Lung ultrasound findings associated with COVID-19 ARDS, ICU-admission and all-cause mortality

SUPPLEMENTAL MATERIAL

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**Table 1.** Definition of ARDS in our study, according to the Berlin Criteria.

|  |  |
| --- | --- |
| **Origin of edema**  | Respiratory failure not fully explained by cardiac failure or fluid overload  |
| **Timing**  | Onset of respiratory symptoms within 1 week of clinical insult or new or worsening respiratory symptoms in the past week |
| **Imaging**  | Bilateral opacities present on chest X-ray |
| **Oxygenation** | PaO2/FIO2 $\leq $300 mmHg and PEEP or CPAP ≥5 cm H2O\*  |

*PaO2, partial pressure of arterial oxygen; FIO2, fraction of inspired oxygen; PEEP, positive end expiratory pressure; CPAP, continuous positive airway pressure.*

\*According to the Berlin criteria [1], ARDS is grouped by severity according to oxygen requirements (mild, moderate and severe). However, in our study we considered all severities as presence of ARDS under one variable (ARDS yes/no).

**References:**

1. Ranieri, V.M., et al., *Acute respiratory distress syndrome: the Berlin Definition.* Jama, 2012. **307**(23): p. 2526-33.

**Table 2.** LUS scores.

|  |  |  |  |
| --- | --- | --- | --- |
| **LUS score**  | **How to assign points per zone** | **Maximum points per zone** | **Maximum points/B-lines per patient** |
| 1. LUS score
 | ≥3 B-lines | 1 point | 3 points | 24 points  |
| Confluent B-line | 2 points |
| Subpleural consolidation or lobar consolidation | 3 points |
| Two findings, e.g. ≥3 B-lines + subpleural consolidation | 3 points\* |
| 1. Total number of B-lines
 | B-lines | Count number | 7 B-lines \*\* | 56 B-lines |
| Confluent B-lines | 7 \*\* |

\* Highest attainable score for the individual LUS findings, in this case 3 points for subpleural consolidation.

\*\* Highest number of B-lines in a single zone in this dataset.

**Table 3.** Event rates of in-hospital incident ARDS, ICU admission, and all-cause mortality and the composite outcome in all patients and those included in the analysis.

|  |  |  |
| --- | --- | --- |
| **Events** | **Number of events in all patients (n=215), n (%)** | **Number of events in patients included in the analysis\* (n=168), n (%)** |
| **ARDS** | 27 (13 %) | 24 (14%) |
| **ICU admission** | 14 (7%) | 9 (5%) |
| **In-hospital mortality**  | 23 (11%) | 17 (10%) |
| **Composite**  | 39 (18 %) | 31 (18%) |

*ARDS, acute respiratory distress syndrome; ICU, intensive care unit.*

\*Patients with prior ICU-admission or ARDS (n=38) or missing or uninterpretable images for all eight LUS zones (n=9) were excluded from this analysis.

**Table 4.** Sensitivity analysis – Association between LUS-findings and the in-hospital composite outcome of incident ARDS, ICU admission or all-cause mortality using logistic regression.

|  |  |  |
| --- | --- | --- |
|  | **ARDS, ICU admission and death** |  |
| **Model 1 – adjusted for missing zones (n=168)** | **Odds Ratio, 95% CI**  | **P-value** |
| LUS score, per 1 point increase | 1.07, 0.94-1.23 | 0.30 |
| Total number of B-lines, per 3 B-lines  | 1.09, 0.94-1.25 | 0.25 |
| ≥3 B-lines in ≥2 bilateral zones | 2.55, 0.995-6.52 | 0.05 |
| **Model 2 – unadjusted, for 6 zones only\*\* (n=168)** | **Odds Ratio, 95% CI** | **P-value** |
| LUS score, per 1 point increase | 1.08, 0.91-1.27 | 0.38 |
| Total number of B-lines, per 3 B-lines | 1.06, 0.89-1.26 | 0.50 |
| ≥3 B-lines in ≥2 bilateral zones | 1.82, 0.65-5.10 | 0.26 |
| **Model 3 – unadjusted, for 6 zones only and no missing zones\*\*\* (n=144)** | **Odds Ratio, 95% CI** | **P-value** |
| LUS score, per 1 point increase | 1.11, 0.93-1.33 | 0.24 |
| Total number of B-lines, per 3 B-lines | 1.10, 0.91-1.32 | 0.32 |
| ≥3 B-lines in ≥2 bilateral zones | 2.06, 0.71-5.95 | 0.18 |

*ARDS, acute respiratory distress syndrome; LUS, lung ultrasound.*

\*Model 1: adjusted for a variable of the number of missing zones.

\*\*Model 2: 6 zones only, excluding the basal zones on each hemi-thorax (zones 4 and 8).

\*\*\*Model 3: 6 zones only and in patients with a complete set of zones, e.g. no missing zones.