**Additional Table (Additional file 2): Comparison between patients who were discharged alive from ICU and those who died in ICUs after post-extubation respiratory failure.**

| Characteristics of the patients at admission | Discharged alive from ICU (n=116) | Died in the ICU (n=30) | P value |
|---------------------------------------------|---------------------------------|------------------------|---------|
| Age, years                                  | 70 ± 9                          | 73 ± 9                 | 0.1298  |
| Male sex, n (%)                             | 76 (65%)                        | 17 (57%)               | 0.3689  |
| Body-mass index, kg/m²                       | 29 ± 7                          | 27 ± 7                 | 0.1239  |
| Obesity, n (%)                              | 43 (38%)                        | 7 (25%)                | 0.2067  |
| SAPS II at admission, points                | 57 ± 18                         | 60 ± 17                | 0.4278  |
| Underlying chronic cardiac disease, n (%)   | 50 (43)                         | 15 (50)                | 0.4981  |
| Underlying chronic lung disease, n (%)      | 47 (41)                         | 10 (33)                | 0.4722  |
| Acute respiratory failure as reason for intubation, No. (%) | 74 (64) | 15 (50) | 0.1675 |

**Characteristics of the patients the day of extubation**

| Characteristics | Discharged alive from ICU (n=116) | Died in the ICU (n=30) | P value |
|-----------------|---------------------------------|------------------------|---------|
| SOFA score, points | 4,3 ± 2,8 | 5,0 ± 2,7 | 0.2191 |
| Duration of mechanical ventilation, median (IQR), days | 6 [3-11] | 6 [4-9] | 0.9421 |
| Weaning difficulty, No. (%) | 66 (57%) | 19 (63%) | 0.2035 |
| Simple weaning | 50 (43%) | 11 (37%) | 0.4772 |
| Difficult or prolonged weaning | 34 (31%) | 12 (40%) | 0.3474 |
| Ineffective cough, n / n total (%) | 47 (43%) | 15 (50%) | 0.4211 |
| Abundant secretions, n / n total (%) | 95 (5%) | 93 (5%) | 0.1086 |
| Administration of steroids before extubation, n (%) | 82 (33%) | 79 (20%) | 0.7228 |
| Prophylactic non-invasive ventilation after extubation, n (%) | 188 (76%) | 171 (68%) | 0.3921 |
| pH, units | 7.43 ± 0.09 | 7.41 ± 0.09 | 0.2626 |
| PaCO₂, mm Hg | 45 ± 14 | 46 ± 16 | 0.8860 |
| Hypercapnia (PaCO₂ > 45 mm Hg), n / n total (%) | 38/99 (38%) | 8/24 (33%) | 0.6464 |
|-----------------------------------------------|-------------|------------|--------|
| **Treatment of ARF**                          |             |            |        |
| Use of non-invasive ventilation as rescue therapy, n (%) | 68 (59%) | 16 (53%) | 0.6015 |
| Duration of NIV, hours                        | 16 [2-46]   | 4 [1-10]   | 0.0614 |
| Duration of high-flow nasal oxygen, hours     | 3 [0-18]    | 2 [0-9]    | 0.3376 |
| Duration of treatment between the onset of respiratory failure and recovery or reintubation, hours | 27 [5-67] | 7 [2-19] | **0.0069** |
| Reintubation at any time in the ICU, n (%)    | 52 (45%)    | 23 (77%)   | **0.0019** |

**Abbreviations:** NIV = Non-invasive ventilation; SAPS = Simplified Acute Physiology Score.

Values are given as mean ± standard deviation or median [interquartile range, 25th-75th percentiles]

# Weaning difficulty was defined as following: simple weaning included patients extubated after success of the initial spontaneous breathing trial, difficult weaning included patients who failed the initial spontaneous breathing trial and were extubated within the 7 following days, and prolonged weaning included patients extubated more than 7 days after the initial spontaneous breathing trial.