**Appendix**

**Appendix 1. Univariate logistic regression analyses of shock requiring vasopressor or inotrope and 28-day mortality and univariate Cox proportional analysis of 28-day mortality**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Shock requiring vasopressor/inotrope** | | **28-day mortality** | | **28-day mortality** | |
|  | **OR (95% CI)** | **P-value** | **OR (95% CI)** | **P-value** | **HR (95% CI)** | **P-value** |
| **Demographic data** |  |  |  |  |  |  |
| **Sex** | 1.095 (0.663-1.808) | 0.723 | 0.922 (0.349-2.434) | 0.87 | 0.879 (0.339-2.281) | 0.792 |
| **Age** | 1.021 (1.001-1.043) | 0.045\* | 1.031 (0.989-1.076) | 0.153 | 1.033 (0.988-1.079) | 0.154 |
| **Risk factor** |  |  |  |  |  |  |
| **ERCP** | 0.492 (0.297-0.814) | 0.006\* | 0.104 (0.029-0.367) | <.001\* | 0.145 (0.041-0.509) | 0.003\* |
| **PTCS** | 1.445 (0.393-5.31) | 0.579 | 0.849 (0.044-16.319) | 0.913 | 0.364 (0.019-6.859) | 0.5 |
| **PTBD** | 2.779 (1.584-4.875) | <0.001\* | 4.518 (1.687-12.096) | 0.003\* | 2.063 (0.757-5.624) | 0.157 |
| **Operation** | 0.451 (0.208-0.977) | 0.044\* | 0.112 (0.007-1.908) | 0.13 | 0.093 (0.005-1.674) | 0.107 |
| **Nursing\_home** | 8.134 (1.335-49.553) | 0.023\* | 47.357 (7.323-306.231) | <.001\* | 14.102 (4.004-49.674) | <.001\* |
| **Neoplastic disease** | 3.2 (1.92-5.333) | <.001\* | 6.334 (2.186-18.355) | <.001\* | 3.868 (1.335-11.208) | 0.013\* |
| **Liver disease** | 4.519 (2.151-9.494) | <.001\* | 2.957 (0.805-10.86) | 0.102 | 2.074 (0.591-7.28) | 0.255 |
| **Congestive heart failure** | 2.637 (0.236-29.462) | 0.43 | 3.603 (0.114-114.094) | 0.467 | 2.516 (0.136-46.43) | 0.535 |
| **Cerebrovascular accident** | 0.92 (0.263-3.221) | 0.896 | 0.591 (0.032-10.91) | 0.724 | 0.463 (0.025-8.449) | 0.604 |
| **Renal disease** | 1.036 (0.025-42.996) | 0.985 | 5.061 (0.119-214.871) | 0.397 | 14.821 (0.715-307.388) | 0.081 |
| **Clinical data** |  |  |  |  |  |  |
| **Systolic blood pressure** | 0.95 (0.937-0.962) | <.001\* | 0.975 (0.956-0.993) | 0.009\* | 0.981 (0.963-0.999) | 0.035\* |
| **Diastolic blood pressure** | 0.923 (0.903-0.943) | <.001\* | 0.964 (0.931-0.997) | 0.033\* | 0.975 (0.943-1.007) | 0.123 |
| **Heart rate** | 1.034 (1.02-1.048) | <.001\* | 1.029 (1.005-1.055) | 0.02\* | 1.02 (0.997-1.044) | 0.091 |
| **Body temperature** | 1.272 (0.998-1.621) | 0.052 | 0.654 (0.366-1.168) | 0.151 | 0.598 (0.333-1.075) | 0.086 |
| **Respiratory rate** | 0.918 (0.824-1.023) | 0.121 | 1.092 (0.893-1.336) | 0.392 | 1.145 (0.94-1.395) | 0.178 |
| **Laboratory results** |  |  |  |  |  |  |
| **White blood cell count** | 1.005 (1-1.009) | 0.029\* | 1.007 (1.001-1.014) | 0.032\* | 1.006 (0.999-1.012) | 0.078 |
| **Hemoglobin** | 0.745 (0.655-0.847) | <.001\* | 0.699 (0.556-0.879) | 0.002\* | 0.775 (0.62-0.97) | 0.026\* |
| **Platelet count** | 1 (0.999-1) | 0.002\* | 0.999 (0.998-1) | 0.005\* | 0.999 (0.999-1) | 0.015\* |
| **DNI (Day0)** | 1.147 (1.105-1.192) | <.001\* | 1.096 (1.059-1.135) | <.001\* | 1.08 (1.05-1.111) | <.001\* |
| **DNI (Day1)** | 1.163 (1.11-1.218) | <.001\* | 1.075 (1.038-1.113) | <.001\* | 1.054 (1.022-1.087) | 0.001\* |
| **DNI (Day2)** | 1.244 (1.118-1.385) | <.001\* | 1.091 (1.044-1.14) | 0.001\* | 1.076 (1.036-1.118) | 0.001\* |
| **DNI (Day3)** | 1.292 (1.139-1.466) | <.001\* | 1.11 (1.032-1.194) | 0.005\* | 1.092 (1.048-1.137) | <.001\* |
| **DNI (Day4)** | 1.386 (1.196-1.605) | <.001\* | 1.23 (1.052-1.439) | 0.009\* | 1.129 (1.056-1.207) | <.0001\* |
| **ESR** | 1.004 (0.997-1.012) | 0.271 | 0.992 (0.976-1.009) | 0.376 | 0.988 (0.971-1.005) | 0.16 |
| **CRP** | 1.006 (1.004-1.009) | <.001\* | 1.008 (1.003-1.013) | 0.002\* | 1.006 (1.001-1.01) | 0.022\* |
| **Glucose** | 1 (0.995-1.005) | 0.954 | 0.989 (0.976-1.003) | 0.116 | 0.99 (0.977-1.002) | 0.112 |
| **Blood urea nitrogen** | 1.082 (1.053-1.112) | <.001\* | 1.074 (1.037-1.113) | <.001\* | 1.039 (1.019-1.059) | <.001\* |
| **Creatinine** | 2.3 (1.431-3.696) | 0.001\* | 1.471 (1.025-2.11) | 0.036\* | 1.331 (0.99-1.788) | 0.058 |
| **Albumin** | 0.161 (0.101-0.255) | <.001\* | 0.046 (0.016-0.131) | <.001\* | 0.09 (0.039-0.205) | <.001\* |
| **AST** | 1.001 (1-1.001) | 0.218 | 1.001 (1-1.002) | 0.03\* | 1.001 (1-1.003) | 0.011\* |
| **ALT** | 0.999 (0.997-1) | 0.089 | 0.998 (0.995-1.001) | 0.272 | 0.999 (0.996-1.002) | 0.422 |
| **Total bilirubin** | 1.122 (1.053-1.195) | <.001\* | 1.16 (1.064-1.265) | 0.001\* | 1.092 (1.019-1.17) | 0.013\* |
| **Sodium** | 0.812 (0.763-0.865) | <.001\* | 0.875 (0.8-0.957) | 0.003\* | 0.906 (0.832-0.987) | 0.023\* |
| **Potassium** | 0.762 (0.443-1.308) | 0.324 | 0.252 (0.09-0.71) | 0.009\* | 0.253 (0.093-0.687) | 0.007\* |
| **Chloride** | 0.884 (0.837-0.933) | <.001\* | 0.931 (0.846-1.025) | 0.145 | 0.953 (0.866-1.05) | 0.333 |
| **tCO2** | 0.758 (0.696-0.826) | <.001\* | 0.756 (0.667-0.855) | <.001\* | 0.792 (0.704-0.89) | <.001\* |
| **Direct bilirubin** | 1.186 (1.085-1.297) | <.001\* | 1.246 (1.11-1.399) | <.001\* | 1.142 (1.045-1.249) | 0.004\* |
| **r-GT** | 0.999 (0.998-1) | 0.046\* | 0.999 (0.997-1.001) | 0.257 | 0.999 (0.997-1.001) | 0.308 |
| **Bacteremia** | 5.25 (2.97-9.28) | <.001\* | 6.473 (1.834-22.846) | 0.004\* | 3.935 (1.107-13.989) | 0.034\* |

**Appendix 1. Univariate logistic regression analyses of shock requiring vasopressor or inotrope and 28-day mortality and univariate Cox proportional analysis of 28-day mortality**

\*; p<0.05, ERCP; Endoscopic retrograde cholangiopancreatography, PTCS; Percutaneous transhepatic cholangioscopy(PTCS), PTBD; Percutaneous transhepatic biliary drainage, DNI; Delta neutrophil index, ESR; Erythrocyte sedimentation rate, CRP; C-reactive protein, AST; Aminotransferase ALT; Alanine transaminase, r-GT; Gamma-glutamyl transpeptidase

**Appendix 2.** We retrospectively analysed patients who were initially diagnosed with acute cholecystitis and hepatitis at emergency department (ED) admission, followed by a final diagnosis. A total of 454 patients with acute cholecystitis at ED admission during the same study period were included in this analysis. The mean DNI values at admission differed significantly between patients with acute cholecystitis and cholangitis (1.704 ± 1.995% vs. 4.892 ± 7.889%; p < 0.001). The areas under the receiver operating characteristic (ROC) curves (AUCs) were determined to assess the ability of the DNI to discriminate between acute cholangitis and cholecystitis. The AUC of DNI values at admission for predicting acute cholangitis was 0.639 (0.607–0.670; p < 0.001). The optimal DNI cut-off at ED admission was 2.2% (sensitivity, 52.71% and specificity, 70.7%). The sonographic Murphy’s sign is a very reliable indicator of acute cholecystitis, with a specificity exceeding 90%. Our results suggest that the DNI value facilitates the additional diagnosis of cholangitis in patients with cholecystitis and acute biliary inflammation and infection

**Appendix 3.** The areas under the ROC curves (AUCs) of DNI and band values on day 0 were 0.768 (0.798-0.873) and 0.798 (0.725-0.871), respectively, for shock prediction (p = 0.99) and 0.842 (0.74-0.937) and 0.704 (0.602-0.807), respectively, for 28-day mortality prediction (p < 0.001). In other words, a significant difference in predictability for 28-day mortality was observed between the DNI and manual band measurement methods. The accuracy of DNI for predicting 28-day mortality was superior to that of manual band measurement (%)

