# Supplementary Tables

**Supplementary Table 1. Baseline demographic and clinical characteristics of patients by cluster**

|  | **Cluster = 1 (N=13,987)** | | **Cluster = 2 (N=4270)** | | **Cluster = 3 (N=513)** | | **Chi-Square P-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Mean/N** | **SD/%** | **Mean/N** | **SD/%** | **Mean/N** | **SD/%** |  |
| **Age** | 51.3 | 8.8 | 51.9 | 8.3 | 49.4 | 9.3 | <.0001\*\* |
| **Gender** |  |  |  |  |  |  |  |
| Male | 6,423 | 45.9% | 1,643 | 38.5% | 170 | 33.1% | <.0001\*\* |
| Female | 7,564 | 54.1% | 2,627 | 61.5% | 343 | 66.9% |  |
| **Place of Service1** |  |  |  |  |  |  |  |
| Inpatient | 12,480 | 89.2% | 3,873 | 90.7% | 467 | 91.0% | 0.0122\* |
| Outpatient | 1,507 | 10.8% | 397 | 9.3% | 46 | 9.0% |  |
| **Proportion Discharged Home2** |  |  |  |  |  |  |  |
| Yes | 11,912 | 85.2% | 3,501 | 82.0% | 410 | 79.9% | <.0001\*\* |
| No | 2,075 | 14.8% | 769 | 18.0% | 103 | 20.1% |  |
| **Number of levels** |  |  |  |  |  |  |  |
| 1 | 11,155 | 79.8% | 3,343 | 78.3% | 409 | 79.7% | 0.1159 |
| 2 | 2,832 | 20.2% | 927 | 21.7% | 104 | 20.3% |  |
| **Posterolateral Fusion and/or Interbody Fusion** |  |  |  |  |  |  |  |
| Posterolateral fusion only | 4,590 | 32.8% | 1,451 | 34.0% | 153 | 29.8% | 0.0424\* |
| Interbody fusion only | 1,652 | 11.8% | 447 | 10.5% | 69 | 13.5% |  |
| Both posterolateral and interbody fusion | 7,745 | 55.4% | 2,372 | 55.6% | 291 | 56.7% |  |
| **Functional Comorbidity Index Score** |  |  |  |  |  |  |  |
| 0 | 154 | 1.1% | 12 | 0.3% | 0 | 0.0% | <.0001\*\* |
| 1-2 | 4,755 | 34.0% | 631 | 14.8% | 72 | 14.0% |  |
| 3-5 | 8,206 | 58.7% | 2,797 | 65.5% | 319 | 62.2% |  |
| 6+ | 872 | 6.2% | 830 | 19.4% | 122 | 23.8% |  |
| **Elixhauser Comorbidity Score** |  |  |  |  |  |  |  |
| 0 | 4,248 | 30.4% | 552 | 12.9% | 14 | 2.7% | <.0001\*\* |
| 1-2 | 7,465 | 53.4% | 2,032 | 47.6% | 283 | 55.2% |  |
| 3-5 | 2,160 | 15.4% | 1,450 | 34.0% | 186 | 36.3% |  |
| 6+ | 114 | 0.8% | 236 | 5.5% | 30 | 5.8% |  |
| **Individual Elixhauser Comorbidities (>5%)** | | | | | | | |
| **Elx. Gr. 02 Cardiac Arrhythmia** | 829 | 5.9% | 465 | 10.9% | 33 | 6.4% | <.0001\*\* |
| **Elx. Gr. 06 Hypertension Uncomplicated** | 5,821 | 41.6% | 2,210 | 51.8% | 198 | 38.6% | <.0001\*\* |
| **Elx. Gr. 10 Chronic Pulmonary Disease** | 1,462 | 10.5% | 820 | 19.2% | 78 | 15.2% | <.0001\*\* |
| **Elx. Gr. 11 Diabetes Uncomplicated** | 1,825 | 13.0% | 1,034 | 24.2% | 60 | 11.7% | <.0001\*\* |
| **Elx. Gr. 13 Hypothyroidism** | 1,453 | 10.4% | 647 | 15.2% | 79 | 15.4% | <.0001\*\* |
| **Elx. Gr. 21 Rheumatoid Arthritis/Collagen** | 1,112 | 8.0% | 745 | 17.4% | 64 | 12.5% | <.0001\*\* |
| **Elx. Gr. 23 Obesity (includes Morbid Obesity)** | 779 | 5.6% | 443 | 10.4% | 45 | 8.8% | <.0001\*\* |
| **Elx. Gr. 31 Depression** | 1,351 | 9.7% | 968 | 22.7% | 456 | 88.9% | <.0001\*\* |

|  |
| --- |
| 1. Inpatient includes hospitalizations where (either): a) claim was obtained from Inpatient Services table and dates of admission and discharge were NOT same day; b) claim was obtained from Outpatient Services table and place of service = Inpatient. Outpatient includes hospitalizations where (either): a) claim was obtained from Inpatient Services table and dates of admission and discharge were same day; b) claim was obtained from Outpatient Services table and place of service = Outpatient or ASC  2. Includes hospitalizations obtained from the (1) Inpatient Services data where DISCHARGE STATUS = DISCHARGED\_HOME + (2) Outpatient Services data. |

**Supplementary Table 2. One-year preoperative medication costs, overall and by cluster**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ALL (N=18,770)** | | **Cluster = 1 (N=13,987)** | | **Cluster = 2 (N=4270)** | | **Cluster = 3 (N=513)** | | **Range\*** |
|  | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** |
| **TOTAL** | $ 3,865.00 | $ 7,189.10 | $ 2,937.25 | $ 5,379.93 | $ 6,549.95 | $ 9,730.41 | $ 6,811.88 | $ 14,906.40 | 3874.63 |
| Opiate Agonists | $ 360.75 | $ 2,778.62 | $ 204.31 | $ 1,520.83 | $ 789.83 | $ 3,351.62 | $ 1,054.55 | $ 11,112.95 | 850.24 |
| Antidepressants | $ 298.18 | $ 764.36 | $ 220.59 | $ 628.12 | $ 483.44 | $ 990.40 | $ 871.63 | $ 1,296.70 | 651.04 |
| Anticonvulsants | $ 105.95 | $ 560.47 | $ 74.49 | $ 442.35 | $ 176.76 | $ 710.49 | $ 374.44 | $ 1,349.12 | 299.95 |
| CNS Agents | $ 139.28 | $ 1,139.32 | $ 108.79 | $ 1,205.61 | $ 238.63 | $ 950.53 | $ 143.56 | $ 488.63 | 129.84 |
| Muscle Relaxants | $ 79.81 | $ 334.27 | $ 62.36 | $ 260.93 | $ 133.62 | $ 490.12 | $ 107.46 | $ 447.44 | 71.26 |
| NSAIDS | $ 140.72 | $ 469.31 | $ 124.34 | $ 433.86 | $ 193.25 | $ 571.38 | $ 150.15 | $ 423.94 | 68.91 |
| Benzodiazepines | $ 16.85 | $ 113.75 | $ 12.49 | $ 101.44 | $ 28.61 | $ 147.11 | $ 37.65 | $ 103.47 | 25.16 |
| Analgesics | $ 28.30 | $ 162.06 | $ 26.01 | $ 152.83 | $ 34.14 | $ 179.41 | $ 42.20 | $ 236.14 | 16.19 |

1. All payment amounts adjusted to $US 2016 using the Medical Care Component of the CPI-U.

\* p-values for between-cluster differences for non-parametric Kruskal-Wallis within each medication categories were significant at the .01 level

**Supplementary Table 3. One-year preoperative medical costs (non-pharmacy), overall and by cluster**

|  | **ALL (N=18,770)** | | **Cluster = 1 (N=13,987)** | | **Cluster = 2 (N=4270)** | | **Cluster = 3 (N=513)** | | **Kruskal-Wallis P-value** | **Range** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** |
| **TOTAL** | $15,862.93 | $19,742.67 | $12,198.82 | $13,076.06 | $27,089.34 | $30,127.13 | $22,321.09 | $24,295.04 | <.0001\*\* | 14890.52 |
| Non-TL Spine Acute Inpatient | $ 1,406.38 | $ 7,491.31 | $ 482.10 | $ 3,872.62 | $ 4,420.58 | $13,411.04 | $ 1,518.06 | $ 6,988.48 | <.0001\*\* | 3938.48 |
| Non-TL Spine HOPD Visits | $ 2,458.39 | $ 6,058.24 | $ 1,951.84 | $ 5,228.97 | $ 4,081.27 | $ 7,999.17 | $ 2,761.39 | $ 5,997.56 | <.0001\*\* | 2129.43 |
| Other: Behavioral Health | $ 113.34 | $ 903.01 | $ 25.84 | $ 543.10 | $ 166.24 | $ 1,158.50 | $ 2,058.46 | $ 2,573.15 | <.0001\*\* | 2032.62 |
| TL Spine Decompression | $ 924.42 | $ 5,750.40 | $ 565.74 | $ 4,015.42 | $ 2,076.99 | $ 9,255.27 | $ 1,110.42 | $ 6,549.14 | <.0001\*\* | 1511.25 |
| Non-TL Spine Office Visits | $ 1,678.98 | $ 3,107.03 | $ 1,395.71 | $ 2,541.76 | $ 2,531.19 | $ 4,381.38 | $ 2,309.03 | $ 2,949.94 | <.0001\*\* | 1135.48 |
| TL Spine Injection | $ 1,999.94 | $ 4,485.00 | $ 1,819.63 | $ 3,834.68 | $ 2,504.32 | $ 5,951.30 | $ 2,717.76 | $ 6,072.17 | <.0001\*\* | 898.13 |
| Non-TL Spine Home Visits | $ 210.36 | $ 3,748.80 | $ 49.71 | $ 504.46 | $ 722.57 | $ 7,649.96 | $ 327.20 | $ 4,167.55 | <.0001\*\* | 672.86 |
| TL Spine MRI | $ 1,599.00 | $ 2,816.89 | $ 1,448.75 | $ 1,448.84 | $ 2,079.53 | $ 5,206.20 | $ 1,695.93 | $ 2,233.94 | <.0001\*\* | 630.78 |
| Other: Spine Decompression | $ 106.50 | $ 2,394.47 | $ 47.68 | $ 1,216.61 | $ 234.71 | $ 3,347.60 | $ 643.10 | $ 8,705.71 | <.0001\*\* | 595.42 |
| Non-TL Spine Emergency Services | $ 356.77 | $ 1,421.68 | $ 231.94 | $ 987.53 | $ 753.94 | $ 2,247.69 | $ 454.30 | $ 1,891.76 | <.0001\*\* | 522.00 |
| Other: PT/OT/Chiropractic/ Acupuncture | $ 714.98 | $ 1,682.57 | $ 609.67 | $ 1,317.13 | $ 1,016.96 | $ 2,298.17 | $ 1,072.73 | $ 3,341.08 | <.0001\*\* | 463.06 |
| Other: Cervical Spine Fusion | $ 170.85 | $ 3,352.26 | $ 131.03 | $ 2,749.95 | $ 255.82 | $ 4,488.65 | $ 549.08 | $ 6,094.39 | 0.0023\*\* | 418.05 |
| TL Spine X-ray | $ 426.70 | $ 1,789.51 | $ 366.59 | $ 1,166.58 | $ 581.38 | $ 2,530.25 | $ 778.13 | $ 5,139.47 | <.0001\*\* | 411.54 |
| Non-TL Spine Rehab or SNF | $ 156.05 | $ 1,551.23 | $ 79.32 | $ 969.89 | $ 405.93 | $ 2,687.11 | $ 168.39 | $ 1,276.30 | <.0001\*\* | 326.61 |
| Non-TL Spine ASC Visits | $ 364.87 | $ 2,197.07 | $ 326.25 | $ 1,949.61 | $ 466.87 | $ 2,771.65 | $ 568.78 | $ 2,983.66 | <.0001\*\* | 242.53 |
| TL Spine CT/Myelography | $ 401.40 | $ 1,730.32 | $ 349.08 | $ 1,235.73 | $ 579.57 | $ 2,819.35 | $ 344.73 | $ 1,193.04 | <.0001\*\* | 234.84 |
| TL Spine HOPD Visits | $ 396.98 | $ 2,952.89 | $ 348.02 | $ 2,833.30 | $ 563.20 | $ 3,427.92 | $ 348.44 | $ 1,444.33 | <.0001\*\* | 215.18 |
| Other: Pain Pump/Neurostim | $ 116.97 | $ 2,260.09 | $ 72.27 | $ 1,858.78 | $ 265.53 | $ 3,320.10 | $ 99.11 | $ 849.46 | <.0001\*\* | 193.26 |
| Other: Spine Radiology | $ 207.83 | $ 1,877.58 | $ 167.81 | $ 1,179.29 | $ 338.77 | $ 3,286.30 | $ 208.99 | $ 1,003.82 | <.0001\*\* | 170.96 |
| TL Spine Acute Inpatient | $ 132.30 | $ 2,346.79 | $ 103.31 | $ 2,139.63 | $ 233.65 | $ 3,009.16 | $ 79.33 | $ 1,107.64 | <.0001\*\* | 154.32 |
| TL Spine Discography | $ 307.75 | $ 1,989.48 | $ 295.19 | $ 1,849.14 | $ 332.42 | $ 2,396.14 | $ 444.96 | $ 1,946.93 | 0.0126\* | 149.77 |
| Other: EMG/NCV | $ 157.44 | $ 906.97 | $ 120.90 | $ 475.36 | $ 267.35 | $ 1,665.84 | $ 238.88 | $ 836.81 | <.0001\*\* | 146.45 |
| TL Spine Office Visits | $ 527.46 | $ 562.00 | $ 499.50 | $ 542.32 | $ 606.29 | $ 604.68 | $ 633.47 | $ 641.19 | <.0001\*\* | 133.97 |
| Non-TL Spine Ambulance | $ 33.22 | $ 449.17 | $ 5.78 | $ 216.62 | $ 121.74 | $ 839.13 | $ 44.67 | $ 396.38 | <.0001\*\* | 115.96 |
| Other: Ambulation Device | $ 33.89 | $ 893.13 | $ 8.57 | $ 428.41 | $ 117.99 | $ 1,697.57 | $ 24.22 | $ 351.98 | <.0001\*\* | 109.42 |
| Non-TL Spine Other | $ 124.25 | $ 824.08 | $ 98.80 | $ 690.67 | $ 202.04 | $ 1,167.18 | $ 170.50 | $ 659.81 | <.0001\*\* | 103.24 |
| Other: Spine MRI | $ 73.67 | $ 571.55 | $ 54.30 | $ 361.98 | $ 127.09 | $ 957.39 | $ 157.05 | $ 844.04 | <.0001\*\* | 102.75 |
| Other: Spine Fracture Repair | $ 2.78 | $ 286.75 | $ - | $ - | $ - | $ - | $ 101.73 | $ 1,733.27 | <.0001\*\* | 101.73 |
| Other: Spine CT | $ 31.48 | $ 651.43 | $ 13.18 | $ 285.04 | $ 93.37 | $ 1,261.20 | $ 15.16 | $ 182.15 | <.0001\*\* | 80.19 |
| TL Spine Emergency Services | $ 75.16 | $ 449.38 | $ 57.52 | $ 335.10 | $ 131.66 | $ 704.33 | $ 86.09 | $ 404.74 | <.0001\*\* | 74.14 |
| Other: Spine Injection | $ 43.70 | $ 529.38 | $ 37.46 | $ 517.90 | $ 57.37 | $ 443.77 | $ 99.99 | $ 1,139.55 | <.0001\*\* | 62.53 |
| TL Spine Home Visits | $ 24.29 | $ 271.42 | $ 9.46 | $ 154.21 | $ 70.58 | $ 481.10 | $ 43.25 | $ 311.14 | <.0001\*\* | 61.12 |
| Other: Spine X-Ray | $ 40.26 | $ 564.09 | $ 26.33 | $ 459.72 | $ 84.05 | $ 827.58 | $ 55.65 | $ 398.84 | <.0001\*\* | 57.72 |
| Other: Spine Procedure | $ 34.29 | $ 1,092.89 | $ 30.40 | $ 1,041.20 | $ 51.15 | $ 1,303.51 | $ - | $ - | 0.4174 | 51.15 |
| TL Spine Rehab or SNF | $ 35.37 | $ 332.22 | $ 23.88 | $ 245.07 | $ 70.41 | $ 518.23 | $ 56.96 | $ 389.70 | <.0001\*\* | 46.53 |
| TL Spine ASC Visits | $ 28.44 | $ 836.82 | $ 18.38 | $ 634.07 | $ 62.07 | $ 1,324.13 | $ 23.00 | $ 238.29 | 0.0033\*\* | 43.69 |
| TL Spine Fusion | $ 6.77 | $ 550.60 | $ - | $ - | $ 29.74 | $ 1,154.20 | $ - | $ - | 0.0061\*\* | 29.74 |
| Other: Spine Orthosis | $ 287.31 | $ 957.10 | $ 285.63 | $ 1,044.38 | $ 294.67 | $ 648.95 | $ 271.53 | $ 522.52 | 0.1165 | 23.14 |
| TL Spine Other | $ 24.19 | $ 271.74 | $ 20.03 | $ 248.78 | $ 38.66 | $ 345.19 | $ 17.10 | $ 143.36 | <.0001\*\* | 21.56 |
| TL Spine Ambulance | $ 9.37 | $ 225.18 | $ 5.26 | $ 116.97 | $ 23.63 | $ 421.16 | $ 2.74 | $ 62.09 | <.0001\*\* | 20.89 |
| Other: Spine Fixation | $ 6.27 | $ 376.80 | $ 3.48 | $ 295.87 | $ 16.17 | $ 580.77 | $ - | $ - | 0.0088\*\* | 16.17 |
| Non-TL Spine Urgent Care | $ 7.68 | $ 63.41 | $ 7.84 | $ 63.47 | $ 6.48 | $ 63.12 | $ 13.40 | $ 63.93 | 0.0024\*\* | 6.92 |
| TL Spine Outpatient Rehab | $ 1.70 | $ 52.38 | $ 1.34 | $ 45.42 | $ 2.50 | $ 66.16 | $ 4.89 | $ 87.79 | 0.1706 | 3.55 |
| Other: Spine Hardware Revision | $ 1.22 | $ 108.32 | $ 1.64 | $ 125.48 | $ - | $ - | $ - | $ - | 0.5987 | 1.64 |
| Non-TL Spine Outpatient Rehab | $ 0.78 | $ 38.96 | $ 0.58 | $ 27.91 | $ 1.44 | $ 63.80 | $ 0.92 | $ 20.85 | 0.5841 | 0.86 |

1.All payment amounts adjusted to $US 2016 using the Medical Care Component of the CPI-U.

\* = significance at the 0.05 level

\*\* = significance at the 0.01 level