to.1layhid5	1.539438325
MES.to.1layhid5	-0.966242351
SUV.to.1layhid5	-1.338417858
SUE.to.1layhid5	-1.427520498
DIV.to.1layhid5	0.51051481

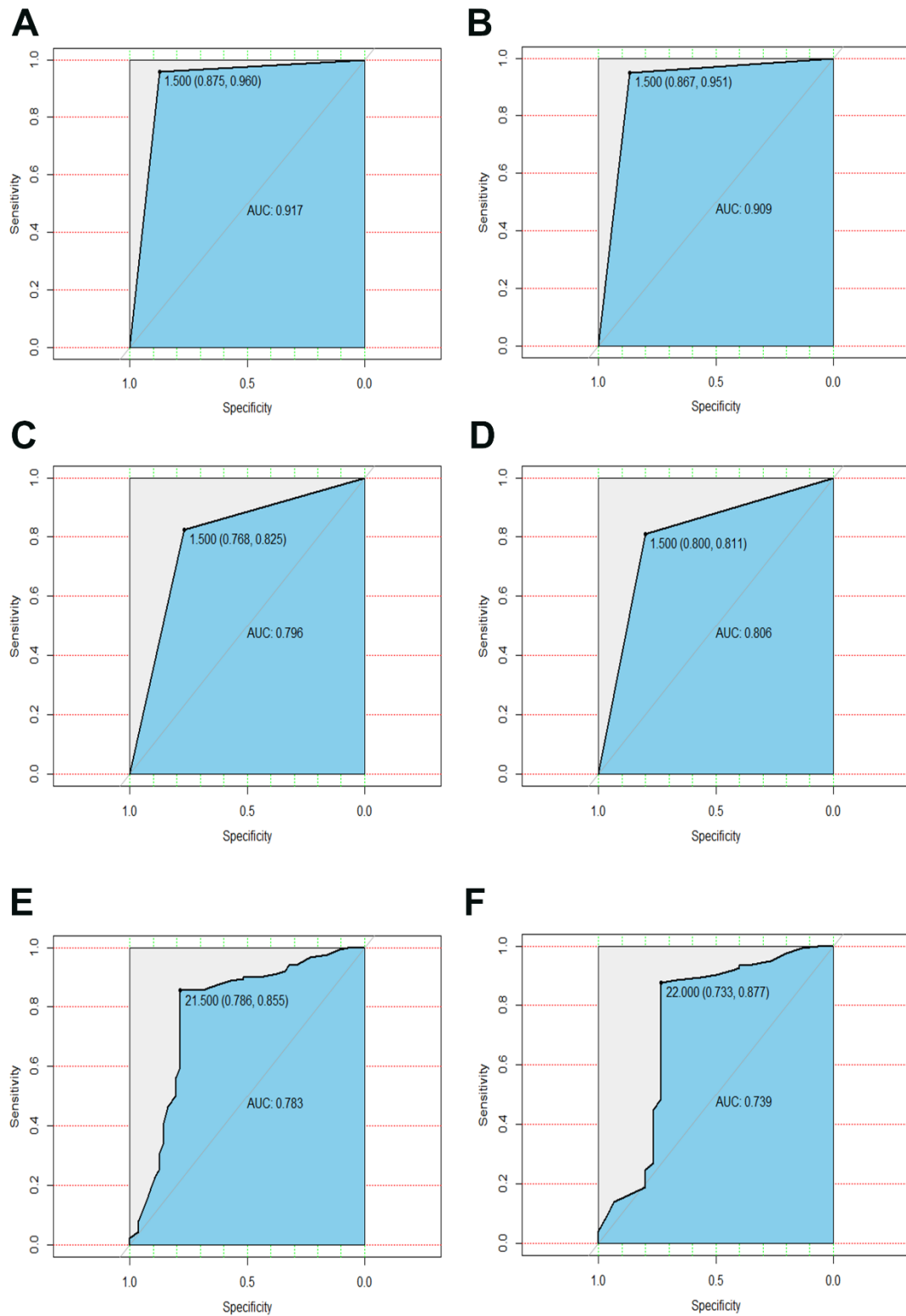
Intercept.to.1layhid6	-35.54871455
Energy.to.1layhid6	0.550472477
SOS.to.1layhid6	1.043214069
IND.to.1layhid6	1.088909128
MES.to.1layhid6	-0.018589705
SUV.to.1layhid6	0.394640927
SUE.to.1layhid6	0.334670294
DIV.to.1layhid6	0.029421403
Intercept.to.2layhid1	1.376958069
1layhid1.to.2layhid1	3.570209341
1layhid2.to.2layhid1	-2.201547321
1layhid3.to.2layhid1	0.961290004
1layhid4.to.2layhid1	-0.202548132
1layhid5.to.2layhid1	-0.847952641
1layhid6.to.2layhid1	-5.781990359
Intercept.to.2layhid2	1.221041908
1layhid1.to.2layhid2	4.933385129
1layhid2.to.2layhid2	-4.357409005
1layhid3.to.2layhid2	1.444678496
1layhid4.to.2layhid2	-1.979437329
1layhid5.to.2layhid2	-0.126266383
1layhid6.to.2layhid2	-0.846544385
Intercept.to.2layhid3	-0.482553764
1layhid1.to.2layhid3	0.029393843
1layhid2.to.2layhid3	0.503065936
1layhid3.to.2layhid3	-0.786936257
1layhid4.to.2layhid3	0.367880109

1layhid5.to.2layhid3	-0.454103943
1layhid6.to.2layhid3	-1.156861698
Intercept.to.2layhid4	0.398027168
1layhid1.to.2layhid4	0.124257593
1layhid2.to.2layhid4	1.013560129
1layhid3.to.2layhid4	-0.245906639
1layhid4.to.2layhid4	-0.475993206
1layhid5.to.2layhid4	0.638766021
1layhid6.to.2layhid4	-0.769340719
Intercept.to.2layhid5	-0.209953301
1layhid1.to.2layhid5	-1.227508957
1layhid2.to.2layhid5	-0.610547703
1layhid3.to.2layhid5	0.073384134
1layhid4.to.2layhid5	1.216796479
1layhid5.to.2layhid5	-1.180576284
1layhid6.to.2layhid5	0.574376073
Intercept.to.2layhid6	-0.430340285
1layhid1.to.2layhid6	-4.890818552
1layhid2.to.2layhid6	-1.08022408
1layhid3.to.2layhid6	0.68601585
1layhid4.to.2layhid6	-0.302800061
1layhid5.to.2layhid6	-2.013782363
1layhid6.to.2layhid6	-2.316450707
Intercept.to.1	-1.649913984
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2layhid2.to.1	0.510002263
2layhid3.to.1	-1.418200749

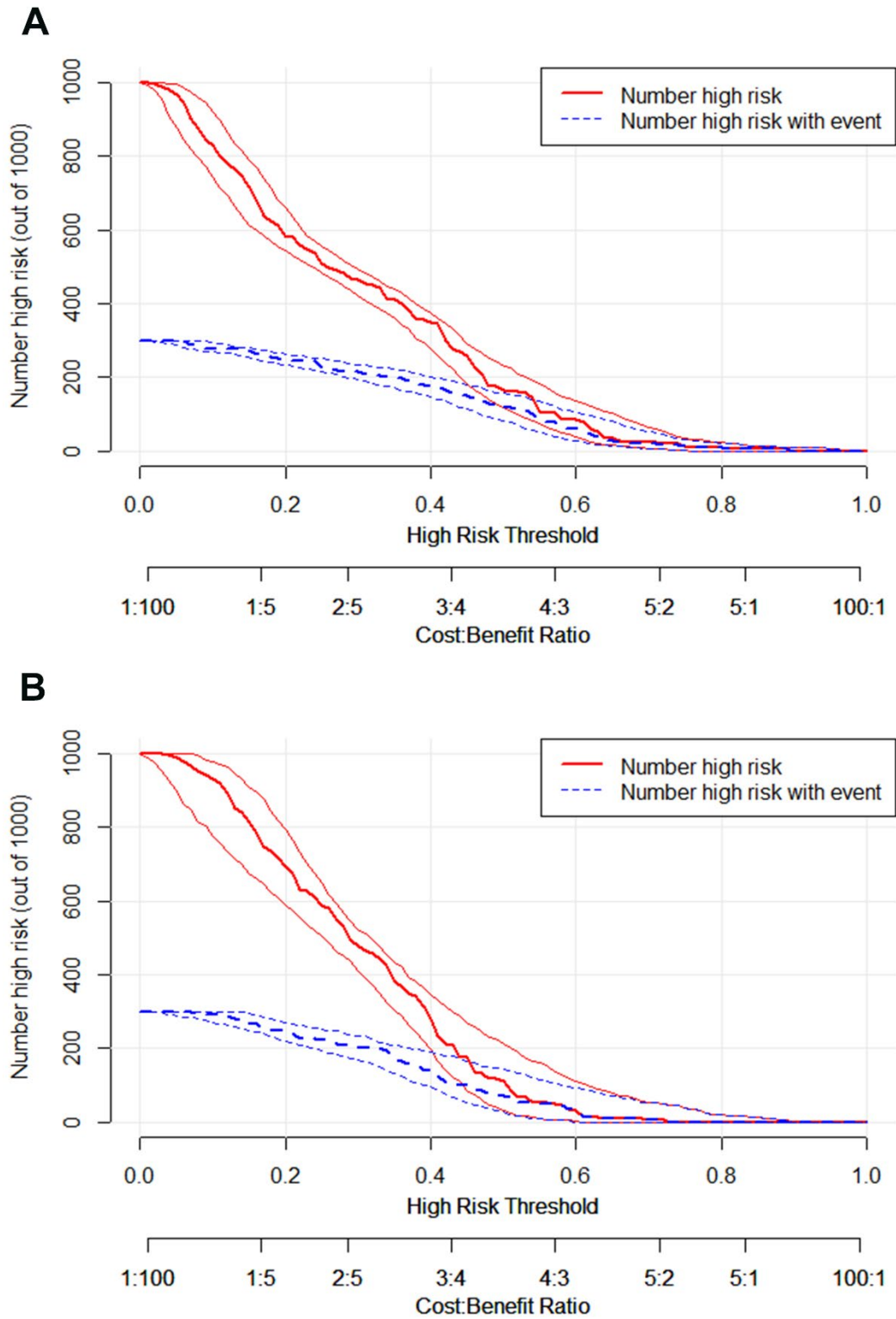
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2layhid5.to.1	1.199262445
2layhid6.to.1	0.491864945
Intercept.to.0	0.013756749
2layhid1.to.0	-0.422685662
2layhid2.to.0	-0.428219904
2layhid3.to.0	-1.820684016
2layhid4.to.0	1.204526848
2layhid5.to.0	1.383798323



Supplementary Figure 1 Patient inclusion and screening process diagram



Supplementary Figure 2 ROC curve of the three prediction models for the prediction of SLM.(A) ROC curve of RFM in training set;(B) ROC curve of RFM in testing set;(C) ROC curve of ANNM in training set;(D) ROC curve of ANNM in testing set; (E) ROC curve of GLRM in training set;(F) ROC curve of GLRM in testing set.



Supplementary Figure 3 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 SLM.