**APPENDIX. Propensity score analysis results**

**Table A1.** Standardized differences in covariates between groups in the unmatched (original sample) and matched sample (based on propensity scores)

|  |  |  |
| --- | --- | --- |
|  | **Unmatched (n=117,269)** | **Matched (n=19,976)** |
| ***PATIENT DEMOGRAPHICS*** |  |  |
| **Age** | 0.0053 | 0.0185 |
| **Gender** | 0.0083 | 0.0073 |
| **Race** | 0.2220 | 0.0571 |
| ***HEALTHCARE RELATED*** |  |  |
| **Insurance Type** | 0.0185 | 0.0368 |
| **Hospital Location** | 0.0085 | 0.0127 |
| **Hospital Size** | 0.2220 | 0.0571 |
| **Hospital Teaching Status** | 0.1193 | 0.0191 |
| **# of Annual Spine Procedures\*** | 0.1109 | 0.0608 |
| ***PROCEDURE RELATED*** |  |  |
| **Year of Procedure** | 0.8082 | 0.1575 |
| ***ANESTHESIA/ANALGESIA*** |  |  |
| **PCA Use** | 0.0111 | 0.0048 |
| **NSAID Use** |  |  |
| **Day 0** | 0.0588 | 0.0132 |
| **Day 1+** | 0.0348 | 0.0135 |
| **Cox-2 Inhibitor Use** |  |  |
| **Day 0** | 0.1188 | 0.0116 |
| **Day 1+** | 0.1440 | 0.0531 |
| **Ketamine Use** |  |  |
| **Day 0** | 0.1056 | 0.0171 |
| **Day 1+** | 0.0011 | 0.0323 |
| **Pregabalin/Gabapentin Use** |  |  |
| **Day 0** | 0.0991 | 0.0226 |
| **Day 1+** | 0.0985 | 0.0067 |
| ***COMORBIDITIES*** |  |  |
| **Charlson Comorbidity Index (categorized)** | 0.0222 | 0.0396 |
| **History of Substance Use/Abuse** | 0.0045 | 0.0116 |
| **Pain Conditions** | 0.0130 | 0.0047 |
| **Psychiatric Comorbidities** | 0.0390 | 0.0067 |

**APPENDIX. Propensity score analysis results**

**Table A2.** Prevalence of study variables by ivAPAP use in the matched sample (based on propensity scores)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ivAPAP Use** | | | |
|  | **Yes (n=4,994)** | | **No (n=14,982)** | |
|  | **n** | **%** | **n** | **%** |
| ***PATIENT DEMOGRAPHICS*** |  |  |  |  |
| **Age \*** | 62 | 52-70 | 62 | 51-70 |
| **Gender** |  |  |  |  |
| **Female** | 2,838 | 56.8 | 8,568 | 57.2 |
| **Male** | 2,156 | 43.2 | 6,414 | 42.8 |
| **Race** |  |  |  |  |
| **White** | 3,811 | 76.3 | 11,369 | 75.9 |
| **Black** | 408 | 8.2 | 1,189 | 7.9 |
| **Hispanic** | 5 | 0.1 | 13 | 0.1 |
| **Other** | 770 | 15.4 | 2,411 | 16.1 |
| ***HEALTHCARE RELATED*** |  |  |  |  |
| **Insurance Type** |  |  |  |  |
| **Commercial** | 1,950 | 39.0 | 5,781 | 38.6 |
| **Medicaid** | 231 | 4.6 | 731 | 4.9 |
| **Medicare** | 2,325 | 46.6 | 6,926 | 46.2 |
| **Uninsured** | 38 | 0.8 | 110 | 0.7 |
| **Unknown** | 450 | 9.0 | 1,434 | 9.6 |
| **Hospital Location** |  |  |  |  |
| **Rural** | 490 | 9.8 | 1,527 | 10.2 |
| **Urban** | 4,504 | 90.2 | 13,455 | 89.8 |
| **Hospital Size** |  |  |  |  |
| **<300 beds** | 1,160 | 23.2 | 3,805 | 25.4 |
| **300-499 beds** | 1,703 | 34.1 | 4,796 | 32.0 |
| **>500 beds** | 2,131 | 42.7 | 6,381 | 42.6 |
| **Hospital Teaching Status** |  |  |  |  |
| **Non-Teaching** | 2,633 | 52.7 | 8,042 | 53.7 |
| **Teaching** | 2,361 | 47.3 | 6,940 | 46.3 |
| **# of Annual Spine Procedures\*** | 181 | 101-270 | 181 | 103-292 |
| ***PROCEDURE RELATED*** |  |  |  |  |
| **Year of Procedure** |  |  |  |  |
| **2011** | 790 | 15.8 | 2,245 | 15.0 |
| **2012** | 1,472 | 29.5 | 4,785 | 31.9 |
| **2013** | 1,212 | 24.3 | 4,324 | 28.9 |
| **2014** | 1,520 | 30.4 | 3,628 | 24.2 |
| ***ANESTHESIA/ANALGESIA*** |  |  |  |  |
| **PCA Use** | 1,238 | 24.8 | 3,745 | 25.0 |
| **NSAID Use** |  |  |  |  |
| **Day 0** | 685 | 13.7 | 1,999 | 13.3 |
| **Day 1+** | 627 | 12.6 | 1,825 | 12.2 |
| **Cox-2 Inhibitor Use** |  |  |  |  |
| **Day 0** | 158 | 3.2 | 498 | 3.3 |
| **Day 1+** | 106 | 2.1 | 442 | 3.0 |
| **Ketamine Use** |  |  |  |  |
| **Day 0** | 255 | 5.1 | 715 | 4.8 |
| **Day 1+** | 21 | 0.4 | 36 | 0.2 |
| **Pregabalin/Gabapentin Use** |  |  |  |  |
| **Day 0** | 942 | 18.9 | 2,957 | 19.7 |
| **Day 1+** | 1,241 | 24.9 | 3,756 | 25.1 |
| **IV Acetaminophen Dose** |  |  |  |  |
| **POD 0, 1 dose** | 3,750 | 75.1 | - | - |
| **POD 0, >1 dose** | 810 | 16.2 | - | - |
| **POD 1, 1 dose** | 386 | 7.7 | - | - |
| **POD 1, >1 dose** | 629 | 12.6 | - | - |
| **POD 1+, ≥1 dose** | 184 | 3.7 | - | - |
| ***COMORBIDITIES*** |  |  |  |  |
| **Charlson Comorbidity Index (categorized)** | |  |  |  |
| **0** | 3,679 | 73.7 | 11,033 | 73.6 |
| **1** | 904 | 18.1 | 2,852 | 19.0 |
| **2** | 269 | 5.4 | 706 | 4.7 |
| **2+** | 142 | 2.8 | 391 | 2.6 |
| **History of Substance Use/Abuse** | 824 | 16.5 | 2,471 | 16.5 |
| **Pain Conditions** | 4,957 | 99.3 | 14,877 | 99.3 |
| **Psychiatric Comorbidities** | 1,160 | 23.2 | 3,507 | 23.4 |

**APPENDIX.** Propensity score analysis results

**Table A3.** Final results from propensity score analysis showing the association between any ivAPAP use during hospitalization and opioid prescription (in oral morphine equivalents), length and cost of hospitalization and opioid related adverse outcomes; odds ratios for binary variables and for continuous outcomes exponentiated coefficients from the log model depicting % change compared to reference (= no ivAPAP use).

|  |  |
| --- | --- |
|  | **Any use of ivAPAP** |
|  | **[reference= No ivAPAP use]** |
| **Total Opioid Prescription** | 8.9% (6.5; 11.4%)\* |
| **Length of Hospital Stay** | 3.8% (2.0; 5.6%)\* |
| **Cost of Hospitalization** | 4.4% (2.7; 6.2%)\* |
|  |  |
| **Respiratory Complications** | 1.05 (0.85; 1.29) |
| **Gastrointestinal Complications** | 1.37 (1.16; 1.61)\* |
| **Genitourinary Complications** | 1.32 (1.09; 1.59)\* |
| **Central Nervous System Complications** | 1.04 (0.75; 1.43) |
| **Other Complications\*\*** | 1.12 (0.88; 1.43) |
| **Naloxone Use** | 1.19 (0.96; 1.48) |

\*P<0.05

\*\*"Other" includes postoperative bradycardia, rash or itching, fall from bed, or "drugs causing adverse effects with therapeutic use