**Supplementary Materials**

Supplementary materials for “Early triage of patients diagnosed with COVID-19 based on predicted prognosis: A Korean national cohort study”

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**Figure S1. Ordinal logistic regression nomograms of Models 1, 2A, 2B, 3, and 4.** The nomogram is used by first giving each variable a score on the ‘Point’ scale. The points for all variables are then added to obtain the total points and a vertical line is drawn from the ‘Total points’ row to estimate the probability of requiring treatment and that of requiring critical care or death.

(A) Ordinal logistic regression nomograms of Model 1



(B) Ordinal logistic regression nomograms of Model 2A



(C) Ordinal logistic regression nomograms of Model 2B



(D) Ordinal logistic regression nomograms of Model 3



(E) Ordinal logistic regression nomograms of Model 4



**Table S1. Criteria for COVID-19 severity proposed by the Korea Medical Association**

|  |  |
| --- | --- |
| **Severity** | **Criteria** |
| **Asymptomatic** | All of the following conditions must be met:  1: No altered consciousness  2: Younger than 50 years  3: No underlying disease  4: Temperature <37.5°C without taking antipyretics  5: No smoking |
| **Mild** | No altered consciousness AND at least one of the following conditions:  1: Younger than 50 years  2: No underlying disease  3: Temperature ≤38°C while taking antipyretics  4: More than one relevant symptom\* except for altered consciousness  5: Smoking |
| **Moderate** | No altered consciousness AND at least one of the following conditions:  1: Temperature >38°C while taking antipyretics  2: Shortness of breath (dyspnea)  3: Radiologic evidence of pneumonia |
| **Severe** | At least one of the following conditions:  1: Altered consciousness  2: Moderate or severe shortness of breath (dyspnea)  3: Oxygen saturation ≤ 90%  4: Radiologic evidence of moderate pneumonia involving lungs bilaterally or >50% |

If a patient is from a long-term care facility or facility for the handicapped, disease severity should be upgraded by one level. Forty-eight hours after the relevant symptoms are resolved, disease severity can be downgraded by one level.

\*headache, cough, sore throat, sputum production, fatigue, myalgia, shortness of breath (dyspnea)

**Table S2. Modified Early Warning Score (MEWS)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Score** | **3** | **2** | **1** | **0** | **1** | **2** | **3** |
| Respiratory rate (per min) |  | ≤ 8 |  | 9–14 | 15–20 | 21–29 | > 29 |
| Heart rate (per min) |  | ≤ 40 | 41–50 | 51–100 | 101–110 | 111–129 | > 129 |
| Systolic BP (mmHg) | ≤ 70 | 71–80 | 81–100 | 101–199 |  | ≥ 200 |  |
| Temperature (°C) |  | ≤ 35 | 35.1–36 | 36.1–38 | 38.1–38.5 | ≥ 38.6 |  |
| Neurological |  |  |  | Alert | Reacting to voice | Reacting to pain | Unresponsive |

According to the sum of the scores, disease severity can be determined as follows: 0-4, mild (low risk); 5-6, moderate (intermediate risk); 7 or higher, severe (high risk). If the total score is 7 or higher (high risk), consider applying critical care.

**Table S3. Characteristics of patients in the training and test cohorts**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | | **Training cohort**  **(n = 3940)** | **Test cohort**  **(n = 1656)** | ***p-*value** | **Total**  **(n = 5596)** |
| Age | 0-9 years | 43 (65.2%) | 23 (34.8%) | 0.920 | 66 (100%) |
| 10-19 years | 148 (72.2%) | 57 (27.8%) |  | 205 (100%) |
| 20-29 years | 774 (69.8%) | 335 (30.2%) |  | 1109 (100%) |
| 30-39 years | 400 (71.2%) | 162 (28.8%) |  | 562 (100%) |
| 40-49 years | 522 (70.6%) | 217 (29.4%) |  | 739 (100%) |
| 50-59 years | 801 (70.3%) | 339 (29.7%) |  | 1140 (100%) |
| 60-69 years | 633 (69.9%) | 273 (30.1%) |  | 906 (100%) |
| 70-79 years | 383 (70.3%) | 162 (29.7%) |  | 545 (100%) |
| ≥80 years | 217 (67%) | 107 (33%) |  | 324 (100%) |
| Sex | Female | 2297 (69.8%) | 992 (30.2%) | 0.677 | 3289 (100%) |
| Male | 1624 (70.4%) | 683 (29.6%) |  | 2307 (100%) |
| Pregnancy | No | 3899 (70%) | 1669 (30%) | 0.923 | 5568 (100%) |
| Yes | 14 (73.7%) | 5 (26.3%) |  | 19 (100%) |
| Missing | 8 (88.9%) | 1 (11.1%) |  | 9 (100%) |
| Body mass index (kg/cm2) | <18.5 | 177 (68.3%) | 82 (31.7%) | 0.294 | 259 (100%) |
| 18.5-23 | 1271 (68.6%) | 583 (31.4%) |  | 1854 (100%) |
| 23-25 | 735 (71.2%) | 298 (28.8%) |  | 1033 (100%) |
| 25-30 | 752 (72%) | 293 (28%) |  | 1045 (100%) |
| >30 | 142 (68.6%) | 65 (31.4%) |  | 207 (100%) |
| Missing | 844 (70.5%) | 354 (29.5%) |  | 1198 (100%) |
| Subjective fever | Absent | 2992 (69.7%) | 1302 (30.3%) | 0.263 | 4294 (100%) |
| Present | 929 (71.4%) | 373 (28.6%) |  | 1302 (100%) |
| Cough | Absent | 2288 (70.1%) | 977 (29.9%) | 1.000 | 3265 (100%) |
| Present | 1633 (70.1%) | 698 (29.9%) |  | 2331 (100%) |
| Sputum | Absent | 2810 (70.5%) | 1175 (29.5%) | 0.265 | 3985 (100%) |
| Present | 1111 (69%) | 500 (31%) |  | 1611 (100%) |
| Dyspnea | Absent | 3471 (70.4%) | 1460 (29.6%) | 0.163 | 4931 (100%) |
| Present | 450 (67.7%) | 215 (32.3%) |  | 665 (100%) |
| Sore throat | Absent | 3312 (70.1%) | 1412 (29.9%) | 0.904 | 4724 (100%) |
| Present | 609 (69.8%) | 263 (30.2%) |  | 872 (100%) |
| Rhinorrhea | Absent | 3493 (70.2%) | 1486 (29.8%) | 0.722 | 4979 (100%) |
| Present | 428 (69.4%) | 189 (30.6%) |  | 617 (100%) |
| Myalgia | Absent | 3275 (70%) | 1402 (30%) | 0.901 | 4677 (100%) |
| Present | 646 (70.3%) | 273 (29.7%) |  | 919 (100%) |
| Fatigue | Absent | 3759 (70.1%) | 1604 (29.9%) | 0.912 | 5363 (100%) |
| Present | 162 (69.5%) | 71 (30.5%) |  | 233 (100%) |
| Headache | Absent | 3251 (70.2%) | 1382 (29.8%) | 0.742 | 4633 (100%) |
| Present | 670 (69.6%) | 293 (30.4%) |  | 963 (100%) |
| Nausea or vomiting | Absent | 3745 (70%) | 1607 (30%) | 0.517 | 5352 (100%) |
| Present | 176 (72.1%) | 68 (27.9%) |  | 244 (100%) |
| Diarrhea | Absent | 3559 (70.1%) | 1521 (29.9%) | 1.000 | 5080 (100%) |
| Present | 362 (70.2%) | 154 (29.8%) |  | 516 (100%) |
| Altered consciousness | Absent | 3894 (70%) | 1667 (30%) | 0.464 | 5561 (100%) |
| Present | 27 (77.1%) | 8 (22.9%) |  | 35 (100%) |
| Diabetes mellitus | Absent | 3432 (69.9%) | 1477 (30.1%) | 0.526 | 4909 (100%) |
| Present | 489 (71.2%) | 198 (28.8%) |  | 687 (100%) |
| Hypertension | Absent | 3098 (70.4%) | 1300 (29.6%) | 0.257 | 4398 (100%) |
| Present | 823 (68.7%) | 375 (31.3%) |  | 1198 (100%) |
| Heart disease | Absent | 3878 (70%) | 1659 (30%) | 0.740 | 5537 (100%) |
| Present | 43 (72.9%) | 16 (27.1%) |  | 59 (100%) |
| Asthma | Absent | 3833 (70.1%) | 1635 (29.9%) | 0.817 | 5468 (100%) |
| Present | 88 (68.8%) | 40 (31.2%) |  | 128 (100%) |
| Chronic obstructive pulmonary disease | Absent | 3894 (70.1%) | 1662 (29.9%) | 0.855 | 5556 (100%) |
| Present | 27 (67.5%) | 13 (32.5%) |  | 40 (100%) |
| Chronic kidney disease | Absent | 3882 (70.1%) | 1659 (29.9%) | 1.000 | 5541 (100%) |
| Present | 39 (70.9%) | 16 (29.1%) |  | 55 (100%) |
| Cancer | Absent | 3819 (70.1%) | 1632 (29.9%) | 1.000 | 5451 (100%) |
| Present | 102 (70.3%) | 43 (29.7%) |  | 145 (100%) |
| Chronic liver disease | Absent | 3638 (70.1%) | 1552 (29.9%) | 0.755 | 5190 (100%) |
| Present | 60 (72.3%) | 23 (27.7%) |  | 83 (100%) |
| missing | 223 (69%) | 100 (31%) |  | 323 (100%) |
| Autoimmune disease | Absent | 3669 (70.2%) | 1560 (29.8%) | 0.446 | 5229 (100%) |
| Present | 24 (63.2%) | 14 (36.8%) |  | 38 (100%) |
| missing | 228 (69.3%) | 101 (30.7%) |  | 329 (100%) |
| Dementia | Absent | 3538 (70.1%) | 1508 (29.9%) | 1.000 | 5046 (100%) |
| Present | 157 (70.1%) | 67 (29.9%) |  | 224 (100%) |
| missing | 226 (69.3%) | 100 (30.7%) |  | 326 (100%) |
| Heart rate (beat/min) | Bradycardia (<60) | 81 (75%) | 27 (25%) | 0.490 | 108 (100%) |
| Normal (60-100) | 3079 (69.9%) | 1324 (30.1%) |  | 4403 (100%) |
| Tachycardia (>100) | 666 (69.4%) | 293 (30.6%) |  | 959 (100%) |
| Missing | 95 (75.4%) | 31 (24.6%) |  | 126 (100%) |
| Body temperature (°C) | <37.5 | 3431 (70.2%) | 1454 (29.8%) | 0.785 | 4885 (100%) |
| 37.5-38 | 316 (68.3%) | 147 (31.7%) |  | 463 (100%) |
| 38-38.5 | 92 (67.6%) | 44 (32.4%) |  | 136 (100%) |
| 38.5≥38.5 | 53 (72.6%) | 20 (27.4%) |  | 73 (100%) |
| Missing | 29 (74.4%) | 10 (25.6%) |  | 39 (100%) |
| Systolic blood pressure (mmHg) | <120 | 928 (71.1%) | 378 (28.9%) | 0.196 | 1306 (100%) |
| 120-129 | 823 (72.3%) | 315 (27.7%) |  | 1138 (100%) |
| 130-139 | 745 (68.8%) | 338 (31.2%) |  | 1083 (100%) |
| 140-159 | 972 (68.6%) | 445 (31.4%) |  | 1417 (100%) |
| ≥160 | 353 (68.8%) | 160 (31.2%) |  | 513 (100%) |
| Missing | 100 (71.9%) | 39 (28.1%) |  | 139 (100%) |
| Diastolic blood pressure (mmHg) | <80 | 1472 (70%) | 630 (30%) | 0.597 | 2102 (100%) |
| 80-89 | 1265 (70.4%) | 531 (29.6%) |  | 1796 (100%) |
| 90-99 | 723 (68.5%) | 332 (31.5%) |  | 1055 (100%) |
| ≥100 | 361 (71.6%) | 143 (28.4%) |  | 504 (100%) |
| Missing | 100 (71.9%) | 39 (28.1%) |  | 139 (100%) |
| Hemoglobin (g/dL) | Anemia | 718 (70%) | 307 (30%) | 0.082 | 1025 (100%) |
| Normal\* | 1778 (70.5%) | 745 (29.5%) |  | 2523 (100%) |
| Elevated | 349 (65.6%) | 183 (34.4%) |  | 532 (100%) |
| Missing | 1076 (71%) | 440 (29%) |  | 1516 (100%) |
| Hematocrit (%) | Anemia | 613 (70.3%) | 259 (29.7%) | 0.230 | 872 (100%) |
| Normal\*\* | 1846 (70.2%) | 784 (29.8%) |  | 2630 (100%) |
| Elevated | 382 (66.7%) | 191 (33.3%) |  | 573 (100%) |
| Missing | 1080 (71%) | 441 (29%) |  | 1521 (100%) |
| White blood cell count (×103/µL) | Leukocytopenia (<4) | 487 (70.7%) | 202 (29.3%) | 0.318 | 689 (100%) |
| Normal (4-11) | 2203 (69.8%) | 951 (30.2%) |  | 3154 (100%) |
| Leukocytosis (≥ 11) | 156 (65.5%) | 82 (34.5%) |  | 238 (100%) |
| Missing | 1075 (71%) | 440 (29%) |  | 1515 (100%) |
| Lymphocyte count (×103/µL) | Lymphocytopenia (<1) | 546 (69.6%) | 239 (30.4%) | 0.319 | 785 (100%) |
| Normal (1-4.8) | 2258 (69.7%) | 980 (30.3%) |  | 3238 (100%) |
| Lymphocytosis (>4.8) | 19 (57.6%) | 14 (42.4%) |  | 33 (100%) |
| Missing | 1098 (71.3%) | 442 (28.7%) |  | 1540 (100%) |
| Platelet count (×103/µL) | Thrombocytopenia (<150) | 362 (72.4%) | 138 (27.6%) | 0.384 | 500 (100%) |
| Normal (150-450) | 2434 (69.4%) | 1075 (30.6%) |  | 3509 (100%) |
| Thrombocytosis (>450) | 50 (69.4%) | 22 (30.6%) |  | 72 (100%) |
| Missing | 1075 (71%) | 440 (29%) |  | 1515 (100%) |

Values in cells and parentheses are the number and percentage of patients, respectively.

\*Male, 13.8–17.2 g/dL; Female, 12.1–15.1 g/dL

\*\*Male, 41–50%; Female, 36–48%

**Table S4. The full results of predictor selection**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Tier 1** | | | **Tiers 1/2** | | | **Tiers 1/3** | | | **Tiers 1/2/3** | | | **Tiers 1/2/3/4** | | |
| **Variable** | OR | Frequency | VI | OR | Frequency | VI | OR | Frequency | VI | OR | Frequency | VI | OR | Frequency | VI |
| Age, 50-59y | 1.062 (0.009) | 100% (500/500) | 24.551 (2.471) | 1.015 (0.009) | 93.6% (468/500) | 13.196 (1.679) | 1.061 (0.009) | 100% (500/500) | 22.811 (2.219) | 1.025 (0.01) | 100% (500/500) | 13.467 (1.476) | 1.002 (0.004) | 32% (160/500) | 13.563 (1.759) |
| Age, 60-69y | 1.19 (0.015) | 100% (500/500) |  | 1.11 (0.015) | 100% (500/500) |  | 1.181 (0.015) | 100% (500/500) |  | 1.113 (0.016) | 100% (500/500) |  | 1.053 (0.016) | 100% (500/500) |  |
| Age, 70-79y | 1.596 (0.037) | 100% (500/500) |  | 1.44 (0.035) | 100% (500/500) |  | 1.599 (0.038) | 100% (500/500) |  | 1.403 (0.033) | 100% (500/500) |  | 1.264 (0.03) | 100% (500/500) |  |
| Age, >=80y | 2.803 (0.122) | 100% (500/500) |  | 2.231 (0.102) | 100% (500/500) |  | 3.034 (0.13) | 100% (500/500) |  | 2.239 (0.111) | 100% (500/500) |  | 1.939 (0.093) | 100% (500/500) |  |
| Male sex | 1.091 (0.01) | 100% (500/500) | 4.405 (1.561) | 1.117 (0.011) | 100% (500/500) | 3.768 (1.611) | 1.103 (0.01) | 100% (500/500) | 5.145 (1.788) | 1.098 (0.011) | 100% (500/500) | 4.507 (1.42) | 1.092 (0.013) | 100% (500/500) | 3.145 (1.308) |
| Pregnancy | 1 (0) | 0% (0/500) | -0.113 (0.431) |  |  |  |  |  |  |  |  |  |  |  |  |
| BMI, underweight | 0.999 (0.003) | 6.8% (34/500) | -0.877 (1.352) |  |  |  |  |  |  |  |  |  |  |  |  |
| BMI, obese | 1.021 (0.011) | 96.4% (482/500) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Subjective fever | 1.211 (0.014) | 100% (500/500) | 10.094 (2.035) | 1.193 (0.014) | 100% (500/500) | 7.871 (1.785) | 1.096 (0.015) | 100% (500/500) | 7.284 (1.956) | 1.125 (0.017) | 100% (500/500) | 9.073 (1.601) | 1.099 (0.022) | 100% (500/500) | 7.042 (1.681) |
| Cough | 1 (0.001) | 2.2% (11/500) | 0.958 (1.496) |  |  |  |  |  |  |  |  |  |  |  |  |
| Sputum production | 1.004 (0.006) | 54.8% (274/500) | 1.994 (1.445) |  |  |  |  |  |  |  |  |  |  |  |  |
| Sore throat | 0.975 (0.009) | 99.8% (499/500) | 2.311 (1.466) |  |  |  |  |  |  |  |  |  |  |  |  |
| Rhinorrhea | 0.934 (0.01) | 100% (500/500) | 2.808 (1.325) | 0.954 (0.01) | 100% (500/500) | -0.079 (1.367) | 0.932 (0.01) | 100% (500/500) | 1.41 (1.449) |  |  |  |  |  |  |
| Myalgia | 0.999 (0.003) | 16.6% (83/500) | 0.014 (1.439) |  |  |  |  |  |  |  |  |  |  |  |  |
| Fatigue | 1.004 (0.008) | 28% (140/500) | -1.14 (1.311) |  |  |  |  |  |  |  |  |  |  |  |  |
| Dyspnea | 1.665 (0.035) | 100% (500/500) | 19.52 (2.176) | 1.761 (0.04) | 100% (500/500) | 22.778 (2.395) | 1.67 (0.037) | 100% (500/500) | 20.109 (2.22) | 1.678 (0.036) | 100% (500/500) | 14.456 (1.938) | 1.609 (0.036) | 100% (500/500) | 13.531 (1.921) |
| Headache | 0.948 (0.01) | 100% (500/500) | 1.996 (1.48) |  |  |  |  |  |  |  |  |  |  |  |  |
| Altered consciousness | 3.855 (0.462) | 100% (500/500) | 11.742 (1.911) | 2.479 (0.321) | 100% (500/500) | 6.378 (1.722) | 3.375 (0.39) | 100% (500/500) | 10.674 (1.999) | 3.45 (0.474) | 100% (500/500) | 8.738 (1.625) | 3.457 (0.519) | 100% (500/500) | 7.843 (1.371) |
| Nausea or vomiting | 1.005 (0.011) | 26.8% (134/500) | 0.001 (1.41) |  |  |  |  |  |  |  |  |  |  |  |  |
| Diarrhea | 0.999 (0.004) | 16.6% (83/500) | 2.414 (1.514) |  |  |  |  |  |  |  |  |  |  |  |  |
| Diabetes mellitus |  |  |  | 1.148 (0.025) | 100% (500/500) | 1.134 (1.622) |  |  |  | 1.119 (0.023) | 100% (500/500) | 3.741 (1.43) | 1.097 (0.024) | 100% (500/500) | 4.133 (1.426) |
| Hypertension |  |  |  | 1.037 (0.015) | 99.2% (496/500) | 6.05 (1.684) |  |  |  | 1.069 (0.018) | 100% (500/500) | 4.737 (1.408) | 1.055 (0.018) | 99.8% (499/500) | 5.072 (1.569) |
| Heart disease |  |  |  | 1.151 (0.108) | 91.4% (457/500) | 3.581 (1.594) |  |  |  | 1.323 (0.126) | 99.8% (499/500) | 2.809 (1.337) | 1.244 (0.123) | 97.8% (489/500) | 1.319 (1.314) |
| Asthma |  |  |  | 0.992 (0.018) | 31% (155/500) | 1.125 (1.354) |  |  |  |  |  |  |  |  |  |
| COPD |  |  |  | 1.028 (0.05) | 42.6% (213/500) | 1.672 (1.445) |  |  |  |  |  |  |  |  |  |
| Chronic kidney disease |  |  |  | 1.275 (0.11) | 99% (495/500) | 3.068 (1.758) |  |  |  | 1.568 (0.152) | 100% (500/500) | 2.9 (1.524) | 1.666 (0.168) | 100% (500/500) | 2.72 (1.476) |
| Cancer |  |  |  | 1.198 (0.05) | 100% (500/500) | 0.904 (1.419) |  |  |  | 1.166 (0.05) | 100% (500/500) | 0.85 (1.372) | 1.168 (0.046) | 100% (500/500) | 1.756 (1.396) |
| Chronic liver disease |  |  |  | 1.001 (0.009) | 11% (55/500) | 0.589 (1.35) |  |  |  |  |  |  |  |  |  |
| Dementia |  |  |  | 1.464 (0.082) | 100% (500/500) | 6.075 (1.497) |  |  |  | 1.301 (0.077) | 100% (500/500) | 6.261 (1.304) | 1.288 (0.073) | 100% (500/500) | 6.41 (1.472) |
| Autoimmune disease |  |  |  | 1.16 (0.077) | 87.2% (436/500) | 2.153 (1.586) |  |  |  |  |  |  |  |  |  |
| Tachycardia |  |  |  |  |  |  | 1.056 (0.013) | 100% (500/500) | 3.529 (1.663) | 1.052 (0.014) | 100% (500/500) | 0.499 (1.312) | 1.02 (0.014) | 88.4% (442/500) | 1.201 (1.257) |
| Temperature, 37.5-38°C |  |  |  |  |  |  | 1.077 (0.025) | 99.8% (499/500) | 6.974 (1.743) | 1.051 (0.024) | 98.2% (491/500) | 6.489 (1.397) | 1.069 (0.029) | 99.4% (497/500) | 4.267 (1.344) |
| Temperature, 38-38.5°C |  |  |  |  |  |  | 1.384 (0.065) | 100% (500/500) |  | 1.337 (0.064) | 100% (500/500) |  | 1.141 (0.059) | 99.2% (496/500) |  |
| Temperature, >38.5°C |  |  |  |  |  |  | 1.309 (0.075) | 100% (500/500) |  | 1.283 (0.069) | 100% (500/500) |  | 1.134 (0.068) | 97.2% (486/500) |  |
| Systolic BP ≥ 160mmHg |  |  |  |  |  |  | 0.994 (0.01) | 46.6% (233/500) | 1.436 (1.662) | 0.991 (0.013) | 56.6% (283/500) | -0.623 (1.262) |  |  |  |
| Anemia |  |  |  |  |  |  |  |  |  |  |  |  | 1.064 (0.019) | 100% (500/500) | 2.014 (1.38) |
| Thrombocytopenia |  |  |  |  |  |  |  |  |  |  |  |  | 1.133 (0.029) | 100% (500/500) | 2.628 (1.513) |
| Leukocytosis |  |  |  |  |  |  |  |  |  |  |  |  | 1.342 (0.046) | 100% (500/500) | 4.896 (1.504) |
| Lymphocytopenia |  |  |  |  |  |  |  |  |  |  |  |  | 1.452 (0.029) | 100% (500/500) | 13.322 (1.835) |

VI, variable importance; BMI, body mass index; COPD, Chronic obstructive pulmonary disease; BP, blood pressure.

**Table S5. The full results of model performances**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | | **No significant treatment Vs. O2 therapy or more** | | | | | | | **No critical care required Vs. Critical care\* or death** | | | | | | |
| AUC | TP/TN/FP/FN | Sensitivity | Specificity | Accuracy | Precision | NPV | AUC | TP/TN/FP/FN | Sensitivity | Specificity | Accuracy | Precision | NPV |
| OLR | Model1 | 0.880 (0.855-0.904) | 193/1199/236/48 | 80.1% (74.5-84.9) | 83.6% (81.5-85.4) | 83.1% (81.2-84.8) | 45% (40.2-49.8) | 96.2% (94.9-97.1) | 0.903 (0.869-0.937) | 75/1336/251/14 | 84.3% (75-91.1) | 84.2% (82.3-85.9) | 84.2% (82.4-85.9) | 23% (18.5-28) | 99% (98.3-99.4) |
| Model2A | 0.889 (0.865-0.912) | 195/1119/209/43 | 81.9% (76.4-86.6) | 84.3% (82.2-86.2) | 83.9% (82-85.7) | 48.3% (43.3-53.3) | 96.3% (95-97.3) | 0.905 (0.869-0.94) | 81/1164/313/8 | 91% (83.1-96) | 78.8% (76.6-80.9) | 79.5% (77.4-81.5) | 20.6% (16.7-24.9) | 99.3% (98.7-99.7) |
| Model2B | 0.866 (0.841-0.892) | 181/1147/261/53 | 77.4% (71.4-82.5) | 81.5% (79.3-83.5) | 80.9% (78.9-82.8) | 41% (36.3-45.7) | 95.6% (94.3-96.7) | 0.914 (0.884-0.944) | 72/1312/247/11 | 86.7% (77.5-93.2) | 84.2% (82.2-85.9) | 84.3% (82.4-86) | 22.6% (18.1-27.6) | 99.2% (98.5-99.6) |
| Model3 | 0.894 (0.871-0.917) | 192/1082/210/40 | 82.8% (77.3-87.4) | 83.7% (81.6-85.7) | 83.6% (81.6-85.4) | 47.8% (42.8-52.8) | 96.4% (95.2-97.4) | 0.922 (0.892-0.953) | 76/1199/242/7 | 91.6% (83.4-96.5) | 83.2% (81.2-85.1) | 83.7% (81.7-85.5) | 23.9% (19.3-29) | 99.4% (98.8-99.8) |
| Model4 | 0.907 (0.884-0.929) | 189/835/172/31 | 85.9% (80.6-90.2) | 82.9% (80.5-85.2) | 83.5% (81.3-85.5) | 52.4% (47.1-57.6) | 96.4% (95-97.6) | 0.927 (0.894-0.96) | 68/1046/100/13 | 84% (74.1-91.2) | 91.3% (89.5-92.8) | 90.8% (89-92.3) | 40.5% (33-48.3) | 98.8% (97.9-99.3) |
| RF | Model1 | 0.793 (0.762-0.825) | 160/1299/136/81 | 66.4% (60-72.3) | 90.5% (88.9-92) | 87.1% (85.4-88.6) | 54.1% (48.2-59.8) | 94.1% (92.8-95.3) | 0.825 (0.776-0.874) | 66/1393/194/23 | 74.2% (63.8-82.9) | 87.8% (86.1-89.3) | 87.1% (85.4-88.6) | 25.4% (20.2-31.1) | 98.4% (97.6-99) |
|  | Model2A | 0.843 (0.813-0.872) | 187/1130/198/51 | 78.6% (72.8-83.6) | 85.1% (83.1-87) | 84.1% (82.2-85.9) | 48.6% (43.5-53.7) | 95.7% (94.4-96.8) | 0.858 (0.812-0.904) | 68/1321/156/21 | 76.4% (66.2-84.8) | 89.4% (87.8-91) | 88.7% (87-90.2) | 30.4% (24.4-36.8) | 98.4% (97.6-99) |
|  | Model2B | 0.806 (0.774-0.838) | 167/1210/198/67 | 71.4% (65.1-77.1) | 85.9% (84-87.7) | 83.9% (82-85.6) | 45.8% (40.6-51) | 94.8% (93.4-95.9) | 0.863 (0.819-0.908) | 69/1348/211/14 | 83.1% (73.3-90.5) | 86.5% (84.7-88.1) | 86.3% (84.5-87.9) | 24.6% (19.7-30.1) | 99% (98.3-99.4) |
|  | Model3 | 0.86 (0.833-0.888) | 194/1051/241/38 | 83.6% (78.2-88.1) | 81.3% (79.1-83.4) | 81.7% (79.7-83.6) | 44.6% (39.9-49.4) | 96.5% (95.2-97.5) | 0.91 (0.876-0.944) | 74/1206/235/9 | 89.2% (80.4-94.9) | 83.7% (81.7-85.6) | 84% (82.1-85.8) | 23.9% (19.3-29.1) | 99.3% (98.6-99.7) |
|  | Model4 | 0.884 (0.857-0.911) | 190/799/208/30 | 86.4% (81.1-90.6) | 79.3% (76.7-81.8) | 80.6% (78.3-82.8) | 47.7% (42.7-52.8) | 96.4% (94.9-97.5) | 0.925 (0.892-0.958) | 69/1017/129/12 | 85.2% (75.6-92.1) | 88.7% (86.8-90.5) | 88.5% (86.6-90.2) | 34.8% (28.2-41.9) | 98.8% (98-99.4) |
| Linear SVM | Model1 | 0.851 (0.825-0.877) | 179/1142/292/62 | 74.3% (68.3-79.7) | 79.6% (77.5-81.7) | 78.9% (76.8-80.8) | 38% (33.6-42.6) | 94.9% (93.4-96) | 0.898 (0.863-0.932) | 80/1210/376/9 | 89.9% (81.7-95.3) | 76.3% (74.1-78.4) | 77% (74.9-79) | 17.5% (14.2-21.4) | 99.3% (98.6-99.7) |
|  | Model2A | 0.857 (0.832-0.883) | 179/1086/252/58 | 75.5% (69.5-80.9) | 81.2% (79-83.2) | 80.3% (78.3-82.3) | 41.5% (36.8-46.3) | 94.9% (93.5-96.1) | 0.896 (0.86-0.931) | 78/1191/295/11 | 87.6% (79-93.7) | 80.1% (78-82.1) | 80.6% (78.5-82.5) | 20.9% (16.9-25.4) | 99.1% (98.4-99.5) |
|  | Model2B | 0.859 (0.832-0.885) | 179/1151/257/55 | 76.5% (70.5-81.8) | 81.7% (79.6-83.7) | 81% (79-82.9) | 41.1% (36.4-45.8) | 95.4% (94.1-96.5) | 0.91 (0.879-0.941) | 73/1306/253/10 | 88% (79-94.1) | 83.8% (81.8-85.6) | 84% (82.1-85.7) | 22.4% (18-27.3) | 99.2% (98.6-99.6) |
|  | Model3 | 0.857 (0.83-0.883) | 163/1149/163/67 | 70.9% (64.5-76.7) | 87.6% (85.7-89.3) | 85.1% (83.2-86.8) | 50% (44.4-55.6) | 94.5% (93.1-95.7) | 0.913 (0.882-0.944) | 76/1180/279/7 | 91.6% (83.4-96.5) | 80.9% (78.8-82.9) | 81.5% (79.4-83.4) | 21.4% (17.3-26) | 99.4% (98.8-99.8) |
|  | Model4 | 0.87 (0.842-0.897) | 169/821/191/46 | 78.6% (72.5-83.9) | 81.1% (78.6-83.5) | 80.7% (78.4-82.9) | 46.9% (41.7-52.2) | 94.7% (93-96.1) | 0.921 (0.888-0.955) | 68/1011/135/13 | 84% (74.1-91.2) | 88.2% (86.2-90) | 87.9% (86-89.7) | 33.5% (27-40.4) | 98.7% (97.8-99.3) |
| RBF SVM | Model1 | 0.625 (0.577-0.673) | 105/1363/71/136 | 43.6% (37.2-50.1) | 95% (93.8-96.1) | 87.6% (86-89.2) | 59.7% (52-67) | 90.9% (89.4-92.3) | 0.863 (0.819-0.907) | 75/1260/326/14 | 84.3% (75-91.1) | 79.4% (77.4-81.4) | 79.7% (77.7-81.6) | 18.7% (15-22.9) | 98.9% (98.2-99.4) |
|  | Model2A | 0.727 (0.684-0.771) | 142/1189/149/95 | 59.9% (53.4-66.2) | 88.9% (87.1-90.5) | 84.5% (82.6-86.3) | 48.8% (42.9-54.7) | 92.6% (91-94) | 0.877 (0.836-0.919) | 76/1228/258/13 | 85.4% (76.3-92) | 82.6% (80.6-84.5) | 82.8% (80.8-84.6) | 22.8% (18.4-27.6) | 99% (98.2-99.4) |
|  | Model2B | 0.759 (0.72-0.799) | 134/1248/160/100 | 57.3% (50.7-63.7) | 88.6% (86.9-90.2) | 84.2% (82.3-85.9) | 45.6% (39.8-51.5) | 92.6% (91.1-93.9) | 0.879 (0.837-0.922) | 71/1329/230/12 | 85.5% (76.1-92.3) | 85.2% (83.4-87) | 85.3% (83.5-86.9) | 23.6% (18.9-28.8) | 99.1% (98.4-99.5) |
|  | Model3 | 0.796 (0.761-0.831) | 158/1140/172/72 | 68.7% (62.3-74.6) | 86.9% (84.9-88.7) | 84.2% (82.3-86) | 47.9% (42.4-53.4) | 94.1% (92.6-95.3) | 0.906 (0.873-0.94) | 77/1201/258/6 | 92.8% (84.9-97.3) | 82.3% (80.3-84.2) | 82.9% (80.9-84.7) | 23% (18.6-27.9) | 99.5% (98.9-99.8) |
|  | Model4 | 0.813 (0.773-0.853) | 162/830/182/53 | 75.3% (69-81) | 82% (79.5-84.3) | 80.8% (78.5-83) | 47.1% (41.7-52.5) | 94% (92.2-95.5) | 0.903 (0.86-0.946) | 70/986/160/11 | 86.4% (77-93) | 86% (83.9-88) | 86.1% (84-88) | 30.4% (24.6-36.8) | 98.9% (98-99.4) |
| KMA model | | 0.723 (0.693-0.753) | 129/108/1308/106 | 54.9% (61.4) | 7.6% (6.3-9.148.3-) | 14.4% (12.7-16.1) | 9% (7.5-10.6) | 50.5% (43.6-57.4) | 0.728 (0.678-0.778) | 43/1395/171/42 | 50.6% (39.5-61.6) | 89.1% (87.4-90.6) | 87.1% (85.4-88.7) | 20.1% (14.9-26.1) | 97.1% (96.1-97.9) |
| MEWS | | 0.598 (0.563-0.633) | 129/314/1023/98 | 56.8% (50.1-63.4) | 23.5% (21.2-25.9) | 28.3% (26.1-30.6) | 11.2% (9.4-13.2) | 76.2% (71.8-80.2) | 0.631 (0.574-0.689) | 41/1112/371/40 | 50.6% (39.3-61.9) | 75% (72.7-77.2) | 73.7% (71.5-75.9) | 10% (7.2-13.3) | 96.5% (95.3-97.5) |

Values in parentheses are 95% confidence intervals. OLR, ordinal logistic regression; RF, random forest; SVM, support vector machine; RBF, radial basis function; KMA, Korean Medical Association; MEWS, Modified Early Warning Score; AUC, area under the receiver operator characteristics curve; TP, true positive; TN, true negative, FP, false positive, FN, false negative; NPV, negative predictive value.

\*multi-organ failure, the use of a ventilator or extracorporeal membrane oxygenation machine.