**Additional file 1**

**Figure S1.** Area under incident/dynamic receiver operating characteristic curve to predict mortality (A) in patients with OSA (n=262), (B) in patients with moderate-to-severe OSA (n=146), and (C) in patients with COPD (n=94).



\**P* <0.05 compared to the C-index of the clinical model.

**Table S1. Clinical Characteristics of the Study Patients according to the Presence of Moderate-to-Severe OSA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **AHI <15 /h****(n=209)** | **AHI** ≥**15 /h****(n=146)** | ***P* Value** |
| Demographics  |  |  |  |
| Male | 113 (54.1) | 95 (65.1) | 0.04 |
| Age, years | 64 (55–70) | 65 (58–72) | 0.21 |
| BMI, kg/m2 | 23.7 (21.6–25.9) | 25.5 (22.9–28.2) | <0.001 |
| Smoking status |  |  |  |
| Never  | 120 (57.4) | 75 (51.4) | 0.03 |
| Former or current smoker | 79 (37.8) | 70 (48.0) |
| Unknown  | 10 (4.8) | 1 (0.7) |
| Pack-year (n=321) | 0 (0–19) | 0 (0–25) | 0.12 |
| Comorbidities |  |  |  |
| Hypertension  | 68 (32.5) | 82 (56.2) | <0.001 |
| Diabetes mellitus | 35 (16.8) | 35 (24.0) | 0.09 |
| Coronary heart disease | 18 (8.6) | 25 (17.1) | 0.02 |
| Congestive heart failure | 1 (0.5) | 4 (2.7) | 0.16 |
| Stroke | 9 (4.3) | 8 (5.5) | 0.61 |
| Depression | 18 (8.6) | 15 (10.3) | 0.60 |
| CCI | 2 (1–3) | 2 (1–4) | 0.01 |
| Sleep questionnaire |  |  |  |
| ESS (n=177) | 7 (3–11) | 7 (5–12) | 0.68 |
| PSQI (n=147) | 12 (9–14) | 10 (8–13) | 0.09 |
| BDI (n=174) | 14 (8–21) | 14 (8–21) | 0.80 |
| PSG variables |  |  |  |
| Total sleep time, min | 395 (333–433) | 386 (322–432) | 0.65 |
| Sleep efficiency, % | 80 (71–88) | 79 (68–88) | 0.67 |
| Total slow wave sleep, % (n=314) | 1.9 (0–6.7) | 0.7 (0–7.7) | 0.46 |
| Sleep latency, min | 11 (6–26) | 10 (5–20) | 0.19 |
| REM latency, min(n=353) | 96 (72–150) | 97 (69–166) | 0.89 |
| AHI, /h | 5.5 (2.0–9.1) | 31.1 (23.3–45.1) | <0.001 |
| REM AHI, /h (n=254) | 8.0 (2.8–17.9) | 35.4 (23.1–51.4) | <0.001 |
| NREM AHI, /h (n=254) | 3.8 (1.6–7.2) | 29.3 (20.0–45.5) | <0.001 |
| Supine AHI, /h (n=252) | 8.7 (3.2–15.1) | 42.1 (27.7–62.8) | <0.001 |
| Nonsupine AHI, /h (n=252) | 1.4 (0–4.8) | 9.8 (0.7–22.7) | <0.001 |
| TS90, min | 0 (0–1) | 6 (1–41) | <0.001 |
| TS90, % | 0 (0–0.1) | 1.3 (0.2–8.3) | <0.001 |
| Nocturnal hypoxemia | 10 (4.8) | 60 (41.1) | <0.001 |
| Mean SpO2, % | 96 (94–97) | 94 (92–96) | <0.001 |
| Lowest SpO2, % | 90 (86–92) | 83 (76–87) | <0.001 |
| Spirometry |  |  |  |
| Post-BDR FEV1/FVC | 77 (68–82) | 76 (69–82) | 0.68 |
| Post-BDR FEV1, % | 99 (86–112) | 102 (87–111) | 0.76 |
| Post-BDR FVC, % | 95 (85–105) | 95 (84–105) | 0.87 |
| Treatment prescription |  |  |  |
| PAP | 9 (4.3) | 93 (63.7) | <0.001 |
| Bronchodilator | 34 (16.3) | 32 (21.9) | 0.18 |

*Definition of abbreviations*: AHI = apnea–hypopnea index; BDI = Beck Depression Inventory; BDR = bronchodilator response; BMI = body mass index; CCI = Charlson comorbidity index; ESS = Epworth Sleepiness Scale; NREM = non-rapid eye movement; OSA = obstructive sleep apnea; PAP = positive airway pressure; PSG = polysomnography; PSQI = Pittsburgh Sleep Quality Index; REM = rapid eye movement; SpO2 = oxygen saturation; TS90 = sleep time spent with oxygen saturation less than 90%.

Data are presented as n (%) or median (interquartile range), unless otherwise noted.

**Table S2. Clinical Characteristics of the Study Patients according to the Presence of COPD**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Without COPD (n=261)** | **With COPD****(n=94)** | ***P* Value** |
| Demographics  |  |  |  |
| Male | 129 (49.4) | 79 (84.0) | <0.001 |
| Age, years | 63 (55–69) | 68 (61–73) | <0.001 |
| BMI, kg/m2 | 24.2 (22.1–26.9) | 24.3 (22.6–26.6) | 0.62 |
| Smoking status |  |  |  |
| Never  | 171 (65.5) | 24 (25.5) | <0.001 |
| Former or current smoker | 81 (31.0) | 68 (72.3) |
| Unknown  | 9 (3.5) | 2 (2.1) |
| Pack-year (n=321) | 0 (0–10) | 25 (0–45) | <0.001 |
| Comorbidities |  |  |  |
| Hypertension  | 103 (39.5) | 47 (50.0) | 0.08 |
| Diabetes mellitus | 51 (19.5) | 19 (20.2) | 0.89 |
| Coronary heart disease | 26 (10.0) | 17 (18.1) | 0.04 |
| Congestive heart failure | 4 (1.5) | 1 (1.1) | >0.99 |
| Stroke | 11 (4.2) | 6 (6.4) | 0.41 |
| Depression | 27 (10.3) | 6 (6.4) | 0.26 |
| CCI | 2 (1–3) | 2 (1–3) | 0.01 |
| Sleep questionnaire |  |  |  |
| ESS (n=177) | 7 (4–12) | 7 (4–11) | 0.91 |
| PSQI (n=147) | 12 (9–14) | 10 (6–13) | 0.04 |
| BDI (n=174) | 15 (9–21) | 12 (7–21) | 0.07 |
| PSG variables |  |  |  |
| Total sleep time, min | 392 (328–423) | 388 (328–433) | 0.497 |
| Sleep efficiency, % | 80.0 (70.3–89.0) | 78.7 (68.0–87.0) | 0.14 |
| Total slow wave sleep,% (n=314) | 2.1 (0.1–7.7) | 0.6 (0–3.6) | 0.02 |
| Sleep latency, min | 10 (4–24) | 12 (6–22) | 0.14 |
| REM latency, min(n=353) | 98 (69–159) | 96 (75–157) | 0.92 |
| AHI, /h | 11.2 (3.9–26.3) | 10.2 (5.2–27.2) | 0.68 |
| REM AHI, /h (n=254) | 18.8 (5.2–36.3) | 17.3 (6.4–34.7) | 0.90 |
| NREM AHI, /h (n=254) | 9.3 (2.7–24.1) | 10.3 (4.7–29.3) | 0.46 |
| Supine AHI, /h (n=252) | 20.8 (6.3–36.3) | 26.3 (10.0–52.7) | 0.06 |
| Nonsupine AHI, /h (n=252) | 2.5 (0–10.1) | 3.6 (0.9–11.3) | 0.25 |
| TS90, min | 1 (0–5) | 1 (0–6) | 0.46 |
| TS90, % | 0.1 (0–1.1) | 0.1 (0–1.3) | 0.48 |
| Nocturnal hypoxemia | 51 (19.5) | 19 (20.2) | 0.89 |
| Mean SpO2, % | 95 (94–97) | 95 (93–96) | 0.01 |
| Lowest SpO2, % | 87 (83–91) | 88 (82–90) | 0.29 |
| Spirometry |  |  |  |
| Post-BDR FEV1/FVC | 80 (75–84) | 62 (53–67) | <0.001 |
| Post-BDR FEV1, % | 104 (93–117) | 83 (71–95) | <0.001 |
| Post-BDR FVC, % | 96 (85–105) | 94 (85–106) | 0.98 |
| Treatment prescription |  |  |  |
| PAP | 79 (30.3) | 23 (24.5) | 0.29 |
| Bronchodilator | 20 (7.7) | 46 (48.9) | <0.001 |

For definition of abbreviations, see table E1.

Data are presented as n (%) or median (interquartile range), unless otherwise noted.

**Table S3. Effect of the Presence of COPD and Moderate-to-Severe OSA on Mortality**

|  |  |  |
| --- | --- | --- |
|  | **Unadjusted HR (95% CI)** | **Adjusted HR**\* **(95% CI)** |
| Moderate-to-severe OSA only | 2.01 (0.79 to 5.10) | 1.37 (0.51 to 3.68) |
| COPD without moderate-to-severe OSA | 4.14 (1.71 to 9.98) | 2.98 (1.14 to 7.80) |
| COPD with moderate-to-severe OSA | 4.55 (1.57 to 13.18) | 3.19 (1.02 to 9.96) |
| RERI |  –0.60 (–5.22 to 4.02) | –0.16 (–3.48 to 3.16) |

*Definition of abbreviations:* CI = confidence interval; COPD = chronic obstructive pulmonary disease; HR = hazard ratio; OSA = obstructive sleep apnea; RERI = relative excess risk due to interaction.

\*Adjusted for age, sex, body mass index, Charlson comorbidity index.

**Table S4. Effect of the Presence of COPD and Nocturnal Hypoxemia on Mortality**

|  |  |  |
| --- | --- | --- |
|  | **Unadjusted HR (95% CI)** | **Adjusted HR**\* **(95% CI)** |
| Nocturnal hypoxemia only | 2.07 (0.74 to 5.83) | 2.16 (0.72 to 6.51) |
| COPD only | 2.80 (1.28 to 6.14) | 2.35 (0.99 to 5.60) |
| COPD with nocturnal hypoxemia | 6.88 (2.74 to 17.26) | 6.48 (2.41 to 17.43) |
| RERI | 3.00 (–2.74 to 8.75) | 2.97 (–2.56 to 8.50) |

For definition of abbreviations, see table E3.

\*Adjusted for age, sex, body mass index, Charlson comorbidity index.