**Supplementary Table 1.** Statistical result of each variable.

|  |  |  |
| --- | --- | --- |
| **Variables** | **Statistical result** | **P value** |
| **Demographic information** |  |  |
|  **Age** (year) | 55.94 ± 15.15 | <0.001 |
|  Gender (male) | 403.00 | 0.146 |
|  Smoking history | 110.00 | 0.852 |
|  Drinking history | 80.00 | 0.989 |
| **Previous medical history** |  |  |
| 　Diabetes | 68.00 | 0.188 |
| 　Hypertension | 232.00 | 0.123 |
| 　COPDa | 4.00 | 0.632 |
|  Chronic renal disease | 4.00 | 0.600 |
| Coronary heart disease | 25.00 | 0.725 |
|  Tumors | 16.00 | 0.475 |
| Atrial fibrillation | 16.00 | 0.835 |
| **Brain injury inducements** |  |  |
| **Vascular diseases** | 537.00 | <0.001 |
| **Brain tumor** | 129.00 | <0.001 |
| **Cerebral contusion and laceration** | 121.00 | 0.037 |
| Hydrocephalus | 53.00 | 0.101 |
| **Epilepsy** | 58.00 | 0.011 |
| **Infection sources** |  |  |
| **Pulmonary infection** | 455.00 | <0.001 |
| **Urinary infection** | 70.00 | <0.001 |
| **Intracranial infection** | 65.00 | <0.001 |
| **Vital signs** |  |  |
| Blood pressure(mmHg) |  |  |
|  Diastolic pressure |  |  |
| First | 71.23 ± 14.83 | 0.944 |
| Maximum | 75.37 ± 15.30 | 0.112 |
| Minimum | 68.03 ± 16.20 | 0.486 |
|  Systolic pressure |  |  |
| First | 130.00 ± 25.00 | 0.051 |
| **Maximum** | 139.50 ± 32.00 | <0.001 |
| **Minimum** | 115.00 ± 34.75 | <0.001 |
| Heart rate (Times/min) |  |  |
| First | 86.18 ± 22.90 | 0.087 |
| **Maximum** | 122.00 ± 35.00 | <0.001 |
| Minimum | 60.00 ± 16.00 | 0.693 |
| Respiratory rate (Times/min) |  |  |
| **First** | 17.00 ± 7.00 | 0.004 |
| **Maximum** | 28.00 ± 12.00 | <0.001 |
| **Minimum** | 11.00 ± 2.00 | <0.001 |
| Temperature (℃) |  |  |
| **First** | 36.80 ± 0.90 | 0.019 |
| **Maximum** | 38.40 ± 1.50 | <0.001 |
| **Minimum** | 36.20 ± 0.50 | <0.001 |
| Pulse (Times/min) |  |  |
| **First** | 84.00 ± 29.00 | 0.003 |
| **Maximum** | 120.00 ± 35.00 | <0.001 |
| **Minimum** | 60.00 ± 20.00 | 0.004 |
| **GCSb score** |  |  |
| **First time** | 8.00 ± 10.00 | <0.001 |
| **First time and daily course of disease** | 8.00 ± 10.00 | <0.001 |
| **Daily course of disease** | 7.00 ± 8.00 | <0.001 |
| **Hematoma properties** |  |  |
|  Subarachnoid | 316.00 | 0.551 |
|  Subdural  | 71.00 | 0.246 |
|  **Intracerebral**  | 292.00 | <0.001 |
|  Epidural  | 38.00 | 0.567 |
| **Laboratory test in ICU** |  |  |
|  Haemoglobin (g/L) |  |  |
| **First** | 121.00 ± 34.80 | 0.005 |
| Maximum | 126.99 ± 20.49 | 0.298 |
| **Minimum** | 89.00 ± 35.00 | <0.001 |
|  Platelets (10^9/L) |  |  |
| **First** | 185.03 ± 69.41 | 0.020 |
| **Maximum** | 346.05 ± 149.28 | <0.001 |
| **Minimum** | 140.44 ± 61.67 | <0.001 |
|  White blood cells (10^9/L) |  |  |
| **First** | 12.14 ± 5.25 | 0.043 |
| **Maximum** | 16.86 ± 6.43 | <0.001 |
| **Minimum** | 6.31 ± 3.80 | <0.001 |
| Red blood cells (10^12/L) |  |  |
| **First** | 4.01 ± 1.06 | 0.009 |
| Maximum | 4.19 ± 0.69 | 0.419 |
| **Minimum** | 2.99 ± 0.78 | <0.001 |
|  Prothrombin time (s) |  |  |
| First | 13.40 ± 2.10 | 0.763 |
| **Maximum** | 14.75 ± 2.60 | <0.001 |
| **Minimum** | 12.80 ± 1.50 | <0.001 |
|  Sodium (mmol/L) |  |  |
| First | 141.60 ± 5.50 | 0.908 |
| **Maximum** | 148.10 ± 11.70 | <0.001 |
| **Minimum** | 135.10 ± 6.20 | <0.001 |
| Potassium (mmol/L) |  |  |
| First | 3.88 ± 0.45 | 0.498 |
| **Maximum** | 4.57 ± 0.58 | <0.001 |
| **Minimum** | 3.40 ± 0.46 | <0.001 |
| Calcium (mmol/L) |  |  |
| **First** | 2.16 ± 0.19 | <0.001 |
| Maximum | 2.34 ± 0.18 | 0.657 |
| **Minimum** | 1.95 ± 0.18 | <0.001 |
|  ALTc (U/L) |  |  |
| **First** | 19.00 ± 15.80 | 0.013 |
| **Maximum** | 69.40 ± 120.10 | <0.001 |
| Minimum | 14.00 ± 9.00 | 0.335 |
|  ASTd (U/L) |  |  |
| **First** | 24.00 ± 19.00 | 0.006 |
| **Maximum** | 66.00 ± 109.90 | <0.001 |
| Minimum | 17.00 ± 10.00 | 0.700 |
| GGTe (U/L) |  |  |
| First | 23.00 ± 24.00 | 0.537 |
| **Maximum** | 97.60 ± 176.00 | <0.001 |
| Minimum | 19.80 ± 19.00 | 0.896 |
| Uric acid (μmol/L) |  |  |
| First | 270.00 ± 163.00 | 0.401 |
| Maximum | 316.00 ± 172.00 | 0.074 |
| **Minimum** | 119.00 ± 90.00 | <0.001 |
| HDL-Cf (mmol/L) |  |  |
| **First** | 1.07 ± 0.50 | 0.002 |
| **Maximum** | 1.15 ± 0.46 | 0.012 |
| **Minimum** | 0.60 ± 0.41 | <0.001 |
| LDL-Cg (mmol/L) |  |  |
| First | 2.46 ± 0.97 | 0.283 |
| Maximum | 3.02 ± 1.29 | 0.196 |
| **Minimum** | 1.82 ± 0.79 | <0.001 |
| Direct bilirubin (μmol/L) |  |  |
| First | 4.51 ± 3.16 | 0.966 |
| **Maximum** | 6.34 ± 4.98 | <0.001 |
| **Minimum** | 2.04 ± 1.70 | <0.001 |
| Total protein (g/L) |  |  |
| **First** | 63.06 ± 10.40 | 0.006 |
| **Maximum** | 70.30 ± 7.80 | 0.002 |
| **Minimum** | 53.09 ± 8.34 | <0.001 |
| Blood urea nitrogen (mmol/L) |  |  |
| **First** | 5.18 ± 2.68 | <0.001 |
| **Maximum** | 9.50 ± 6.98 | <0.001 |
| Minimum | 3.30 ± 2.35 | 0.200 |
| Creatinine (μmol/L) |  |  |
| **First** | 74.00 ± 37.00 | 0.001 |
| **Maximum** | 91.00 ± 54.00 | <0.001 |
| **Minimum** | 47.00 ± 28.00 | <0.001 |
| Globulin (g/L) |  |  |
| First | 25.65 ± 4.79 | 0.703 |
| **Maximum** | 31.05 ± 7.20 | <0.001 |
| **Minimum** | 22.85 ± 4.02 | 0.002 |
| Lactate dehydrogenase (U/L) |  |  |
| **First** | 209.00 ± 151.23 | <0.001 |
| **Maximum** | 370.30 ± 301.18 | <0.001 |
| Minimum | 168.00 ± 60.93 | 0.521 |
| Alkaline phosphatase (U/L) |  |  |
| First | 66.00 ± 28.40 | 0.498 |
| **Maximum** | 117.00 ± 100.30 | <0.001 |
| Minimum | 55.00 ± 21.00 | 0.122 |
| Albumin (U/L) |  |  |
| **First** | 37.50 ± 10.30 | <0.001 |
| Maximum | 40.90 ± 7.50 | 0.664 |
| **Minimum** | 28.47± 6.33 | <0.001 |
| Gluh (mmol/L) |  |  |
| **First** | 6.90 ± 3.08 | 0.020 |
| **Maximum** | 9.77 ± 4.97 | <0.001 |
| **Minimum** | 5.00 ± 1.42 | <0.001 |
| CK-MBi (U/L) |  |  |
| First | 13.93 ± 9.70 | 0.703 |
| **Maximum** | 19.00 ± 14.58 | <0.001 |
| **Minimum** | 7.90 ± 6.42 | <0.001 |
| Osmotic pressure (mOSM/L) |  |  |
| **First** | 277.11 ± 13.90 | 0.003 |
| **Maximum** | 288.82 ± 23.66 | <0.001 |
| **Minimum** | 265.56 ± 15.67 | 0.030 |
| Urine volume (mL) |  |  |
| **First** | 200.00 ± 400.00 | 0.008 |
| **Maximum** | 600.00 ± 550.00 | 0.024 |
| **Minimum** | 30.00 ± 30.00 | <0.001 |
| SpO2j (%) |  |  |
| First | 100.00 ± 0.00 | 0.154 |
| Maximum | 100.00 ± 0.00 | 0.463 |
| **Minimum** | 95.00 ± 9.00 | <0.001 |
| Total cholesterol (mmol/L) |  |  |
| **First** | 4.00 ± 1.22 | 0.023 |
| Maximum | 4.66 ± 1.32 | 0.420 |
| **Minimum** | 3.08 ± 1.04 | <0.001 |
| Triglyceride (mmol/L) |  |  |
| First | 1.16 ± 0.97 | 0.680 |
| **Maximum** | 1.99 ± 1.81 | <0.001 |
| **Minimum** | 0.87 ± 0.56 | <0.001 |
| Magnesium (mmol/L) |  |  |
| First | 0.86 ± 0.14 | 0.977 |
| **Maximum** | 1.05 ± 0.22 | <0.001 |
| **Minimum** | 0.79 ± 0.12 | <0.001 |
| Procalcitonin (ng/mL) |  |  |
| **First** | 0.27 ± 1.00 | 0.005 |
| **Maximum** | 0.80 ± 3.17 | <0.001 |
| **Minimum** | 0.06 ± 0.19 | <0.001 |
| **Therapeutic index** |  |  |
| Operation time (minutes) | 158.47 ± 70.56 | 0.529 |
|  Anesthesia type |  |  |
| Intravenous anesthesia | 4.00 | 0.127 |
| Intravenous Inhalation Anesthesia | 236.00 | 0.339 |
| Local anesthesia | 34.00 | 0.913 |
| Local anesthesia and general anesthesia | 9.00 | 0.973 |
| General anesthesia | 316.00 | 0.450 |
|  **Tracheotomy**  | 308.00 | <0.001 |
|  **Nasal feeding**  | 326.00 | <0.001 |
|  Mechanical ventilation  | 468.00 | 0.729 |

Statistical results are mean ± SD, median (25th and 75th percentiles), or number of patients (percentage of column total).

P value is the result of Chi-squared test, t-test, and Wilcoxon test between two groups (group 1: LoICUS ≥ 15 days; group 2: LoICUS < 15 days). Bold Fonts indicate variables that are significantly different from the outcome.

aCOPD: chronic obstructive pulmonary disease

bGCS: Glasgow Coma Scale

cALT: alanine aminotransferase

dAST: aspartate aminotransferase

eGGT: gamma-glutamyl transferase

fHDL-C: high-density lipoprotein cholesterol

gLDL-C: low-density lipoprotein cholesterol

hGlu: fasting blood sugar

iCK-MB: creatine kinase isoenzymes

jSpO2%: oxygen saturation of blood

**Supplementary Table 2.** Statistical result of each variable corresponding to the two groups (group 1: LoICUS ≥ 15 days; group 2: LoICUS < 15 days).

|  |  |  |
| --- | --- | --- |
| **Variables** | **Group 1 (319)****N statistic ± range/ %** | **Group 2 (312)****N statistic ± range / %** |
| **Demographic information** |  |  |  |  |
|  Age (year) | 319 | 58.14 ± 15.44 | 312 | 53.69 ± 14.63 |
|  Gender　(male) | 213 | 66.77 | 190 | 60.90 |
|  Smoking history | 57 | 17.87 | 53 | 16.99 |
|  Drinking history | 41 | 12.85 | 39 | 12.50 |
| **Previous medical history** |  |  |  |  |
| 　Diabetes | 40 | 12.54 | 28 | 8.97 |
| 　Hypertension | 127 | 39.81 | 105 | 33.65 |
| 　COPDa | 2 | 0.63 | 2 | 0.64 |
|  Chronic renal disease | 1 | 0.31 | 3 | 0.96 |
| Coronary heart disease | 14 | 4.39 | 11 | 3.53 |
|  Tumors | 10 | 3.14 | 6 | 1.92 |
| Atrial fibrillation | 8 | 2.51 | 8 | 2.56 |
| **Brain injury inducements** |  |  |  |  |
| Vascular diseases | 291 | 91.22 | 246 | 78.85 |
| Brain tumor diseases | 43 | 13.48 | 86 | 27.56 |
| Cerebral contusion and laceration | 72 | 22.57 | 49 | 15.71 |
| Hydrocephalus | 33 | 10.34 | 20 | 6.41 |
| Epilepsy | 39 | 12.23 | 19 | 6.09 |
| **Infection sources** |  |  |  |  |
| Pulmonary infection | 274 | 85.89 | 181 | 58.01 |
| Urinary infection | 59 | 18.50 | 11 | 3.53 |
| Intracranial infection | 46 | 14.42 | 19 | 6.09 |
| **Vital signs** |  |  |  |  |
| Blood pressure(mmHg) |  |  |  |  |
|  Diastolic pressure |  |  |  |  |
| First | 268 | 71.19 ± 14.65 | 236 | 71.28 ± 15.06 |
| Maximum | 268 | 76.38 ± 15.60 | 236 | 74.21 ± 14.90 |
| Minimum | 268 | 67.56 ± 16.05 | 236 | 68.57 ± 16.40 |
|  Systolic pressure |  |  |  |  |
| First | 269 | 132.00 ± 24.00 | 239 | 128.00 ± 26.00 |
| Maximum | 269 | 145.00 ± 33.50 | 239 | 135.00 ± 29.00 |
| Minimum | 269 | 110.00 ± 36.50 | 239 | 120.00 ± 33.00 |
| Heart rate (Times/min) |  |  |  |  |
| First | 285 | 87.76 ± 24.38 | 247 | 84.36 ± 20.97 |
| Maximum | 285 | 126.00 ± 32.00 | 247 | 114.00 ± 31.00 |
| Minimum | 285 | 60.00 ± 15.00 | 247 | 60.00 ± 18.00 |
| Respiratory rate (Times/min) |  |  |  |  |
| First | 308 | 18.00 ± 7.00 | 291 | 16.00 ± 7.00 |
| Maximum | 310 | 32.00 ± 12.00 | 292 | 25.00 ± 7.00 |
| Minimum | 310 | 11.00 ± 2.00 | 292 | 12.00 ± 2.00 |
| Temperature (℃) |  |  |  |  |
| First | 295 | 37.00 ± 1.00 | 278 | 36.80 ± 0.80 |
| Maximum | 310 | 38.95 ± 1.20 | 288 | 38.00 ± 1.38 |
| Minimum | 309 | 36.20 ± 0.40 | 288 | 36.30 ± 0.60 |
| Pulse (Times/min) |  |  |  |  |
| First | 308 | 86.00 ± 27.75 | 291 | 82.00 ± 27.00 |
| Maximum | 307 | 125.00 ± 32.00 | 288 | 109.00 ± 31.00 |
| Minimum | 308 | 59.00 ± 20.00 | 287 | 60.00 ± 20.00 |
| **GCSb score** |  |  |  |  |
| First time | 198 | 7.00 ±8.00 | 161 | 11.00 ± 9.00 |
| First time and daily course of disease | 293 | 7.00 ± 6.00 | 258 | 10.00 ± 10.00 |
| Daily course of disease | 287 | 6.00 ± 6.00 | 247 | 8.00 ± 10.00 |
| **Hematoma properties** |  |  |  |  |
|  Subarachnoid | 164 | 51.41 | 152 | 48.72 |
|  Subdural  | 41 | 12.85 | 30 | 9.62 |
|  Intracerebral  | 171 | 53.61 | 121 | 38.78 |
|  Epidural  | 17 | 5.33 | 21 | 6.73 |
| **Laboratory test in ICU** |  |  |  |  |
|  Haemoglobin (g/L) |  |  |  |  |
| First | 318 | 118.30 ± 34.25 | 309 | 124.00 ± 31.50 |
| Maximum | 318 | 126.15 ± 19.08 | 309 | 127.85 ± 21.84 |
| Minimum | 318 | 79.50 ± 29.00 | 309 | 97.00 ± 32.50 |
|  Platelets (10^9/L) |  |  |  |  |
| First | 318 | 178.68 ± 71.31 | 309 | 191.56 ± 66.88 |
| Maximum | 318 | 395.02 ± 153.31 | 309 | 295.64 ± 126.79 |
| Minimum | 318 | 129.46 ± 59.52 | 309 | 151.74 ± 61.90 |
|  White blood cells (10^9/L) |  |  |  |  |
| First | 318 | 12.55 ± 5.28 | 309 | 11.71 ± 5.19 |
| Maximum | 318 | 17.48 ± 6.61 | 309 | 15.98 ± 6.61 |
| Minimum | 318 | 5.46 ± 2.87 | 309 | 7.17 ± 4.44 |
| Red blood cells (10^12/L) |  |  |  |  |
| First | 318 | 3.89 ± 1.17 | 309 | 4.12 ± 1.02 |
| Maximum | 318 | 4.17 ± 0.66 | 309 | 4.22 ± 0.73 |
| Minimum | 318 | 2.74 ± 0.72 | 309 | 3.25 ± 0.75 |
|  Prothrombin time (s) |  |  |  |  |
| First | 314 | 13.40 ± 2.30 | 286 | 13.30 ± 2.00 |
| Maximum | 314 | 15.10 ± 2.60 | 286 | 14.30 ± 2.50 |
| Minimum | 314 | 12.60 ± 1.72 | 286 | 12.95 ± 1.40 |
|  Sodium (mmol/L) |  |  |  |  |
| First | 318 | 141.50 ± 6.12 | 309 | 141.60 ± 5.05 |
| Maximum | 318 | 150.35 ± 10.93 | 309 | 145.60 ± 10.70 |
| Minimum | 318 | 134.05 ± 5.30 | 309 | 136.20 ± 6.90 |
| Potassium (mmol/L) |  |  |  |  |
| First | 318 | 3.87 ± 0.42 | 309 | 3.89 ± 0.47 |
| Maximum | 318 | 4.72 ± 0.57 | 309 | 4.43 ± 0.56 |
| Minimum | 318 | 3.33 ± 0.42 | 309 | 3.46 ± 0.48 |
| Calcium (mmol/L) |  |  |  |  |
| First | 318 | 2.13 ± 0.18 | 309 | 2.19 ± 0.20 |
| Maximum | 318 | 2.34 ± 0.18 | 309 | 2.34 ± 0.18 |
| Minimum | 318 | 1.91 ± 0.16 | 309 | 1.99 ± 0.19 |
|  ALTc (U/L) |  |  |  |  |
| First | 318 | 20.00 ± 18.25 | 309 | 18.90 ± 13.95 |
| Maximum | 318 | 104.00 ± 168.10 | 309 | 40.00 ± 66.10 |
| Minimum | 318 | 14.00 ± 8.00 | 309 | 14.00 ± 10.00 |
|  ASTd (U/L) |  |  |  |  |
| First | 318 | 25.80 ± 21.92 | 309 | 23.00 ± 15.70 |
| Maximum | 318 | 100.80 ± 143.22 | 309 | 41.80 ± 51.65 |
| Minimum | 318 | 17.00 ± 9.60 | 309 | 17.00 ± 10.70 |
| GGTe (U/L) |  |  |  |  |
| First | 318 | 24.00 ± 27.62 | 309 | 23.00 ± 23.25 |
| Maximum | 318 | 143.75 ± 192.73 | 309 | 62.50 ± 116.80 |
| Minimum | 318 | 19.95 ± 19.15 | 309 | 19.10 ± 19.00 |
| Uric acid (μmol/L) |  |  |  |  |
| First | 318 | 286.93 ± 130.44 | 309 | 278.25 ± 128.02 |
| Maximum | 318 | 327.50 ± 179.25 | 309 | 301.00 ± 168.50 |
| Minimum | 318 | 100.50 ± 64.00 | 309 | 148.00 ± 118.50 |
| HDL-Cf (mmol/L) |  |  |  |  |
| First | 315 | 1.02 ± 0.48 | 301 | 1.13 ± 0.49 |
| Maximum | 315 | 1.11 ± 0.47 | 301 | 1.19 ± 0.46 |
| Minimum | 315 | 0.51 ± 0.28 | 301 | 0.78 ± 0.50 |
| LDL-Cg (mmol/L) |  |  |  |  |
| First | 315 | 2.42 ± 0.96 | 301 | 2.50 ± 0.97 |
| Maximum | 315 | 3.08 ± 1.20 | 301 | 2.92 ± 1.40 |
| Minimum | 315  | 1.64 ± 0.73 | 301 | 2.02 ± 0.81 |
| Direct bilirubin (μmol/L) |  |  |  |  |
| First | 318 | 4.60 ± 3.32 | 305 | 4.34 ± 2.95 |
| Maximum | 318 | 6.70 ± 6.05 | 305 | 5.77 ± 4.54 |
| Minimum | 318 | 1.64 ± 1.27 | 305 | 2.47 ± 1.91  |
| Total protein (g/L) |  |  |  |  |
| First | 318 | 61.94 ± 10.31 | 309 | 64.21 ± 10.39 |
| Maximum | 318 | 71.25 ± 6.82 | 309 | 69.32 ± 8.59 |
| Minimum | 318 | 51.47 ± 7.02 | 309 | 54.76 ± 9.30 |
| Blood urea nitrogen (mmol/L) |  |  |  |  |
| First | 318 | 5.45 ± 2.82 | 309 | 4.83 ± 2.33 |
| Maximum | 318 | 11.15 ± 7.29 | 309 | 7.80 ± 5.60 |
| Minimum | 318 | 3.20 ± 2.31 | 309 | 3.40 ± 2.30 |
| Creatinine (μmol/L) |  |  |  |  |
| First | 318 | 77.50 ± 41.25 | 309 | 72.00 ± 32.50 |
| Maximum | 318 | 96.50 ± 59.25 | 309 | 86.00 ± 49.00 |
| Minimum | 318 | 43.50 ± 26.00 | 309 | 53.00 ± 30.50 |
| Globulin (g/L) |  |  |  |  |
| First | 318  | 25.58 ± 4.63 | 305 | 25.73 ± 4.97 |
| Maximum | 318 | 32.73 ± 7.26 | 305 | 29.40 ± 7.50 |
| Minimum | 318 | 22.36 ± 3.72 | 305 | 23.37 ± 4.26 |
| Lactate dehydrogenase (U/L) |  |  |  |  |
| First | 313 | 221.00 ± 174.25 | 301 | 194.00 ± 121.35 |
| Maximum | 313 | 425.50 ± 284.00 | 301 | 295.30 ± 238.00 |
| Minimum | 313 | 170.00 ± 56.65 | 301 | 167.00 ± 66.50 |
| Alkaline phosphatase (U/L) |  |  |  |  |
| First | 318 | 64.85 ± 28.92 | 309 | 67.00 ± 29.10 |
| Maximum | 318 | 150.00 ± 127.07 | 309 | 91.00 ± 61.05 |
| Minimum | 318 | 55.00 ± 19.55 | 309 | 56.00 ± 22.00 |
| Albumin (U/L) |  |  |  |  |
| First | 318 | 36.08 ± 7.37 | 309 | 38.26 ± 7.41 |
| Maximum | 318 | 40.70 ± 7.62 | 309 | 41.20 ± 7.55 |
| Minimum | 318 | 26.62 ± 5.25 | 309 | 30.37 ± 6.77 |
| Gluh (mmol/L) |  |  |  |  |
| First | 316 | 7.18 ± 3.17 | 304 | 6.64 ± 3.04 |
| Maximum | 316 | 10.44 ± 4.85 | 304 | 9.22 ± 4.50 |
| Minimum | 316 | 4.84 ± 1.25 | 304 | 5.14 ± 1.74 |
| CK-MBi (U/L) |  |  |  |  |
| First | 313 | 14.00 ± 10.00 | 301 | 13.90 ± 9.05 |
| Maximum | 313 | 21.10 ± 15.40 | 301 | 17.10 ± 12.40 |
| Minimum | 313 | 6.80 ± 6.90 | 301 | 8.70 ± 6.35 |
| Osmotic pressure (mOSM/L) |  |  |  |  |
| First | 310 | 279.26 ± 16.25 | 294 | 275.46 ± 11.75 |
| Maximum | 310 | 292.08 ± 22.06 | 294 | 284.87 ± 20.81 |
| Minimum | 310 | 264.86 ± 15.70 | 294 | 267.03 ± 15.96 |
| Urine volume (mL) |  |  |  |  |
| First | 291 | 150.00 ± 410.00 | 252 | 200.00 ± 457.5 |
| Maximum | 291 | 600.00 ± 500.00 | 252 | 600.00 ± 600.00 |
| Minimum | 291 | 30.00 ± 22.00 | 252 | 47.50 ± 40.00 |
| SpO2j (%) |  |  |  |  |
| First | 268 | 100.00 ± 1.00 | 245 | 100.00 ± 0.00 |
| Maximum | 268 | 100.00 ± 0.00 | 245 | 100.00 ± 0.00 |
| Minimum | 268 | 93.00 ± 9.75 | 245 | 96.00 ± 8.50 |
| Total cholesterol (mmol/L) |  |  |  |  |
| First | 315 | 3.89 ± 1.18 | 301 | 4.11 ± 1.25 |
| Maximum | 315 | 4.62 ± 1.17 | 301 | 4.70 ± 1.46 |
| Minimum | 315 | 2.76 ± 0.95 | 301 | 3.41 ± 1.04 |
| Triglyceride (mmol/L) |  |  |  |  |
| First | 315 | 1.16 ± 0.90 | 301 | 1.15 ± 1.04 |
| Maximum | 315 | 2.25 ± 2.09 | 301 | 1.73 ± 1.68 |
| Minimum | 315 | 0.83 ± 0.47 | 301 | 0.94 ± 0.65 |
| Magnesium (mmol/L) |  |  |  |  |
| First | 318 | 0.86 ± 0.16 | 309 | 0.86 ± 0.31 |
| Maximum | 318 | 1.09 ± 0.19 | 309 | 0.99 ± 0.21 |
| Minimum | 318 | 0.77 ± 0.12 | 309 | 0.80 ± 0.11 |
| Procalcitonin (ng/mL) |  |  |  |  |
| First | 303 | 0.35 ± 1.20 | 243 | 0.20 ± 0.71 |
| Maximum | 303 | 1.37 ± 4.20 | 243 | 0.40 ± 1.64 |
| Minimum | 303 | 0.05 ± 0.13 | 243 | 0.09 ± 0.32 |
| **Therapeutic index** |  |  |  |  |
| Operation time (minutes) | 308 | 156.69 ± 69.36 | 304 | 160.28 ± 71.82 |
|  Anesthesia type |  |  |  |  |
| Intravenous anesthesia | 0 | 0 | 4 | 1.28 |
| Intravenous Inhalation Anesthesia | 113 | 35.42 | 123 | 39.42 |
| Local anesthesia | 18 | 5.64 | 16 | 5.13 |
| Local anesthesia and general anesthesia | 4 | 1.25 | 5 | 1.60 |
| General anesthesia | 165 | 51.72 | 151 | 48.40 |
|  Tracheotomy  | 221 | 69.28 | 87 | 27.88 |
|  Nasal feeding  | 220 | 68.97 | 106 | 33.97 |
|  Mechanical ventilation  | 239 | 74.92 | 229 | 73.40 |

**Supplemental Table 3.** Optimized hyperparameters per ML model.

|  |  |
| --- | --- |
| Model | Variables |
| Pre operation  |  |
| LR | penalty='l2', tol=0.0001, C=1.0, solver='lbfgs', max\_iter=100 |
| RF | n\_estimators=150, max\_depth=2, min\_samples\_split=52, min\_samples\_leaf=1, max\_features=’sqrt’ |
| GBDT | learning rate=0.1, subsample=0.3, n\_estimators=20, max\_depth=2, min\_samples\_split=124, min\_samples\_leaf=9, max\_features=’sqrt’ |
| RuleFit (GBDT based) | model\_type=’r’, max\_rules=500, rfmode=’classify’, tree\_generator=GBDT |
| Post operation |  |
| LR | penalty='l2', tol=0.0001, C=1.0, solver='lbfgs', max\_iter=100 |
| RF | n\_estimators=100, max\_depth=2, min\_samples\_split=2, min\_samples\_leaf=51, max\_features=7 |
| GBDT | learning rate=0.01, subsample=1.0, n\_estimators=40, max\_depth=2, min\_samples\_split=158, min\_samples\_leaf=57, max\_features=’sqrt’ |
| RuleFit (GBDT based) | model\_type=’r’, max\_rules=2000, rfmode=’classify’, tree\_generator=GBDT |

**Supplemental Table 4.** Results of regression model on test set.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model | EVS | MSE | RMSE | MAE | R2 | Adjusted R2 |
| Pre operation  |  |  |  |  |  |  |
| Linear Regression | -0.06 (-0.22, 0.10) | 650.27 (231.30, 1141.43) | 25.04 (15.21, 33.79) | 15.83 (11.35, 20.39) | -0.09 (-0.26, 0.09) | -0.21 (-0.40, 0.00) |
| Poisson Regression | -0.07 (-0.20, 0.07) | 652.27 (220.31, 1160.72) | 25.08 (14.84, 34.07) | 15.90 (11.08, 20.52) | -0.09 (-0.24, 0.06) | -0.21 (-0.38, -0.04) |
| Hurdle Regression | -0.09 (-0.27, 0.09) | 696.91 (233.19, 1240.98) | 25.90 (15.27, 35.23) | 15.70 (10.94, 20.79) | -0.17 (-0.36, 0.05) | -0.29 (-0.50, -0.05) |
| RFR | -0.01 (-0.12, 0.08) | 625.61 (226.12, 1130.71) | 24.54 (15.04, 33.63) | 15.26 (10.65, 20.25) | -0.05 (-0.18, 0.06) | -0.16 (-0.30, -0.03) |
| GBR  | -0.02 (-0.16, 0.10) | 630.83 (224.73, 1133.13) | 24.65 (14.99, 33.66) | 15.13 (10.38, 19.92) | -0.06 (-0.21, 0.09) | -0.17 (-0.33, -0.00) |
| RuleFit (GBR based) | -0.03 (-0.14, 0.09) | 644.78 (228.26, 1164.85) | 24.92 (15.11, 34.13) | 15.19 (10.30, 19.95) | -0.08 (-0.22, 0.06) | -0.19 (-0.35, -0.04) |
| Post operation |  |  |  |  |  |  |
| Linear Regression | 0.22 (-0.02, 0.54) | 504.42 (130.71, 1045.76) | 21.74 (11.43, 32.34) | 12.69 (8.27, 18.01) | 0.19 (-0.11, 0.54) | 3.32 (2.32, 4.16) |
| Poisson Regression | 0.01 (-0.00, 0.01) | 613.52 (224.30, 1084.99) | 24.33 (14.98, 32.94) | 15.64 (10.74, 20.61) | -0.03 (-0.10, -0.00) | 3.95 (3.86, 4.15) |
| Hurdle Regression | 0.15 (-0.06, 0.42) | 602.91 (179.27, 1180.75) | 23.89 (13.39, 34.36) | 13.38 (8.54, 19.75) | 0.02 (-0.26, 0.32) | 3.81 (2.94, 4.62) |
| RFR | 0.19 (0.05, 0.41) | 521.90 (130.33, 1032.84) | 22.22 (11.42, 32.14) | 13.09 (8.74, 18.04) | 0.15 (-0.06, 0.39) | 3.42 (2.74, 4.03) |
| GBR | 0.15 (-0.06, 0.44) | 561.74 (144.39, 1150.13) | 23.00 (12.02, 33.91) | 12.35 (7.76, 17.58) | 0.10 (-0.16, 0.40) | 3.59 (2.73, 4.33) |
| RuleFit (GBR based) | 0.03 (-0.17, 0.24) | 610.24 (233.00, 1103.63) | 24.24 (15.26, 33.22) | 16.05 (11.67, 21.58) | -0.02 (-0.25, 0.19) | 3.93 (3.33, 4.59) |

**Supplementary Table 5.** Results of sensitivity analysis of death situation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model type | Death situation | AUC | Sensitivity | Specificity |
| Pre-operation | With | 0.632 | 0.444 | **0.735** |
| Pre-operation | Without | **0.678** | **0.704** | 0.588 |
| Post-operation | With | 0.976 | 0.926 | **0.941** |
| Post-operation | Without | **0.988** | 0.926 | 0.912 |