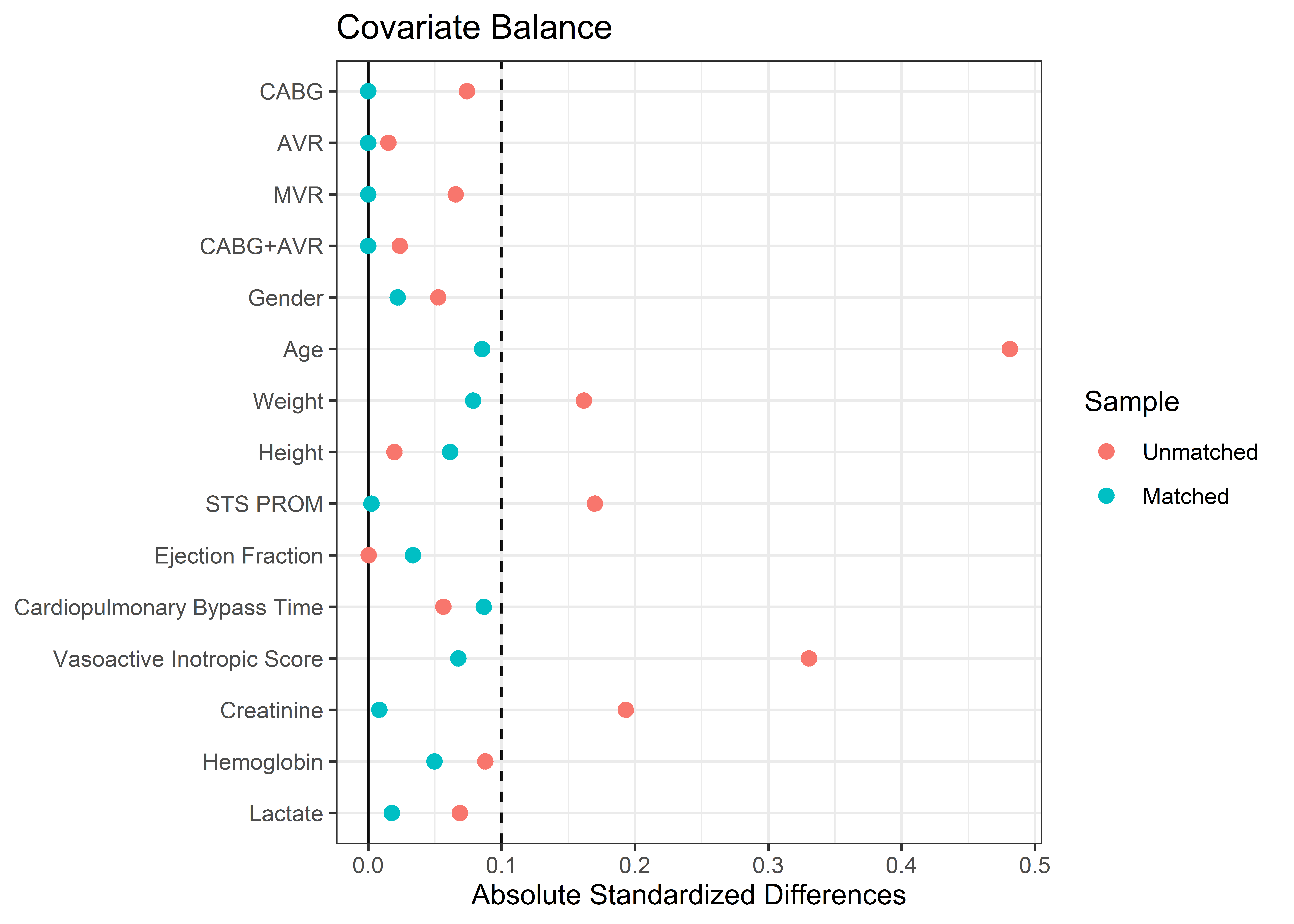
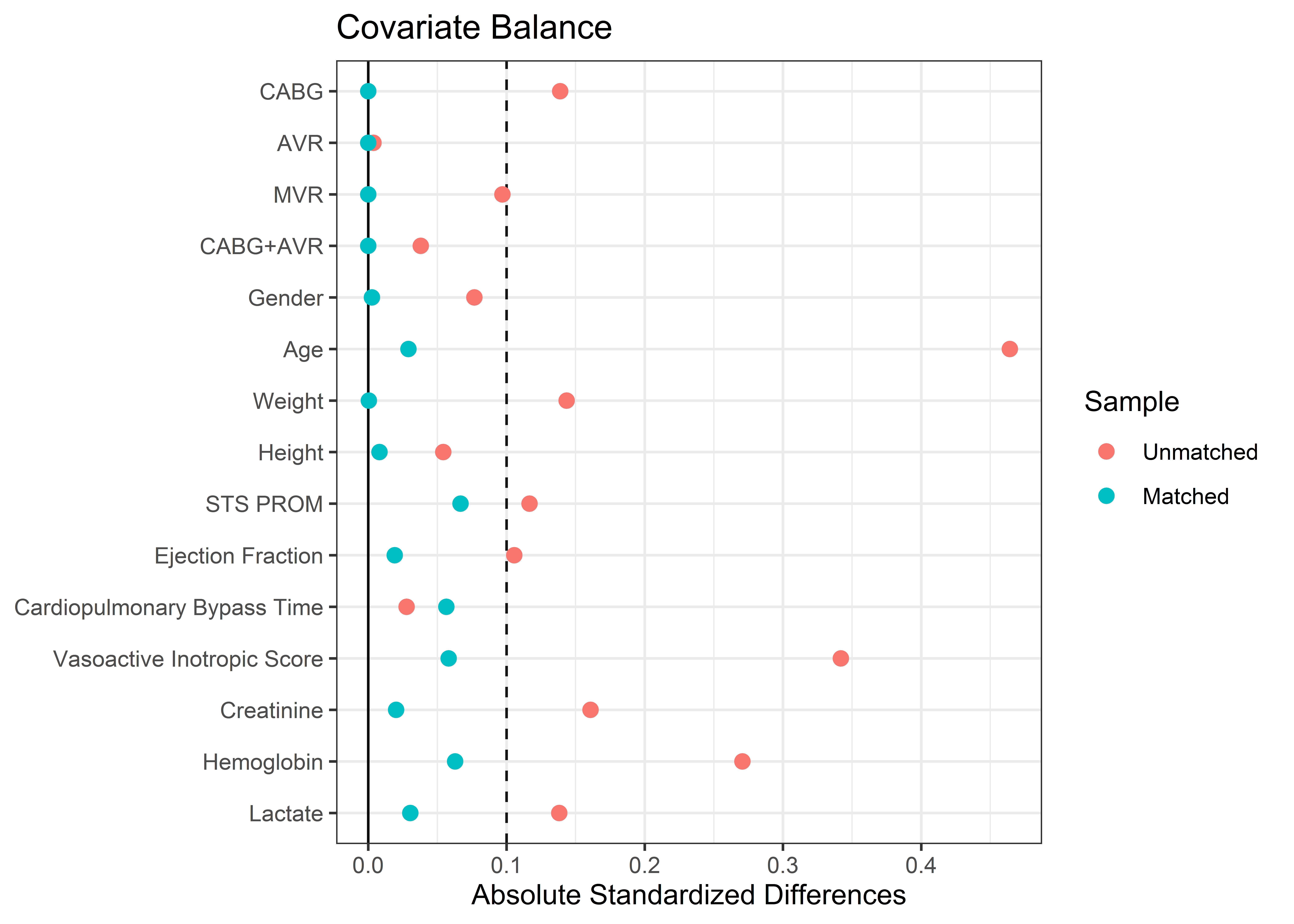
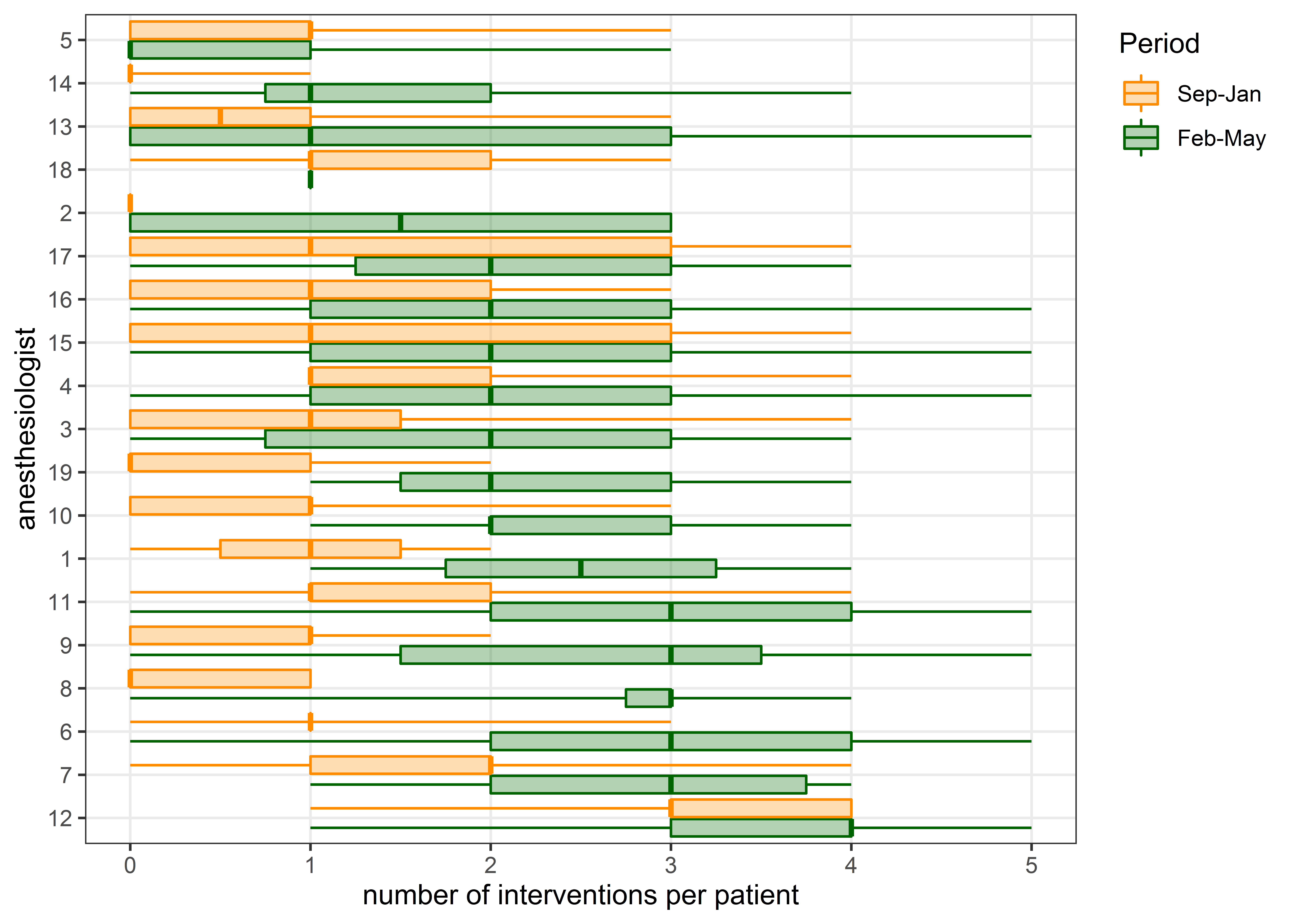
**Supplemental Figure 1**

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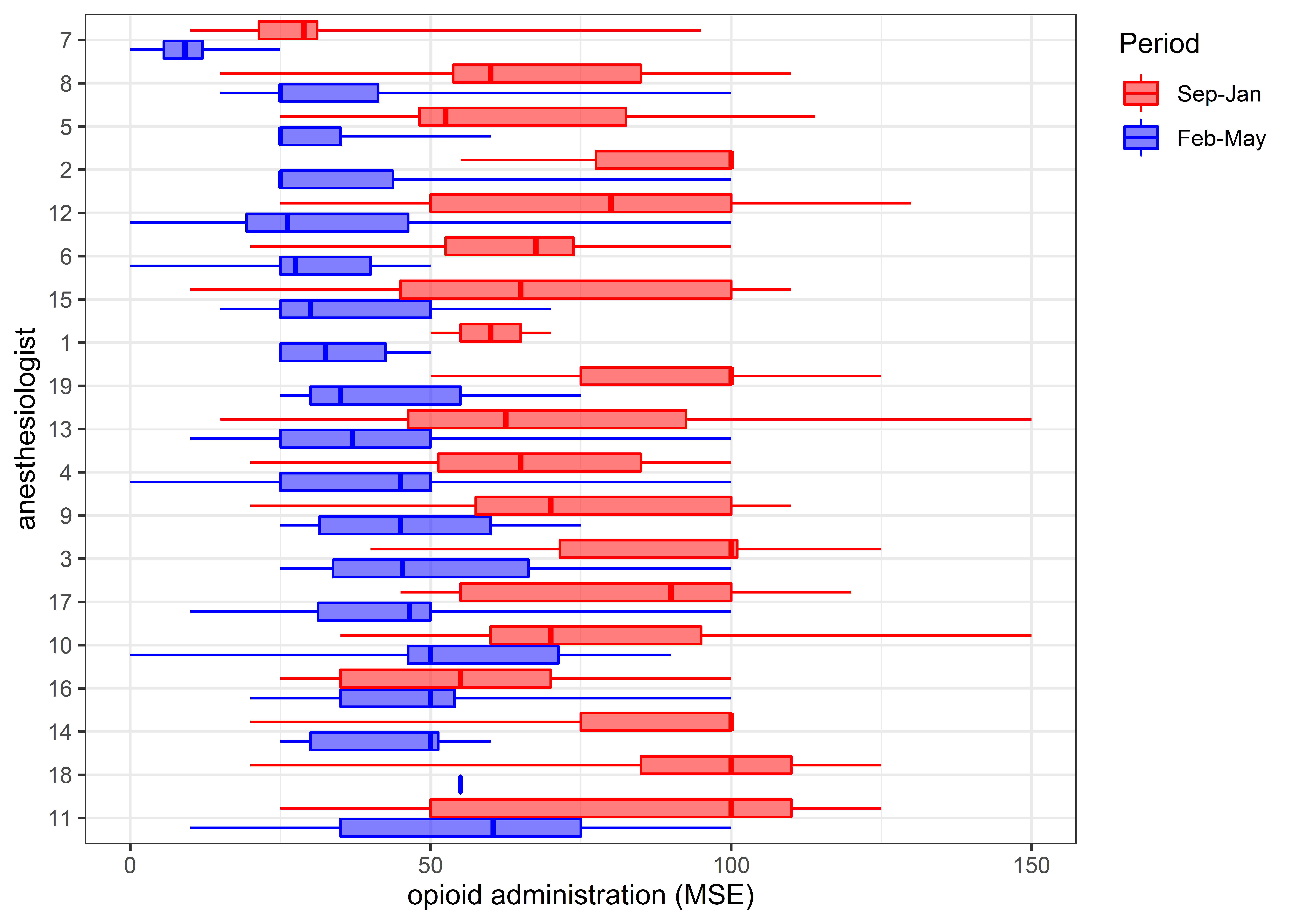
**Supplemental Figure 2**

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**Supplemental Figure 3**

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**Supplemental Figure 4**

****

**Supplemental Table 1: Demographics and procedure characteristics of high and ultra-low propensity matched cohorts**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Unmatched** | | | **Matched** | | |
| **>50 MSE** | **≤25 MSE** | **ASD** | **>50 MSE** | **≤25 MSE** | **ASD** |
| **Cases, number** | 214 (100.0%) | 91 (100.0%) |  | 63 (100.0%)  [132 (100.0%)] | 63 (100.0%)  [63 (100.0%)] |  |
| **Gender, male** | 166 (77.6%) | 61 (67.0%) | 0.077 | 44.8 (71.2%)  [100 (75.8%)] | 45 (71.4%)  [45 (71.4%)] | 0.003 |
| **Age, years** | 61.4 (±12.0) | 66.0 (±11.9) | 0.464 | 66.7 (±8.9) | 66.4 (±10.2) | 0.029 |
| **ICU arrival**  **vasopressor, score** | 4.85 (±4.22) | 7.20 (±6.16) | 0.342 | 6.16 (±4.83) | 5.87 (±4.98) | 0.058 |
| **STS PROM, %** | 1.93 (±3.52) | 2.21 (±2.69) | 0.117 | 2.05 (±2.09) | 1.84 (±2.13) | 0.067 |
| **Ejection fraction** | 53.27 (±11.83) | 54.73 (±11.31) | 0.106 | 53.66 (±12.77) | 53.89 (±11.09) | 0.019 |
| **Preoperative**  **hemoglobin, gm/dL** | 13.06 (±2.10) | 12.51 (±2.19) | 0.271 | 12.47 (±2.02) | 12.60 (±2.08) | 0.063 |
| **Creatinine, mg/dL** | 1.11 (±0.76) | 1.23 (±0.86) | 0.161 | 1.09 (±0.33) | 1.07 (±0.30) | 0.020 |
| **Lactate, mmol/L** | 1.00 (±0.61) | 0.93 (±0.34) | 0.138 | 0.93 (±0.39) | 0.94 (±0.36) | 0.030 |
| **Weight, kg** | 88.49 (±21.75) | 84.90 (±18.56) | 0.144 | 86.91 (±20.76) | 86.92 (±17.81) | < 0.001 |
| **Height, m** | 1.72 (±0.10) | 1.72 (±0.10) | 0.054 | 1.72 (±0.10) | 1.72 (±0.10) | 0.008 |
| **Cardiopulmonary**  **bypass time, min** | 116.8 (±54.9) | 120.8 (±53.8) | 0.028 | 112.6 (±54.0) | 109.7 (±48.7) | 0.056 |
| **CABG** | 155 (72.4%) | 50 (54.9%) | 0.139 | 47 (74.6%)  [106 (80.3%)] | 47 (74.6%)  [47 (74.6%)] | 0 |
| **AVR** | 22 (10.3%) | 9 (9.9%) | 0.004 | 4 (6.3%)  [7 (5.3%)] | 4 (6.3%)  [4 (6.3%)] | 0 |
| **MVR** | 13 (6.1%) | 13 (14.3%) | 0.097 | 7 (11.1%)  [8 (6.1%)] | 7 (11.1%)  [7 (11.1%)] | 0 |
| **CABG+AVR** | 15 (7.0%) | 9 (9.9%) | 0.038 | 5 (7.9%)  [11 (8.3%)] | 5 (7.9%)  [5 (7.9%)] | 0 |
| **CABG+MVR** | 5 (2.3%) | 2 (2.2%) |  | 0 | 0 |  |
| **AVR+TVR** | 1 (0.5%) | 0 (0.0%) |  | 0 | 0 |  |
| **AVR+MVR+TVR** | 1 (0.5%) | 0 (0.0%) |  | 0 | 0 |  |
| **AVR+MVR** | 1 (0.5%) | 2 (2.2%) |  | 0 | 0 |  |
| **TVR** | 1 (0.5%) | 3 (3.3%) |  | 0 | 0 |  |
| **AVR+MVR+CABG** | 0 (0.0%) | 2 (2.2%) |  | 0 | 0 |  |
| **MVR+TVR** | 0 (0.0%) | 1 (1.1%) |  | 0 | 0 |  |

**Abbreviations:** ICU=intensive care unit; STS=Society of Thoracic Surgeons; CABG=coronary artery bypass grafting; AVR=aortic valve replacement/repair; MVR=mitral valve replacement/repair; TVR=tricuspid valve replacement/repair; MSE=morphine sulfate equivalents; ASD=absolute standardized difference.

\*For matched binary variables, the values are reported as weighted count (percentage) [unweighted count (percentage)].

**Supplemental Table 2: Clinical parameters and outcomes based upon high and ultra-low propensity matching**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Unmatched** | | | | **Matched** | | | |  |
| **All cases** | **>50 MSE** | **≤ 25 MSE** | ***P-*value** | **All cases** | **>50 MSE** | **≤ 25 MSE** | ***P-*value** | **95% CIi** |
| **Cases, number** | 305 (100.0%) | 214 (100.0%) | 91 (100.0%) |  | 126 (100.0%)  [195 (100.0%)] | 63 (100.0%)  [132 (100.0%)] | 63 (100.0%)  [63 (100.0%)] |  |  |
| **Intraoperative**  **lactate (peak)** | 2.9 (±1.9) | 2.9 (±2.0) | 2.8 (±1.7) | 0.83a | 2.7 (±1.7) | 2.7 (±1.6) | 2.8 (±1.8) | 0.99e | -0.3, 0.4g |
| **Intraoperative**  **hemoglobin (low)** | 8.5 (±1.6) | 8.6 (±1.6) | 8.2 (±1.6) | 0.023a | 8.2 (±1.5) | 8.3 (±1.5) | 8.2 (±1.6) | 0.53e | -0.6, 0.3g |
| **Pain score**  **0-12 hour (NRS)** | 4.0 (±2.9) | 4.2 (±2.9) | 3.6 (±3.0) | 0.15a | 3.8 (±2.9) | 3.8 (±2.9) | 3.7 (±3.0) | 0.73e | -1.2, 0.8g |
| **Pain score**  **12-24 hour (NRS)** | 4.2 (±2.6) | 4.4 (±2.6) | 3.8 (±2.6) | 0.041a | 3.9 (±2.6) | 4.1 (±2.6) | 3.8 (±2.7) | 0.49e | -1.2, 0.5g |
| **Creatinine (Δ)** | 0.1 (±0.7) | 0.1 (±0.7) | 0.2 (±0.7) | 0.37a | 0.2 (±0.6) | 0.1 (±0.6) | 0.2 (±0.5) | 0.93e | -0.1, 0.1g |
| **No AKI** | 236 (77.4%) | 171 (79.9%) | 65 (71.4%) | 0.08a | 93.3 (74.1%)  [150 (76.9%)] | 48.3 (76.7%)  [105(79.5%] | 45 (71.4%)  [45 (71.4%)] | 0.23e | -0.2, 0.7g |
| **AKI1** | 51 (16.7%) | 34 (15.9%) | 17 (18.7%) | 25.3 (20.1%)  [35 (17.9%)] | 13.3 (21.2%)  [23(17.4%)] | 12 (19.0%)  [12 (19.0%)] |
| **AKI2** | 11 (3.6%) | 5 (2.3%) | 6 (6.6%) | 5.3 (4.2%)  [6 (3.1%)] | 0.3 (0.5%)  [1 (0.8%)] | 5 (7.9%)  [5 (7.9%)] |
| **AKI3** | 7 (2.3%) | 4 (1.9%) | 3 (3.3%) | 2 (1.6%)  [4 (2.1%)] | 1 (1.6%)  [3 (2.3%)] | 1 (1.6%)  [1 (1.6%)] |
| **ICU hemoglobin**  **(low)** | 8.3 (±1.5) | 8.5 (±1.5) | 8.0 (±1.4) | 0.013a | 8.2 (±1.5) | 8.3 (±1.5) | 8.1 (±1.4) | 0.19e | -0.8, 0.2g |
| **ICU lactate**  **(peak)** | 5.4 (±3.5) | 5.4 (±3.7) | 5.4 (±3.1) | 0.77a | 5.3 (±3.4) | 5.2 (±3.4) | 5.4 (±3.4) | 0.91e | -0.9, 0.9g |
| **Reintubation** | 17 (5.6%) | 8 (3.7%) | 9 (9.9%) | 0.061c | 6.3 (5.0%)  [9 (4.6%)] | 1.3 (2.1%)  [4 (3.0%)] | 5 (7.9%)  [5 (7.9%)] | 0.18f | 0.5, 24.9h |
| **ICU atrial**  **fibrillation** | 51 (16.7%) | 24 (11.2%) | 27 (29.7%) | < 0.001c | 25.5 (20.2%)  [34 (17.4%)] | 9.5 (15.1%)  [18 (13.6%)] | 16 (25.4%)  [16 (25.4%)] | 0.17f | 0.8, 3.9h |
| **ICU chest tube**  **output (24 hour)** | 1311.0 (±972.5) | 1305.5 (±989.9) | 1323.7 (±935.8) | 0.73a | 1348.6 (±1007.0) | 1312.5 (±979.4) | 1384.8 (±1069.1) | 0.91e | -207.5, 235.0g |
| **ICU delirium** | 13 (4.3%) | 10 (4.7%) | 3 (3.3%) | 0.76b | 5.8 (4.6%)  [8 (4.1%)] | 3.8 (6.1%)  [6 (4.5%)] | 2 (3.2%)  [2 (3.2%)] | 0.46f | 0.1, 2.9h |
| **In hospital**  **mortality** | 17 (5.6%) | 13 (6.1%) | 4 (4.4%) | 0.75c | 4.3 (3.4%)  [7 (3.6%)] | 2.3 (3.7%)  [5 (3.8%)] | 2 (3.2%)  [2 (3.2%)] | 0.87f | 0.1, 5.7h |
| **Median intubation**  **time, hours** | 5 (4.5, 5) | 5 (4.5, 5.5) | 4.5 (3.5, 6)i | 0.66d | 4.5 (4, 5.5) | 5 (4, 7) | 3.5 (3, 5)i | 0.34d |  |
| **Median ICU**  **time, hours** | 41 (32, 44.5) | 36.75 (27, 44) | 45 (40, 65)i | 0.012d | 40.5 (29, 44.5) | 43.5 (28, 51.5) | 41 (29.5, 52)i | 0.23d |  |
| **Median floor**  **time, hours** | 119 (115, 122) | 120.25 (116, 124) | 116.25 (100, 122.5)i | 0.29d | 119 (104, 122.5) | 122.5 (103.5, 147.5) | 115.5 (99.5, 122.5)i | 0.87d |  |
| **Median hospital**  **time, hours** | 164.5 (148, 169.5) | 164 (147, 169.5) | 167.5 (147, 210.5)i | 0.11d | 164.5 (147, 171) | 168 (148, 205) | 147 (140, 188.5)i | 0.89d |  |

**Abbreviations:** NRS=numeric rating score; AKI (1,2,3)=acute kidney injury (Stage 1,2,3); ICU=intensive care unit; MSE=morphine sulfate equivalents; 95% CI=confidence interval

\*For matched binary variables, the values are reported as weighted count (percentage) [unweighted count (percentage)].

a Wicoxon rank sum test

b Fisher exact test

c Chi-square text

d Logrank test

e Wilcoxon signed rank test; in each pair, the mean of the control values was utilized

f Conditional logistic regression.

g Hodges-Lehmann confidence interval for pseudomedian of matched differences [≤25 MSE observation] - [>50 MSE observation]

h Conditional logistic regression confidence interval for odds ratio [odds for ≤25 MSE] / [odds for >50 MSE]

i Confidence interval based on the cumulative hazard