**Supplementary Tables**

Supplementary Table 1: Baseline Characteristics of Patients in the Development and Validation Cohorts

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| --- | --- | --- | --- | --- |
| Variables | Total  (n=2188) | Development Cohort (n=1531) | Validation Cohort (n=657) | *P*- value |
| Age, years | 62 (50, 70) | 62 (50, 70) | 61 (49, 69) | 0.452 |
| Male, % | 1055 (48.2) | 725 (47.4) | 330 (50.2) | 0.225 |
| Smoking History, % | 222 (10.1) | 153 (10.0) | 69 (10.5) | 0.757 |
| Diabetes Mellitus, % | 272 (12.4) | 181 (11.8) | 91 (13.9) | 0.203 |
| Hypertension, % | 586 (26.8) | 425 (27.8) | 161 (24.5) | 0.127 |
| CHD, % | 179 (8.2) | 127 (8.3) | 52 (7.9) | 0.799 |
| COPD, % | 62 (2.8) | 44 (2.9) | 18 (2.7) | 1.000 |
| CKD, % | 60 (2.7) | 43 (3.8) | 17 (2.6) | 0.887 |
| Cancer, % | 26 (1.2) | 20 (1.3) | 6 (0.9) | 0.523 |
| Asthma, % | 11 (0.5) | 6 (0.4) | 5 (0.8) | 0.322 |
| Hepatitis, % | 11 (0.5) | 8 (0.5) | 3 (0.5) | 1.000 |
| Stroke, % | 120 (5.5) | 77 (5.0) | 43 (6.5) | 0.153 |
| Number of Comorbidities, % |  |  |  | 0.356 |
| 0 | 1392 (63.6) | 964 (63.0) | 428 (65.1) |  |
| 1 | 448 (20.5) | 326 (21.3) | 122 (18.6) |  |
| ≥ 2 | 348 (15.9) | 241 (15.7) | 107 (16.3) |  |
| SpO2, % | 97.0 (95.0, 99.0) | 97.0 (95.0, 99.0) | 97.0 (95.0, 99.0) | 0.549 |
| Glucose, mmol/L | 6.1 (5.2, 7.6) | 6.1 (5.2, 7.5) | 6.1 (5.2, 7.8) | 0.377 |
| C-reactive protein, mg/L | 25.6 (5.2, 51.5) | 26.1 (4.7, 54.4) | 23.7 (5.8, 43.3) | 0.421 |
| Neutrophil/Lymphocyte | 3.7 (2.2, 6.6) | 3.6 (2.1, 6.7) | 3.8 (2.4, 6.5) | 0.259 |
| Platelet count, 109/L | 197.2 (151.0, 250.1) | 198.0 (150.0, 248.0) | 196.3 (151.0, 256.0) | 0.500 |
| Procalcitonin, ng/mL | 0.1 (0.0, 0.2) | 0.1 (0.0, 0.2) | 0.1 (0.0, 0.2) | 0.290 |
| Lactate dehydrogenase, U/L | 228.1 (179.0, 315.7) | 228.7 (177.1, 316.0) | 227.3 (181.0, 311.0) | 0.567 |
| ALT, U/L | 24.0, (16.0, 36.8) | 24.0 (15.7, 36.2) | 24.0 (16.7, 37.8) | 0.275 |
| AST, U/L | 26.6 (18.6, 39.0) | 26.0 (18.4, 38.9) | 27.0 (18.9, 39.0) | 0.436 |
| Total Bilirubin, μmol /L | 9.2 (6.9, 12.2) | 9.3 (6.9, 12.2) | 9.1 (6.9, 12.2) | 0.901 |
| Direct Bilirubin, μmol /L | 3.2 (2.3, 4.6) | 3.2 (2.2, 4.6) | 3.3 (2.3, 4.7) | 0.261 |
| Indirect Bilirubin, μmol /L | 5.7 (4.3, 7.7) | 5.7 (4.3, 7.7) | 5.6 (4.2, 7.5) | 0.538 |
| Albumin, g/L | 37.5 (33.3, 41.7) | 37.4 (33.2, 41.7) | 37.7 (33.4, 41.6) | 0.494 |
| Creatinine, μmol/L | 68.0 (55.1, 84.0) | 68.8 (55.7, 85.7) | 67.0 (57.9, 82.0) | 0.193 |
| Hemoglobin, g/L | 126.6 (117.0, 136.7) | 126.0 (117.0, 136.0) | 127.4 (118.0, 138.0) | 0.105 |
| BUN, mmol/L | 4.5 (3.6, 5.7) | 4.5 (3.5, 5.8) | 4.4 (3.6, 5.6) | 0.320 |
| Sodium, mmol/L | 140.0 (137.2, 142.7) | 140.0 (137.1, 143.0) | 140.0 (137.7, 142.0) | 0.367 |
| Potassium, mmol/L | 3.9 (3.5, 4.2) | 3.9 (3.5, 4.2) | 3.9 (3.5, 4.2) | 0.630 |
| Chlorine, mmol/L | 104.8 (101.3, 107.0) | 105.0 (101.8, 107.0) | 104.0 (1.01.0, 107.0) | 0.192 |
| D-dimer, mg/L | 0.4 (0.2, 0.9) | 0.4 (0.2, 0.9) | 0.4 (0.2, 0.9) | 0.524 |
| PT, seconds | 12.2 (10.6, 13.7) | 12.2 (10.6, 13.7) | 12.2 (10.7, 13.8) | 0.584 |
| APTT, seconds | 29.8 (25.2, 34.9) | 30.0 (25.2, 34.8) | 29.6 (25.1, 34.9) | 0.777 |
| INR | 1.0 (0.9, 1.1) | 1.0 (0.9, 1.1) | 1.0 (0.9, 1.1) | 0.559 |
| FIB, g/L | 3.7 (2.9, 4.4) | 3.6 (2.9, 4.4) | 3.8 (3.0, 4.4) | 0.183 |

Notes: Continuous variables were shown as median and interquartile range, categorical variables were shown as number and percentages.

Abbreviations: CHD=coronary artery heart disease, COPD=chronic obstructive pulmonary disease, CKD=chronic kidney disease, SpO2=saturation of pulse oxygen, ALT=Alanine aminotransferase, AST= Aspartate aminotransferase, BUN=blood urea nitrogen, PT= Prothrombin time, APTT= activated partial thromboplastin time, INR= international normalized ratio, FIB=fibrinogen.

Supplementary Table 2: Baseline characteristics between survivor and non-survivors in the development cohort

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Total  (n=1531) | Survivors (n=1379) | Non-survivors (n=152) |
| Age, years | 62 (50, 70) | 60 (49, 69) | 72 (64, 82) |
| Male, % | 725 (47.4) | 622 (45.1) | 103 (67.8) |
| Smoking History, % | 153 (10.0) | 131 (9.5) | 22 (14.5) |
| Diabetes Mellitus, % | 181 (11.8) | 152 (11.0) | 29 (19.1) |
| Hypertension, % | 425 (27.8) | 364 (26.4) | 61 (40.1) |
| CHD, % | 127 (8.3) | 92 (6.7) | 35 (23.0) |
| COPD, % | 44 (2.9) | 33 (2.4) | 11 (7.2) |
| CKD, % | 43 (3.8) | 31 (2.2) | 12 (7.9) |
| Cancer, % | 20 (1.3) | 16 (1.2) | 4 (2.6) |
| Asthma, % | 6 (0.4) | 6 (0.4) | 0 (0.0) |
| Hepatitis, % | 8 (0.5) | 7 (0.5) | 1 (0.7) |
| Stroke, % | 77 (5.0) | 53 (3.8) | 24 (15.8) |
| Number of Comorbidities, % |  |  |  |
| 0 | 964 (63.0) | 900 (65.3) | 64 (42.1) |
| 1 | 326 (21.3) | 288 (20.9) | 38 (25.0) |
| ≥ 2 | 241 (15.7) | 191 (13.9) | 50 (32.9) |
| SpO2, % | 97.0 (95.0, 99.0) | 98.0 (96.0, 99.0) | 90.0 (84.0, 95.7) |
| Glucose, mmol/L | 6.1 (5.2, 7.5) | 21.9 (3.9, 45.9) | 87.2 (36.2, 156) |
| C-reactive protein, mg/L | 26.1 (4.7, 54.5) | 21.9 (3.9, 45.9) | 87.2 (36.2, 156) |
| Neutrophil/Lymphocyte | 3.6 (2.1, 6.7) | 3.4 (2.1, 5.6) | 11.2 (6.0, 20.5) |
| Platelet count, 109/L | 198 (150, 248) | 200 (154, 252) | 174 (125, 222) |
| Procalcitonin, ng/mL | 0.1 (0.0, 0.2) | 0.1 (0.0, 0.1) | 0.3 (0.1, 0.7) |
| Lactate dehydrogenase, U/L | 2297 (177, 316) | 219 (172, 289) | 411 (281, 587) |
| ALT, U/L | 24.0 (15.7, 36.2) | 23.1 (15.3, 35.6) | 26.2 (18.0, 42.6) |
| AST, U/L | 26.0 (18.4, 38.9) | 25.1 (18.0, 37.0) | 40.3 (27.0, 58.0) |
| Total Bilirubin, μmol /L | 9.3 (6.9, 12.2) | 9.1 (6.9, 11.9) | 10.7 (7.7, 15.4) |
| Direct Bilirubin, μmol /L | 3.2 (2.2, 4.6) | 3.1 (2.2, 4.3) | 5.0 (3.3, 7.4) |
| Indirect Bilirubin, μmol /L | 5.7 (4.3, 7.7) | 5.7 (4.3, 7.8) | 5.7 (3.9, 7.6) |
| Albumin, g/L | 37.4 (33.2, 41.7) | 37.9 (34.0, 42.2) | 32.9 (29.2, 36.4) |
| Creatinine, μmol/L | 68.8 (55.7, 85.7) | 67.7 (54.9, 82.3) | 88.0 (65.3, 123) |
| Hemoglobin, g/L | 126 (117, 136) | 126 (117, 136) | 127 (115, 138) |
| BUN, mmol/L | 4.5 (3.5, 5.8) | 4.4 (3.5, 5.5) | 7.1 (5.1, 12.2) |
| Sodium, mmol/L | 140 (137, 143) | 140 (138, 143) | 139.0 (135, 143) |
| Potassium, mmol/L | 3.9 (3.5, 4.2) | 3.9 (3.5, 4.2) | 3.9 (3.5, 4.5) |
| Chlorine, mmol/L | 105. (102, 107) | 105 (102, 107) | 103 (100, 108) |
| D-dimer, mg/L | 0.4 (0.2, 0.9) | 0.4 (0.2, 0.7) | 1.6 (0.6, 6.2) |
| PT, seconds | 12.2 (10.6, 13.7) | 12.1 (10.5, 13.6) | 12.8 (11.5, 14.4) |
| APTT, seconds | 30.0 (25.2, 34.8) | 29.8 (24.9, 34.7) | 31.3 (27.1, 36.4) |
| INR | 1.0 (0.9, 1.1) | 1.0 (0.9, 1.1) | 1.0 (1.0, 1.2) |
| FIB, g/L | 3.6 (2.9, 4.4) | 3.6 (2.8, 4.4) | 3.9 (3.0, 4.7) |

Notes: Continuous variables were shown as median and interquartile range, categorical variables were shown as number and percentages.

Abbreviations: CHD=coronary artery heart disease, COPD=chronic obstructive pulmonary disease, CKD=chronic kidney disease, SpO2=saturation of pulse oxygen, ALT=Alanine aminotransferase, AST=Aspartate aminotransferase, BUN=blood urea nitrogen, PT=Prothrombin time, APTT=activated partial thromboplastin time, INR=international normalized ratio, FIB=fibrinogen.

Supplementary Table 3. Comparisons of different models with ranked AUC among 2,188 Patients

|  |  |  |
| --- | --- | --- |
| Models | AUCs | Delong *p*-value |
| SpO2 | 0.814 |  |
| SpO2 + LDH | 0.850 | **0.009** |
| SpO2 + LDH + Age | 0.908 | **<0.001** |
| SpO2 + LDH + Age + CRP | 0.914 | **0.025** |
| SpO2 + LDH + Age + CRP + NLR | 0.918 | **0.038** |
| SpO2 + LDH + Age + CRP + NLR + BUN | 0.920 | 0.1224 |

Notes: Delong p-value compared the change of AUC from the previous model.

Abbreviations: SpO2=oxygen saturation, NLR=neutrophil/lymphocyte ratio, LDH=lactate dehydrogenase, CRP=C-reactive protein, BUN=blood urea nitrogen

Supplementary Table 4. Coefficients and odds ratio in the CRPS and SCRPS model

|  |  |  |
| --- | --- | --- |
| Variables | Coefficients (95% CI) | Odds ratio (95% CI) |
| 1. CRPS model |  |  |
| SpO2 | -4.796 (-5.390 to -4.215) | 0.008 (0.005 to 0.015) |
| Age | 3.602 (2.880 to 4.148) | 36.672 (17.814 to 63.307) |
| LDH | 2.670 (1.747 to 3.585) | 14.440 (5.737 to 36.053) |
| NLR | 2.521 (1.940 to 3.087) | 12.441 (6.959 to 21.911) |
| CRP | 3.571 (2.491 to 4.345) | 35.552 (12.073 to 77.092) |
| Intercept | -1.026(-1.595 to -0.374) |  |
| 1. SCRPS model |  |  |
| SpO2 | -5.721 (-6.312 to -5.065) | 0.003 (0.002 to 0.006) |
| Age | 4.112 (3.387 to 4.885) | 61.069 (29.577 to 132.29) |
| Intercept | 0.550(-0.093 to 1.250) |  |

Notes: CRPS: COVID-19 risk prediction score; SCRPS: Simplified version of COVID-19 risk prediction score.

Abbreviations: SpO2=saturation of pulse oxygen, LDH=lactate dehydrogenase, NLR=Neutrophil/Lymphocyte, CRP= C-reactive protein