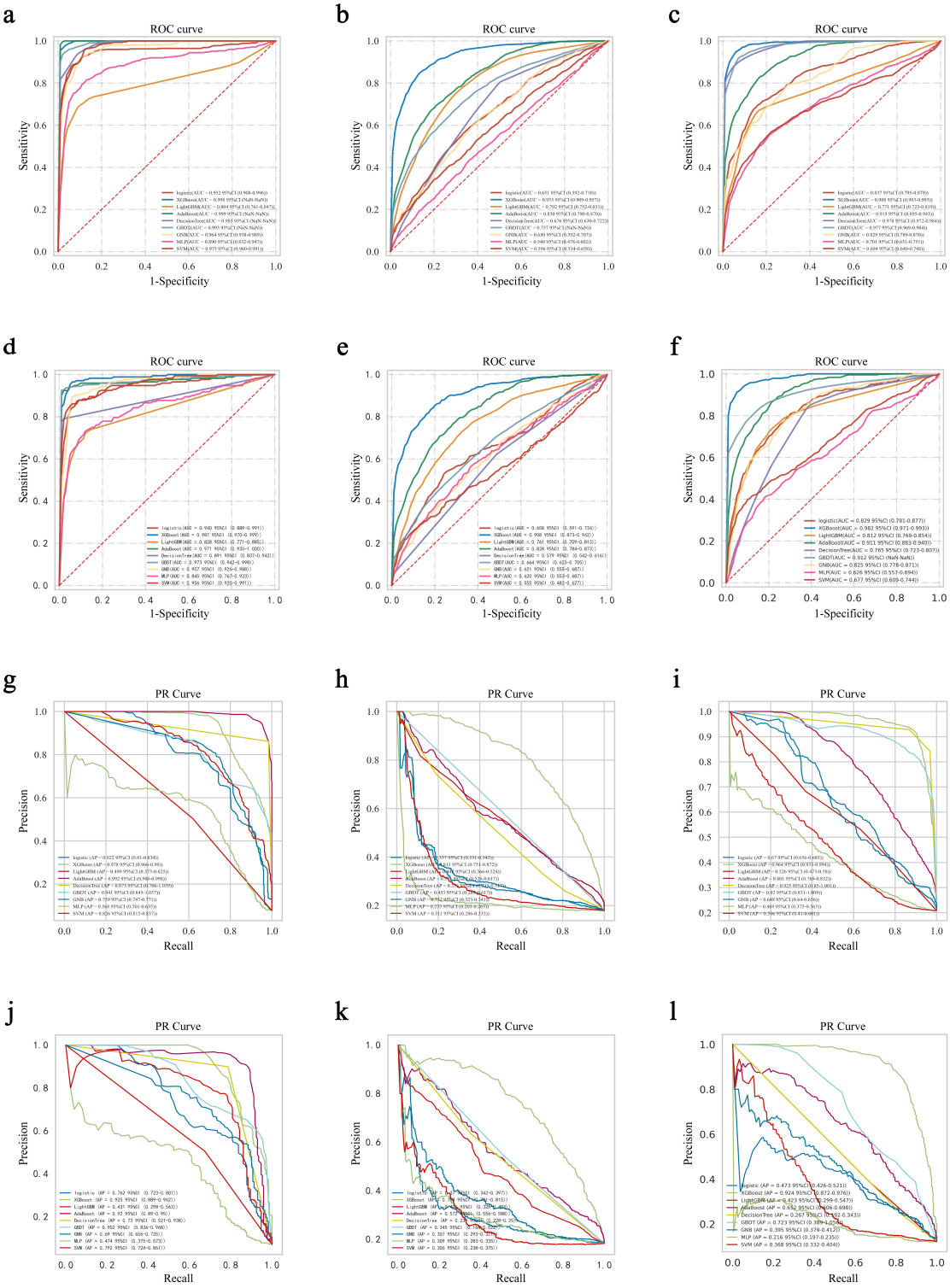
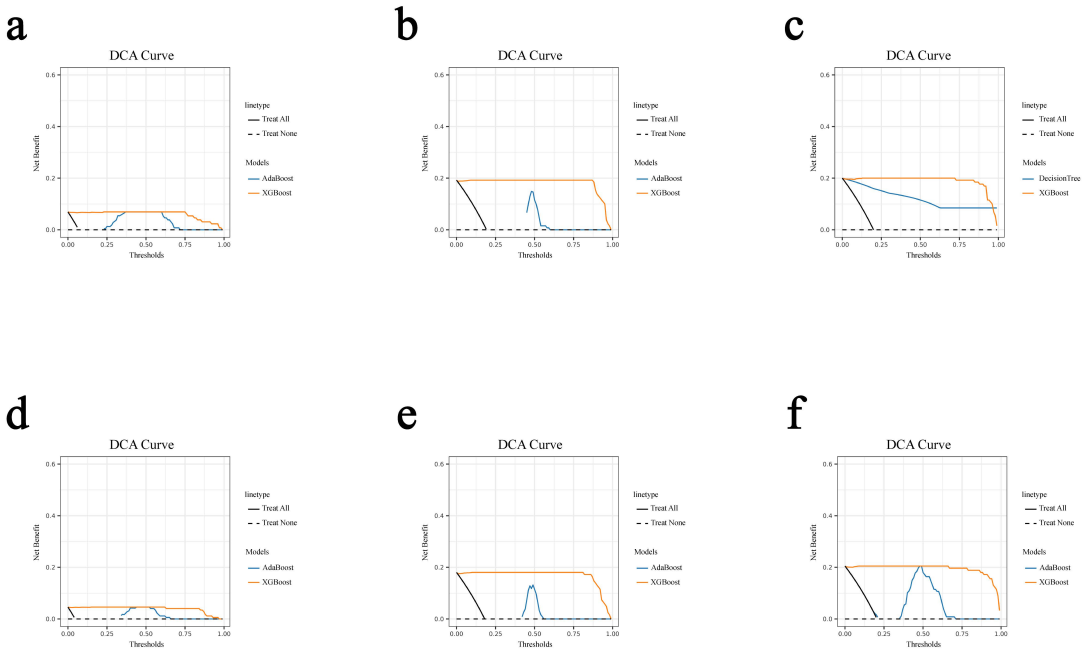
SUPPLEMENTARY FIGURES



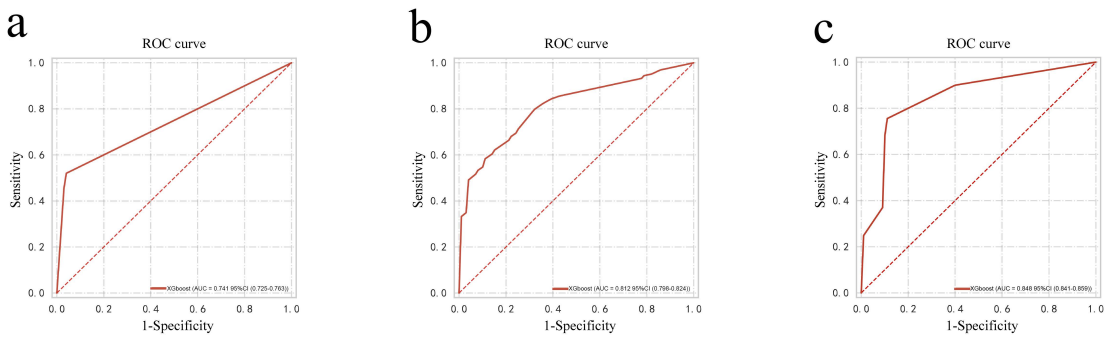
Supplementary Figure S1.

Receiver operating characteristic curve (a-f) and Precision-Recall curve (g-l) of the nine models. Outcomes of patients admitted to the ICU: in-hospital mortality (a, g), re-admission within 30 days after discharge (b, h), and mortality within 180 days after discharge (c, i). Outcomes of patients underwent biliary drainage during ICU treatment: in-hospital mortality (d, j), re-admission within 30 days after discharge (e, k), and mortality within 180 days after discharge (f, l).



Supplementary Figure S2.

The decision curve analyses of XGBoost and the moedel with the most disputable predictive efficacy apart from XGBoost. Outcomes of patients admitted to the ICU (a-c): in-hospital mortality, re-admission within 30 days after discharge, and mortality within 180 days after discharge. Outcomes of patients underwent biliary drainage during ICU treatment (d-f).



Supplementary Figure S3.

Receiver operating characteristic curve of the XGBoost in external validation set. Outcomes of patients underwent biliary drainage during ICU treatment in Zhongda Hospital: in-hospital mortality (a), re-admission within 30 days after discharge (b), and mortality within 180 days after discharge (c).

SUPPLEMENTARY TABLES

Supplementary Table S1. Baseline characteristics of patients admitted to the ICU (n=652).

Characteristics	n (%), mean ± SD (range), or Med [IQR]
Age (years)	79 [67-86]
Male, n (%)	328 (50.3%)
Female, n (%)	324 (49.7%)
Length of stay in hospital (days)	7 [5-11]
Length of stay in ICU (hours)	45.9 [29-84]
Re-admission within 1 month after discharge, n (%)	117 (17.9%)
Death in hospital, n (%)	50 (7.7%)
Follow-up after discharge until death, n (%)	240 (36.8%)
Death within 180 days after discharge, n (%)	136 (20.9%)
Severity of cholangitis, n (%)	
Mild	45 (6.9%)
Moderate	93 (14.3%)
Severe	514 (78.8%)
Surgical operations, n (%)	191 (29.3%)
Endoscopy, n (%)	580 (89%)
Interventional operations, n (%)	74 (11.3%)
Surgical or interventional or endoscopic operations, n (%)	614 (94.2%)
Endoscopy combined with surgical operations, n (%)	163 (25%)
Endoscopy combined with interventional operations, n (%)	57 (8.7%)
Endoscopy combined with another operations, n (%)	200 (30.7%)
Surgical or interventional operations other than endoscopy, n (%)	34 (5.2%)
Endoscopic, surgical, and interventional procedures were performed during a single hospitalization, n (%)	20 (3.1%)
Duration of intravenous antibiotic use (hours)	160.5 [75.3-282.5]
Blood culture positive, n (%)	152 (23.3%)
Bile culture positive, n (%)	26 (4%)
Hypertension, n (%)	335 (51.4%)
Diabetes, n (%)	210 (32.2%)
Acute pancreatitis, n (%)	158 (2.8%)
Anion gap _ max (mEq/L)	17 [15-20]
Anion gap _ avg (mEq/L)	13.6 [12.2-15]
Anion gap _ min (mEq/L)	11 [9-12]
Bicarbonate _ max (mEq/L)	28 [25-30]
Bicarbonate _ avg (mEq/L)	23.9±3.5 (21.8-26)
Bicarbonate _ min (mEq/L)	20 [17-23]
Chloride _ max (mEq/L)	110 [107-113]
Chloride _ avg (mEq/L)	105.4±4.2 (91-119.7)
Chloride _ min (mEq/L)	101 [98-104]
Creatinine _ max (mg/dL)	1.2 [0.9-1.9]
Creatinine _ avg (mg/dL)	1 [0.7-1.4]

Creatinine _ min (mg/dL)	0.8 [0.6-1.1]
Glucose _ max (mg/dL)	153 [125-210.8]
Glucose _ avg (mg/dL)	113.1 [99.4-132.6]
Glucose _ min (mg/dL)	82 [71-93]
Potassium _ max (mEq/L)	4.4 [4.1-4.9]
Potassium _ avg (mEq/L)	3.8 [3.7-4.1]
Potassium _ min (mEq/L)	3.3 [3.1-3.5]
Sodium _ max (mEq/L)	142.5 [140-145]
Sodium _ avg (mEq/L)	139.4±3.1 (128.3-150)
Sodium _ min (mEq/L)	136 [134-138]
Urea nitrogen _ max (mg/dL)	26 [18-41]
Urea nitrogen _ avg (mg/dL)	18.9 [12.7-29.8]
Urea nitrogen _ min (mg/dL)	12 [8-19]
Hematocrit _ max (%)	36.2±4.6 (25.1-53.4)
Hematocrit _ avg (%)	32±4.2 (17.4-46.1)
Hematocrit _ min (%)	28.6±5.2 (10-43.4)
Hemoglobin _ max (g/dL)	12±1.7 (8.3-18.3)
Hemoglobin _ avg (g/dL)	10.6±1.5 (6.6-15.4)
Hemoglobin _ min (g/dL)	9.5±1.8 (3.8-14.7)
MCH _ max (pg)	31.1 [29.7-32.5]
MCH _ avg (pg)	30.4 [29-31.7]
MCH _ min (pg)	29.8 [28.3-31]
MCHC _ max (%)	34.2 [33.3-35.1]
MCHC _ avg (%)	33.2 [32.5-33.9]
MCHC _ min (%)	32.3 [31.3-33]
MCV _ max (fL)	93 [90-98]
MCV _ avg (fL)	91.6±6.6 (67-123.7)
MCV _ min (fL)	89 [86-93]
PLT _ max (K/uL)	243 [174.3-356.8]
PLT _ avg (K/uL)	184.6 [133.8-260.5]
PLT _ min (K/uL)	142 [100-196]
RDW _ max (%)	15.2 [14.3-16.6]
RDW _ avg (%)	14.8 [13.9-15.9]
RDW _ min (%)	14.3 [13.4-15.2]
RBC _ max (m/uL)	4±0.6 (2.2-6.4)
RBC _ avg (m/uL)	3.5±0.5 (2-5.4)
RBC _ min (m/uL)	3.2±0.6 (1.5-5.1)
WBC _ max (K/uL)	16.6 [12.1-22.7]
WBC _ avg (K/uL)	11.1 [8.3-14.4]
WBC _ min (K/uL)	7.1 [5.3-9.7]
TBil _ max (mg/dL)	4.5 [2.4-6.6]
TBil _ avg (mg/dL)	2.4 [1.5-4.2]
TBil _ min (mg/dL)	1.1 [0.7-2.2]
ALT _max (IU/L)	170 [84-326.3]

ALT _avg (IU/L)	99.4 [52.6-164.4]
ALT _ min (IU/L)	47 [25-80]
ALP _ max (IU/L)	260 [163-413]
ALP _ avg (IU/L)	196 [133.7-296.4]
ALP _ min (IU/L)	142 [102-222.8]
AST _max (IU/L)	163.5 [83.3-334.5]
AST _avg (IU/L)	81.1 [48.4-137.2]
AST _min (IU/L)	31 [22-48]
Magnesium _ max (mg/dL)	2.3 [2.1-2.5]
Magnesium _ avg (mg/dL)	2±0.2 (1.2-2.7)
Magnesium _ min (mg/dL)	1.6 [1.5-1.8]
Calcium _ max (mg/dL)	8.7 [8.3-9.1]
Calcium _ avg (mg/dL)	8.2±0.6 (5.1-10.6)
Calcium _ min (mg/dL)	7.6 [7.1-8]
Phosphate _ max (mg/dL)	3.7 [3.2-4.5]
Phosphate _ avg (mg/dL)	2.9 [2.5-3.3]
Phosphate _ min (mg/dL)	2 [1.7-2.5]
INR(PT) _ max	1.4 [1.2-1.9]
INR(PT) _ avg	1.3 [1.2-1.5]
INR(PT) _ min	1.2 [1.1-1.3]
PT _ max (seconds)	16 [14.1-20.4]
PT _ avg (seconds)	14.6 [13.4-16.5]
PT _ min (seconds)	13.2 [12.4-14.3]
PTT _ max (seconds)	34.1 [29.2-47.2]
PTT _ avg (seconds)	40 [27.2-37.6]
PTT _ min (seconds)	27.4 [24.6-30.3]
Lipase _ max (IU/L)	69.5 [21-570.5]
Lipase _ avg (IU/L)	53.3 [19-263.9]
Lipase _ min (IU/L)	25 [14-85]
Basophils _ max (%)	0.3 [0.1-0.6]
Basophils _ avg (%)	0.2 [0.1-0.3]
Basophils _ min (%)	0.1 [0-0.2]
Eosinophils _ max (%)	1 [0.2-2.5]
Eosinophils _ avg (%)	0.6 [0.1-1.6]
Eosinophils _ min (%)	0.2 [0-0.7]
Lymphocytes _ max (%)	10 [5.9-15.1]
Lymphocytes _ avg (%)	8 [4.9-11.6]
Lymphocytes _ min (%)	5.7 [3-9.2]
Monocytes _ max (%)	5 [3.3-7]
Monocytes _ avg (%)	4.1 [3-5.5]
Monocytes _ min (%)	3 [2-4.6]
Neutrophils _ max (%)	87.9 [82.5-91.8]
Neutrophils _ avg (%)	83.6 [78.7-88.4]
Neutrophils _ min (%)	80 [72.2-87]

Albumin _ max (g/dL)	3.2±0.6 (1.5-5.2)
Albumin _ avg (g/dL)	3±0.5 (1.3-4.5)
Albumin _ min (g/dL)	2.9 [2.4-3.2]
LD _ max (IU/L)	262 [197-384.2]
LD _ avg (IU/L)	224.5 [177.3-304.9]
LD _ min (IU/L)	189 [153.7-247]
PH _ max (units)	6 [5.3-6.5]
PH _ avg (units)	5.8 [5.3-6.3]
PH _ min (units)	5.5 [5-6.1]
Specific gravity _ max	1.018 [1.011-1.029]
Specific gravity _ avg	1.017 [1.012-1.026]
Specific gravity _ min	1.016 [1.010-1.026]
Lactate _ max (mmol/L)	2.1 [1.3-3.3]
Lactate _ avg (mmol/L)	1.7 [1.3-2.3]
Lactate _ min (mmol/L)	1.3 [1-1.8]
Amylase _ max (IU/L)	77.3 [30.3-276.2]
Amylase _ avg (IU/L)	78.5 [28.3-199.7]
Amylase _ min (IU/L)	55 [21-169.5]
NLR _ avg	10.5 [6.8-17.6]
PLR _ avg	24.3 [15.3-41.2]
MLR _ avg	0.5 [0.3-0.8]
SII _ avg (K/uL)	1991.8 [1242.9-3549.3]
SIRI _ avg (%)	42.7 [28.2-64.2]
GNRI _ avg	102.5±16.6 (45.4-162.4)
Weight (Kg)	77 [64.9-90.2]
Height (cm)	165.3±10.5 (97.5-193.2)
BMI (kg/m2)	28.3 [24-33]
APSIII score	49 [38-64]
GCS score	15 [14-15]
LODS score	4 [3-6]
MELD score	18 [14-24]
OASIS score	32.5 [27-39.8]
SIRS score	3 [2-4]
SOFA score	6 [4-8]
Sepsis, n (%)	405 (62.1%)
AKI stage, n (%)	
0	231 (35.4%)
1	88 (13.5%)
2	211 (32.4%)
3	122 (18.7%)
Renal replacement therapy, n (%)	38 (5.8%)
Duration of auxiliary ventilation (hours)	7.9 [0-40]
Duration of vasopressor drug use (hours)	0 [0-6.2]
Urine volume on the first day of ICU admission (ml)	1277.5 [835-1988]

Duration of arterial catheterization (hours)	0 [0-15.4]
Duration of intravenous catheterization (hours)	0 [0-50]
Heart rate on the first day of ICU _ max (beats/minute)	100 [89-118.8]
Heart rate on the first day of ICU _ avg (beats/minute)	84.2±15.7 (41.4-137.1)
Heart rate on the first day of ICU _ min (beats/minute)	69 [60-79]
SysBP on the first day of ICU _ max (mmHg)	145 [131-161]
SysBP on the first day of ICU _ avg (mmHg)	114 [104.9-126.1]
SysBP on the first day of ICU _ min (mmHg)	89 [79-99]
DiasBP on the first day of ICU _ max (mmHg)	83 [72.3-96]
DiasBP on the first day of ICU _ avg (mmHg)	59.3±9.9 (36.9-94.8)
DiasBP on the first day of ICU _ min (mmHg)	42±11 (10-76)
Mean arterial pressure on the first day of ICU admission _ max (mmHg)	99 [88-113]
Mean arterial pressure on the first day of ICU admission _ avg (mmHg)	73 [67.4-81.1]
Mean arterial pressure on the first day of ICU admission _ min (mmHg)	55 [48-63]
Respiratory rate on the first day of ICU _ max (mmHg)	27 [24-31]
Respiratory rate on the first day of ICU _ avg (mmHg)	19.3 [17.2-22.3]
Respiratory rate on the first day of ICU _ min (mmHg)	13 [11-15]
Temperature on the first day of ICU admission _ max(℃)	37.3 [37-37.8]
Temperature on the first day of ICU admission _ avg (℃)	36.7 [36.5-37.1]
Temperature on the first day of ICU admission _ min (℃)	36.3 [35.8-36.7]
SpO2 on the first day of ICU _ max (%)	100 [99-100]
SpO2 on the first day of ICU _ avg (%)	96.6 [95.3-97.8]
SpO2 on the first day of ICU _ min (%)	92 [90-94]
Glucose on the first day of ICU admission _ max (mg/dl)	136 [108.3-174]
Glucose on the first day of ICU admission _ avg (mg/dl)	119 [98-142.8]
Glucose on the first day of ICU admission _ min (mg/dl)	101 [83-121]

* SD, standard deviation; IQR, inter-quartile range; ICU, intensive care unit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean corpuscular volume; PLT, platelet count; RDW, red blood cell distribution width; RBC, red blood cells; WBC, white blood cells; TBil, total bilirubin; ALT, alanine aminotransferase; ALP, alkaline phosphatase; AST, aspartate aminotransferase; INR(PT), international normalized ratio of prothrombin time; PT, prothrombin time; PTT, partial thromboplastin time; LD, lactate dehydrogenase; NLR, neutrophil-lymphocyte ratio; PLR, platelet-lymphocyte ratio; MLR, monocyte-lymphocyte ratio; SII, platelet*neutrophil/lymphocyte; SIRI, neutrocyte*monocyte/lymphocyte; GNRI, geriatric nutritional risk index; BMI, body mass index; APSIII, acute physiology score iii; GCS, glasgow coma scale; LODS, logistic organ dysfunction system; MELD, model for end-stage liver disease; OASIS, oxford acute severity of illness score; SIRS, systemic inflammatory response syndrome; SOFA, sepsis-related organ failure; AKI, acute kidney injury; SysBP, systolic blood pressure; DiasBP, diastolic blood pressure.

Supplementary Table S2. Baseline characteristics of patients underwent operations during ICU treatment (n=614).

Characteristics	n (%), mean ± SD (range), or Med [IQR]
Age (years)	79 [67-86]
Male, n (%)	308 (50.2%)
Female, n (%)	306 (49.8%)
Length of stay in hospital (days)	7 [5-10]
Length of stay in ICU (hours)	45.9 [29-83.2]
Re-admission within 1 month after discharge, n (%)	112 (18.2%)
Death in hospital, n (%)	43 (7.0%)
Follow-up after discharge until death, n (%)	219 (35.7%)
Death within 180 days after discharge, n (%)	122 (19.9%)
Severity of cholangitis, n (%)	
Mild	41 (6.7%)
Moderate	88 (14.3%)
Severe	485 (79.0%)
Surgical operations, n (%)	191 (31.1%)
Endoscopy, n (%)	580 (94.4%)
Interventional operations, n (%)	74 (12.1%)
Endoscopy combined with surgical operations, n (%)	163 (26.5%)
Endoscopy combined with interventional operations, n (%)	57 (9.3%)
Endoscopy combined with another operations, n (%)	200 (32.6%)
Surgical or interventional operations other than endoscopy, n (%)	34 (5.5%)
Endoscopic, surgical, and interventional procedures were performed during a single hospitalization, n (%)	20 (3.3%)
Interval between admission and operation (Priority given to endoscopy) (days)	0 [0-1]
Duration of intravenous antibiotic use (hours)	158.5 [75-281.5]
Blood culture positive, n (%)	147 (23.9%)
Bile culture positive, n (%)	26 (4.2%)
Hypertension, n (%)	320 (52.1%)
Diabetes, n (%)	197 (32.1%)
Acute pancreatitis, n (%)	140 (22.8%)
Anion gap _ max (mEq/L)	17 [15-20]
Anion gap _ avg (mEq/L)	13.5 [12.2-15]
Anion gap _ min (mEq/L)	11 [9-12]
Bicarbonate _ max (mEq/L)	28 [25-30]
Bicarbonate _ avg (mEq/L)	24.2 [21.9-26]
Bicarbonate _ min (mEq/L)	20 [17-23]
Chloride _ max (mEq/L)	110 [107-113]
Chloride _ avg (mEq/L)	105.2 [103-108]
Chloride _ min (mEq/L)	101 [98-104]
Creatinine _ max (mg/dL)	1.2 [0.9-1.8]

Creatinine _ avg (mg/dL)	1 [0.7-1.4]
Creatinine _ min (mg/dL)	0.8 [0.6-1.1]
Glucose _ max (mg/dL)	153 [125-207.8]
Glucose _ avg (mg/dL)	113.1 [99.3-132.5]
Glucose _ min (mg/dL)	82 [71-93]
Potassium _ max (mEq/L)	4.4 [4.1-4.9]
Potassium _ avg (mEq/L)	3.8 [3.7-4.1]
Potassium _ min (mEq/L)	3.3 [3.1-3.5]
Sodium _ max (mEq/L)	142 [140-145]
Sodium _ avg (mEq/L)	139.3 [137.5-141.2]
Sodium _ min (mEq/L)	136 [134-138]
Urea nitrogen _ max (mg/dL)	26 [18-41]
Urea nitrogen _ avg (mg/dL)	18.8 [12.7-29.3]
Urea nitrogen _ min (mg/dL)	12 [8-19]
Hematocrit _ max (%)	35.9 [33.2-39]
Hematocrit _ avg (%)	31.8 [29.1-34.8]
Hematocrit _ min (%)	28.7±5.2 (10-43.4)
Hemoglobin _ max (g/dL)	11.9 [11-13.1]
Hemoglobin _ avg (g/dL)	10.5 [9.7-11.6]
Hemoglobin _ min (g/dL)	9.5±1.8 (3.8-14.7)
MCH _ max (pg)	31.1 [29.8-32.5]
MCH _ avg (pg)	30.4 [29.1-31.7]
MCH _ min (pg)	29.8 [28.3-31.1]
MCHC _ max (%)	34.2 [33.4-35.1]
MCHC _ avg (%)	33.3 [32.5-34]
MCHC _ min (%)	32.3 [31.3-33.1]
MCV _ max (fL)	93 [90-98]
MCV _ avg (fL)	91.2 [87.9-95.6]
MCV _ min (fL)	90 [86-93]
PLT _ max (K/uL)	243 [174.8-350.8]
PLT _ avg (K/uL)	184.2 [133.7-257.4]
PLT _ min (K/uL)	142 [99.5-194.3]
RDW _ max (%)	15.2 [14.3-16.6]
RDW _ avg (%)	14.7 [13.8-15.8]
RDW _ min (%)	14.3 [13.4-15.2]
RBC _ max (m/uL)	4 [3.6-4.4]
RBC _ avg (m/uL)	3.5 [3.2-3.9]
RBC _ min (m/uL)	3.2±0.6 (1.5-5.1)
WBC _ max (K/uL)	16.4 [12.1-22.4]
WBC _ avg (K/uL)	11.1 [8.3-14.4]
WBC _ min (K/uL)	7.2 [5.3-9.7]
TBil _ max (mg/dL)	4.7 [2.7-6.6]
TBil _ avg (mg/dL)	2.5 [1.6-4.3]
TBil _ min (mg/dL)	1.2 [0.7-2.2]

ALT _max (IU/L)	172.5 [89-332.3]
ALT _avg (IU/L)	100.9 [55.9-164.7]
ALT _ min (IU/L)	48.5 [26-80]
ALP _ max (IU/L)	263 [167-423.3]
ALP _ avg (IU/L)	199.7 [135.1-300.7]
ALP _ min (IU/L)	148 [103.8-224.8]
AST _max (IU/L)	166 [86-337]
AST _avg (IU/L)	83.2 [50-137.5]
AST _min (IU/L)	31 [22-48.3]
Magnesium _ max (mg/dL)	2.3 [2.1-2.5]
Magnesium _ avg (mg/dL)	2 [1.8-2.1]
Magnesium _ min (mg/dL)	1.6 [1.5-1.8]
Calcium _ max (mg/dL)	8.7 [8.3-9.1]
Calcium _ avg (mg/dL)	8.1 [7.9-8.5]
Calcium _ min (mg/dL)	7.6 [7.2-8]
Phosphate _ max (mg/dL)	3.7 [3.2-4.4]
Phosphate _ avg (mg/dL)	2.9 [2.5-3.3]
Phosphate _ min (mg/dL)	2 [1.7-2.5]
INR(PT) _ max	1.4 [1.2-1.9]
INR(PT) _ avg	1.3 [1.2-1.5]
INR(PT) _ min	1.2 [1.1-1.3]
PT _ max (seconds)	16 [14.1-20.3]
PT _ avg (seconds)	14.6 [13.4-16.4]
PT _ min (seconds)	13.2 [12.4-14.3]
PTT _ max (seconds)	33.9 [29-46]
PTT _ avg (seconds)	30.9 [27-37.2]
PTT _ min (seconds)	27.3 [24.5-30.3]
Lipase _ max (IU/L)	65 [21-522.3]
Lipase _ avg (IU/L)	49.3 [19-246.6]
Lipase _ min (IU/L)	24 [14-80.3]
Basophils _ max (%)	0.2 [0.1-0.6]
Basophils _ avg (%)	0.2 [0.1-0.3]
Basophils _ min (%)	0.1 [0-0.2]
Eosinophils _ max (%)	1 [0.2-2.4]
Eosinophils _ avg (%)	0.6 [0.1-1.6]
Eosinophils _ min (%)	0.1 [0-0.6]
Lymphocytes _ max (%)	9.5 [5.7-15]
Lymphocytes _ avg (%)	7.8 [4.7-11.5]
Lymphocytes _ min (%)	5.7 [3-9.1]
Monocytes _ max (%)	5 [3.3-6.9]
Monocytes _ avg (%)	4 [3-5.5]
Monocytes _ min (%)	3 [2-4.6]
Neutrophils _ max (%)	88 [82.5-91.9]
Neutrophils _ avg (%)	83.6 [78.7-88.6]

Neutrophils _ min (%)	80.2 [72.2-87.1]
Albumin _ max (g/dL)	3.2 [2.9-3.5]
Albumin _ avg (g/dL)	3 [2.7-3.3]
Albumin _ min (g/dL)	2.9 [2.5-3.2]
LD _ max (IU/L)	260 [195-380.3]
LD _ avg (IU/L)	224.3 [176.5-297]
LD _ min (IU/L)	188 [153-244.1]
PH _ max (units)	6 [5.2-6.5]
PH _ avg (units)	5.8 [5.3-6.3]
PH _ min (units)	5.5 [5-6]
Specific gravity _ max	1.018 [1.011-1.028]
Specific gravity _ avg	1.017 [1.012-1.026]
Specific gravity _ min	1.016 [1.011-1.026]
Lactate _ max (mmol/L)	2.1 [1.3-3.2]
Lactate _ avg (mmol/L)	1.7 [1.2-2.3]
Lactate _ min (mmol/L)	1.3 [1-1.8]
Amylase _ max (IU/L)	77 [31-252]
Amylase _ avg (IU/L)	72.6 [28-182.4]
Amylase _ min (IU/L)	52.5 [21-148.2]
NLR _ avg	10.6 [6.9-18.1]
PLR _ avg	24.2 [15.6-41.4]
MLR _ avg	0.5 [0.3-0.8]
SII _ avg (K/uL)	1989.5 [1244.8-3547.6]
SIRI _ avg (%)	43.9 [28.4-64.7]
GNRI _ avg	100.5 [90.1-111.9]
Weight (Kg)	77 [65-90]
Height (cm)	165.1 [159.3-172.6]
BMI (kg/m2)	28.2 [23.9-32.8]
APSIII score	49 [38-64]
GCS score	15 [14-15]
LODS score	4 [3-6]
MELD score	18 [14-24]
OASIS score	32 [27-39]
SIRS score	3 [2-4]
SOFA score	6 [4-8]
Sepsis, n (%)	383 (62.4%)
AKI stage, n (%)	
0	220 (35.8%)
1	82 (13.3%)
2	195 (31.8%)
3	117 (19.1%)
Renal replacement therapy, n (%)	34 (5.5%)
Duration of auxiliary ventilation (hours)	7 [0-38]
Duration of vasopressor drug use (hours)	0 [0-5.5]

Urine volume on the first day of ICU admission (ml)	1277.5 [835-1969]
Duration of arterial catheterization (hours)	0 [0-14.3]
Duration of intravenous catheterization (hours)	0 [0-49.1]
Heart rate on the first day of ICU _ max (beats/minute)	100 [88-118]
Heart rate on the first day of ICU _ avg (beats/minute)	82.2 [71.7-93.3]
Heart rate on the first day of ICU _ min (beats/minute)	68 [60-79]
SysBP on the first day of ICU _ max (mmHg)	145 [131-161]
SysBP on the first day of ICU _ avg (mmHg)	114.3 [104.9-126.5]
SysBP on the first day of ICU _ min (mmHg)	89 [79-99.1]
DiasBP on the first day of ICU _ max (mmHg)	82.5 [73-97]
DiasBP on the first day of ICU _ avg (mmHg)	58.4 [51.9-66]
DiasBP on the first day of ICU _ min (mmHg)	42 [35-49]
Mean arterial pressure on the first day of ICU admission _ max (mmHg)	99 [87-113]
Mean arterial pressure on the first day of ICU admission _ avg (mmHg)	73.1 [67.6-81.2]
Mean arterial pressure on the first day of ICU admission _ min (mmHg)	55 [48-63]
Respiratory rate on the first day of ICU _ max (mmHg)	27 [24-32]
Respiratory rate on the first day of ICU _ avg (mmHg)	19.3 [17.2-22.3]
Respiratory rate on the first day of ICU _ min (mmHg)	13 [11-15]
Temperature on the first day of ICU admission _ max(℃)	37.3 [36.9-37.8]
Temperature on the first day of ICU admission _ avg (℃)	36.7 [36.5-37.1]
Temperature on the first day of ICU admission _ min (℃)	36.3 [35.8-36.7]
SpO2 on the first day of ICU _ max (%)	100 [99-100]
SpO2 on the first day of ICU _ avg (%)	96.6 [95.3-97.8]
SpO2 on the first day of ICU _ min (%)	92 [90-94]
Glucose on the first day of ICU admission _ max (mg/dl)	135 [108-173]
Glucose on the first day of ICU admission _ avg (mg/dl)	118 [98-141.8]
Glucose on the first day of ICU admission _ min (mg/dl)	101 [83-121]

* SD, standard deviation; IQR, inter-quartile range; ICU, intensive care unit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean corpuscular volume; PLT, platelet count; RDW, red blood cell distribution width; RBC, red blood cells; WBC, white blood cells; TBil, total bilirubin; ALT, alanine aminotransferase; ALP, alkaline phosphatase; AST, aspartate aminotransferase; INR(PT), international normalized ratio of prothrombin time; PT, prothrombin time; PTT, partial thromboplastin time; LD, lactate dehydrogenase; NLR, neutrophil-lymphocyte ratio; PLR, platelet-lymphocyte ratio; MLR, monocyte-lymphocyte ratio; SII, platelet*neutrophil/lymphocyte; SIRI, neutrocyte*monocyte/lymphocyte; GNRI, geriatric nutritional risk index; BMI, body mass index; APSIII, acute physiology score iii; GCS, glasgow coma scale; LODS, logistic organ dysfunction system; MELD, model for end-stage liver disease; OASIS, oxford acute severity of illness score; SIRS, systemic inflammatory response syndrome; SOFA, sepsis-related organ failure; AKI, acute kidney injury; SysBP, systolic blood pressure; DiasBP, diastolic blood pressure.

Supplementary Table S3. Summary table of conversion relationship between variable data units collected from Zhongda Hospital and existing data units of MIMIC database.

Variables	Zhongda hospital	MIMIC database	Conversion formulas
AKI stage	-	-	-
Duration of auxiliary ventilation	hour	hour	-
Duration of intravenous antibiotics use	hour	day	1 day = 24 hours
Duration of vasopressor drug use	hour	minute	1 hour = 60 minutes
APSIII score	-	-	-
LODS score	-	-	-
OASIS score	-	-	-
SOFA score	-	-	-
GCS score	-	-	-
SpO2 on the first day of ICU _ min	%	%	-
Temperature on the first day of ICU admission _ min	° C	° C	-
Albumin	g/L	g/dL	1 g/L = 10 g/dL
ALP	IU/L	IU/L	-
Anion gap	mEq/L	mEq/L	-
Bicarbonate	mEq/L	mEq/L	-
Chloride	mEq/L	mEq/L	-
Glucose	mg/dL	mg/dL	-
Lactate	mmol/L	mmol/L	-
Lipase	IU/L	IU/L	-
MCHC	%	%	-
PH	unit	unit	-
Phosphate	mg/dL	mg/dL	-
PTT	second	second	-
RDW	%	%	-
TBil	μ mol/L	mg/dL	1mg/dL = 17.1 μ mol/L
Urea nitrogen	mg/dL	mg/dL	-
WBC	10^9/L	K/uL	10^9/L = 1K/uL

* ICU, intensive care unit; AKI, acute kidney injury; APSIII, acute physiology score iii; LODS, logistic organ dysfunction system; OASIS, oxford acute severity of illness score; SOFA, sepsis-related organ failure; GCS, glasgow coma scale; ALP, alkaline phosphatase; MCHC, mean corpuscular hemoglobin concentration; PTT, partial thromboplastin time; RDW, red blood cell distribution width; TBil, total bilirubin; WBC, white blood cells.

Supplementary Table S4. Analysis of factors leading to different outcomes of all the patients (n=1156).

Factors	Outcomes		
	Death in hospital P value	Re-admission within 1 month after discharge P value	Death within 180 days after discharge P value
Age	0.185	0.021	＜0.001
Gender	0.538	0.988	0.194
Length of stay in hospital	0.009	0.718	＜0.001
Length of stay in ICU	＜0.001	＜0.001	＜0.001
Severity of cholangitis	＜0.001	0.900	＜0.001
Surgical operations	0.311	0.554	0.219
Endoscopy	0.124	0.479	0.347
Interventional operations	0.126	0.040	0.031
Surgical or interventional or endoscopic operations	0.078	0.411	0.055
Endoscopy combined with surgical operations	0.262	0.957	0.280
Endoscopy combined with interventional operations	0.802	0.900	0.060
Endoscopy combined with another operations	0.600	0.340	0.736
Surgical or interventional operations other than endoscopy	0.760	0.899	0.489
Endoscopic, surgical, and interventional procedures were performed during a single hospitalization	0.245	0.874	0.280
Duration of intravenous antibiotic use	＜0.001	0.064	＜0.001
Blood culture results	0.026	0.770	0.001
Bile culture results	0.060	0.806	0.201
Hypertension	0.590	0.948	0.983
Diabetes	0.848	0.398	0.279
Acute pancreatitis	0.006	0.060	0.614
Anion gap _ max	＜0.001	0.050	＜0.001
Anion gap _ avg	＜0.001	0.236	0.001
Anion gap _ min	0.039	0.591	0.095
Bicarbonate _ max	＜0.001	0.259	0.026
Bicarbonate _ avg	＜0.001	0.634	＜0.001
Bicarbonate _ min	＜0.001	0.236	＜0.001
Chloride _ max	＜0.001	0.003	＜0.001
Chloride _ avg	0.095	0.014	0.065
Chloride _ min	0.759	0.326	0.311

Creatinine _ max	＜0.001	0.002	＜0.001
Creatinine _ avg	＜0.001	0.007	＜0.001
Creatinine _ min	＜0.001	0.029	0.001
Glucose _ max	＜0.001	0.686	＜0.001
Glucose _ avg	＜0.001	0.437	0.001
Glucose _ min	＜0.001	0.819	＜0.001
Potassium _ max	＜0.001	0.433	＜0.001
Potassium _ avg	＜0.001	0.918	＜0.001
Potassium _ min	0.472	0.844	0.037
Sodium _ max	0.189	0.003	0.006
Sodium _ avg	0.019	0.003	0.046
Sodium _ min	＜0.001	0.066	＜0.001
Urea nitrogen _ max	＜0.001	0.029	＜0.001
Urea nitrogen _ avg	＜0.001	0.048	＜0.001
Urea nitrogen _ min	＜0.001	0.121	＜0.001
Hematocrit _ max	0.972	0.455	0.007
Hematocrit _ avg	＜0.001	0.648	＜0.001
Hematocrit _ min	＜0.001	0.931	＜0.001
Hemoglobin _ max	0.600	0.145	＜0.001
Hemoglobin _ avg	＜0.001	0.224	＜0.001
Hemoglobin _ min	＜0.001	0.523	＜0.001
MCH _ max	＜0.001	0.875	0.507
MCH _ avg	0.002	0.900	0.125
MCH _ min	0.029	0.919	0.028
MCHC _ max	0.624	0.013	0.001
MCHC _ avg	0.030	0.047	＜0.001
MCHC _ min	＜0.001	0.151	＜0.001
MCV _ max	＜0.001	0.326	＜0.001
MCV _ avg	＜0.001	0.250	0.052
MCV _ min	0.071	0.169	0.890
PLT _ max	0.013	0.446	0.458
PLT _ avg	＜0.001	0.198	0.154
PLT _ min	＜0.001	0.111	＜0.001
RDW _ max	＜0.001	0.017	＜0.001
RDW _ avg	＜0.001	0.005	＜0.001
RDW _ min	＜0.001	0.002	＜0.001
RBC _ max	0.103	0.094	0.005
RBC _ avg	＜0.001	0.168	＜0.001
RBC _ min	＜0.001	0.341	＜0.001
WBC _ max	＜0.001	0.018	＜0.001
WBC _ avg	＜0.001	0.037	＜0.001
WBC _ min	＜0.001	0.124	＜0.001
TBil _ max	＜0.001	0.424	0.001
TBil _ avg	＜0.001	0.246	0.004

TBil _ min	＜0.001	0.218	0.025
ALT _max	0.985	0.001	＜0.001
ALT _avg	0.158	0.001	＜0.001
ALT _ min	0.002	0.017	＜0.001
ALP _ max	0.284	0.205	＜0.001
ALP _ avg	0.532	0.187	0.003
ALP _ min	0.002	0.108	0.421
AST _max	0.002	0.012	0.764
AST _avg	0.004	0.007	0.281
AST _min	0.004	0.104	0.018
Magnesium _ max	＜0.001	0.593	＜0.001
Magnesium _ avg	0.002	0.835	＜0.001
Magnesium _ min	0.304	0.964	0.905
Calcium _ max	0.883	0.858	0.439
Calcium _ avg	0.019	0.547	＜0.001
Calcium _ min	＜0.001	0.379	＜0.001
Phosphate _ max	＜0.001	0.991	＜0.001
Phosphate _ avg	＜0.001	0.113	＜0.001
Phosphate _ min	0.403	0.003	0.270
INR(PT) _ max	＜0.001	0.125	＜0.001
INR(PT) _ avg	＜0.001	0.012	＜0.001
INR(PT) _ min	0.022	0.059	0.025
PT _ max	＜0.001	0.086	＜0.001
PT _ avg	＜0.001	0.027	＜0.001
PT _ min	0.008	0.310	0.002
PTT _ max	＜0.001	0.311	＜0.001
PTT _ avg	＜0.001	0.051	＜0.001
PTT _ min	0.001	0.013	0.110
Lipase _ max	0.103	0.026	0.673
Lipase _ avg	0.038	0.101	0.957
Lipase _ min	0.699	0.094	0.399
Basophils _ max	0.676	0.299	0.885
Basophils _ avg	0.010	0.149	0.004
Basophils _ min	＜0.001	0.016	＜0.001
Eosinophils _ max	0.667	0.188	0.282
Eosinophils _ avg	0.004	0.027	＜0.001
Eosinophils _ min	＜0.001	0.003	＜0.001
Lymphocytes _ max	0.431	0.132	0.049
Lymphocytes _ avg	0.003	0.028	＜0.001
Lymphocytes _ min	＜0.001	0.007	＜0.001
Monocytes _ max	0.007	0.026	0.047
Monocytes _ avg	0.498	0.004	0.523
Monocytes _ min	＜0.001	0.009	＜0.001
Neutrophils _ max	＜0.001	0.070	＜0.001

Neutrophils _ avg	0.021	0.160	＜0.001
Neutrophils _ min	0.631	0.247	0.457
Albumin _ max	0.002	0.373	＜0.001
Albumin _ avg	＜0.001	0.686	＜0.001
Albumin _ min	＜0.001	0.831	＜0.001
LD _ max	＜0.001	0.745	0.001
LD _ avg	＜0.001	0.725	0.005
LD _ min	＜0.001	0.374	0.398
PH _ max	0.839	0.207	0.165
PH _ avg	0.049	0.021	0.001
PH _ min	＜0.001	0.011	＜0.001
Specific gravity _ max	0.413	0.830	0.279
Specific gravity _ avg	0.332	0.614	0.856
Specific gravity _ min	0.006	0.406	0.075
Lactate _ max	＜0.001	0.630	＜0.001
Lactate _ avg	＜0.001	0.639	＜0.001
Lactate _ min	0.110	0.813	0.109
Amylase _ max	0.018	0.276	0.131
Amylase _ avg	＜0.001	0.210	0.019
Amylase _ min	＜0.001	0.512	0.046
NLR _ avg	0.003	0.028	＜0.001
PLR _ avg	0.835	0.330	0.025
MLR _ avg	0.003	0.471	0.001
SII _ avg	0.992	0.283	0.015
SIRI _ avg	0.004	0.680	＜0.001

*ICU, Intensive care unit; MCH, Mean Corpuscular Hemoglobin; MCHC, Mean Corpuscular Hemoglobin Concentration; MCV, Mean Corpuscular Volume; PLT, Platelet count; RDW, Red Cell Distribution Width; RBC, Red blood cells; WBC, White blood cells; TBil, Total bilirubin; ALT, Alanine Aminotransferase; ALP, Alkaline Phosphatase; AST, Aspartate Aminotransferase; INR(PT), International normalized ratio of prothrombin time; PT, Prothrombin time; PTT, Partial thromboplastin time; LD, Lactate dehydrogenase; NLR, Neutrophil-lymphocyte ratio; PLR, Platelet-lymphocyte ratio; MLR, Monocyte-lymphocyte ratio; SII, Platelet*neutrophil/lymphocyte; SIRI, Neutrocyte*monocyte/lymphocyte.

Supplementary Table S5. Baseline characteristics of patients re-admitted within 30 days after discharge (n=262).

Characteristics	n (%), mean ± SD (range), or Med [IQR]
Age (years)	73 [62-84]
Male, n (%)	135 (51.5%)
Female, n (%)	127 (48.5%)
Length of stay in hospital (days)	6 [4-8]
Length of stay in ICU (hours)	0 [0-41.5]
Re-admission within 30 days after discharge, n (%)	262 (100%)
Death in hospital, n (%)	0 (0%)
Follow-up after discharge until death, n (%)	79 (30.2%)
Death within 180 days after discharge, n (%)	35 (13.4%)
Severity of cholangitis, n (%)	
Mild	67 (25.6%)
Moderate	31 (11.8%)
Severe	164 (62.6%)
Surgical operations, n (%)	71 (27.1%)
Endoscopy, n (%)	229 (87.4%)
Interventional operations, n (%)	32 (23.7%)
Surgical or interventional or endoscopic operations, n (%)	245 (93.5%)
Endoscopy combined with surgical operations, n (%)	61 (23.3%)
Endoscopy combined with interventional operations, n (%)	24 (9.2%)
Endoscopy combined with another operations, n (%)	79 (30.2%)
Surgical or interventional operations other than endoscopy, n (%)	16 (6.1%)
Endoscopic, surgical, and interventional procedures were performed during a single hospitalization, n (%)	6 (2.3%)
Duration of intravenous antibiotic use (hours)	133 [70-254.5]
Blood culture positive, n (%)	48 (18.3%)
Bile culture positive, n (%)	9 (3.4%)
Hypertension, n (%)	135 (51.5%)
Diabetes, n (%)	83 (31.7%)
Acute pancreatitis, n (%)	45 (17.2%)
Anion gap _ max (mEq/L)	16 [14-18]
Anion gap _ avg (mEq/L)	13.5 [12-14.7]
Anion gap _ min (mEq/L)	11 [9-12]
Bicarbonate _ max (mEq/L)	27 [25-30]
Bicarbonate _ avg (mEq/L)	24.8±3.2 (14.8-35.8)
Bicarbonate _ min (mEq/L)	22 [19-24]
Chloride _ max (mEq/L)	107 [105-110]
Chloride _ avg (mEq/L)	104 [102-107]
Chloride _ min (mEq/L)	101 [98-104]
Creatinine _ max (mg/dL)	1 [0.8-1.5]
Creatinine _ avg (mg/dL)	0.8 [0.7-1.2]

Creatinine _ min (mg/dL)	0.7 [0.6-1]
Glucose _ max (mg/dL)	140.5 [113-171.3]
Glucose _ avg (mg/dL)	106 [96.2-125.8]
Glucose _ min (mg/dL)	83.5 [71-96]
Potassium _ max (mEq/L)	4.2 [4-4.6]
Potassium _ avg (mEq/L)	3.8 [3.6-4]
Potassium _ min (mEq/L)	3.4 [3.1-3.7]
Sodium _ max (mEq/L)	141 [140-143]
Sodium _ avg (mEq/L)	139 [137-140.8]
Sodium _ min (mEq/L)	136 [134-139]
Urea nitrogen _ max (mg/dL)	19.5 [14-30]
Urea nitrogen _ avg (mg/dL)	15 [10.5-22.2]
Urea nitrogen _ min (mg/dL)	11 [7-16]
Hematocrit _ max (%)	36.3±5 (25.6-50.8)
Hematocrit _ avg (%)	32.3 [29.7-36.6]
Hematocrit _ min (%)	30.4±5.3 (12.7-43.3)
Hemoglobin _ max (g/dL)	11.9±1.8 (8.2-17)
Hemoglobin _ avg (g/dL)	10.9±1.7 (7.5-15.9)
Hemoglobin _ min (g/dL)	10.1±1.9 (3.8-15.2)
MCH _ max (pg)	31.1 [29.5-32.2]
MCH _ avg (pg)	30.6 [28.9-31.6]
MCH _ min (pg)	29.9 [28.4-31.1]
MCHC _ max (%)	33.8±1.4 (30-37.8)
MCHC _ avg (%)	33.1 [32.1-33.9]
MCHC _ min (%)	32.3 [31.2-33.2]
MCV _ max (fL)	93 [90-97.3]
MCV _ avg (fL)	91.8 [88.5-95.4]
MCV _ min (fL)	90 [87-94]
PLT _ max (K/uL)	243.5 [171.8-340]
PLT _ avg (K/uL)	200.4 [149.5-263.1]
PLT _ min (K/uL)	170.4±84.2 (6-600)
RDW _ max (%)	15 [14-16.2]
RDW _ avg (%)	14.6 [13.8-15.8]
RDW _ min (%)	14.3 [13.5-15.4]
RBC _ max (m/uL)	3.9±0.6 (2.6-5.9)
RBC _ avg (m/uL)	3.6±0.6 (2.2-5.4)
RBC _ min (m/uL)	3.3±0.6 (1.5-5.2)
WBC _ max (K/uL)	12.3 [8.4-19]
WBC _ avg (K/uL)	8.9 [6.6-12.6]
WBC _ min (K/uL)	6.4 [4.8-9.1]
TBil _ max (mg/dL)	3.9 [1.6-6.2]
TBil _ avg (mg/dL)	2.1 [1.2-3.9]
TBil _ min (mg/dL)	1.1 [0.6-2.1]
ALT _max (IU/L)	135 [76.8-238.5]

ALT _avg (IU/L)	86.7 [50.9-151.4]
ALT _ min (IU/L)	48 [25-93]
ALP _ max (IU/L)	249 [159.8-422.8]
ALP _ avg (IU/L)	193 [133.1-328.6]
ALP _ min (IU/L)	162 [103.8-270.5]
AST _max (IU/L)	130 [69.8-243.3]
AST _avg (IU/L)	70.5 [45.7-113.8]
AST _min (IU/L)	33 [23-52]
Magnesium _ max (mg/dL)	2.2 [2-2.4]
Magnesium _ avg (mg/dL)	1.9 [1.8-2.1]
Magnesium _ min (mg/dL)	1.7 [1.5-1.9]
Calcium _ max (mg/dL)	8.8 [8.3-9.2]
Calcium _ avg (mg/dL)	8.3±0.5 (5.8-10.5)
Calcium _ min (mg/dL)	8 [7.5-8.4]
Phosphate _ max (mg/dL)	3.5 [3-4.3]
Phosphate _ avg (mg/dL)	2.9 [2.5-3.3]
Phosphate _ min (mg/dL)	2.3 [1.9-2.7]
INR(PT) _ max	1.4 [1.2-1.9]
INR(PT) _ avg	1.3 [1.2-1.5]
INR(PT) _ min	1.2 [1.1-1.3]
PT _ max (seconds)	15.7 [13.5-21]
PT _ avg (seconds)	14.7 [13.1-16.7]
PT _ min (seconds)	13.3 [12.2-14.5]
PTT _ max (seconds)	34 [29.2-44.1]
PTT _ avg (seconds)	32.1 [28.2-37.2]
PTT _ min (seconds)	29.3 [26-32.5]
Lipase _ max (IU/L)	43 [14-534]
Lipase _ avg (IU/L)	37.8 [15.9-258]
Lipase _ min (IU/L)	25 [13-83]
Basophils _ max (%)	0.3 [0.1-0.7]
Basophils _ avg (%)	0.2 [0.1-0.4]
Basophils _ min (%)	0.2 [0-0.3]
Eosinophils _ max (%)	1.4 [0.3-2.9]
Eosinophils _ avg (%)	1.1 [0.3-2.3]
Eosinophils _ min (%)	0.5 [0.1-2]
Lymphocytes _ max (%)	11.2 [7.2-16.4]
Lymphocytes _ avg (%)	9.8 [6.6-13.6]
Lymphocytes _ min (%)	8 [5.3-11.1]
Monocytes _ max (%)	5.5 [4-7.1]
Monocytes _ avg (%)	4.8 [3.6-6.1]
Monocytes _ min (%)	4.1 [2.9-5.5]
Neutrophils _ max (%)	84.2 [80.2-89.3]
Neutrophils _ avg (%)	81.8 [78-85.9]
Neutrophils _ min (%)	79.1 [72.4-85]

Albumin _ max (g/dL)	3.2±0.6 (1.6-4.7)
Albumin _ avg (g/dL)	3.1±0.5 (1.4-4.7)
Albumin _ min (g/dL)	3±0.6 (1.2-4.7)
LD _ max (IU/L)	261.5[184-408.9]
LD _ avg (IU/L)	225.1 [169.8-295]
LD _ min (IU/L)	194 [146.5-265.3]
PH _ max (units)	6 [5.5-6.7]
PH _ avg (units)	6 [5.5-6.5]
PH _ min (units)	6 [5.5-6.3]
Specific gravity _ max	1.019 [1.007-1.034]
Specific gravity _ avg	1.018 [1.013-1.032]
Specific gravity _ min	1.019 [1.011-1.031]
Lactate _ max (mmol/L)	1.8 [1-2.8]
Lactate _ avg (mmol/L)	1.6 [1.1-2.2]
Lactate _ min (mmol/L)	1.3 [1-1.8]
Amylase _ max (IU/L)	61 [12-306.5]
Amylase _ avg (IU/L)	62.7 [19.9-187.6]
Amylase _ min (IU/L)	50.5 [16.8-209.4]
NLR _ avg	8.3 [5.9-12.9]
PLR _ avg	21 [12.5-35]
MLR _ avg	0.5 [0.3-0.7]
SII _ avg (K/uL)	1720 [953.5-3039.3]
SIRI _ avg (%)	39.1 [27.4-61.1]

* SD, standard deviation; IQR, inter-quartile range; ICU, intensive care unit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean corpuscular volume; PLT, platelet count; RDW, red blood cell distribution width; RBC, red blood cells; WBC, white blood cells; TBil, total bilirubin; ALT, alanine aminotransferase; ALP, alkaline phosphatase; AST, aspartate aminotransferase; INR(PT), international normalized ratio of prothrombin time; PT, prothrombin time; PTT, partial thromboplastin time; LD, lactate dehydrogenase; NLR, neutrophil-lymphocyte ratio; PLR, platelet-lymphocyte ratio; MLR, monocyte-lymphocyte ratio; SII, platelet*neutrophil/lymphocyte; SIRI, neutrocyte*monocyte/lymphocyte.

Supplementary Table S6. Analysis of factors for whether patients re-admitted within 30 days will die within 180 days after discharge (univariate logistic regression, n=262).

Factors	Univariate logistic regression				
	β	S.E	Z	P value	OR (95%CI)
Age	0.06	0.02	3.37	<0.001	1.06 (1.02 - 1.09)
Gender					
0					1.00 (Reference)
1	-0.40	0.37	-1.10	0.272	0.67 (0.33 - 1.37)
Length of stay in hospital	0.02	0.02	1.39	0.165	1.03 (0.99 - 1.06)
Length of stay in ICU	0.00	0.00	0.65	0.513	1.00 (1.00 - 1.00)
Severity of cholangitis					
1					1.00 (Reference)
2	1.96	1.18	1.66	0.096	7.07 (0.71 - 70.90)
3	2.73	1.03	2.66	0.008	15.38 (2.06 - 115.08)
Surgical operations					
0					1.00 (Reference)
1	0.08	0.40	0.21	0.833	1.09 (0.49 - 2.40)
Endoscopy					
0					1.00 (Reference)
1	0.96	0.75	1.27	0.203	2.61 (0.60 - 11.43)
Interventional operations					
0					1.00 (Reference)
1	0.21	0.52	0.40	0.688	1.23 (0.44 - 3.45)
Surgical or interventional or endoscopic operations					
0					1.00 (Reference)
1	0.15	0.78	0.20	0.842	1.17 (0.26 - 5.34)
Endoscopy combined with surgical operations					
0					1.00 (Reference)
1	0.32	0.41	0.79	0.428	1.38 (0.62 - 3.06)
Endoscopy combined with interventional operations					
0					1.00 (Reference)
1	0.60	0.54	1.12	0.265	1.82 (0.63 - 5.25)
Endoscopy combined with another operations					
0					1.00 (Reference)
1	0.51	0.37	1.35	0.176	1.66 (0.80 - 3.46)
Surgical or interventional operations other than endoscopy					
0					1.00 (Reference)
1	-15.77	989.05	-0.02	0.987	0.00 (0.00 - Inf)

Endoscopic, surgical, and interventional procedures were performed during a single hospitalization					
0					1.00 (Reference)
1	0.27	1.11	0.24	0.810	1.31 (0.15 - 11.52)
Duration of intravenous antibiotic use	0.00	0.00	1.50	0.133	1.00 (1.00 - 1.00)
Blood culture results					
0					1.00 (Reference)
1	0.69	0.41	1.66	0.097	1.99 (0.88 - 4.48)
Bile culture results					
0					1.00 (Reference)
1	-14.74	799.85	-0.02	0.985	0.00 (0.00 - Inf)
Hypertension					
0					1.00 (Reference)
1	0.13	0.36	0.35	0.726	1.14 (0.56 - 2.32)
Diabetes					
0					1.00 (Reference)
1	0.56	0.37	1.51	0.130	1.75 (0.85 - 3.63)
Acute pancreatitis					
0					1.00 (Reference)
1	-0.54	0.56	-0.96	0.338	0.59 (0.20 - 1.75)
Anion gap _ max	0.11	0.05	2.38	0.017	1.12 (1.02 - 1.23)
Anion gap _ avg	0.13	0.09	1.49	0.137	1.14 (0.96 - 1.35)
Anion gap _ min	0.02	0.08	0.20	0.845	1.02 (0.87 - 1.18)
Bicarbonate _ max	-0.03	0.05	-0.60	0.552	0.97 (0.88 - 1.07)
Bicarbonate _ avg	-0.08	0.06	-1.31	0.190	0.93 (0.82 - 1.04)
Bicarbonate _ min	-0.08	0.05	-1.83	0.067	0.92 (0.84 - 1.01)
Chloride _ max	0.04	0.04	1.12	0.262	1.04 (0.97 - 1.12)
Chloride _ avg	-0.01	0.04	-0.33	0.743	0.99 (0.91 - 1.07)
Chloride _ min	-0.04	0.03	-1.16	0.245	0.96 (0.90 - 1.03)
Creatinine _ max	0.38	0.11	3.34	<0.001	1.46 (1.17 - 1.81)
Creatinine _ avg	0.69	0.18	3.78	<0.001	1.99 (1.39 - 2.83)
Creatinine _ min	0.96	0.29	3.30	<0.001	2.62 (1.48 - 4.65)
Glucose _ max	0.00	0.00	0.26	0.792	1.00 (1.00 - 1.00)
Glucose _ avg	-0.00	0.01	-0.28	0.778	1.00 (0.99 - 1.01)
Glucose _ min	-0.02	0.01	-1.96	0.050	0.98 (0.97 - 0.99)
Potassium _ max	0.49	0.22	2.28	0.023	1.64 (1.07 - 2.51)
Potassium _ avg	0.72	0.51	1.40	0.160	2.06 (0.75 - 5.64)
Potassium _ min	-0.56	0.49	-1.14	0.254	0.57 (0.22 - 1.49)
Sodium _ max	0.07	0.05	1.32	0.185	1.07 (0.97 - 1.19)
Sodium _ avg	-0.02	0.06	-0.41	0.684	0.98 (0.87 - 1.10)
Sodium _ min	-0.06	0.04	-1.49	0.137	0.94 (0.87 - 1.02)

Urea nitrogen _ max	0.03	0.01	4.68	<0.001	1.03 (1.02 - 1.05)
Urea nitrogen _ avg	0.05	0.01	4.88	<0.001	1.05 (1.03 - 1.07)
Urea nitrogen _ min	0.06	0.01	4.36	<0.001	1.06 (1.03 - 1.09)
Hematocrit _ max	-0.03	0.04	-0.91	0.365	0.97 (0.90 - 1.04)
Hematocrit _ avg	-0.08	0.04	-2.03	0.042	0.92 (0.85 - 0.99)
Hematocrit _ min	-0.07	0.03	-2.11	0.035	0.93 (0.87 - 0.99)
Hemoglobin _ max	-0.23	0.11	-2.10	0.036	0.79 (0.63 - 0.98)
Hemoglobin _ avg	-0.39	0.12	-3.12	0.002	0.68 (0.53 - 0.87)
Hemoglobin _ min	-0.29	0.10	-2.86	0.004	0.75 (0.62 - 0.91)
MCH _ max	-0.30	0.08	-3.62	<0.001	0.74 (0.63 - 0.87)
MCH _ avg	-0.33	0.09	-3.85	<0.001	0.72 (0.61 - 0.85)
MCH _ min	-0.34	0.09	-3.93	<0.001	0.71 (0.60 - 0.84)
MCHC _ max	-0.54	0.14	-3.93	<0.001	0.59 (0.45 - 0.76)
MCHC _ avg	-0.72	0.15	-4.73	<0.001	0.49 (0.36 - 0.66)
MCHC _ min	-0.61	0.13	-4.64	<0.001	0.54 (0.42 - 0.70)
MCV _ max	-0.03	0.03	-1.04	0.299	0.97 (0.92 - 1.03)
MCV _ avg	-0.04	0.03	-1.44	0.149	0.96 (0.90 - 1.02)
MCV _ min	-0.05	0.03	-1.59	0.113	0.95 (0.89 - 1.01)
PLT _ max	0.01	0.00	3.00	0.003	1.01 (1.01 - 1.01)
PLT _ avg	0.01	0.00	2.87	0.004	1.01 (1.01 - 1.01)
PLT _ min	0.01	0.00	2.38	0.017	1.01 (1.01 - 1.01)
RDW _ max	0.32	0.09	3.76	<0.001	1.38 (1.17 - 1.64)
RDW _ avg	0.35	0.10	3.50	<0.001	1.41 (1.16 - 1.72)
RDW _ min	0.35	0.10	3.33	<0.001	1.42 (1.15 - 1.74)
RBC _ max	-0.05	0.31	-0.15	0.883	0.96 (0.52 - 1.76)
RBC _ avg	-0.46	0.34	-1.34	0.179	0.63 (0.32 - 1.23)
RBC _ min	-0.43	0.29	-1.48	0.139	0.65 (0.37 - 1.15)
WBC _ max	0.07	0.02	3.47	<0.001	1.07 (1.03 - 1.12)
WBC _ avg	0.10	0.04	2.79	0.005	1.11 (1.03 - 1.19)
WBC _ min	0.09	0.06	1.63	0.102	1.10 (0.98 - 1.22)
TBil _ max	0.02	0.05	0.49	0.627	1.02 (0.93 - 1.12)
TBil _ avg	-0.02	0.07	-0.33	0.739	0.98 (0.84 - 1.13)
TBil _ min	-0.13	0.14	-0.99	0.321	0.87 (0.67 - 1.14)
ALT _max	-0.00	0.00	-0.22	0.822	1.00 (1.00 - 1.00)
ALT _avg	-0.00	0.00	-0.95	0.340	1.00 (0.99 - 1.00)
ALT _ min	-0.01	0.00	-2.09	0.037	0.99 (0.98 - 0.99)
ALP _ max	0.01	0.00	2.84	0.005	1.01 (1.01 - 1.01)
ALP _ avg	0.01	0.00	2.76	0.006	1.01 (1.01 - 1.01)
ALP _ min	0.01	0.00	3.05	0.002	1.01 (1.01 - 1.01)
AST _max	0.00	0.00	0.77	0.441	1.00 (1.00 - 1.00)
AST _avg	-0.00	0.00	-0.07	0.941	1.00 (1.00 - 1.00)
AST _min	-0.01	0.01	-1.69	0.091	0.99 (0.97 - 1.00)
Magnesium _ max	1.32	0.50	2.66	0.008	3.74 (1.41 - 9.88)
Magnesium _ avg	3.19	1.06	3.02	0.003	24.32 (3.06 - 193.08)

Magnesium _ min	0.70	0.79	0.89	0.376	2.01 (0.43 - 9.46)
Calcium _ max	-0.19	0.26	-0.73	0.467	0.83 (0.50 - 1.37)
Calcium _ avg	-0.87	0.35	-2.50	0.012	0.42 (0.21 - 0.83)
Calcium _ min	-0.68	0.24	-2.83	0.005	0.51 (0.32 - 0.81)
Phosphate _ max	0.35	0.13	2.70	0.007	1.43 (1.10 - 1.84)
Phosphate _ avg	0.93	0.24	3.81	<0.001	2.54 (1.57 - 4.10)
Phosphate _ min	0.71	0.29	2.42	0.015	2.03 (1.14 - 3.59)
INR(PT) _ max	0.18	0.11	1.58	0.114	1.20 (0.96 - 1.49)
INR(PT) _ avg	0.71	0.36	2.01	0.044	2.04 (1.02 - 4.10)
INR(PT) _ min	-0.01	0.88	-0.01	0.991	0.99 (0.17 - 5.61)
PT _ max	0.02	0.01	1.42	0.157	1.02 (0.99 - 1.04)
PT _ avg	0.07	0.04	2.04	0.042	1.08 (1.01 - 1.16)
PT _ min	0.03	0.08	0.31	0.753	1.03 (0.87 - 1.21)
PTT _ max	0.01	0.01	1.84	0.066	1.01 (1.00 - 1.02)
PTT _ avg	0.00	0.02	0.24	0.811	1.00 (0.97 - 1.04)
PTT _ min	-0.04	0.03	-1.13	0.259	0.96 (0.90 - 1.03)
Lipase _ max	-0.00	0.00	-0.28	0.782	1.00 (1.00 - 1.00)
Lipase _ avg	-0.00	0.00	-0.43	0.664	1.00 (1.00 - 1.00)
Lipase _ min	0.00	0.00	0.02	0.982	1.00 (1.00 - 1.00)
Basophils _ max	-0.47	0.45	-1.05	0.293	0.62 (0.26 - 1.50)
Basophils _ avg	-0.84	0.74	-1.14	0.254	0.43 (0.10 - 1.83)
Basophils _ min	-0.31	0.80	-0.39	0.693	0.73 (0.15 - 3.48)
Eosinophils _ max	-0.21	0.11	-1.85	0.064	0.81 (0.65 - 1.01)
Eosinophils _ avg	-0.40	0.17	-2.36	0.018	0.67 (0.48 - 0.93)
Eosinophils _ min	-0.37	0.18	-2.06	0.040	0.69 (0.49 - 0.98)
Lymphocytes _ max	-0.09	0.03	-2.80	0.005	0.92 (0.86 - 0.97)
Lymphocytes _ avg	-0.16	0.05	-3.57	<0.001	0.85 (0.78 - 0.93)
Lymphocytes _ min	-0.19	0.05	-3.71	<0.001	0.83 (0.75 - 0.91)
Monocytes _ max	-0.13	0.07	-1.76	0.079	0.88 (0.76 - 1.02)
Monocytes _ avg	-0.17	0.09	-1.77	0.077	0.85 (0.70 - 1.02)
Monocytes _ min	-0.15	0.09	-1.67	0.094	0.86 (0.72 - 1.03)
Neutrophils _ max	0.14	0.04	3.95	<0.001	1.15 (1.07 - 1.24)
Neutrophils _ avg	0.13	0.03	3.88	<0.001	1.14 (1.06 - 1.21)
Neutrophils _ min	0.07	0.02	2.97	0.003	1.07 (1.02 - 1.12)
Albumin _ max	-0.75	0.34	-2.17	0.030	0.47 (0.24 - 0.93)
Albumin _ avg	-0.80	0.37	-2.15	0.032	0.45 (0.22 - 0.93)
Albumin _ min	-0.63	0.33	-1.91	0.056	0.54 (0.28 - 1.01)
LD _ max	-0.00	0.00	-0.06	0.954	1.00 (1.00 - 1.00)
LD _ avg	0.00	0.00	0.46	0.643	1.00 (1.00 - 1.00)
LD _ min	0.00	0.00	0.51	0.610	1.00 (1.00 - 1.00)
PH _ max	-0.10	0.18	-0.55	0.584	0.90 (0.63 - 1.30)
PH _ avg	-0.34	0.27	-1.27	0.204	0.71 (0.42 - 1.20)
PH _ min	-0.48	0.28	-1.75	0.080	0.62 (0.36 - 1.06)
Specific gravity _ max	3.73	8.28	0.45	0.653	41.58 (0.00 -

					467464365.93)
Specific gravity _ avg	1.40	11.04	0.13	0.899	4.07 (0.00 - 10113489067.05)
Specific gravity _ min	-3.14	12.14	-0.26	0.796	0.04 (0.00 - 922968830.58)
Lactate _ max	0.04	0.11	0.38	0.705	1.04 (0.84 - 1.28)
Lactate _ avg	0.03	0.20	0.13	0.898	1.03 (0.70 - 1.51)
Lactate _ min	0.12	0.24	0.49	0.624	1.12 (0.71 - 1.79)
Amylase _ max	-0.00	0.00	-0.13	0.898	1.00 (1.00 - 1.00)
Amylase _ avg	-0.00	0.00	-0.08	0.938	1.00 (1.00 - 1.00)
Amylase _ min	0.00	0.00	0.32	0.749	1.00 (1.00 - 1.00)
NLR _ avg	0.02	0.01	1.79	0.074	1.02 (1.00 - 1.03)
PLR _ avg	0.01	0.01	2.74	0.006	1.02 (1.01 - 1.03)
MLR _ avg	0.18	0.29	0.63	0.526	1.20 (0.68 - 2.12)
SII _ avg	0.01	0.00	2.84	0.005	1.01 (1.01 - 1.01)
SIRI _ avg	0.00	0.00	0.90	0.369	1.00 (1.00 - 1.01)

* ICU, Intensive care unit; MCH, Mean corpuscular hemoglobin; MCHC, Mean corpuscular hemoglobin concentration; MCV, Mean corpuscular volume; PLT, Platelet count; RDW, Red cell distribution width; RBC, Red blood cells; WBC, White blood cells; TBil, Total bilirubin; ALT, Alanine aminotransferase; ALP, Alkaline phosphatase; AST, Aspartate aminotransferase; INR(PT), International normalized ratio of prothrombin time; PT, Prothrombin time; PTT, Partial thromboplastin time; LD, Lactate dehydrogenase; NLR, Neutrophil-lymphocyte ratio; PLR, Platelet-lymphocyte ratio; MLR, Monocyte-lymphocyte ratio; SII, Platelet*neutrophil/lymphocyte; SIRI, Neutrocyte*monocyte/lymphocyte.

Supplementary Table S7. Analysis of factors for whether patients re-admitted within 30 days will die within 180 days after discharge (multivariate logistic regression analysis, n=262).

Factors	Univariate logistic regression	Multivariate logistic regression analysis			
	P value	β	S.E	Z	P value
Severity of cholangitis					
1					
2	0.096	-40.45	40202.17	0	0.999
3	0.008	-69.83	38299.95	0	0.999
Age	<0.001	5.7	1488.42	0	0.997
Anion gap _ max	0.017	-7.51	8353.31	0	0.999
Creatinine _ max	<0.001	-131.86	118230.9	0	0.999
Creatinine _ avg	<0.001	341.51	293578.2	0	0.999
Creatinine _ min	<0.001	-213.46	193902.6	0	0.999
Glucose _ min	0.050	1.17	845.78	0	0.999
Potassium _ max	0.023	39.06	59581.27	0	0.999
Urea nitrogen _ max	<0.001	5.44	6853.65	0	0.999
Urea nitrogen _ avg	<0.001	-3.92	12609.83	0	1
Urea nitrogen _ min	<0.001	-0.59	7094.77	0	1
Hematocrit _ avg	0.042	19.89	64253.28	0	1
Hematocrit _ min	0.035	21.03	18539.43	0	0.999
Hemoglobin _ max	0.036	5.05	44487.22	0	1
Hemoglobin _ avg	0.002	-241.44	241800.9	0	0.999
Hemoglobin _ min	0.004	111.48	67880.99	0	0.999
MCH _ max	<0.001	-176.71	78215.01	0	0.998
MCH _ avg	<0.001	-30.95	127861.6	0	1
MCH _ min	<0.001	200.67	68540.69	0	0.998
MCHC _ max	<0.001	231.61	61087.87	0	0.997
MCHC _ avg	<0.001	-268.76	138756.2	0	0.998
MCHC _ min	<0.001	52.24	65509.74	0	0.999
PLT _ max	0.003	0.93	512.63	0	0.999
PLT _ avg	0.004	-0.18	1589.05	0	1
PLT _ min	0.017	0.02	1477.69	0	1
RDW _ max	<0.001	29.43	74577.72	0	1
RDW _ avg	<0.001	30.8	192712.9	0	1
RDW _ min	<0.001	-26.75	131165	0	1
WBC _ max	<0.001	0.33	7385.93	0	1
WBC _ avg	0.005	-6.11	9546.91	0	0.999
ALT _ min	0.037	-0.15	264.71	0	1
ALP _ max	0.005	0.58	261.99	0	0.998
ALP _ avg	0.006	-1.4	745.2	0	0.999
ALP _ min	0.002	0.81	489.19	0	0.999

Magnesium _ max	0.008	-63.64	37930.84	0	0.999
Magnesium _ avg	0.003	270.15	130386.5	0	0.998
Calcium _ avg	0.012	149.68	69395.41	0	0.998
Calcium _ min	0.005	-171.58	47310.48	0	0.997
Phosphate _ max	0.007	11.21	25532.67	0	1
Phosphate _ avg	<0.001	-88.12	75304.97	0	0.999
Phosphate _ min	0.015	124.65	86615.44	0	0.999
INR(PT) _ avg	0.044	-77.59	115200.2	0	0.999
PT _ avg	0.042	13.21	11817.69	0	0.999
Eosinophils _ avg	0.018	-91.49	34588.32	0	0.998
Eosinophils _ min	0.040	84.61	41897.51	0	0.998
Lymphocytes _ max	0.005	-22.81	4967.7	0	0.996
Lymphocytes _ avg	<0.001	70.64	20415.4	0	0.997
Lymphocytes _ min	<0.001	-46.85	13686.64	0	0.997
Neutrophils _ max	<0.001	-26.77	11914.86	0	0.998
Neutrophils _ avg	<0.001	68.05	20908.51	0	0.997
Neutrophils _ min	0.003	-27.54	6953.47	0	0.997
Albumin _ max	0.030	-196.91	58194.43	0	0.997
Albumin _ avg	0.032	172.25	90601.49	0	0.998
PLR _ avg	0.006	-11.88	27364.7	0	1
SII _ avg	0.005	0.11	277.66	0	1
Intercept		-2933.54	2050696	0	0.999

* MCH, Mean corpuscular hemoglobin; MCHC, Mean corpuscular hemoglobin concentration; PLT, Platelet count; RDW, Red cell distribution width; WBC, White blood cells; ALT, Alanine aminotransferase; ALP, Alkaline phosphatase; INR(PT), International normalized ratio of prothrombin time; PT, Prothrombin time; PLR, Platelet-lymphocyte ratio; SII, Platelet*neutrophil/lymphocyte.

Supplementary Table S8. Analysis of whether patients re-admitted within 30 days will die within 180 days after discharge (in-hospital death excluded, n=1104).

Outcomes	Patients re-admitted within 30 days after discharge				
	Yes (n=262)	No (n=842)	P-Value	Kappa	P-Value of Kappa
Mortality within 180 days after discharge	35(13.4%)	79(9.4%)	＜0.001	0.049	0.065

Supplementary Table S9. Analysis of factors leading to different outcomes of patients admitted to the ICU (n=652).

Factors	Outcomes		
	Death in hospital P value	Re-admission within 1 month after discharge P value	Death within 180 days after discharge P value
Age	0.429	0.419	0.002
Gender	0.769	0.919	0.563
Length of stay in hospital	0.288	0.785	0.008
Length of stay in ICU	0.001	0.763	＜0.001
Severity of cholangitis	0.001	0.507	＜0.001
Surgical operations	0.239	0.463	0.416
Endoscopy	0.010	0.979	0.014
Interventional operations	0.281	0.232	0.279
Surgical or interventional or endoscopic operations	0.010	0.428	0.013
Endoscopy combined with surgical operations	0.126	0.444	0.182
Endoscopy combined with interventional operations	0.847	0.522	0.705
Endoscopy combined with another operations	0.287	0.981	0.232
Surgical or interventional operations other than endoscopy	0.357	0.384	0.408
Endoscopic, surgical, and interventional procedures were performed during a single hospitalization	0.191	0.347	0.644
Duration of intravenous antibiotic use	0.012	0.012	＜0.001
Blood culture results	0.245	0.369	0.328
Bile culture results	0.132	0.729	0.205
Hypertension	0.839	0.666	0.547
Diabetes	0.728	0.945	0.968
Acute pancreatitis	0.018	0.300	0.374
Anion gap _ max	＜0.001	0.037	＜0.001
Anion gap _ avg	＜0.001	0.026	＜0.001
Anion gap _ min	0.001	0.034	0.675
Bicarbonate _ max	＜0.001	0.714	0.001
Bicarbonate _ avg	＜0.001	0.191	＜0.001
Bicarbonate _ min	＜0.001	0.556	＜0.001
Chloride _ max	0.033	0.032	0.003
Chloride _ avg	0.598	0.065	0.131
Chloride _ min	0.278	0.194	0.628

Creatinine _ max	＜0.001	0.064	＜0.001
Creatinine _ avg	＜0.001	0.133	＜0.001
Creatinine _ min	＜0.001	0.394	0.001
Glucose _ max	＜0.001	0.206	＜0.001
Glucose _ avg	0.001	0.032	0.013
Glucose _ min	0.005	0.089	0.002
Potassium _ max	＜0.001	0.762	＜0.001
Potassium _ avg	＜0.001	0.828	＜0.001
Potassium _ min	0.026	0.610	0.775
Sodium _ max	0.989	0.015	0.086
Sodium _ avg	0.005	0.005	0.151
Sodium _ min	0.001	0.100	0.001
Urea nitrogen _ max	＜0.001	0.126	＜0.001
Urea nitrogen _ avg	＜0.001	0.146	＜0.001
Urea nitrogen _ min	＜0.001	0.292	＜0.001
Hematocrit _ max	0.623	0.262	0.652
Hematocrit _ avg	0.025	0.541	＜0.001
Hematocrit _ min	0.001	0.872	＜0.001
Hemoglobin _ max	0.879	0.026	0.043
Hemoglobin _ avg	0.007	0.093	＜0.001
Hemoglobin _ min	＜0.001	0.521	＜0.001
MCH _ max	0.001	0.600	0.416
MCH _ avg	0.003	0.672	0.248
MCH _ min	0.008	0.511	0.207
MCHC _ max	0.431	0.002	＜0.001
MCHC _ avg	0.009	0.004	＜0.001
MCHC _ min	＜0.001	0.010	＜0.001
MCV _ max	＜0.001	0.690	0.005
MCV _ avg	＜0.001	0.363	0.125
MCV _ min	0.012	0.309	0.678
PLT _ max	0.002	0.414	0.656
PLT _ avg	＜0.001	0.316	0.250
PLT _ min	＜0.001	0.317	0.019
RDW _ max	＜0.001	0.410	＜0.001
RDW _ avg	＜0.001	0.238	＜0.001
RDW _ min	0.001	0.150	＜0.001
RBC _ max	0.183	0.056	0.456
RBC _ avg	0.001	0.207	0.001
RBC _ min	＜0.001	0.527	＜0.001
WBC _ max	＜0.001	0.330	＜0.001
WBC _ avg	＜0.001	0.425	＜0.001
WBC _ min	＜0.001	0.730	＜0.001
TBil _ max	＜0.001	0.732	0.010
TBil _ avg	＜0.001	0.796	0.010

TBil _ min	＜0.001	0.803	0.002
ALT _max	0.567	0.039	0.001
ALT _avg	0.140	0.049	＜0.001
ALT _ min	0.034	0.369	＜0.001
ALP _ max	0.880	0.037	0.003
ALP _ avg	0.308	0.055	0.045
ALP _ min	0.010	0.036	0.472
AST _max	0.055	0.240	0.320
AST _avg	0.020	0.190	0.458
AST _min	＜0.001	0.288	0.826
Magnesium _ max	0.014	0.223	＜0.001
Magnesium _ avg	0.008	0.205	＜0.001
Magnesium _ min	0.310	0.898	0.048
Calcium _ max	0.977	0.667	0.901
Calcium _ avg	0.036	0.592	0.011
Calcium _ min	＜0.001	0.699	＜0.001
Phosphate _ max	＜0.001	0.783	＜0.001
Phosphate _ avg	＜0.001	0.633	＜0.001
Phosphate _ min	0.035	0.111	0.031
INR(PT) _ max	＜0.001	0.011	＜0.001
INR(PT) _ avg	＜0.001	0.007	＜0.001
INR(PT) _ min	0.010	0.071	0.094
PT _ max	＜0.001	0.008	＜0.001
PT _ avg	＜0.001	0.010	0.001
PT _ min	0.012	0.398	0.064
PTT _ max	＜0.001	0.135	＜0.001
PTT _ avg	＜0.001	0.047	＜0.001
PTT _ min	＜0.001	0.111	0.002
Lipase _ max	0.186	0.014	0.508
Lipase _ avg	0.053	0.055	0.629
Lipase _ min	0.927	0.908	0.900
Basophils _ max	0.496	0.186	0.157
Basophils _ avg	0.136	0.044	0.620
Basophils _ min	＜0.001	0.009	0.003
Eosinophils _ max	0.807	0.287	0.540
Eosinophils _ avg	0.186	0.090	0.302
Eosinophils _ min	＜0.001	0.012	＜0.001
Lymphocytes _ max	0.900	0.388	0.935
Lymphocytes _ avg	0.117	0.166	0.123
Lymphocytes _ min	＜0.001	0.059	＜0.001
Monocytes _ max	0.003	0.224	0.009
Monocytes _ avg	0.560	0.119	0.316
Monocytes _ min	0.038	0.107	0.130
Neutrophils _ max	0.001	0.183	＜0.001

Neutrophils _ avg	0.209	0.491	0.142
Neutrophils _ min	0.698	0.786	0.763
Albumin _ max	0.002	0.322	＜0.001
Albumin _ avg	＜0.001	0.783	＜0.001
Albumin _ min	＜0.001	0.866	＜0.001
LD _ max	＜0.001	0.856	0.005
LD _ avg	＜0.001	0.855	0.028
LD _ min	＜0.001	0.742	0.122
PH _ max	0.955	0.268	0.194
PH _ avg	0.116	0.050	0.041
PH _ min	0.003	0.006	0.020
Specific gravity _ max	0.445	0.734	0.372
Specific gravity _ avg	0.631	0.876	0.820
Specific gravity _ min	0.078	0.982	0.533
Lactate _ max	＜0.001	0.660	＜0.001
Lactate _ avg	＜0.001	0.592	＜0.001
Lactate _ min	0.067	0.878	0.176
Amylase _ max	0.033	0.145	0.107
Amylase _ avg	＜0.001	0.235	0.003
Amylase _ min	＜0.001	0.509	0.006
NLR _ avg	0.099	0.136	0.222
PLR _ avg	0.250	0.688	0.869
MLR _ avg	0.021	0.766	0.049
SII _ avg	0.336	0.646	0.774
SIRI _ avg	0.032	0.776	0.057
GNRI _ avg	0.023	0.566	＜0.001
Weight	0.158	0.686	0.008
Height	0.433	0.458	0.256
BMI	0.305	0.916	0.015
APSIII score	＜0.001	0.807	＜0.001
GCS score	0.802	0.032	0.023
LODS score	＜0.001	0.501	＜0.001
MELD score	＜0.001	0.897	＜0.001
OASIS score	＜0.001	0.744	＜0.001
SIRS score	＜0.001	0.647	＜0.001
SOFA score	＜0.001	0.514	＜0.001
Sepsis	0.035	0.001	0.135
AKI stage	＜0.001	0.637	＜0.001
Renal replacement therapy	＜0.001	0.721	＜0.001
Duration of auxiliary ventilation	＜0.001	＜0.001	＜0.001
Duration of vasopressor drug use	＜0.001	0.085	＜0.001
Urine volume on the first day of ICU admission	＜0.001	0.932	＜0.001

Duration of arterial catheterization	＜0.001	0.010	＜0.001
Duration of intravenous catheterization	＜0.001	0.855	＜0.001
Heart rate on the first day of ICU _ max	＜0.001	0.510	＜0.001
Heart rate on the first day of ICU _ avg	＜0.001	0.313	＜0.001
Heart rate on the first day of ICU _ min	0.061	0.077	0.004
SysBP on the first day of ICU _ max	0.080	0.090	0.589
SysBP on the first day of ICU _ avg	＜0.001	0.386	0.036
SysBP on the first day of ICU _ min	＜0.001	0.772	0.002
DiasBP on the first day of ICU _ max	0.085	0.702	0.556
DiasBP on the first day of ICU _ avg	0.001	0.653	0.010
DiasBP on the first day of ICU _ min	＜0.001	0.062	＜0.001
Mean arterial pressure on the first day of ICU admission _ max	0.966	0.133	0.499
Mean arterial pressure on the first day of ICU admission _ avg	＜0.001	0.389	0.041
Mean arterial pressure on the first day of ICU admission _ min	＜0.001	0.423	0.001
Respiratory rate on the first day of ICU _ max	＜0.001	0.688	0.001
Respiratory rate on the first day of ICU _ avg	＜0.001	0.294	＜0.001
Respiratory rate on the first day of ICU _ min	0.851	0.017	0.648
Temperature on the first day of ICU admission _ max	0.938	0.626	0.037
Temperature on the first day of ICU admission _ avg	0.795	0.299	0.018
Temperature on the first day of ICU admission _ min	0.272	0.051	0.011
SpO2 on the first day of ICU _	0.656	0.578	0.073

max			
SpO2 on the first day of ICU _ avg	0.031	0.326	0.458
SpO2 on the first day of ICU _ min	＜0.001	0.146	＜0.001
Glucose on the first day of ICU admission _ max	0.041	0.794	0.006
Glucose on the first day of ICU admission _ avg	0.125	0.463	0.130
Glucose on the first day of ICU admission _ min	0.966	0.159	0.435

* ICU, Intensive care unit; MCH, Mean corpuscular hemoglobin; MCHC, Mean corpuscular hemoglobin concentration; MCV, Mean corpuscular volume; PLT, Platelet count; RDW, Red cell distribution width; RBC, Red blood cells; WBC, White blood cells; TBil, Total bilirubin; ALT, Alanine aminotransferase; ALP, Alkaline phosphatase; AST, Aspartate aminotransferase; INR(PT), International normalized ratio of prothrombin time; PT, Prothrombin time; PTT, Partial thromboplastin time; LD, Lactate dehydrogenase; NLR, Neutrophil-lymphocyte ratio; PLR, Platelet-lymphocyte ratio; MLR, Monocyte-lymphocyte ratio; SII, Platelet*neutrophil/lymphocyte; SIRI, Neutrocyte*monocyte/lymphocyte; GNRI, Geriatric nutritional risk index; BMI, Body mass index; APSIII, Acute physiology score iii; GCS, Glasgow coma scale; LODS, Logistic organ dysfunction system; MELD, Model for end-stage liver disease; OASIS, Oxford acute severity of illness score; SIRS, Systemic inflammatory response syndrome; SOFA, Sepsis-related organ failure; AKI, Acute kidney injury; SysBP, Systolic blood pressure; DiasBP, Diastolic blood pressure.

Supplementary Table S10. Analysis of factors leading to different outcomes of patients underwent operations during ICU treatment (n=614).

Factors	Outcomes		
	Death in hospital P value	Re-admission within 1 month after discharge P value	Death within 180 days after discharge P value
Age	0.363	0.607	0.008
Gender	0.443	0.805	0.657
Length of stay in hospital	0.448	0.631	0.009
Length of stay in ICU	＜0.001	0.567	＜0.001
Severity of cholangitis	0.002	0.217	＜0.001
Surgical operations	0.417	0.386	0.670
Endoscopy	0.263	0.412	0.321
Interventional operations	0.171	0.261	0.182
Endoscopy combined with surgical operations	0.222	0.377	0.315
Endoscopy combined with interventional operations	0.996	0.564	0.560
Endoscopy combined with another operations	0.499	0.914	0.420
Surgical or interventional operations other than endoscopy	0.263	0.412	0.321
Endoscopic, surgical, and interventional procedures were performed during a single hospitalization	0.213	0.332	0.559
Interval between admission and first operation (Priority given to endoscopy) (days)	0.624	0.401	0.209
Duration of intravenous antibiotic use	0.022	0.007	＜0.001
Blood culture results	0.170	0.306	0.170
Bile culture results	0.087	0.700	0.155
Hypertension	0.852	0.620	0.933
Diabetes	0.684	0.988	0.688
Acute pancreatitis	0.007	0.379	0.497
Anion gap _ max	＜0.001	0.077	＜0.001
Anion gap _ avg	＜0.001	0.030	＜0.001
Anion gap _ min	0.004	0.022	0.441
Bicarbonate _ max	＜0.001	0.975	0.004
Bicarbonate _ avg	＜0.001	0.794	＜0.001
Bicarbonate _ min	＜0.001	0.740	＜0.001
Chloride _ max	0.021	0.036	0.004
Chloride _ avg	0.188	0.066	0.224

Chloride _ min	0.425	0.249	0.893
Creatinine _ max	＜0.001	0.183	＜0.001
Creatinine _ avg	＜0.001	0.320	＜0.001
Creatinine _ min	＜0.001	0.713	0.001
Glucose _ max	＜0.001	0.252	＜0.001
Glucose _ avg	＜0.001	0.055	0.011
Glucose _ min	0.006	0.126	0.001
Potassium _ max	＜0.001	0.850	＜0.001
Potassium _ avg	＜0.001	0.563	＜0.001
Potassium _ min	0.029	0.622	0.837
Sodium _ max	0.942	0.014	0.236
Sodium _ avg	0.017	0.009	0.072
Sodium _ min	0.001	0.074	0.001
Urea nitrogen _ max	＜0.001	0.298	＜0.001
Urea nitrogen _ avg	＜0.001	0.355	＜0.001
Urea nitrogen _ min	＜0.001	0.586	＜0.001
Hematocrit _ max	0.368	0.211	0.755
Hematocrit _ avg	0.016	0.627	＜0.001
Hematocrit _ min	0.001	0.820	＜0.001
Hemoglobin _ max	0.581	0.021	0.064
Hemoglobin _ avg	0.009	0.118	＜0.001
Hemoglobin _ min	0.001	0.435	＜0.001
MCH _ max	0.001	0.474	0.318
MCH _ avg	0.003	0.539	0.160
MCH _ min	0.006	0.383	0.129
MCHC _ max	0.713	0.001	＜0.001
MCHC _ avg	0.031	0.001	＜0.001
MCHC _ min	＜0.001	0.004	＜0.001
MCV _ max	＜0.001	0.560	0.014
MCV _ avg	＜0.001	0.408	0.198
MCV _ min	0.026	0.304	0.874
PLT _ max	0.008	0.431	0.576
PLT _ avg	＜0.001	0.329	0.894
PLT _ min	＜0.001	0.399	0.122
RDW _ max	＜0.001	0.220	＜0.001
RDW _ avg	＜0.001	0.116	＜0.001
RDW _ min	0.006	0.090	＜0.001
RBC _ max	0.388	0.037	0.697
RBC _ avg	＜0.001	0.245	0.001
RBC _ min	＜0.001	0.562	＜0.001
WBC _ max	＜0.001	0.360	＜0.001
WBC _ avg	＜0.001	0.492	＜0.001
WBC _ min	＜0.001	0.808	＜0.001
TBil _ max	＜0.001	0.641	0.016

TBil _ avg	＜0.001	0.869	0.024
TBil _ min	0.001	0.931	0.008
ALT _max	0.778	0.019	0.002
ALT _avg	0.215	0.016	＜0.001
ALT _ min	0.048	0.176	＜0.001
ALP _ max	0.403	0.032	＜0.001
ALP _ avg	0.931	0.062	0.002
ALP _ min	0.121	0.045	0.088
AST _max	0.057	0.118	0.338
AST _avg	0.026	0.070	0.489
AST _min	＜0.001	0.157	0.954
Magnesium _ max	0.021	0.181	＜0.001
Magnesium _ avg	0.005	0.278	0.001
Magnesium _ min	0.564	0.649	0.094
Calcium _ max	0.940	0.771	0.675
Calcium _ avg	0.145	0.640	0.082
Calcium _ min	＜0.001	0.759	＜0.001
Phosphate _ max	＜0.001	0.773	＜0.001
Phosphate _ avg	＜0.001	0.569	＜0.001
Phosphate _ min	0.016	0.106	0.007
INR(PT) _ max	＜0.001	0.005	＜0.001
INR(PT) _ avg	0.002	0.004	0.003
INR(PT) _ min	0.123	0.030	0.268
PT _ max	＜0.001	0.005	＜0.001
PT _ avg	0.002	0.007	0.005
PT _ min	0.091	0.292	0.184
PTT _ max	＜0.001	0.049	＜0.001
PTT _ avg	＜0.001	0.015	＜0.001
PTT _ min	＜0.001	0.050	0.003
Lipase _ max	0.113	0.021	0.494
Lipase _ avg	0.090	0.083	0.851
Lipase _ min	0.380	0.776	0.622
Basophils _ max	0.784	0.061	0.407
Basophils _ avg	0.014	0.010	0.278
Basophils _ min	＜0.001	0.005	0.003
Eosinophils _ max	0.999	0.143	0.503
Eosinophils _ avg	0.170	0.045	0.398
Eosinophils _ min	＜0.001	0.011	0.001
Lymphocytes _ max	0.619	0.217	0.859
Lymphocytes _ avg	0.084	0.082	0.163
Lymphocytes _ min	＜0.001	0.034	＜0.001
Monocytes _ max	0.003	0.167	0.008
Monocytes _ avg	0.473	0.101	0.260
Monocytes _ min	0.060	0.106	0.156

Neutrophils _ max	0.005	0.181	0.001
Neutrophils _ avg	0.305	0.371	0.226
Neutrophils _ min	0.656	0.575	0.587
Albumin _ max	0.002	0.232	＜0.001
Albumin _ avg	＜0.001	0.419	＜0.001
Albumin _ min	＜0.001	0.672	＜0.001
LD _ max	＜0.001	0.971	0.001
LD _ avg	＜0.001	0.956	0.006
LD _ min	＜0.001	0.739	0.046
PH _ max	0.920	0.253	0.184
PH _ avg	0.109	0.064	0.047
PH _ min	0.007	0.010	0.053
Specific gravity _ max	0.642	0.962	0.377
Specific gravity _ avg	0.568	0.992	0.608
Specific gravity _ min	0.129	0.977	0.986
Lactate _ max	＜0.001	0.876	＜0.001
Lactate _ avg	＜0.001	0.725	0.006
Lactate _ min	0.100	0.898	0.276
Amylase _ max	0.033	0.178	0.104
Amylase _ avg	＜0.001	0.382	0.008
Amylase _ min	0.001	0.653	0.052
NLR _ avg	0.075	0.092	0.239
PLR _ avg	0.668	0.531	0.373
MLR _ avg	0.013	0.985	0.059
SII _ avg	0.782	0.483	0.339
SIRI _ avg	0.025	0.990	0.072
GNRI _ avg	0.002	0.785	＜0.001
Weight	0.207	0.650	0.025
Height	0.338	0.641	0.813
BMI	0.069	0.730	0.009
APSIII score	＜0.001	0.538	＜0.001
GCS score	0.228	0.030	0.009
LODS score	＜0.001	0.888	＜0.001
MELD score	＜0.001	0.821	＜0.001
OASIS score	＜0.001	0.980	＜0.001
SIRS score	＜0.001	0.488	＜0.001
SOFA score	＜0.001	0.679	＜0.001
Sepsis	0.019	0.001	0.099
AKI stage	＜0.001	0.623	＜0.001
Renal replacement therapy	＜0.001	0.927	＜0.001
Duration of auxiliary ventilation	＜0.001	＜0.001	＜0.001
Duration of vasopressor drug use	＜0.001	0.146	＜0.001
Urine volume on the first day of	＜0.001	0.636	＜0.001

ICU admission			
Duration of arterial catheterization	＜0.001	0.013	＜0.001
Duration of intravenous catheterization	＜0.001	0.890	＜0.001
Heart rate on the first day of ICU _ max	＜0.001	0.613	＜0.001
Heart rate on the first day of ICU _ avg	0.001	0.218	＜0.001
Heart rate on the first day of ICU _ min	0.277	0.101	0.025
SysBP on the first day of ICU _ max	0.150	0.122	0.263
SysBP on the first day of ICU _ avg	＜0.001	0.285	0.229
SysBP on the first day of ICU _ min	＜0.001	0.534	0.014
DiasBP on the first day of ICU _ max	0.040	0.599	0.750
DiasBP on the first day of ICU _ avg	0.002	0.588	0.013
DiasBP on the first day of ICU _ min	＜0.001	0.132	0.002
Mean arterial pressure on the first day of ICU admission _ max	0.517	0.175	0.451
Mean arterial pressure on the first day of ICU admission _ avg	0.003	0.288	0.182
Mean arterial pressure on the first day of ICU admission _ min	＜0.001	0.888	0.003
Respiratory rate on the first day of ICU _ max	＜0.001	0.392	＜0.001
Respiratory rate on the first day of ICU _ avg	＜0.001	0.109	0.001
Respiratory rate on the first day of ICU _ min	0.067	0.013	0.883
Temperature on the first day of ICU admission _ max	0.459	0.909	0.156
Temperature on the first day of ICU admission _ avg	0.362	0.391	0.145
Temperature on the first day of ICU admission _ min	0.944	0.064	0.119

SpO2 on the first day of ICU _ max	0.304	0.493	0.062
SpO2 on the first day of ICU _ avg	0.026	0.554	0.305
SpO2 on the first day of ICU _ min	＜0.001	0.325	＜0.001
Glucose on the first day of ICU admission _ max	0.048	0.958	0.008
Glucose on the first day of ICU admission _ avg	0.150	0.574	0.156
Glucose on the first day of ICU admission _ min	0.985	0.242	0.405

* ICU, Intensive care unit; MCH, Mean corpuscular hemoglobin; MCHC, Mean corpuscular hemoglobin concentration; MCV, Mean corpuscular volume; PLT, Platelet count; RDW, Red cell distribution width; RBC, Red blood cells; WBC, White blood cells; TBil, Total bilirubin; ALT, Alanine aminotransferase; ALP, Alkaline phosphatase; AST, Aspartate aminotransferase; INR(PT), International normalized ratio of prothrombin time; PT, Prothrombin time; PTT, Partial thromboplastin time; LD, Lactate dehydrogenase; NLR, Neutrophil-lymphocyte ratio; PLR, Platelet-lymphocyte ratio; MLR, Monocyte-lymphocyte ratio; SII, Platelet*neutrophil/lymphocyte; SIRI, Neutrocyte*monocyte/lymphocyte; GNRI, Geriatric nutritional risk index; BMI, Body mass index; APSIII, Acute physiology score iii; GCS, Glasgow coma scale; LODS, Logistic organ dysfunction system; MELD, Model for end-stage liver disease; OASIS, Oxford acute severity of illness score; SIRS, Systemic inflammatory response syndrome; SOFA, Sepsis-related organ failure; AKI, Acute kidney injury; SysBP, Systolic blood pressure; DiasBP, Diastolic blood pressure.

Supplementary Table S11. Variables classified according to the type of data distribution corresponding to various patient categories.

All the patients. (n=142)			**Patients admitted to the ICU. (n=185)**			**Patients underwent operations during ICU treatment. (n=186)**		
Normal distribution variables	Abnormal distribution variables	Categorical variables	Normal distribution variables	Abnormal distribution variables	Categorical variables	Normal distribution variables	Abnormal distribution variables	Categorical variables
Hematocrit _ max	Age	Gender	Bicarbonate _ avg	Age	Gender	Hematocrit _ min	Age	Gender
Hematocrit _ min	Length of stay in hospital	Severity of cholangitis	Chloride _ avg	Length of stay in hospital	Severity of cholangitis	Hemoglobin _ min	Length of stay in hospital	Severity of cholangitis
Hemoglobin _ max	Length of stay in ICU	Surgical operations	Sodium _ avg	Length of stay in ICU	Surgical operations	RBC _ min	Length of stay in ICU	Surgical operations
Hemoglobin _ min	Duration of intravenous antibiotic use	Endoscopy	Hematocrit _ max	Duration of intravenous antibiotic use	Endoscopy		Interval between admission and operation (Priority given to endoscopy)	Endoscopy
RBC _ max	Anion gap _ max	Interventional operations	Hematocrit _ avg	Anion gap _ max	Interventional operations		Anion gap _ max	Interventional operations
RBC _ avg	Anion gap _ avg	Surgical or interventional or endoscopic operations	Hematocrit _ min	Anion gap _ avg	Surgical or interventional or endoscopic operations		Anion gap _ avg	Surgical or interventional or endoscopic operations
RBC _ min	Anion gap _ min	Endoscopy combined with surgical operations	Hemoglobin _ max	Anion gap _ min	Endoscopy combined with surgical operations		Anion gap _ min	Endoscopy combined with surgical operations
Albumin _ avg	Bicarbonate _ max	Endoscopy combined with interventional operations	Hemoglobin _ avg	Bicarbonate _ max	Endoscopy combined with interventional operations		Bicarbonate _ max	Endoscopy combined with interventional operations
	Bicarbona	Endoscopy	Hemoglo	Bicarbonat	Endoscopy		Bicarbonat	Endoscopy

	te _ avg	combined with another operations	bin _ min	e _ min	combined with another operations		e _ avg	combined with another operations
	Bicarbonate _ min	Surgical or interventional operations other than endoscopy	MCV _ avg	Chloride _ max	Surgical or interventional operations other than endoscopy		Bicarbonate _ min	Surgical or interventional operations other than endoscopy
	Chloride _ max	Endoscopic, surgical, and interventional procedures were performed during a single hospitalization	RBC _ max	Chloride _ min	Endoscopic, surgical, and interventional procedures were performed during a single hospitalization		Chloride _ max	Endoscopic, surgical, and interventional procedures were performed during a single hospitalization
	Chloride _ avg	Blood culture results	RBC _ avg	Creatinine _ max	Blood culture results		Chloride _ avg	Blood culture results
	Chloride _ min	Bile culture results	RBC _ min	Creatinine _ avg	Bile culture results		Chloride _ min	Bile culture results
	Creatinine _ max	Hypertension	Magnesium _ avg	Creatinine _ min	Hypertension		Creatinine _ max	Hypertension
	Creatinine _ avg	Diabetes	Calcium _ avg	Glucose _ max	Diabetes		Creatinine _ avg	Diabetes
	Creatinine _ min	Acute pancreatitis	Albumin _ max	Glucose _ avg	Acute pancreatitis		Creatinine _ min	Acute pancreatitis
	Glucose _ max		Albumin _ avg	Glucose _ min	Sepsis		Glucose _ max	Sepsis
	Glucose _ avg		GNRI _ avg	Potassium _ max	AKI stage		Glucose _ avg	AKI stage
	Glucose _ min		Height	Potassium _ avg	Renal replacement therapy		Glucose _ min	Renal replacement therapy
	Potassium _ max		Heart rate on the first day of ICU _	Potassium _ min			Potassium _ max	

			avg					
	Potassium _ avg		DiasBP on the first day of ICU _ avg	Sodium _ max			Potassium _ avg	
	Potassium _ min		DiasBP on the first day of ICU _ min	Sodium _ min			Potassium _ min	
	Sodium _ max			Urea nitrogen _ max			Sodium _ max	
	Sodium _ avg			Urea nitrogen _ avg			Sodium _ avg	
	Sodium _ min			Urea nitrogen _ min			Sodium _ min	
	Urea nitrogen _ max			MCH _ max			Urea nitrogen _ max	
	Urea nitrogen _ avg			MCH _ avg			Urea nitrogen _ avg	
	Urea nitrogen _ min			MCH _ min			Urea nitrogen _ min	
	Hematocrit _ avg			MCHC _ max			Hematocrit _ max	
	Hemoglobin _ avg			MCHC _ avg			Hematocrit _ avg	
	MCH _ max			MCHC _ min			Hemoglobin _ max	
	MCH _ avg			MCV _ max			Hemoglobin _ avg	
	MCH _ min			MCV _ min			MCH _ max	
	MCHC _ max			PLT _ max			MCH _ avg	
	MCHC _ avg			PLT _ avg			MCH _ min	
	MCHC _			PLT _ min			MCHC _	

	min						max	
	MCV _ max			RDW _ max			MCHC _ avg	
	MCV _ avg			RDW _ avg			MCHC _ min	
	MCV _ min			RDW _ min			MCV _ max	
	PLT _ max			WBC _ max			MCV _ avg	
	PLT _ avg			WBC _ avg			MCV _ min	
	PLT _ min			WBC _ min			PLT _ max	
	RDW _ max			TBil _ max			PLT _ avg	
	RDW _ avg			TBil _ avg			PLT _ min	
	RDW _ min			TBil _ min			RDW _ max	
	WBC _ max			ALT _max			RDW _ avg	
	WBC _ avg			ALT _avg			RDW _ min	
	WBC _ min			ALT _ min			RBC _ max	
	TBil _ max			ALP _ max			RBC _ avg	
	TBil _ avg			ALP _ avg			WBC _ max	
	TBil _ min			ALP _ min			WBC _ avg	
	ALT _max			AST _max			WBC _ min	
	ALT _avg			AST _avg			TBil _ max	
	ALT _ min			AST _min			TBil _ avg	
	ALP _ max			Magnesium _ max			TBil _ min	
	ALP _ avg			Magnesium _ min			ALT _max	
	ALP _ min			Calcium _ max			ALT _avg	
	AST _max			Calcium _ min			ALT _ min	

	AST _avg			Phosphate _ max			ALP _ max	
	AST _min			Phosphate _ avg			ALP _ avg	
	Magnesium _ max			Phosphate _ min			ALP _ min	
	Magnesium _ avg			INR(PT) _ max			AST _max	
	Magnesium _ min			INR(PT) _ avg			AST _avg	
	Calcium _ max			INR(PT) _ min			AST _min	
	Calcium _ avg			PT _ max			Magnesium _ max	
	Calcium _ min			PT _ avg			Magnesium _ avg	
	Phosphate _ max			PT _ min			Magnesium _ min	
	Phosphate _ avg			PTT _ max			Calcium _ max	
	Phosphate _ min			PTT _ avg			Calcium _ avg	
	INR(PT) _ max			PTT _ min			Calcium _ min	
	INR(PT) _ avg			Lipase _ max			Phosphate _ max	
	INR(PT) _ min			Lipase _ avg			Phosphate _ avg	
	PT _ max			Lipase _ min			Phosphate _ min	
	PT _ avg			Basophils _ max			INR(PT) _ max	
	PT _ min			Basophils _ avg			INR(PT) _ avg	
	PTT _ max			Basophils _ min			INR(PT) _ min	
	PTT _ avg			Eosinophils _ max			PT _ max	
	PTT _ min			Eosinophils _ avg			PT _ avg	
	Lipase _ max			Eosinophils _ min			PT _ min	
	Lipase _			Lymphocyt			PTT _ max	

	avg			es _ max				
	Lipase _ min			Lymphocytes _ avg			PTT _ avg	
	Basophils _ max			Lymphocytes _ min			PTT _ min	
	Basophils _ avg			Monocytes _ max			Lipase _ max	
	Basophils _ min			Monocytes _ avg			Lipase _ avg	
	Eosinophils _ max			Monocytes _ min			Lipase _ min	
	Eosinophils _ avg			Neutrophils _ max			Basophils _ max	
	Eosinophils _ min			Neutrophils _ avg			Basophils _ avg	
	Lymphocytes _ max			Neutrophils _ min			Basophils _ min	
	Lymphocytes _ avg			Albumin _ min			Eosinophils _ max	
	Lymphocytes _ min			LD _ max			Eosinophils _ avg	
	Monocytes _ max			LD _ avg			Eosinophils _ min	
	Monocytes _ avg			LD _ min			Lymphocytes _ max	
	Monocytes _ min			PH _ max			Lymphocytes _ avg	
	Neutrophils _ max			PH _ avg			Lymphocytes _ min	
	Neutrophils _ avg			PH _ min			Monocytes _ max	
	Neutrophils _ min			Specific gravity _ max			Monocytes _ avg	
	Albumin _ max			Specific gravity _ avg			Monocytes _ min	
	Albumin _ min			Specific gravity _ min			Neutrophils _ max	
	LD _ max			Lactate _ max			Neutrophils _ avg	
	LD _ avg			Lactate _			Neutrophil	

				avg			s _ min	
	LD _ min			Lactate _ min			Albumin _ max	
	PH _ max			Amylase _ max			Albumin _ avg	
	PH _ avg			Amylase _ avg			Albumin _ min	
	PH _ min			Amylase _ min			LD _ max	
	Specific gravity _ max			NLR _ avg			LD _ avg	
	Specific gravity _ avg			PLR _ avg			LD _ min	
	Specific gravity _ min			MLR _ avg			PH _ max	
	Lactate _ max			SII _ avg			PH _ avg	
	Lactate _ avg			SIRI _ avg			PH _ min	
	Lactate _ min			Weight			Specific gravity _ max	
	Amylase _ max			BMI			Specific gravity _ avg	
	Amylase _ avg			APSIII score			Specific gravity _ min	
	Amylase _ min			GCS score			Lactate _ max	
	NLR _ avg			LODS score			Lactate _ avg	
	PLR _ avg			MELD score			Lactate _ min	
	MLR _ avg			OASIS score			Amylase _ max	
	SII _ avg			SIRS score			Amylase _ avg	
	SIRI _ avg			SOFA score			Amylase _ min	

				Duration of auxiliary ventilation			NLR _ avg	
				Duration of vasopresso r drug use			PLR _ avg	
				Urine volume on the first day of ICU admission			MLR _ avg	
				Duration of arterial catheterizat ion			SII _ avg	
				Duration of intravenous catheterizat ion			SIRI _ avg	
				Heart rate on the first day of ICU _ max			GNRI _ avg	
				Heart rate on the first day of ICU _ min			Weight	
				SysBP on the first day of ICU _ max			Height	
				SysBP on the first day of ICU _ avg			BMI	
				SysBP on the first day of ICU _ min			APSIII score	
				DiasBP on the first day of ICU _ max			GCS score	
				0Mean			LODS	

				arterial pressure on the first day of ICU admission _ max			score	
				Mean arterial pressure on the first day of ICU admission _ avg			MELD score	
				Mean arterial pressure on the first day of ICU admission _ min			OASIS score	
				Respiratory rate on the first day of ICU _ max			SIRS score	
				Respiratory rate on the first day of ICU _ avg			SOFA score	
				Respiratory rate on the first day of ICU _ min			Duration of auxiliary ventilation	
				Temperature on the first day of ICU admission _ max			Duration of vasopressor drug use	
				Temperature on the first day of ICU admission _ avg			Urine volume on the first day of ICU admission	

				Temperature on the first day of ICU admission _ min			Duration of arterial catheterization	
				SpO2 on the first day of ICU _ max			Duration of intravenous catheterization	
				SpO2 on the first day of ICU _ avg			Heart rate on the first day of ICU _ max	
				SpO2 on the first day of ICU _ min			Heart rate on the first day of ICU _ avg	
				Glucose on the first day of ICU admission _ max			Heart rate on the first day of ICU _ min	
				Glucose on the first day of ICU admission _ avg			SysBP on the first day of ICU _ max	
				Glucose on the first day of ICU admission _ min			SysBP on the first day of ICU _ avg	
							SysBP on the first day of ICU _ min	
							DiasBP on the first day of ICU _ max	
							DiasBP on the first day of ICU _	

							avg	
							DiasBP on the first day of ICU _ min	
							Mean arterial pressure on the first day of ICU admission _ max	
							Mean arterial pressure on the first day of ICU admission _ avg	
							Mean arterial pressure on the first day of ICU admission _ min	
							Respiratory rate on the first day of ICU _ max	
							Respiratory rate on the first day of ICU _ avg	
							Respiratory rate on the first day of ICU _ min	
							Temperature on the first day of ICU admission _ max	

							Temperature on the first day of ICU admission _ avg	
							Temperature on the first day of ICU admission _ min	
							SpO2 on the first day of ICU _ max	
							SpO2 on the first day of ICU _ avg	
							SpO2 on the first day of ICU _ min	
							Glucose on the first day of ICU admission _ max	
							Glucose on the first day of ICU admission _ avg	
							Glucose on the first day of ICU admission _ min	

* SD, standard deviation; IQR, inter-quartile range; ICU, intensive care unit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean corpuscular volume; PLT, platelet count; RDW, red blood cell distribution width; RBC, red blood cells; WBC, white blood cells; TBil, total bilirubin; ALT, alanine aminotransferase; ALP, alkaline phosphatase; AST, aspartate aminotransferase; INR(PT), international normalized ratio of

prothrombin time; PT, prothrombin time; PTT, partial thromboplastin time; LD, lactate dehydrogenase; NLR, neutrophil-lymphocyte ratio; PLR, platelet-lymphocyte ratio; MLR, monocyte-lymphocyte ratio; SII, platelet*neutrophil/lymphocyte; SIRI, neutrocyte*monocyte/lymphocyte; GNRI, geriatric nutritional risk index; BMI, body mass index; APSIII, acute physiology score iii; GCS, glasgow coma scale; LODS, logistic organ dysfunction system; MELD, model for end-stage liver disease; OASIS, oxford acute severity of illness score; SIRS, systemic inflammatory response syndrome; SOFA, sepsis-related organ failure; AKI, acute kidney injury; SysBP, systolic blood pressure; DiasBP, diastolic blood pressure.

Supplementary Table S12. Influencing factors of different outcomes corresponding to various patient categories (P < 0.1).

All the patients. (n=1156)			Patients admitted to the ICU. (n=652)			Patients underwent operations during ICU treatment. (n=614)		
Re-admission within 1 month after discharge	In-hospital mortality	Mortality within 180 days after discharge	Re-admission within 1 month after discharge	In-hospital mortality	Mortality within 180 days after discharge	Re-admission within 1 month after discharge	In-hospital mortality	Mortality within 180 days after discharge
Age	Length of stay in hospital	Age	Duration of intravenous antibiotic use	Length of stay in ICU	Age	Duration of intravenous antibiotic use	Length of stay in ICU	Age
Length of stay in ICU	Length of stay in ICU	Length of stay in ICU	Anion gap _ max	Severity of cholangitis	Length of stay in hospital	Anion gap _ max	Severity of cholangitis	Length of stay in hospital
Interventional operations	Severity of cholangitis	Severity of cholangitis	Anion gap _ avg	Endoscopy	Length of stay in ICU	Anion gap _ avg	Duration of intravenous antibiotic use	Length of stay in ICU
Duration of intravenous antibiotic use	Surgical or interventional or endoscopic operations	Surgical or interventional or endoscopic operations	Anion gap _ min	Surgical or interventional or endoscopic operations	Severity of cholangitis	Anion gap _ min	Bile culture results	Severity of cholangitis
Acute pancreatitis	Duration of intravenous antibiotic use	Interventional operations	Chloride _ max	Duration of intravenous antibiotic use	Endoscopy	Chloride _ max	Acute pancreatitis	Duration of intravenous antibiotic use
Anion gap _ max	Blood culture results	Surgical or interventional or endoscopic operations	Chloride _ avg	Acute pancreatitis	Surgical or interventional or endoscopic operations	Chloride _ avg	Anion gap _ max	Anion gap _ max
Chloride _ max	Bile culture results	Endoscopy combined with interventional operations	Creatinine _ max	Anion gap _ max	Duration of intravenous antibiotic use	Glucose _ avg	Anion gap _ avg	Anion gap _ avg
Chloride _ avg	Acute pancreatitis	Duration of intravenous antibiotic use	Glucose _ avg	Anion gap _ avg	Anion gap _ max	Sodium _ max	Anion gap _ min	Bicarbonate _ max
Creatinine _ max	Anion gap _ max	Blood culture results	Glucose _ min	Anion gap _ min	Anion gap _ avg	Sodium _ avg	Bicarbonate _ max	Bicarbonate _ avg
Creatinine _ avg	Anion gap _ avg	Anion gap _ max	Sodium _ max	Bicarbonate _ max	Bicarbonate _ max	Sodium _ min	Bicarbonate _ avg	Bicarbonate _ min
Creatinine _ min	Anion gap _ min	Anion gap _ avg	Sodium _ avg	Bicarbonate _ avg	Bicarbonate _ avg	Hemoglobin _ max	Bicarbonate _ min	Chloride _ max
Sodium _ max	Bicarbonate _ max	Anion gap _ min	Hemoglobin _ max	Bicarbonate _ min	Bicarbonate _ min	MCHC _ max	Chloride _ max	Creatinine _ max

Sodium _ avg	Bicarbonate _ avg	Bicarbonate _ max	Hemoglobin _ avg	Chloride _ max	Chloride _ max	MCHC _ avg	Creatinine _ max	Creatinine _ avg
Sodium _ min	Bicarbonate _ min	Bicarbonate _ avg	MCHC _ max	Creatinine _ max	Creatinine _ max	MCHC _ min	Creatinine _ avg	Creatinine _ min
Urea nitrogen _ max	Chloride _ max	Bicarbonate _ min	MCHC _ avg	Creatinine _ avg	Creatinine _ avg	RDW _ min	Creatinine _ min	Glucose _ max
Urea nitrogen _ avg	Chloride _ avg	Chloride _ max	MCHC _ min	Creatinine _ min	Creatinine _ min	RBC _ max	Glucose _ max	Glucose _ avg
MCHC _ max	Creatinine _ max	Chloride _ avg	RBC _ max	Glucose _ max	Glucose _ max	ALT _max	Glucose _ avg	Glucose _ min
MCHC _ avg	Creatinine _ avg	Creatinine _ max	ALT _max	Glucose _ avg	Glucose _ avg	ALT _avg	Glucose _ min	Potassium _ max
RDW _ max	Creatinine _ min	Creatinine _ avg	ALT _avg	Glucose _ min	Glucose _ min	ALP _ max	Potassium _ max	Potassium _ avg
RDW _ avg	Glucose _ max	Creatinine _ min	ALP _ max	Potassium _ max	Potassium _ max	ALP _ avg	Potassium _ avg	Sodium _ avg
RDW _ min	Glucose _ avg	Glucose _ max	ALP _ avg	Potassium _ avg	Potassium _ avg	ALP _ min	Potassium _ min	Sodium _ min
RBC _ max	Glucose _ min	Glucose _ avg	ALP _ min	Potassium _ min	Sodium _ max	AST _avg	Sodium _ avg	Urea nitrogen _ max
WBC _ max	Potassium _ max	Glucose _ min	INR(PT) _ max	Sodium _ avg	Sodium _ min	INR(PT) _ max	Sodium _ min	Urea nitrogen _ avg
WBC _ avg	Potassium _ avg	Potassium _ max	INR(PT) _ avg	Sodium _ min	Urea nitrogen _ max	INR(PT) _ avg	Urea nitrogen _ max	Urea nitrogen _ min
ALT _max	Sodium _ avg	Potassium _ avg	INR(PT) _ min	Urea nitrogen _ max	Urea nitrogen _ avg	INR(PT) _ min	Urea nitrogen _ avg	Hematocrit _ avg
ALT _avg	Sodium _ min	Potassium _ min	PT _ max	Urea nitrogen _ avg	Urea nitrogen _ min	PT _ max	Urea nitrogen _ min	Hematocrit _ min
ALT _ min	Urea nitrogen _ max	Sodium _ max	PT _ avg	Urea nitrogen _ min	Hematocrit _ avg	PT _ avg	Hematocrit _ avg	Hemoglobin _ max
AST _max	Urea nitrogen _ avg	Sodium _ avg	PTT _ avg	Hematocrit _ avg	Hematocrit _ min	PTT _ max	Hematocrit _ min	Hemoglobin _ avg
AST _avg	Urea nitrogen _ min	Sodium _ min	Lipase _ max	Hematocrit _ min	Hemoglobin _ max	PTT _ avg	Hemoglobin _ avg	Hemoglobin _ min
Phosphate _ min	Hematocrit _ avg	Urea nitrogen _ max	Lipase _ avg	Hemoglobin _ avg	Hemoglobin _ avg	PTT _ min	Hemoglobin _ min	MCHC _ max
INR(PT) _ avg	Hematocrit _ min	Urea nitrogen _ avg	Basophils _ avg	Hemoglobin _ min	Hemoglobin _ min	Lipase _ max	MCH _ max	MCHC _ avg
INR(PT) _ min	Hemoglobin _ avg	Urea nitrogen _ min	Basophils _ min	MCH _ max	MCHC _ max	Lipase _ avg	MCH _ avg	MCHC _ min
PT _ max	Hemoglobin _ min	Hematocrit _ max	Eosinophils _ avg	MCH _ avg	MCHC _ avg	Basophils _ max	MCH _ min	MCV _ max

PT _ avg	MCH _ max	Hematocrit _ avg	Eosinophils _ min	MCH _ min	MCHC _ min	Basophils _ avg	MCHC _ avg	RDW _ max
PTT _ avg	MCH _ avg	Hematocrit _ min	Lymphocytes _ min	MCHC _ avg	MCV _ max	Basophils _ min	MCHC _ min	RDW _ avg
PTT _ min	MCH _ min	Hemoglobin _ max	PH _ avg	MCHC _ min	PLT _ min	Eosinophils _ avg	MCV _ max	RDW _ min
Lipase _ max	MCHC _ avg	Hemoglobin _ avg	PH _ min	MCV _ max	RDW _ max	Eosinophils _ min	MCV _ avg	RBC _ avg
Lipase _ min	MCHC _ min	Hemoglobin _ min	GCS score	MCV _ avg	RDW _ avg	Lymphocytes _ avg	MCV _ min	RBC _ min
Basophils _ min	MCV _ max	MCH _ min	Sepsis	MCV _ min	RDW _ min	Lymphocytes _ min	PLT _ max	WBC _ max
Eosinophils _ avg	MCV _ avg	MCHC _ max	Duration of auxiliary ventilation	PLT _ max	RBC _ avg	PH _ avg	PLT _ avg	WBC _ avg
Eosinophils _ min	MCV _ min	MCHC _ avg	Duration of vasopressor drug use	PLT _ avg	RBC _ min	PH _ min	PLT _ min	WBC _ min
Lymphocytes _ avg	PLT _ max	MCHC _ min	Duration of arterial catheterization	PLT _ min	WBC _ max	NLR _ avg	RDW _ max	TBil _ max
Lymphocytes _ min	PLT _ avg	MCV _ max	Heart rate on the first day of ICU _ min	RDW _ max	WBC _ avg	GCS score	RDW _ avg	TBil _ avg
Monocytes _ max	PLT _ min	MCV _ avg	SysBP on the first day of ICU _ max	RDW _ avg	WBC _ min	Sepsis	RDW _ min	TBil _ min
Monocytes _ avg	RDW _ max	PLT _ min	DiasBP on the first day of ICU _ min	RDW _ min	TBil _ max	Duration of auxiliary ventilation	RBC _ avg	ALT _max
Monocytes _ min	RDW _ avg	RDW _ max	Respiratory rate on the first day of ICU _ min	RBC _ avg	TBil _ avg	Duration of arterial catheterization	RBC _ min	ALT _avg
Neutrophils _ max	RDW _ min	RDW _ avg	Temperature on the first day of ICU admission _ min	RBC _ min	TBil _ min	Respiratory rate on the first day of ICU _ min	WBC _ max	ALT _ min
PH _ avg	RBC _ avg	RDW _ min		WBC _ max	ALT _max	Temperature on the first day of ICU admission _ min	WBC _ avg	ALP _ max

PH _ min	RBC _ min	RBC _ max		WBC _ avg	ALT _avg		WBC _ min	ALP _ avg
NLR _ avg	WBC _ max	RBC _ avg		WBC _ min	ALT _ min		TBil _ max	ALP _ min
	WBC _ avg	RBC _ min		TBil _ max	ALP _ max		TBil _ avg	Magnesium _ max
	WBC _ min	WBC _ max		TBil _ avg	ALP _ avg		TBil _ min	Magnesium _ avg
	TBil _ max	WBC _ avg		TBil _ min	Magnesium _ max		ALT _ min	Magnesium _ min
	TBil _ avg	WBC _ min		ALT _ min	Magnesium _ avg		AST _max	Calcium _ avg
	TBil _ min	TBil _ max		ALP _ min	Magnesium _ min		AST _avg	Calcium _ min
	ALT _ min	TBil _ avg		AST _max	Calcium _ avg		AST _min	Phosphate _ max
	ALP _ min	TBil _ min		AST _avg	Calcium _ min		Magnesium _ max	Phosphate _ avg
	AST _max	ALT _max		AST _min	Phosphate _ max		Magnesium _ avg	Phosphate _ min
	AST _avg	ALT _avg		Magnesium _ max	Phosphate _ avg		Calcium _ min	INR(PT) _ max
	AST _min	ALT _ min		Magnesium _ avg	Phosphate _ min		Phosphate _ max	INR(PT) _ avg
	Magnesium _ max	ALP _ max		Calcium _ avg	INR(PT) _ max		Phosphate _ avg	PT _ max
	Magnesium _ avg	ALP _ avg		Calcium _ min	INR(PT) _ avg		Phosphate _ min	PT _ avg
	Calcium _ avg	AST _min		Phosphate _ max	INR(PT) _ min		INR(PT) _ max	PTT _ max
	Calcium _ min	Magnesium _ max		Phosphate _ avg	PT _ max		INR(PT) _ avg	PTT _ avg
	Phosphate _ max	Magnesium _ avg		Phosphate _ min	PT _ avg		PT _ max	PTT _ min
	Phosphate _ avg	Calcium _ avg		INR(PT) _ max	PT _ min		PT _ avg	Basophils _ min
	INR(PT) _ max	Calcium _ min		INR(PT) _ avg	PTT _ max		PT _ min	Eosinophils _ min
	INR(PT) _ avg	Phosphate _ max		INR(PT) _ min	PTT _ avg		PTT _ max	Lymphocytes _ min
	INR(PT) _ min	Phosphate _ avg		PT _ max	PTT _ min		PTT _ avg	Monocytes _ max
	PT _ max	INR(PT) _ max		PT _ avg	Basophils _ min		PTT _ min	Neutrophils _ max
	PT _ avg	INR(PT) _ avg		PT _ min	Eosinophils _ min		Lipase _ avg	Albumin _ max

	PT _ min	INR(PT) _ min		PTT _ max	Lymphocytes _ min		Basophils _ avg	Albumin _ avg
	PTT _ max	PT _ max		PTT _ avg	Monocytes _ max		Basophils _ min	Albumin _ min
	PTT _ avg	PT _ avg		PTT _ min	Neutrophils _ max		Eosinophils _ min	LD _ max
	PTT _ min	PT _ min		Lipase _ avg	Albumin _ max		Lymphocytes _ avg	LD _ avg
	Lipase _ avg	PTT _ max		Basophils _ min	Albumin _ avg		Lymphocytes _ min	LD _ min
	Basophils _ avg	PTT _ avg		Eosinophils _ min	Albumin _ min		Monocytes _ max	PH _ avg
	Basophils _ min	Basophils _ avg		Lymphocytes _ min	LD _ max		Monocytes _ min	PH _ min
	Eosinophils _ avg	Basophils _ min		Monocytes _ max	LD _ avg		Neutrophils _ max	Lactate _ max
	Eosinophils _ min	Eosinophils _ avg		Monocytes _ min	PH _ avg		Albumin _ max	Lactate _ avg
	Lymphocytes _ avg	Eosinophils _ min		Neutrophils _ max	PH _ min		Albumin _ avg	Amylase _ avg
	Lymphocytes _ min	Lymphocytes _ max		Albumin _ max	Lactate _ max		Albumin _ min	Amylase _ min
	Monocytes _ max	Lymphocytes _ avg		Albumin _ avg	Lactate _ avg		LD _ max	MLR _ avg
	Monocytes _ min	Lymphocytes _ min		Albumin _ min	Amylase _ avg		LD _ avg	SIRI _ avg
	Neutrophils _ max	Monocytes _ max		LD _ max	Amylase _ min		LD _ min	GNRI _ avg
	Neutrophils _ avg	Monocytes _ min		LD _ avg	MLR _ avg		PH _ min	Weight
	Albumin _ max	Neutrophils _ max		LD _ min	SIRI _ avg		Lactate _ max	BMI
	Albumin _ avg	Neutrophils _ avg		PH _ min	GNRI _ avg		Lactate _ avg	APSIII score
	Albumin _ min	Albumin _ max		Specific gravity _ min	Weight		Amylase _ max	GCS score
	LD _ max	Albumin _ avg		Lactate _ max	BMI		Amylase _ avg	LODS score
	LD _ avg	Albumin _ min		Lactate _ avg	APSIII score		Amylase _ min	MELD score
	LD _ min	LD _ max		Lactate _ min	GCS score		NLR _ avg	OASIS score
	PH _ avg	LD _ avg		Amylase _ max	LODS score		MLR _ avg	SIRS score

	PH _ min	PH _ avg		Amylase _ avg	MELD score		SIRI _ avg	SOFA score
	Specific gravity _ min	PH _ min		Amylase _ min	OASIS score		GNRI _ avg	Sepsis
	Lactate _ max	Specific gravity _ min		NLR _ avg	SIRS score		BMI	AKI stage
	Lactate _ avg	Lactate _ max		MLR _ avg	SOFA score		APSIII score	Renal replacement therapy
	Amylase _ max	Lactate _ avg		SIRI _ avg	AKI stage		LODS score	Duration of auxiliary ventilation
	Amylase _ avg	Amylase _ avg		GNRI _ avg	Renal replacement therapy		MELD score	Duration of vasopressor drug use
	Amylase _ min	Amylase _ min		APSIII score	Duration of auxiliary ventilation		OASIS score	Urine volume on the first day of ICU admission
	NLR _ avg	NLR _ avg		LODS score	Duration of vasopressor drug use		SIRS score	Duration of arterial catheterization
	MLR _ avg	PLR _ avg		MELD score	Urine volume on the first day of ICU admission		SOFA score	Duration of intravenous catheterization
	SIRI _ avg	MLR _ avg		OASIS score	Duration of arterial catheterization		Sepsis	Heart rate on the first day of ICU _ max
		SII _ avg		SIRS score	Duration of intravenous catheterization		AKI stage	Heart rate on the first day of ICU _ avg
		SIRI _ avg		SOFA score	Heart rate on the first day of ICU _ max		Renal replacement therapy	Heart rate on the first day of ICU _ min
				Sepsis	Heart rate on the first day of ICU _ avg		Duration of auxiliary ventilation	SysBP on the first day of ICU _ min
				AKI stage	Heart rate on the first day of ICU _ min		Duration of vasopressor drug use	DiasBP on the first day of ICU _ avg
				Renal replacement therapy	SysBP on the first day of ICU _ avg		Urine volume on the first day of ICU admission	DiasBP on the first day of ICU _ min

				Duration of auxiliary ventilation	SysBP on the first day of ICU _ min		Duration of arterial catheterization	Mean arterial pressure on the first day of ICU admission _ min
				Duration of vasopressor drug use	DiasBP on the first day of ICU _ avg		Duration of intravenous catheterization	Respiratory rate on the first day of ICU _ max
				Urine volume on the first day of ICU admission	DiasBP on the first day of ICU _ min		Heart rate on the first day of ICU _ max	Respiratory rate on the first day of ICU _ avg
				Duration of arterial catheterization	Mean arterial pressure on the first day of ICU admission _ avg		Heart rate on the first day of ICU _ avg	SpO2 on the first day of ICU _ max
				Duration of intravenous catheterization	Mean arterial pressure on the first day of ICU admission _ min (mmHg)		SysBP on the first day of ICU _ avg	SpO2 on the first day of ICU _ min
				Heart rate on the first day of ICU _ max	Respiratory rate on the first day of ICU _ max		SysBP on the first day of ICU _ min	Glucose on the first day of ICU admission _ max
				Heart rate on the first day of ICU _ avg	Respiratory rate on the first day of ICU _ avg		DiasBP on the first day of ICU _ max	
				Heart rate on the first day of ICU _ min	Temperature on the first day of ICU admission _ max		DiasBP on the first day of ICU _ avg	
				SysBP on the first day of ICU _ max	Temperature on the first day of ICU admission _ avg		DiasBP on the first day of ICU _ min	

				SysBP on the first day of ICU _ avg	Temperature on the first day of ICU admission _ min		Mean arterial pressure on the first day of ICU admission _ avg	
				SysBP on the first day of ICU _ min	SpO2 on the first day of ICU _ max		Mean arterial pressure on the first day of ICU admission _ min	
				DiasBP on the first day of ICU _ max	SpO2 on the first day of ICU _ min		Respiratory rate on the first day of ICU _ max	
				DiasBP on the first day of ICU _ avg	Glucose on the first day of ICU admission _ max		Respiratory rate on the first day of ICU _ avg	
				DiasBP on the first day of ICU _ min			Respiratory rate on the first day of ICU _ min	
				Mean arterial pressure on the first day of ICU admission _ avg			SpO2 on the first day of ICU _ avg	
				Mean arterial pressure on the first day of ICU admission _ min (mmHg)			SpO2 on the first day of ICU _ min	
				Respiratory rate on the first day of ICU _ max			Glucose on the first day of ICU admission _ max	

				Respiratory rate on the first day of ICU _ avg				
				SpO2 on the first day of ICU _ avg				
				SpO2 on the first day of ICU _ min				
				Glucose on the first day of ICU admission _ max				

* ICU, intensive care unit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean corpuscular volume; PLT, platelet count; RDW, red blood cell distribution width; RBC, red blood cells; WBC, white blood cells; TBil, total bilirubin; ALT, alanine aminotransferase; ALP, alkaline phosphatase; AST, aspartate aminotransferase; INR(PT), international normalized ratio of prothrombin time; PT, prothrombin time; PTT, partial thromboplastin time; LD, lactate dehydrogenase; NLR, neutrophil-lymphocyte ratio; PLR, platelet-lymphocyte ratio; MLR, monocyte-lymphocyte ratio; SII, platelet*neutrophil/lymphocyte; SIRI, neutrocyte*monocyte/lymphocyte; GNRI, geriatric nutritional risk index; BMI, body mass index; APSIII, acute physiology score iii; GCS, glasgow coma scale; LODS, logistic organ dysfunction system; MELD, model for end-stage liver disease; OASIS, oxford acute severity of illness score; SIRS, systemic inflammatory response syndrome; SOFA, sepsis-related organ failure; AKI, acute kidney injury; SysBP, systolic blood pressure; DiasBP, diastolic blood pressure.

Supplementary Table S13. Summary of variables that were finally incorporated into each model after feature selection.

Patient categories	Outcomes	Variables ultimately incorporated into the models
All patients	In-hospital mortality	TBil_min WBC_avg TBil_avg WBC_min LD_avg RDW_max Phosphate_max RDW_avg PTT_max PTT_avg Length of stay in ICU Urea nitrogen_avg Urea nitrogen_min
	Re-admission within 30 days after discharge	Duration of intravenous antibiotic use Age Length of stay in ICU RBC_max MCHC_avg Basophils_min WBC_avg RDW_avg Chloride_avg ALT_avg Chloride_max Sodium_avg PTT_avg PTT_min Monocytes_max
	Mortality within 180 days after discharge	RDW_avg RDW_max Urea nitrogen_min Albumin_min Creatinine_max Urea nitrogen_max Urea nitrogen_avg PTT_max RDW_min WBC_avg Length of stay in ICU WBC_min Phosphate_max

		Albumin_avg Chloride_avg
Patients admitted to the ICU	In-hospital mortality	APSIII score SpO2 on the first day of ICU_min TBil_min Bicarbonate_max Lactate_avg Lactate_max RDW_max Duration of vasopressor drug use Bicarbonate_min LODS score SOFA score PTT_avg WBC_min Phosphate_max Anion gap_avg WBC_avg
	Re-admission within 30 days after discharge	Duration of auxiliary ventilation Duration of intravenous antibiotic use Temperature on the first day of ICU admission_min ALP_min ALP_avg Basophils_avg Glucose_avg PH_avg MCHC_avg ALT_max Heart rate on the first day of ICU_min Chloride_max MCHC_max
	Mortality within 180 days after discharge	APSIII score RDW_avg RDW_max RDW_min Albumin_min SpO2 on the first day of ICU_min Bicarbonate_min Urea nitrogen_min LODS score OASIS score Lactate_max MCHC_avg Anion gap_avg

		AKI stage TBil_min
Patients underwent biliary drainage during ICU treatment	In-hospital mortality	Bicarbonate_avg SpO2 on the first day of ICU_min APSIII score Lactate_max SOFA score Duration of vasopressor drug use Bicarbonate_max TBil_min Bicarbonate_min LODS score WBC_min Urea nitrogen_max Phosphate_max Anion gap_max Urea nitrogen_min
	Re-admission within 30 days after discharge	Duration of auxiliary ventilation Duration of intravenous antibiotic use ALP_avg MCHC_avg Temperature on the first day of ICU admission_min Lipase_avg ALP_min Glucose_avg PH_min Lipase_max PTT_max Chloride_avg ALP_max RDW_min
	Mortality within 180 days after discharge	RDW_max APSIII score RDW_avg LODS score AKI stage RDW_min OASIS score Urea nitrogen_min PTT_max Albumin_min Bicarbonate_avg WBC_min Urea nitrogen_max

		Urea nitrogen_avg Anion gap_avg GCS score

* ICU, intensive care unit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; RDW, red blood cell distribution width; WBC, white blood cells; TBil, total bilirubin; ALT, alanine aminotransferase; ALP, alkaline phosphatase; PTT, partial thromboplastin time; LD, lactate dehydrogenase; APSIII, acute physiology score iii; GCS, glasgow coma scale; LODS, logistic organ dysfunction system; OASIS, oxford acute severity of illness score; SOFA, sepsis-related organ failure; AKI, acute kidney injury.

Supplementary Table S14. Performance of machine learning algorithms (Predicting in-hospital mortality for all the patients included).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.840	0.049	0.831	0.82	0.777	0.177	0.984	0.291	0.226
XGBoost	0.967	0.284	0.968	0.964	0.899	0.665	0.983	0.783	0.623
LightGBM	0.776	0.052	0.936	0.598	0.939	nan	0.978	nan	0.284
AdaBoost	0.926	0.487	0.97	0.884	0.904	0.701	0.981	0.777	0.622
DecisionTree	0.832	0.826	0.948	0.689	0.973	nan	0.961	nan	0.08
GBDT	0.833	0.841	0.965	0.782	0.949	0.598	0.97	0.669	0.417
GNB	0.946	0.011	0.89	0.945	0.903	0.288	0.995	0.439	0.392
MLP	0.586	0.274	0.675	0.513	0.843	0.091	0.969	0.146	0.075
SVM	0.906	0.042	0.901	0.905	0.886	0.305	0.99	0.449	0.396

Supplementary Table S15. Performance of machine learning algorithms (Predicting re-admission within 1 month after discharge for all the patients included).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.630	0.233	0.608	0.586	0.615	0.319	0.839	0.398	0.153
XGBoost	0.886	0.285	0.813	0.808	0.816	0.569	0.934	0.666	0.541
LightGBM	0.653	0.240	0.766	0.458	0.792	nan	0.816	nan	0.18
AdaBoost	0.731	0.434	0.622	0.783	0.576	0.351	0.9	0.484	0.248
DecisionTree	0.576	0.31	0.773	0.473	0.679	nan	0.773	nan	0.0
GBDT	0.596	0.228	0.729	0.539	0.638	nan	0.79	nan	0.029
GNB	0.634	0.187	0.613	0.616	0.613	0.317	0.844	0.417	0.168
SVM	0.514	0.241	0.499	0.598	0.472	0.249	0.806	0.339	0.044
MLP	0.526	0.261	0.539	0.53	0.542	0.276	0.793	0.315	0.056

Supplementary Table S16. Performance of machine learning algorithms (Predicting mortality within 180 days after discharge for all the patients included).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.827	0.169	0.802	0.681	0.823	0.406	0.939	0.502	0.39
XGBoost	0.988	0.299	0.962	0.953	0.965	0.834	0.99	0.887	0.861
LightGBM	0.805	0.158	0.843	0.687	0.861	nan	0.923	nan	0.296
AdaBoost	0.908	0.442	0.804	0.855	0.797	0.418	0.969	0.559	0.451
DecisionTree	0.923	0.337	0.805	0.949	0.78	nan	0.948	nan	0.348
GBDT	0.858	0.335	0.896	0.737	0.958	nan	0.91	nan	0.338
GNB	0.829	0.001	0.72	0.792	0.709	0.313	0.952	0.448	0.304
MLP	0.559	0.292	0.786	0.365	0.858	0.303	0.891	0.3	0.184
SVM	0.680	0.432	0.697	0.617	0.711	0.262	0.921	0.356	0.2

Supplementary Table S17. Performance of machine learning algorithms (Predicting in-hospital mortality for patients admitted to the ICU).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.934	0.072	0.883	0.96	0.902	0.404	0.987	0.563	0.488
XGBoost	0.963	0.328	0.956	0.96	0.947	0.786	0.979	0.84	0.698
LightGBM	0.741	0.283	0.905	0.6	0.933	nan	0.96	nan	0.344
AdaBoost	0.948	0.492	0.954	0.92	0.94	0.714	0.975	0.776	0.671
DecisionTree	0.873	0.827	0.906	0.8	0.932	nan	0.933	nan	0.062
GBDT	0.962	0.649	0.934	0.96	0.927	nan	0.965	nan	0.501
GNB	0.961	0.021	0.9	0.96	0.939	0.462	0.99	0.61	0.545
MLP	0.897	0.321	0.882	0.86	0.94	0.408	0.982	0.54	0.47
SVM	0.955	0.051	0.893	0.98	0.907	0.425	0.991	0.588	0.519

Supplementary Table S18. Performance of machine learning algorithms (Predicting re-admission within 1 month after discharge for patients admitted to the ICU).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.651	0.19	0.67	0.554	0.698	0.286	0.876	0.374	0.18
XGBoost	0.933	0.263	0.86	0.879	0.857	0.588	0.968	0.7	0.613
LightGBM	0.792	0.186	0.765	0.801	0.676	nan	0.915	nan	0.3
AdaBoost	0.830	0.445	0.761	0.736	0.769	0.414	0.928	0.526	0.381
DecisionTree	0.676	0.238	0.779	0.79	0.524	nan	0.85	nan	0.082
GBDT	0.757	0.189	0.801	0.706	0.742	nan	0.894	nan	0.285
GNB	0.650	0.198	0.615	0.623	0.616	0.26	0.88	0.366	0.15
MLP	0.540	0.334	0.565	0.55	0.57	0.231	0.858	0.303	0.081
SVM	0.596	0.301	0.651	0.499	0.686	0.285	0.866	0.329	0.137

Supplementary Table S19. Performance of machine learning algorithms (Predicting mortality within 180 days after discharge for patients admitted to the ICU).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.837	0.233	0.812	0.708	0.842	0.539	0.914	0.611	0.487
XGBoost	0.988	0.353	0.959	0.97	0.958	0.874	0.989	0.917	0.887
LightGBM	0.771	0.347	0.833	0.663	0.857	0.63	0.876	0.644	0.452
AdaBoost	0.919	0.458	0.824	0.857	0.817	0.561	0.953	0.674	0.559
DecisionTree	0.978	0.417	0.941	0.976	0.923	0.859	0.985	0.902	0.854
GBDT	0.977	0.35	0.943	0.97	0.932	0.832	0.984	0.891	0.845
GNB	0.829	0.003	0.735	0.779	0.726	0.427	0.924	0.551	0.383
MLP	0.701	0.366	0.754	0.582	0.801	0.426	0.885	0.455	0.313
SVM	0.694	0.637	0.749	0.574	0.797	0.433	0.881	0.463	0.31

Supplementary Table S20. Performance of machine learning algorithms (Predicting in-hospital mortality for patients underwent operations during ICU treatment).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.940	0.109	0.927	0.867	0.946	0.499	0.988	0.63	0.588
XGBoost	0.987	0.345	0.972	0.953	0.972	0.807	0.993(	0.858	0.824
LightGBM	0.828	0.083	0.915	0.704	0.929	nan	0.962	nan	0.297
AdaBoost	0.971	0.51	0.978	0.954	0.978	0.876	0.992	0.9	0.859
DecisionTree	0.891	0.967	0.93	0.787	0.994	nan	0.93	nan	0.0
GBDT	0.973	0.895	0.963	0.942	0.981	nan	0.963	nan	0.523
GNB	0.957	0.837	0.934	0.902	0.939	0.521	0.989	0.66	0.616
MLP	0.845	0.367	0.877	0.75	0.889	0.336	0.977	0.459	0.396
SVM	0.956	0.091	0.954	0.861	0.96	0.636	0.987	0.728	0.691

Supplementary Table S21. Performance of machine learning algorithms (Predicting re-admission within 1 month after discharge for patients underwent operations during ICU treatment).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.658	0.193	0.695	0.58	0.726	0.319	0.884	0.41	0.225
XGBoost	0.908	0.279	0.846	0.846	0.844	0.575	0.956	0.678	0.576
LightGBM	0.761	0.188	0.763	0.81	0.609	0.412	0.902	0.535	0.312
AdaBoost	0.828	0.428	0.768	0.745	0.776	0.424	0.929	0.539	0.397
DecisionTree	0.579	0.682	0.818	0.353	0.804	nan	0.818	nan	0.0
GBDT	0.664	0.487	0.785	0.517	0.766	nan	0.861	nan	0.144
GNB	0.621	0.179	0.607	0.541	0.68	0.266	0.875	0.349	0.143
MLP	0.620	0.266	0.67	0.563	0.678	0.288	0.871	0.372	0.166
SVM	0.555	0.187	0.758	0.308	0.88	0.353	0.849	0.318	0.18

Supplementary Table S22. Performance of machine learning algorithms (Predicting mortality within 180 days after discharge for patients underwent operations during ICU treatment).

Model	AUC	Cutoff	Accuracy	Sensitivity	Specificity	PPV	NPV	F1 score	Kappa
Logistic	0.829	0.117	0.767	0.759	0.77	0.323	0.957	0.447	0.33
XGBoost	0.982	0.23	0.939	0.943	0.94	0.701	0.99	0.799	0.76
LightGBM	0.812	0.129	0.818	0.765	0.791	nan	0.946	nan	0.309
AdaBoost	0.911	0.426	0.799	0.873	0.79	0.367	0.976	0.514	0.412
DecisionTree	0.765	0.215	0.846	0.811	0.66	nan	0.906	nan	0.135
GBDT	0.912	0.489	0.924	0.887	0.908	0.745	0.971	0.789	0.717
GNB	0.825	0.004	0.711	0.816	0.698	0.273	0.963	0.407	0.274
MLP	0.626	0.335	0.694	0.554	0.714	0.233	0.921	0.311	0.167
SVM	0.677	0.128	0.807	0.462	0.856	0.324	0.919	0.368	0.259

* Logistic, Logistic regression; XGBoost, eXtreme Gradient Boosting; LightBGM, Light Gradient Boosting Machine; AdaBoost, Adaptive Boosting; GBDT, Gradient Boosting Decision Tree; GNB, Gaussian Naive Bayes; MLP, Multi-Layer Perceptron; SVM, Support Vector Machine.

Supplementary Table S23. Variables of patients underwent biliary drainage during ICU treatment in Zhongda Hospital (n= 61).

Variables	n (%), mean ± SD (range), or Med [IQR]
In-hospital mortality, n (%)	5 (8.2%)
Re-admission within 1 month after discharge, n (%)	15 (24.2%)
Mortality within 180 days after discharge, n (%)	12 (19.7%)
AKI stage, n (%)	
0	42 (68.9%)
1	9 (14.8%)
2	4 (6.5%)
3	6 (9.8%)
Duration of auxiliary ventilation (hours)	18 [12.5-65.5]
Duration of intravenous catheterization (hours)	193 [141-364.5]
Duration of vasopressor drug use (hours)	29 [0-63]
APSIII score	17 [15-24.5]
LODS score	19.5±4.7 (10-36)
OASIS score	28.6±10.3 (8-50)
SOFA score	7 [5-11]
GCS score	9.5 [7-12]
SpO2 on the first day of ICU _ min (%)	93 [90.5-96]
Temperature on the first day of ICU admission _ min (˚C)	36.4 [36.1-37]
Albumin _ min (g/dL)	31.1 [27.1-33.1]
ALP _ max (IU/L)	234 [144.5-362.5]
ALP _ avg (IU/L)	204.5 [112.8-265]
ALP _ min (IU/L)	122 [72-185.5]
Anion gap _ max (mEq/L)	10.3 [8.2-13.5]
Anion gap _ avg (mEq/L)	8.5±2.5 (2.4-17.2)
Bicarbonate _ max (mEq/L)	25.4 [22.5-29.8]
Bicarbonate _ avg (mEq/L)	22.4±2.8 (15.5-29.3)
Bicarbonate _ min (mEq/L)	18.7±3.1 (11.9-25.7)
Chloride _ max (mEq/L)	110.5 [107.2-112.8]
Glucose _ avg (mg/dL)	9.1 [7.6-12.2]
Lactate _ max (mmol/L)	2.4 [1.5-4.1]
Lipase _ max (IU/L)	3873 [794.5-4056]
Lipase _ avg (IU/L)	2071 [452-2172]
MCHC _ avg (%)	329±9.7 (302-357)
PH _ min (units)	7.327 [7.275-7.376]
Phosphate _ max (mg/dL)	1.2 [1-1.5]
PTT _ max (seconds)	35.9 [31.7-41.7]
RDW _ max (%)	14.4 [13.5-15.3]
RDW _ avg (%)	13.9 [13.2-14.8]
RDW _ min (%)	13.2 [12.7-13.9]
TBil _ min (mg/dL)	32.7 [15.7-58.8]
Urea nitrogen _ max (mg/dL)	10.7 [7.6-14.3]

Urea nitrogen _ avg (mg/dL)	8.6 [6-10.4]
Urea nitrogen _ min (mg/dL)	5.2 [3.7-7.4]
WBC _ min (K/uL)	8.9 [6.6-12.5]

* ICU, intensive care unit; SD, standard deviation; IQR, inter-quartile range; AKI, acute kidney injury; APSIII, acute physiology score iii; LODS, logistic organ dysfunction system; OASIS, oxford acute severity of illness score; SOFA, sepsis-related organ failure; GCS, glasgow coma scale; ALP, alkaline phosphatase; MCHC, mean corpuscular hemoglobin concentration; PTT, partial thromboplastin time; RDW, red blood cell distribution width; TBil, total bilirubin; WBC, white blood cells.