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# Supplementary text

Quantile regression

Quantile regression is an extension of linear regression that is useful when the conditions of linear regression are not met (i.e., linearity, homoscedasticity, independence, normality, or data with outliers). In this case, quantile regression provides a useful alternative to linear regression which: 1) can be used to comprehensively study the distributional relationships of variables on different conditional quantiles; 2) can help detect heteroscedasticity; 3) is more robust to outliers.

Taking a similar structure to the linear regression model, the quantile regression model equation for the 𝜏th quantile is

where beta coefficients are functions with a dependency on the quantile 𝜏 instead of being constants. Solving the models at a particular quantile value involves almost the same process as it does for regular linear quantization, except we have to change the form of the target function to least absolute deviations estimation. More mathematic computation and theoretical details can be found in Koenker 2005 (Koenker 2005).

In our study, the data was skewed distribution with outliers for which descriptive statistical methods (e.g., ordinary linear regression) might be limited. Moreover, different measures of central tendency and statistical dispersion can be useful to obtain a more comprehensive analysis of the relationship between variables, especially for clinical analysis. Therefore, quantile regression was used in our study.

R offers a practical package “quantreg” (<https://cran.r-project.org/web/packages/quantreg/index.html>) to implement quantile regression used in our analysis.

Quantile shift (QS): a nonparametric analog of Cohen’s d

When comparing two independent groups, there are now a variety of methods aimed at measuring effect size. Certainly, one of the better-known measures of effect size is Cohen's d:

where denote sample mean from two independent random variables X, Y respectively, S is pooled sample standard deviation.

Under normality and homoscedasticity, d is reasonable. There are, however, fundamental concerns regarding Cohen's d. Because d relies on a non-robust measure of central tendency (the mean), and a non-robust measure of dispersion (SD), it is a non-robust measure of effect size, meaning that a single observation can have a dramatic effect on its value. For example, even a single outlier can inflate S, the estimate of the assumed common variance, which can result in a relatively small value for d even when, for the bulk of the data, there is a relatively large effect. Other concerns about Cohen’s d, please see the literature (Wilcox 2018).

Quantile shift (QS) effect size, a robust nonparametric analog of Cohen’s d, captures the spirit of Cohen's d and simultaneously deals with both non-normality and heteroscedasticity. It reflects a shift of location based on the median of the typical difference of the distribution between 2 groups and represents how far the median of the typical difference (D) differs from the situation where the median is zero. If groups have identical distributions, D = X-Y is symmetric about zero, the 0.5 quantile. A QS shift, say to QS = 0.6, indicates that the median of D corresponds to a shift to the 0.6 quantile when the groups have identical distributions. Thus, it captures the spirit of Cohen’s d without specifying any family of distributions. Especially, it does not require or assume normality. Under normality and homoscedasticity, Cohen’s d = 0, 0.2, 0.5, and 0.8 corresponds approximately to a QS effect of 0.5, 0.55, 0.65, and 0.7, respectively. Quantile shift effect sizes are calculated in Table S5. Note that currently there is no clear method for evaluating multivariate effect size for quantile regressions fit with robust methods. For more mathematical computation and theoretical details, please reference Wilcox’ s work (Wilcox 2018).

We calculated QS via R package “WRS2” (<https://cran.r-project.org/web/packages/WRS2/>) created by Patrick Mair and Rand Wilcox.

# Supplementary Figure and Tables



**Figure S1. All indicators in the study.** (A) Continuous variables. (B) Categorical variable. Sex = Yes represents the male.

Table S. Abbreviations and Reference Value of Laboratory Indexes

|  |  |  |
| --- | --- | --- |
| Abbreviation | Full Name | Reference Range/unit |
| WBC | White blood cell | 4-10\*109/L |
| Hb | Hemoglobin | 120-160 g/L |
| PLT | Platelet count | 100-400\*109/L |
| LYMPH | Lymphocyte count | 0.8-4\*109/L |
| Alb | Albumin | 35-55 g/L |
| ALT | Glutamic-pyruvic Transaminase | 0-50 U/L |
| AST | Glutamic Oxaloacetic Transaminase | 0-50 U/L |
| TBIL | Total bilirubin | 0-20 umol/L |
| Bun | Blood urea nitrogen | 1.7-8.2 mmol/L |
| Crea | Creatinine | 38-120 umol/L |
| UA | Uric Acid | 204-428 umol/L |
| CRP | C-reactive protein | 0-10 mg/L |
| PCT | Procalcitonin | 0-0.1 ng/ml |
| ESR | Erythrocyte Sedimentation Rate | 0-25 mm/h |
| PT | Prothrombin Time | 8.6-12 s |
| INR | International Normalized Ratio | 0.8-1.1 |
| APTT | Activated Partial Thromboplastin Time | 26-42 s |
| D-Dimer | / | 0-243 ng/ml |
| FDP | Fibrin Degradation Product | 0-5 ug/ml |
| Fib | Fibrinogen | 1.9-4.6 g/L |
| PH | / | 7.35-7.45 |
| PCO2 | Partial Pressure of Carbon Dioxide | 35-45 mmHg |
| PO2 | Partial pressure of oxygen | 75～100 mmHg |
| SO2 | Oxygen saturation | 95-98 % |
| Lat | Lactate | 0.18-3 mmol/L |
| K＋ | Potassium | 3.8-5.4 mmol/L |
| Na＋ | Sodium | 135-148 mmol/L |
| Ca2＋ | Calcium | 2.25-3 mmol/L |
| BG | Blood Glucose | 3.9-11.1 mmol/L |
| OI | Oxygenation Index | 400-500 mmHg |

Table S2. Imputation percentage of the missing data for each variable

|  |  |  |  |
| --- | --- | --- | --- |
| Variates | Percentage (%) | Variates | Percentage (%) |
| Sex | 0.00 | TBIL | 0.52 |
| Age | 0.00 | BUN | 1.04 |
| Duration | 0.00 | Crea | 1.04 |
| Fever | 0.00 | UA | 1.04 |
| Cough | 0.00 | CRP | 2.60 |
| Myalgia | 0.00 | PCT | 3.13 |
| Diarrhea | 0.00 | ESR | 4.69 |
| Chest-pain | 0.00 | PT | 3.65 |
| Dyspnea | 0.00 | INR | 4.17 |
| Digestive | 0.00 | APTT | 3.65 |
| Cardiovascular | 0.00 | D-Dimer | 3.65 |
| Cerebrovascular | 0.00 | FDP | 4.17 |
| Hematopathy | 0.00 | Fib | 3.65 |
| COPD | 0.00 | PH | 1.56 |
| Chronic-kidney | 0.00 | PCO2 | 1.56 |
| Diabetes | 0.00 | PO2 | 2.08 |
| WBC | 0.00 | SO2 | 2.08 |
| Hb | 0.00 | Lat | 5.73 |
| PLT | 0.00 | K+ | 0.52 |
| LYMPH | 0.00 | Na+ | 0.00 |
| Alb | 0.52 | Ca+ | 2.08 |
| ALT | 0.52 | BG | 13.02 |
| AST | 0.52 | OI | 0.00 |

Table S3. Checking for Normality and Homoscedasticity of Lab-examination Index

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Indexes | Non-survival (n = 50)  Mean (SD) | P (JB test) | Survival (n = 142)  Mean (SD) | P (JB test) | P (levene test) |
| WBC | 12.31 (8.15) | 0.176 | 6.47 (2.81) | < 0.001 | < 0.001 |
| Hb | 122.72 (23.83) | 0.110 | 117.15 (22.66) | < 0.001 | 0.785 |
| PLT | 157.98 (89.27) | 0.003 | 208.49 (103.07) | < 0.001 | 0.749 |
| LYMPH | 0.74 (0.79) | < 0.001 | 1.23 (0.67) | < 0.001 | 0.110 |
| Alb | 31.80 (5.40) | < 0.001 | 35.80 (6.73) | < 0.001 | 0.577 |
| ALT | 32.59 (41.88) | < 0.001 | 29.39 (35.49) | < 0.001 | 0.746 |
| AST | 37.35 (20.02) | < 0.001 | 25.60 (26.96) | < 0.001 | 0.103 |
| TBIL | 19.74 (12.48) | < 0.001 | 16.36 (14.01) | < 0.001 | 0.622 |
| BUN | 11.24 (9.23) | < 0.001 | 9.41 (10.84) | < 0.001 | 0.949 |
| Crea | 126.10 (124.40) | < 0.001 | 238.54 (436.94) | < 0.001 | 0.043 |
| UA | 312.72 (164.67) | 0.033 | 288.88 (136.72) | < 0.001 | 0.212 |
| CRP | 76.28 (46.24) | 0.204 | 25.59 (28.10) | < 0.001 | < 0.001 |
| PCT | 3.32 (6.66) | < 0.001 | 0.44 (1.37) | < 0.001 | < 0.001 |
| ESR | 48.44 (26.72) | 0.135 | 39.69 (28.00) | < 0.001 | 0.856 |
| PT | 15.18 (13.93) | < 0.001 | 12.65 (10.75) | < 0.001 | 0.082 |
| INR | 1.22 (0.16) | 0.132 | 1.10 (0.17) | < 0.001 | 0.348 |
| APTT | 33.12 (13.82) | < 0.001 | 31.51 (8.61) | < 0.001 | 0.259 |
| D-Dimer | 4839.07 (8857.28) | < 0.001 | 611.99 (2201.79) | < 0.001 | < 0.001 |
| FDP | 39.43 (70.99) | < 0.001 | 4.72 (13.48) | < 0.001 | < 0.001 |
| Fib | 4.32 (1.69) | 0.538 | 3.96 (1.14) | 0.002 | 0.002 |
| PH | 7.33 (0.17) | 0.069 | 7.39 (0.08) | < 0.001 | < 0.001 |
| PCO2 | 47.08 (23.96) | 0.014 | 38.61 (5.46) | 0.653 | < 0.001 |
| PO2 | 59.86 (27.28) | < 0.001 | 76.52 (27.73) | < 0.001 | 0.856 |
| SO2 | 85.10 (15.17) | < 0.001 | 93.37 (8.30) | < 0.001 | < 0.001 |
| Lat | 3.75 (3.21) | < 0.001 | 2.26 (1.26) | < 0.001 | 0.001 |
| K+ | 4.24 (1.42) | 0.171 | 4.03 (0.73) | 0.040 | < 0.001 |
| Na+ | 142.31 (8.75) | 0.086 | 138.58 (5.44) | 0.015 | 0.006 |
| Ca2+ | 1.80 (0.45) | 0.013 | 2.01 (0.29) | < 0.001 | 0.001 |
| BG | 10.59 (4.16) | 0.114 | 9.34 (3.44) | < 0.001 | 0.022 |
| OI | 256.78 (66.99) | 0.320 | 328.89 (135.00) | < 0.001 | 0.101 |

Table S4. Divided subgroups of laboratory indexes according to reference range

|  |  |  |  |
| --- | --- | --- | --- |
| **Abbr. (Reference range)** | **Overall (n=192)** | **Non-survival (n = 50)** | **Survival (n = 142)** |
| **WBC (4-10\*109/L)** |  |  |  |
| (Normal) | 116 (60.4%) | 16 (32.0%) | 100 (70.4%) |
| (Low) | 31 (16.1%) | 5 (10.0%) | 26 (18.3%) |
| (High) | 45 (23.4%) | 29 (58.0%) | 16 (11.3%) |
| **Hb (120-160 g/L)** |  |  |  |
| (Normal) | 105 (54.7%) | 34 (68.0%) | 71 (50.0%) |
| (Low) | 87 (45.3%) | 16 (32.0%) | 71 (50.0%) |
| **PLT (100-400\*109/L)** |  |  |  |
| (Normal) | 160 (83.3%) | 38 (76.0%) | 122 (85.9%) |
| (Low) | 22 (11.5%) | 11 (22.0%) | 11 (7.7%) |
| (High) | 10 (5.2%) | 1 (2.0%) | 9 (6.3%) |
| **LYMPH (0.8-4\*109/L)** |  |  |  |
| (Normal) | 119 (62.0%) | 11 (22.0%) | 108 (76.1%) |
| (Low) | 73 (38.0%) | 39 (78.0%) | 34 (23.9%) |
| **Alb (35-55 g/L)** |  |  |  |
| (Normal) | 78 (40.6%) | 11 (22.0%) | 67 (47.2%) |
| (Low) | 111 (57.8%) | 39 (78.0%) | 72 (50.7%) |
| (High) | 3 (1.6%) | 0 (0.0%) | 3 (2.1%) |
| **ALT (0-50 U/L)** |  |  |  |
| (Normal) | 169 (88.0%) | 44 (88.0%) | 125 (88.0%) |
| (High) | 23 (12.0%) | 6 (12.0%) | 17 (12.0%) |
| **AST (0-50 U/L)** |  |  |  |
| (Normal) | 172 (89.6%) | 39 (78.0%) | 133 (93.7%) |
| (High) | 20 (10.4%) | 11 (22.0%) | 9 (6.3%) |
| **TBIL (0-20 umol/L)** |  |  |  |
| (Normal) | 143 (74.5%) | 31 (62.0%) | 112 (78.9%) |
| (High) | 49 (25.5%) | 19 (38.0%) | 30 (21.1%) |
| **BUN (1.7-8.2 mmol/L)** |  |  |  |
| (Normal) | 124 (64.6%) | 20 (40.0%) | 104 (73.2%) |
| (Low) | 3 (1.6%) | 1 (2.0%) | 2 (1.4%) |
| (High) | 65 (33.9%) | 29 (58.0%) | 36 (25.4%) |
| **Crea (38-120 umol/L)** |  |  |  |
| (Normal) | 143 (74.5%) | 35 (70.0%) | 108 (76.1%) |
| (Low) | 10 (5.2%) | 2 (4.0%) | 8 (5.6%) |
| (High) | 39 (20.3%) | 13 (26.0%) | 26 (18.3%) |
| **UA (204-428 umol/L)** |  |  |  |
| (Normal) | 105 (54.7%) | 26 (52.0%) | 79 (55.6%) |
| (Low) | 56 (29.2%) | 14 (28.0%) | 42 (29.6%) |
| (High) | 31 (16.1%) | 10 (20.0%) | 21 (14.8%) |
| **CRP (0-10 mg/L)** |  |  |  |
| (Normal) | 54 (28.1%) | 1 (2.0%) | 53 (37.3%) |
| (High) | 138 (71.9%) | 49 (98.0%) | 89 (62.7%) |
| **PCT (0-0.1 ng/ml)** |  |  |  |
| (Normal) | 99 (51.6%) | 4 (8.0%) | 95 (66.9%) |
| (High) | 93 (48.4%) | 46 (92.0%) | 47 (33.1%) |
| **ESR (0-25 mm/h)** |  |  |  |
| (Normal) | 63 (32.8%) | 8 (16.0%) | 55 (38.7%) |
| (High) | 129 (67.2%) | 42 (84.0%) | 87 (61.3%) |
| **PT (8.6-12 s)** |  |  |  |
| (Normal) | 103 (53.6%) | 13 (26.0%) | 90 (63.4%) |
| (High) | 89 (46.4%) | 37 (74.0%) | 52 (36.6%) |
| **INR (0.8-1.1)** |  |  |  |
| (Normal) | 96 (50.0%) | 12 (24.0%) | 84 (59.2%) |
| (High) | 96 (50.0%) | 38 (76.0%) | 58 (40.8%) |
| **APTT (26-42 s)** |  |  |  |
| (Normal) | 159 (82.8%) | 38 (76.0%) | 121 (85.2%) |
| (Low) | 24 (12.5%) | 8 (16.0%) | 16 (11.3%) |
| (High) | 9 (4.7%) | 4 (8.0%) | 5 (3.5%) |
| **D-Dimer (0-243 ng/ml)** |  |  |  |
| (Normal) | 82 (42.7%) | 8 (16.0%) | 74 (52.1%) |
| (High) | 110 (57.3%) | 42 (84.0%) | 68 (47.9%) |
| **FDP (0-5 ug/ml)** |  |  |  |
| (Normal) | 131 (68.2%) | 21 (42.0%) | 110 (77.5%) |
| (High) | 61 (31.8%) | 29 (58.0%) | 32 (22.5%) |
| **Fib (1.9-4.6 g/L)** |  |  |  |
| (Normal) | 138 (71.9%) | 29 (58.0%) | 109 (76.8%) |
| (Low) | 7 (3.6%) | 4 (8.0%) | 3 (2.1%) |
| (High) | 47 (24.5%) | 17 (34.0%) | 30 (21.1%) |
| **PH (7.35-7.45)** |  |  |  |
| (Normal) | 102 (53.1%) | 16 (32.0%) | 86 (60.6%) |
| (Low) | 52 (27.1%) | 22 (44.0%) | 30 (21.1%) |
| (High) | 38 (19.8%) | 12 (24.0%) | 26 (18.3%) |
| **PCO2 (35-45 mmHg)** |  |  |  |
| (Normal) | 112 (58.3%) | 15 (30.0%) | 97 (68.3%) |
| (Low) | 47 (24.5%) | 16 (32.0%) | 31 (21.8%) |
| (High) | 33 (17.2%) | 19 (38.0%) | 14 (9.9%) |
| **PO2 (75～100 mmHg)** |  |  |  |
| (Normal) | 58 (30.2%) | 6 (12.0%) | 52 (36.6%) |
| (Low) | 119 (62.0%) | 41 (82.0%) | 78 (54.9%) |
| (High) | 15 (7.8%) | 3 (6.0%) | 12 (8.5%) |
| **SO2 (95-98 %)** |  |  |  |
| (Normal) | 48 (25.0%) | 5 (10.0%) | 43 (30.3%) |
| (Low) | 101 (52.6%) | 37 (74.0%) | 64 (45.1%) |
| (High) | 43 (22.4%) | 8 (16.0%) | 35 (24.6%) |
| **Lat (0.18-3 mmol/L)** |  |  |  |
| (Normal) | 147 (76.6%) | 30 (60.0%) | 117 (82.4%) |
| (High) | 45 (23.4%) | 20 (40.0%) | 25 (17.6%) |
| **K+ (3.8-5.4 mmol/L)** |  |  |  |
| (Normal) | 100 (52.1%) | 20 (40.0%) | 80 (56.3%) |
| (Low) | 76 (39.6%) | 23 (46.0%) | 53 (37.3%) |
| (High) | 16 (8.3%) | 7 (14.0%) | 9 (6.3%) |
| **Na+ (135-148 mmol/L)** |  |  |  |
| (Normal) | 145 (75.5%) | 36 (72.0%) | 109 (76.8%) |
| (Low) | 36 (18.8%) | 7 (14.0%) | 29 (20.4%) |
| (High) | 11 (5.7%) | 7 (14.0%) | 4 (2.8%) |
| **Ca2+ (2.25-3 mmol/L)** |  |  |  |
| (Normal) | 14 (7.3%) | 2 (4.0%) | 12 (8.5%) |
| (Low) | 178 (92.7%) | 48 (96.0%) | 130 (91.5%) |
| **BG (3.9-11.1 mmol/L)** |  |  |  |
| (Normal) | 146 (76.0%) | 29 (58.0%) | 117 (82.4%) |
| (Low) | 3 (1.6%) | 1 (2.0%) | 2 (1.4%) |
| (High) | 43 (22.4%) | 20 (40.0%) | 23 (16.2%) |
| **OI (400-500 mmHg)** |  |  |  |
| (Normal) | 10 (5.2%) | 1 (2.0%) | 9 (6.3%) |
| (Low) | 174 (90.6%) | 49 (98.0%) | 125 (88.0%) |
| (High) | 8 (4.2%) | 0 (0.0%) | 8 (5.6%) |

Table S5. Results of Quantile regression

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Quantile = 0.1 | | | | Quantile = 0.3 | | | | Quantile = 0.5 | | | | Quantile = 0.7 | | | | Quantile = 0.9 | | | |
| Dependent Var | **Beta** | **std** | **P-value** | **P*FDR*** | **Beta** | **std** | **P-value** | **P*FDR*** | **Beta** | **std** | **P-value** | **P*FDR*** | **Beta** | **std** | **P-value** | **P*FDR*** | **Beta** | **std** | **P-value** | **P*FDR*** |
| WBC | 0.21 | 0.18 | 0.23 | 1.00 | 0.64 | 0.30 | 0.03 | 0.60 | 1.03 | 0.36 | 0.01 | 0.14 | 1.45 | 0.56 | 0.01 | 0.28 | **2.19** | **0.66** | **0.00** | **0.03** |
| Hb | -0.57 | 0.65 | 0.39 | 1.00 | 0.13 | 0.39 | 0.74 | 1.00 | 0.52 | 0.32 | 0.11 | 1.00 | 0.11 | 0.26 | 0.69 | 1.00 | 0.43 | 0.35 | 0.22 | 1.00 |
| PLT | -0.61 | 0.27 | 0.03 | 0.61 | -0.65 | 0.27 | 0.02 | 0.48 | -0.44 | 0.28 | 0.12 | 1.00 | -0.17 | 0.28 | 0.56 | 1.00 | -0.47 | 0.49 | 0.33 | 1.00 |
| LYMPH | -0.35 | 0.18 | 0.05 | 1.00 | -0.54 | 0.21 | 0.01 | 0.34 | -0.40 | 0.24 | 0.10 | 1.00 | -0.77 | 0.38 | 0.04 | 1.00 | -0.48 | 0.45 | 0.29 | 1.00 |
| Alb | -0.14 | 0.40 | 0.73 | 1.00 | -0.58 | 0.33 | 0.08 | 1.00 | -0.53 | 0.27 | 0.05 | 0.78 | -0.47 | 0.29 | 0.10 | 1.00 | -0.78 | 0.55 | 0.16 | 1.00 |
| ALT | 0.10 | 0.09 | 0.30 | 1.00 | -0.06 | 0.11 | 0.57 | 1.00 | 0.04 | 0.12 | 0.74 | 1.00 | -0.02 | 0.19 | 0.92 | 1.00 | 0.00 | 0.47 | 0.99 | 1.00 |
| AST | 0.21 | 0.14 | 0.15 | 1.00 | 0.46 | 0.20 | 0.02 | 0.57 | **0.68** | **0.19** | **0.00** | **0.01** | 0.70 | 0.32 | 0.03 | 0.74 | 1.69 | 0.68 | 0.01 | 0.34 |
| TBIL | -0.21 | 0.17 | 0.22 | 1.00 | 0.07 | 0.20 | 0.72 | 1.00 | 0.06 | 0.21 | 0.76 | 1.00 | 0.00 | 0.31 | 1.00 | 1.00 | -0.30 | 0.56 | 0.60 | 1.00 |
| BUN | 0.03 | 0.08 | 0.66 | 1.00 | 0.17 | 0.13 | 0.21 | 1.00 | 0.34 | 0.16 | 0.03 | 0.58 | 0.47 | 0.22 | 0.03 | 0.78 | 0.70 | 0.39 | 0.04 | 0.96 |
| Crea | 0.04 | 0.03 | 0.22 | 1.00 | 0.04 | 0.05 | 0.35 | 1.00 | 0.09 | 0.04 | 0.02 | 0.49 | 0.05 | 0.05 | 0.27 | 1.00 | 0.11 | 0.13 | 0.18 | 1.00 |
| UA | 0.07 | 0.28 | 0.80 | 1.00 | 0.17 | 0.23 | 0.46 | 1.00 | 0.07 | 0.29 | 0.81 | 1.00 | 0.34 | 0.26 | 0.20 | 1.00 | -0.05 | 0.55 | 0.93 | 1.00 |
| CRP | 0.80 | 0.31 | 0.01 | 0.26 | **1.32** | **0.16** | **0.00** | **0.00** | **1.50** | **0.24** | **0.00** | **0.00** | **1.73** | **0.29** | **0.00** | **0.00** | **2.05** | **0.49** | **0.00** | **0.00** |
| PCT | 0.03 | 0.01 | 0.02 | 0.47 | 0.07 | 0.03 | 0.02 | 0.49 | 0.18 | 0.07 | 0.01 | 0.24 | 0.41 | 0.24 | 0.10 | 1.00 | 2.60 | 1.29 | 0.04 | 0.97 |
| ESR | 0.43 | 0.21 | 0.04 | 0.87 | 0.54 | 0.24 | 0.02 | 0.58 | 0.33 | 0.38 | 0.38 | 1.00 | 0.32 | 0.40 | 0.42 | 1.00 | 1.31 | 0.70 | 0.06 | 1.00 |
| PT | 0.45 | 0.15 | 0.00 | 0.08 | 0.41 | 0.19 | 0.03 | 0.60 | 0.60 | 0.24 | 0.01 | 0.24 | 0.68 | 0.31 | 0.03 | 0.76 | 0.54 | 0.65 | 0.41 | 1.00 |
| INR | 0.48 | 0.19 | 0.01 | 0.37 | 0.50 | 0.22 | 0.03 | 0.58 | 0.68 | 0.30 | 0.02 | 0.49 | 0.66 | 0.44 | 0.14 | 1.00 | -0.01 | 0.69 | 0.99 | 1.00 |
| APTT | 0.01 | 0.27 | 0.97 | 1.00 | -0.11 | 0.22 | 0.62 | 1.00 | -0.05 | 0.20 | 0.82 | 1.00 | -0.04 | 0.19 | 0.84 | 1.00 | 0.55 | 0.58 | 0.34 | 1.00 |
| D.Dimer | 0.02 | 0.01 | 0.12 | 1.00 | 0.04 | 0.03 | 0.12 | 1.00 | 0.12 | 0.08 | 0.12 | 1.00 | 0.52 | 0.37 | 0.17 | 1.00 | 3.15 | 1.17 | 0.01 | 0.20 |
| FDP | 0.02 | 0.02 | 0.25 | 1.00 | 0.08 | 0.04 | 0.07 | 1.00 | 0.21 | 0.08 | 0.01 | 0.24 | 0.36 | 0.35 | 0.30 | 1.00 | **3.64** | **0.92** | **0.00** | **0.00** |
| Fib | -0.61 | 0.47 | 0.19 | 1.00 | -0.01 | 0.33 | 0.97 | 1.00 | 0.11 | 0.35 | 0.76 | 1.00 | 0.55 | 0.38 | 0.16 | 1.00 | 1.21 | 0.62 | 0.05 | 1.00 |
| PH | **-1.77** | **0.43** | **0.00** | **0.00** | -1.04 | 0.53 | 0.05 | 0.91 | -0.78 | 0.41 | 0.06 | 0.97 | -0.61 | 0.40 | 0.13 | 1.00 | 0.00 | 0.25 | 0.99 | 1.00 |
| PCO2 | -0.42 | 0.26 | 0.10 | 1.00 | -0.31 | 0.27 | 0.25 | 1.00 | 0.05 | 0.38 | 0.89 | 1.00 | 1.26 | 0.58 | 0.04 | 0.96 | **2.31** | **0.69** | **0.00** | **0.03** |
| PO2 | -0.59 | 0.25 | 0.02 | 0.52 | -0.63 | 0.28 | 0.03 | 0.59 | -0.37 | 0.25 | 0.15 | 1.00 | -0.46 | 0.25 | 0.07 | 1.00 | -0.13 | 0.60 | 0.83 | 1.00 |
| SO2 | -1.32 | 0.76 | 0.08 | 1.00 | **-1.19** | **0.33** | **0.00** | **0.01** | -0.97 | 0.39 | 0.01 | 0.29 | -0.27 | 0.27 | 0.31 | 1.00 | 0.12 | 0.15 | 0.42 | 1.00 |
| Lat | 0.26 | 0.14 | 0.07 | 1.00 | 0.35 | 0.24 | 0.15 | 1.00 | 0.42 | 0.23 | 0.07 | 0.98 | 0.78 | 0.31 | 0.01 | 0.35 | 1.07 | 1.06 | 0.31 | 1.00 |
| K | -0.12 | 0.29 | 0.68 | 1.00 | 0.06 | 0.34 | 0.85 | 1.00 | 0.56 | 0.34 | 0.10 | 1.00 | 0.69 | 0.36 | 0.06 | 1.00 | 0.80 | 0.49 | 0.11 | 1.00 |
| Na | -0.08 | 0.49 | 0.87 | 1.00 | 0.08 | 0.37 | 0.83 | 1.00 | 0.46 | 0.30 | 0.13 | 1.00 | 0.53 | 0.31 | 0.08 | 1.00 | 0.10 | 0.56 | 0.86 | 1.00 |
| Ca2+ | -1.75 | 0.85 | 0.04 | 0.90 | -0.37 | 0.59 | 0.52 | 1.00 | **-0.54** | **0.16** | **0.00** | **0.02** | -0.28 | 0.18 | 0.12 | 1.00 | -0.10 | 0.19 | 0.61 | 1.00 |
| BG | 0.56 | 0.39 | 0.16 | 1.00 | 0.64 | 0.29 | 0.03 | 0.60 | 0.60 | 0.27 | 0.03 | 0.50 | 0.59 | 0.42 | 0.17 | 1.00 | **1.71** | **0.36** | **0.00** | **0.00** |
| OI | -0.25 | 0.25 | 0.30 | 1.00 | -0.48 | 0.21 | 0.03 | 0.59 | -0.56 | 0.23 | 0.02 | 0.39 | -0.50 | 0.27 | 0.06 | 1.00 | -0.53 | 0.46 | 0.25 | 1.00 |

Table S6. Quantile shift (QS) of significant indexes

|  |  |  |  |
| --- | --- | --- | --- |
|  | QS | Difference. Score [CI] | P.value |
| AST | 0.735 | 0.679 [0.365, 0.992] | <0.001 |
| BG | 0.608 | 0.319 [-0.013, 0.65] | 0.059 |
| Ca2+ | 0.306 | -0.442 [-0.928, 0.045] | 0.073 |
| CRP | 0.835 | 1.328 [1.004, 1.651] | <0.001 |
| FDP | 0.730 | 0.292 [-0.037, 0.62] | 0.080 |
| PCO2 | 0.606 | 0.223 [-0.321, 0.767] | 0.410 |
| PH | 0.421 | -0.329 [-0.868, 0.211] | 0.224 |
| SO2 | 0.312 | -0.77 [-1.148, -0.392] | <0.001 |
| WBC | 0.743 | 1.059 [0.546, 1.571] | <0.001 |

*Note. A robust measure of “shift”, or quantile shift effect (QS) was computed and can be interpreted as follows: Cohen’s d = 0, 0.2, 0.5, and 0.8 corresponds to QS = 0.5, 0.55, 0.65, and 0.70, respectively. Significant QS values indicate that we can reject the null hypothesis of equal distribution. QS values indicate the quantile to which the distribution has shifted from the population median (0.5).*

Table S7. Odds Ratio from Single-index Logistics Regression

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Odds Ratio** | **CI\_low** | **CI\_up** | **AIC** |
| **Co-variates** |  |  |  | **109.55** |
| **Age\*\*\*** | 1.09 | 1.05 | 1.14 |  |
| Sex (Male) | 1.31 | 0.47 | 3.85 |  |
| **Duration\*\*\*** | 1.33 | 1.23 | 1.48 |  |
| **AST (Ref: 0-50 U/L)** |  |  |  | **107.63** |
| **AST (High)\*** | **4.20** | **1.01** | **18.23** |  |
| Age | 1.09 | 1.04 | 1.14 |  |
| Sex (Male) | 1.16 | 0.40 | 3.55 |  |
| Duration | 1.34 | 1.23 | 1.48 |  |
| **BG (Ref: 3.9-11.1 mmol/L)** | |  |  | **105.26** |
| BG (Low) | 4.27 | 0.11 | 100.79 |  |
| **BG (High)\*\*** | **5.11** | **1.64** | **17.21** |  |
| Age | 1.09 | 1.05 | 1.15 |  |
| Sex (Male) | 1.42 | 0.48 | 4.57 |  |
| Duration | 1.35 | 1.24 | 1.50 |  |
| **Ca2+ (Ref: 2.25-3 mmol/L)** | |  |  | **111.54** |
| Ca (Low) | 1.04 | 0.15 | 10.52 |  |
| Age | 1.09 | 1.05 | 1.14 |  |
| Sex (Male) | 1.31 | 0.46 | 3.89 |  |
| Duration | 1.33 | 1.23 | 1.48 |  |
| **CRP (Ref: 0-10mg/L)** |  |  |  | **86.07** |
| **CRP (High)\*\*** | **205.97** | **14.18** | **9753.64** |  |
| Age | 1.10 | 1.05 | 1.16 |  |
| Sex (Male) | 0.66 | 0.19 | 2.30 |  |
| Duration | 1.37 | 1.25 | 1.55 |  |
| **FDP (Ref: 0-5 ug/ml)** |  |  |  | **107.91** |
| FDP (High)**·** | 2.79 | 0.97 | 8.18 |  |
| Age | 1.08 | 1.04 | 1.13 |  |
| Sex (Male) | 1.26 | 0.44 | 3.80 |  |
| Duration | 1.32 | 1.22 | 1.46 |  |
| **PCO2 (Ref: 35-45mmHg)** | |  |  | **104.34** |
| **PCO2 (Low)\*** | **4.68** | **1.40** | **16.92** |  |
| **PCO2 (High)\*** | **5.45** | **1.40** | **22.79** |  |
| Age | 1.09 | 1.04 | 1.15 |  |
| Sex (Male) | 1.10 | 0.37 | 3.41 |  |
| Duration | 1.33 | 1.22 | 1.47 |  |
| **PH (Ref: 7.35-7.45)** |  |  |  | **100.29** |
| **PH (Low)\*\*\*** | **10.35** | **2.83** | **45.57** |  |
| PH (High) | 2.24 | 0.54 | 9.45 |  |
| Age | 1.09 | 1.04 | 1.14 |  |
| Sex (Male) | 1.13 | 0.35 | 3.78 |  |
| Duration | 1.38 | 1.26 | 1.55 |  |
| **SO2 (Ref: 95-98%)** |  |  |  | **108.11** |
| **SO2 (Low)·** | **5.16** | **1.11** | **34.17** |  |
| SO2 (High) | 1.97 | 0.31 | 15.20 |  |
| Age | 1.09 | 1.05 | 1.15 |  |
| Sex (Male) | 1.28 | 0.44 | 3.87 |  |
| Duration | 1.32 | 1.22 | 1.45 |  |
| **WBC (Ref: 4-10\*109/L)** |  |  |  | **103.01** |
| WBC (Low) | 1.34 | 0.29 | 5.41 |  |
| **WBC (High)\*\*** | **7.82** | **2.19** | **30.71** |  |
| Age | 1.09 | 1.05 | 1.15 |  |
| Sex (Male) | 1.80 | 0.57 | 6.41 |  |
| Duration | 1.29 | 1.19 | 1.43 |  |

*Note. \*\*\*P < 0.001, \*\*P < 0.01, \*P < 0.05,* ***·****P < 0.1. Ref represents “Reference range”.*

Table S8. Average Classification Performance of 5-Fold CV Logistics Regression

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Accuracy | P-value | Sensitivity | Specificity | Precision | Recall | F1 | AUC |
| CRP | 0.932 | 0.000 | 0.942 | 0.922 | 0.929 | 0.942 | 0.932 | 0.985 |
| AST | 0.849 | 0.007 | 0.942 | 0.756 | 0.805 | 0.942 | 0.864 | 0.949 |
| WBC | 0.843 | 0.008 | 0.922 | 0.764 | 0.808 | 0.922 | 0.856 | 0.944 |
| BG | 0.849 | 0.008 | 0.932 | 0.766 | 0.812 | 0.932 | 0.863 | 0.944 |
| PH | 0.847 | 0.010 | 0.932 | 0.762 | 0.809 | 0.932 | 0.862 | 0.944 |
| Ca2+ | 0.832 | 0.011 | 0.910 | 0.754 | 0.799 | 0.910 | 0.845 | 0.944 |
| SO2 | 0.844 | 0.008 | 0.906 | 0.782 | 0.816 | 0.906 | 0.854 | 0.943 |
| FDP | 0.851 | 0.005 | 0.936 | 0.766 | 0.810 | 0.936 | 0.864 | 0.941 |
| PCO2 | 0.819 | 0.015 | 0.910 | 0.728 | 0.783 | 0.910 | 0.836 | 0.938 |

*Note. Sort by AUC value in descending order. All values were the average of 10 under-sampling iterations.*

Reference

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