| Topography | LUS pattern | All patients (n = 140) | 24-hours Critical Respiratory Illness | p value |
|------------|-------------|------------------------|--------------------------------------|---------|
|            |             | n (%)                  | Yes (n = 53)                          |         |
|            |             |                        | No (n = 87)                           |         |
| Left, N (%)|             |                        |                                      |         |
| Inferior   | Anterior    | A 41 (29.3)            | 4 (7.5)                              | <0.001  |
|            |             |                        | 37 (42.5)                            |         |
|            |             | B1 47 (33.6)           | 9 (17.0)                             | 0.002   |
|            |             |                        | 38 (43.7)                            |         |
|            |             | B2 18 (12.9)           | 10 (18.9)                            | 0.120   |
|            |             |                        | 8 (9.2)                              |         |
|            |             | B3 19 (13.6)           | 17 (32.1)                            | <0.001  |
|            |             |                        | 2 (2.3)                              |         |
|            |             | C1 13 (9.3)            | 11 (20.8)                            | <0.001  |
|            |             |                        | 2 (2.3)                              |         |
|            |             | C2 2 (1.4)             | 2 (3.8)                              | 0.142   |
|            |             |                        | 0 (0.0)                              |         |
|            |             | LPT 26 (18.6)          | 20 (37.7)                            | <0.001  |
|            |             |                        | 6 (6.9)                              |         |
|            |             | PE NA                  | NA                                   | NA      |
|            |             | Middle                 |                                      |         |
|            |             | A 57 (40.7)            | 9 (17.0)                             | <0.001  |
|            |             |                        | 48 (55.2)                            |         |
|            |             | B1 34 (24.3)           | 3 (5.7)                              | <0.001  |
|            |             |                        | 31 (35.6)                            |         |
|            |             | B2 12 (8.6)            | 9 (17.0)                             | 0.010   |
|            |             |                        | 3 (3.4)                              |         |
|            |             | B3 23 (16.4)           | 20 (37.7)                            | <0.001  |
|            |             |                        | 3 (3.4)                              |         |
|            |             | C1 14 (10.0)           | 12 (22.6)                            | <0.001  |
|            |             |                        | 2 (2.3)                              |         |
|            |             | C2 NA                  | NA                                   | NA      |
|            |             | LPT 24 (17.1)          | 15 (28.3)                            | 0.010   |
|            |             |                        | 9 (10.3)                             |         |
|            |             | PE NA                  | NA                                   | NA      |
|            |             | Posterior              |                                      |         |
|            |             | A 53 (37.9)            | 48 (55.2)                            | <0.001  |
|            |             |                        | 5 (9.4)                              |         |
|            |             | B1 26 (19.9)           | 5 (9.4)                              | 0.006   |
|            |             |                        | 31 (22.1)                            |         |
|            |             | B2 20 (14.3)           | 15 (28.3)                            | <0.001  |
|            |             |                        | 5 (5.7)                              |         |
|            |             | B3 1 (1.1)             | 9 (17.0)                             | 0.001   |
|            |             |                        | 10 (7.1)                             |         |
|            |             | C1 13 (9.3)            | 10 (18.9)                            | 0.005   |
|            |             |                        | 3 (3.4)                              |         |
|            |             | C2 9 (6.4)             | 7 (13.2)                             | 0.027   |
|            |             |                        | 2 (2.3)                              |         |
|            |             | LPT 22 (15.7)          | 18 (34.0)                            | <0.001  |
|            |             |                        | 4 (4.6)                              |         |
|            |             | PE 5 (3.6)             | 3 (5.7)                              | 0.367   |
|            |             |                        | 2 (2.3)                              |         |
|            |             | Superior               |                                      |         |
|            | Anterior    | A 56 (40.0)            | 8 (15.1)                             | <0.001  |
|            |             |                        | 48 (55.2)                            |         |
|            |             | B1 38 (27.1)           | 8 (15.1)                             | 0.018   |
|       | B2   | B3   | C1   | C2   | LPT  | PE   |
|-------|------|------|------|------|------|------|
|       | 15 (10.7) | 19 (13.6) | 12 (8.6) | NA  | 24 (17.1) | NA  |
|       | 10 (18.9) | 17 (32.1) | 10 (18.9) | NA  | 22 (41.5) | NA  |
|       | 5 (5.7) | 2 (2.3) | 2 (2.3) | NA  | 2 (2.3) | NA  |
|       | 0.023 | <0.001 | 0.001 | NA  | <0.001 | NA  |

|       | B1   | B2   | B3   | C1   | C2   | LPT  | PE   |
|-------|------|------|------|------|------|------|------|
|       | 35 (25.0) | 15 (10.7) | 4 (4.6) | 2 (2.3) | NA  | 21 (15.0) | NA  |
|       | 5 (9.4) | 12 (22.6) | 16 (30.2) | 15 (28.3) | NA  | 18 (34.0) | NA  |
|       | 30 (34.5) | 3 (3.4) | 20 (14.3) | 17 (12.1) | NA  | 3 (3.4) | NA  |
|       | 0.001 | 0.001 | <0.001 | <0.001 | NA  | <0.001 | NA  |

|       | B1   | B2   | B3   | C1   | C2   | LPT  | PE   |
|-------|------|------|------|------|------|------|------|
|       | 32 (36.8) | 18 (12.9) | 1 (1.1) | NA  | 7 (5.0) | NA  |
|       | 2 (3.8) | 11 (20.8) | 12 (22.6) | NA  | 6 (11.3) | NA  |
|       | 34 (24.3) | 7 (8.0) | 1 (1.1) | NA  | 1 (1.1) | NA  |
|       | 0.001 | 0.038 | <0.001 | <0.001 | 0.012 | <0.001 | NA  |

|       | B1   | B2   | B3   | C1   | C2   | LPT  | PE   |
|-------|------|------|------|------|------|------|------|
|       | 34 (24.3) | 21 (15.0) | 1 (1.1) | 13 (9.3) | NA  | NA  | NA  |
|       | 6 (11.3) | 13 (24.5) | 14 (26.4) | 13 (24.5) | NA  | NA  | NA  |
|       | 28 (32.2) | 8 (9.2) | 15 (10.7) | 0 (0.0) | NA  | NA  | NA  |
|       | 0.008 | 0.026 | <0.001 | <0.001 | NA  | NA  | NA  |
|                | LPT | PE  | Middle | PE  | Middle |
|----------------|-----|-----|--------|-----|--------|
|                |     |     |        |     |        |
| Superior       |     |     |        |     |        |
| Anterior       |     |     |        |     |        |
| A              | 54  (38.6) | 7  (13.2) | 47  (54.0) | <0.001 |        |
| B1             | 35  (25.0) | 5  (9.4) | 30  (34.5) | 0.001  |        |
| B2             | 22  (15.7) | 16  (30.2) | 6  (6.9) | 0.001  |        |
| B3             | 20  (14.3) | 17  (32.1) | 3  (3.4) | <0.001 |        |
| C1             | 8    (5.7) | 7  (13.2) | 1  (1.1) | 0.005  |        |
| C2             | 1    (0.7) | 1  (1.9) | 0  (0.0) | 0.379  |        |
| LPT            | 23  (16.4) | 20  (37.7) | 3  (3.4) | <0.001 |        |
| Posterior      |     |     |        |     |        |
| A              | 46  (32.9) | 5  (9.4) | 41  (47.1) | <0.001 |        |
| B1             | 43  (30.7) | 5  (9.4) | 38  (43.7) | <0.001 |        |
| B2             | 9    (6.4) | 9  (17.0) | 0  (0.0) | <0.001 |        |
| B3             | 13  (9.3) | 12  (22.6) | 1  (1.1) | <0.001 |        |
| C1             | 15  (10.7) | 12  (22.6) | 3  (3.4) | 0.001  |        |
| C2             | 9    (6.4) | 8  (15.1) | 1  (1.1) | 0.002  |        |
| LPT            | 30  (21.4) | 24  (45.3) | 6  (6.9) | <0.001 |        |
| Superior       |     |     |        |     |        |
| Anterior       |     |     |        |     |        |
| A              | 45  (32.1) | 5  (9.4) | 40  (46.0) | <0.001 |        |
| B1             | 43  (30.7) | 7  (13.2) | 43  (30.7) | 0.001  |        |
| B2             | 17  (12.1) | 11  (20.8) | 6  (6.9) | 0.030  |        |
| B3             | 17  (12.1) | 15  (28.3) | 2  (2.3) | <0.001 |        |
| C1             | 18  (12.9) | 15  (28.3) | 3  (3.4) | <0.001 |        |
| C2             | NA   | NA  | NA     | NA   | NA     |
| LPT            | 31  (22.1) | 22  (41.5) | 9  (10.3) | <0.001 |        |
| Middle         |     |     |        |     |        |
| A              | 53  (37.9) | 8  (15.1) | 45  (51.7) | <0.001 |        |
| B1             | 40  (28.6) | 4  (7.5) | 36  (41.4) | <0.001 |        |
| B2             | 17  (12.1) | 14  (26.4) | 3  (3.4) | <0.001 |        |
| B3             | 21  (15.0) | 19  (35.8) | 2  (2.3) | <0.001 |        |
|       | C1       | C2       | LPT       | PE       |
|-------|----------|----------|-----------|----------|
| 9 (6.4) | NA       | NA       | 33 (23.6) | NA       |
| 8 (15.1)| NA       | NA       | 26 (49.1) | NA       |
| 1 (1.1) | NA       | NA       | 7 (8.0)   | <0.001   |
| 0.002  |          |          |           |          |
|       | Posterior|          |           |          |
| A     | 49 (35.0)| NA       | 43 (49.4) | <0.001   |
| B1    | 36 (25.7)| NA       | 28 (32.2) | 0.029    |
| B2    | 21 (15.0)| 9 (17.0) | 12 (13.8) | 0.632    |
| B3    | 16 (11.4)| 14 (26.4)| 2 (2.3)   | <0.001   |
| C1    | 17 (12.1)| 16 (30.2)| 1 (1.1)   | <0.001   |
| C2    | NA       | NA       | NA        | <0.001   |
| LPT   | 28 (20.0)| 20 (37.7)| 8 (9.2)   | <0.001   |
| PE    | NA       | NA       | NA        | NA       |

**Overall LUS patterns, Median (IQR)**

| SUMA     | 3.0 (0.0 to 10.0) | 0.0 (0.0 to 1.0) | 5.0 (3.0 to 11.0) | <0.001 |
| SUM B1   | 1.0 (0.0 to 6.0)  | 1.0 (0.0 to 1.0) | 4.0 (0.0 to 8.0)  | <0.001 |
| SUM B2   | 1.0 (0.0 to 3.0)  | 3.0 (1.0 to 4.0) | 0.0 (0.0 to 1.0)  | <0.001 |
| SUM B3   | 0.0 (0.0 to 3.0)  | 3.0 (2.0 to 5.0) | 0.0 (0.0 to 0.0)  | <0.001 |
| SUM C1   | 0.0 (0.0 to 3.0)  | 3.0 (1.0 to 4.0) | 0.0 (0.0 to 0.0)  | <0.001 |
| SUM C2   | 0.0 (0.0 to 0.0)  | 0.0 (0.0 to 1.0) | 0.0 (0.0 to 1.0)  | <0.001 |
| SUM LPT  | 1.0 (0.0 to 4.0)  | 5.0 (2.0 to 7.0) | 0.0 (0.0 to 1.0)  | <0.001 |
| SUM PE   | 0.0 (0.0 to 0.0)  | 0.0 (0.0 to 0.0) | 0.0 (0.0 to 0.0)  | 0.455  |

Supplemental Digital Content 1. **LUS patterns according to patient’s outcomes.** Number of lung quadrants depicting the same LUS pattern at patients’ hospital admission for each outcome group (patients with or without critical respiratory illness at 24 hours from hospital admission). Sum = number of quadrants depicting the same LUS profile (A, B1, B2, B3, C1, C2, TPL, PE). For a detailed description of LUS patterns (A, B1, B2, B3, C1, C2, TPL, PE) please see Methods section. A p-value < 0.05 was considered as statistically significant.
Supplemental Digital Content 2. **Correlation matrix.** Pearson correlation (r) coefficients between lung ultrasound variables. The direction and strength of the linear relationship between the variables (whether causal or not) are represented by r values (ranging from -1 to +1; coded in blue and red, respectively). A correlation matrix is symmetric because the correlation between Xi and Xj is the same as the correlation between Xj and Xi. The reported LUS dataset data showed a high degree of multicollinearity amongst predictor variables, meaning that predictor variable can be linearly predicted from the others with a non-trivial degree of accuracy. In this situation, the reliability of a regression model can be affected. We handled this issue by using a PLS model that reduces and takes into account exact (non-stochastic) linear regression amongst the regressors.
| Variable | Group       | AUC (IC 95%)     | p value | Cutoff | Se (%) | Sp (%) | PPV (%) | NPV (%) | Correctly classified (%) |
|----------|-------------|------------------|---------|--------|--------|--------|---------|---------|--------------------------|
| LUS      | Learning    | 0.966 (0.914 - 1) | 0.000   | 0.5    | 92     | 100    | 100     | 96      | 97                       |
|          | Validation  | 0.80 (0.682 - 0.915) | 0.000   |         |        |        |         |         |                          |
| Clinical | Learning    | 0.791 (0.701 - 0.917) | 0.000   | 0.5    | 54     | 85     | 65      | 78      | 74                       |
|          | Validation  | 0.559 (0.408 - 0.71) | 0.417   |         |        |        |         |         |                          |

*Supplemental Digital Content 3. Predictive classifiers accuracy.* Data included the 95% CI. AUC = area under the receiver-operating curve; Se = sensitivity; Sp = specificity; PPV = positive predictive value; NPV = negative predictive value.