**Supplemental Digital Content 6 -** Extended Characteristics For Entire Cohort, Non-event Controls, and Deterioration Event Patients; and Training / Validation Set Patients versus Temporal Holdout Test Set Patients

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| **Category** | **Feature** | **Entire Cohort**  **N =1555**  **n(%) or median (IQR)** |  | | | | | | |
| **Non-event Control Patients,**  **N =1370**  **n(%) or median (IQR)** | **Deterioration Event Patients, N =185**  **n(%) or median (IQR)** | **p-Value** |  | **Training / Validation Set Patients (2013-2017),**  **N =949**  **n(%) or median (IQR)** | **Holdout Test Set Patients (2017-2020),**  **N =606**  **n(%) or median (IQR)** | **p-Value** |
| **Demographic / Anthropometric Data** | Age, years | 67 [58 - 74] | 66 [57 - 74] | 70 [63 - 77] | 0.457 | 67 [58 - 75] | 65 [58 - 72] | 0.148 |
| Male Gender | 997 (64.1%) | 915 (66.8%) | 82 (44.3%) | <0.001 | 591 (62.3%) | 406 (67.0%) | 0.058 |
| Race  Caucasian | 1370 (88.1%) | 1210 (88.3%) | 160 (86.5%) | 0.005 | 841 (88.6%) | 529 (87.3%) | 0.844 |
| Other | 28 (1.8%) | 27 (2.0%) | 1 (0.5%) | 18 (1.9%) | 10 (1.7%) |
| Unknown | 21 (1.4%) | 19 (1.4%) | 2 (1.1%) | 13 (1.4%) | 8 (1.3%) |
| African American | 99 (6.4%) | 83 (6.1%) | 16 (8.6%) | 55 (5.8%) | 44 (7.3%) |
| Asian | 26 (1.7%) | 22 (1.6%) | 4 (2.2%) | 14 (1.5%) | 12 (2.0%) |
| Patient Refused | 8 (0.5%) | 8 (0.6%) | 0 (0.0%) | 6 (0.6%) | 2 (0.3%) |
| American Indian or Alaskan Native | 1 (0.1%) | 1 (0.1%) | 0 (0.0%) | 1 (0.1%) | 0 (0.0%) |
| Native Hawaiian and Other Pacific Islander | 2 (0.1%) | 0 (0.0%) | 2 (1.1%) | 1 (0.1%) | 1 (0.2%) |
| **Patient Medical History** | Congestive Heart Failure | 659 (42.4%) | 532 (38.8%) | 127 (68.6%) | <0.001 | 326 (34.4%) | 333 (55.0%) | <0.001 |
| Cardiac Arrhythmias | 896 (57.6%) | 762 (55.6%) | 134 (72.4%) | <0.001 | 458 (48.3%) | 438 (72.3%) | <0.001 |
| Valvular Disease | 1357 (87.3%) | 1192 (87.0%) | 165 (89.2%) | 0.403 | 843 (88.8%) | 514 (84.8%) | 0.021 |
| Pulmonary Circulation Disorders | 320 (20.6%) | 244 (17.8%) | 76 (41.1%) | <0.001 | 187 (19.7%) | 133 (21.9%) | 0.286 |
| Peripheral Vascular Disorders | 803 (51.6%) | 713 (52.0%) | 90 (48.6%) | 0.386 | 476 (50.2%) | 327 (54.0%) | 0.143 |
| Hypertension, Complicated | 322 (20.7%) | 254 (18.5%) | 68 (36.8%) | <0.001 | 48 (5.1%) | 274 (45.2%) | <0.001 |
| Hypertension, Uncomplicated | 1125 (72.3%) | 990 (72.3%) | 135 (73.0%) | 0.839 | 641 (67.5%) | 484 (79.9%) | <0.001 |
| Paralysis | 28 (1.8%) | 20 (1.5%) | 8 (4.3%) | 0.006 | 11 (1.2%) | 17 (2.8%) | 0.017 |
| Other Neurological Disorders | 86 (5.5%) | 65 (4.7%) | 21 (11.4%) | <0.001 | 34 (3.6%) | 52 (8.6%) | <0.001 |
| Chronic Pulmonary Disease | 509 (32.7%) | 425 (31.0%) | 84 (45.4%) | <0.001 | 304 (32.0%) | 205 (33.8%) | 0.462 |
| Diabetes, Complicated | 173 (11.1%) | 143 (10.4%) | 30 (16.2%) | 0.019 | 31 (3.3%) | 142 (23.4%) | <0.001 |
| Diabetes, Uncomplicated | 377 (24.2%) | 322 (23.5%) | 55 (29.7%) | 0.064 | 219 (23.1%) | 158 (26.1%) | 0.179 |
| Liver Disease | 155 (10.0%) | 125 (9.1%) | 30 (16.2%) | 0.003 | 82 (8.6%) | 73 (12.0%) | 0.029 |
| Coagulopathy | 312 (20.1%) | 252 (18.4%) | 60 (32.4%) | <0.001 | 109 (11.5%) | 203 (33.5%) | <0.001 |
| Coronary Artery Disease | 722 (46.4%) | 618 (45.1%) | 104 (56.2%) | 0.004 | 364 (38.4%) | 358 (59.1%) | <0.001 |
| Recent MI | 28 (1.8%) | 21 (1.5%) | 7 (3.8%) | 0.031 | 22 (2.3%) | 6 (1.0%) | 0.055 |
| Active Endocarditis | 109 (7.0%) | 87 (6.4%) | 22 (11.9%) | 0.006 | 75 (7.9%) | 34 (5.6%) | 0.084 |
| Preoperative  Labs/Studies & Status | Left ventricular ejection fraction, % | 55 [55 - 65] | 57 [55 - 65] | 55 [45 - 60] | 0.916 | 59 [55 - 65] | 55 [55 - 64] | 0.077 |
| Estimated glomerular filtration rate (mL/min/1.73m2) | 75.0 [58.8 - 88.5] | 76.5 [61.4 - 89.4] | 59.7 [41.7 - 78.9] | 0.201 | 74.2 [58.4 - 88.6] | 76.0 [60.1 - 88.5] | 0.750 |
| Preoperative inotrope infusion | 6 (0.4%) | 3 (0.2%) | 3 (1.6%) | 0.004 | 3 (0.3%) | 3 (0.5%) | 0.579 |
| ASA Physical Status Classification  2  3  4 | 2 (0.1%)  308 (19.8%)  1244 (80.0%) | 2 (0.1%)  283 (20.7%)  1085 (79.2%) | 0 (0.0%)  25 (13.5%)  159 (85.9%) | 0.067 | 0 (0.0%)  189 (19.9%)  760 (80.1%) | 2 (0.3%)  119 (19.6%)  484 (79.9%) | 0.207 |
| Surgery Type | Isolated CABG  Isolated Non-CABG  2 Procedures  3+ Procedures | 160 (10.3%)  829 (53.3%)  437 (28.1%)  38 (2.4%) | 147 (10.7%)  737 (53.8%)  375 (27.4%)  28 (2.0%) | 13 (7.0%)  92 (49.7%)  62 (33.5%)  10 (5.4%) | 0.007 | 51 (5.4%)  480 (50.6%)  299 (31.5%)  29 (3.1%) | 109 (18.0%)  349 (57.6%)  138 (22.8%)  9 (1.5%) | <0.001 |
| Thoracic Aortic Surgery | 375 (24.1%) | 350 (25.5%) | 25 (13.5%) | <0.001 | 218 (23.0%) | 157 (25.9%) | 0.187 |
| Aortic Valve Surgery | 665 (42.8%) | 601 (43.9%) | 64 (34.6%) | 0.017 | 448 (47.2%) | 217 (35.8%) | <0.001 |
| Mitral Valve Surgery | 527 (33.9%) | 445 (32.5%) | 82 (44.3%) | 0.001 | 370 (39.0%) | 157 (25.9%) | <0.001 |
| Tricuspid Valve Surgery | 322 (20.7%) | 257 (18.8%) | 65 (35.1%) | <0.001 | 174 (18.3%) | 148 (24.4%) | 0.004 |
| Other Cardiac Procedure | 23 (1.5%) | 20 (1.5%) | 3 (1.6%) | 0.864 | 2 (0.2%) | 21 (3.5%) | <0.001 |
| MAZE | 258 (16.6%) | 206 (15.0%) | 52 (28.1%) | <0.001 | 163 (17.2%) | 95 (15.7%) | 0.438 |
| Anesthesia Duration, min | 429 [350 - 525] | 422 [349 - 515] | 482 [365 - 600] | <0.001 | 413 [340 - 505] | 450 [368 - 547] | <0.001 |
| Cardiopulmonary Bypass Duration, min | 166 [117 - 235] | 162 [115 - 229] | 202 [132 - 290] | 0.024 | 161 [114 - 228] | 173 [123 - 245] | 0.247 |
| Postoperative non-waveform derived vital signs | SpO2, % | 97 [95 - 99] | 97 [95 - 99] | 96 [95 - 98] | 0.884 | 97 [95 - 99] | 97 [95 - 99] | 0.119 |
| Temperature, Celsius | 36.9 [36.6 - 37.2] | 36.9 [36.6 - 37.2] | 36.8 [36.5 - 37.3] | 0.030 | 36.9 [36.6 - 37.2] | 36.9 [36.6 - 37.2] | 0.502 |
| Postoperative outputs | Median hourly urine output, mL | 35 [0 - 71] | 38 [0.3 - 75] | 25 [0. - 50] | 0.067 | 30 [0 - 60] | 47 [30 - 95] | <0.001 |
| Postoperative Laboratory Values | Creatinine Range  Unknown  <0.5 (female) or <0.7 (male)  0.5-1.0 (female) or 0.7-1.3 (male)  1.1-2.0 (female) or 1.3-2.0 (male)  >2.0 | 0 (0.0%)  95 (6.1%)  1072 (68.9%)  282 (18.1%)  106 (6.8%) | 0 (0.0%)  92 (6.7%)  999 (72.9%)  212 (15.5%)  67 (4.9%) | 0 (0.0%)  3 (1.6%)  73 (39.5%)  70 (37.8%)  39 (21.1%) | <0.001 | 0 (0.0%)  65 (6.8%)  656 (69.1%)  172 (18.1%)  56 (5.9%) | 0 (0.0%)  30 (5.0%)  416 (68.6%)  110 (18.2%)  50 (8.3%) | 0.268 |
|  | Glucose Range, mg/dL  Unknown  <40  40-69  70-180  >180 | 0 (0.0%)  0 (0.0%)  4 (0.3%)  1442 (92.7%)  109 (7.0%) | 0 (0.0%)  0 (0.0%)  3 (0.2%)  1272 (92.8%)  95 (6.9%) | 0 (0.0%)  0 (0.0%)  1 (0.5%)  170 (91.9%)  14 (7.6%) | 0.943 | 0 (0.0%)  0 (0.0%)  4 (0.4%)  885 (93.3%)  60 (6.3%) | 0 (0.0%)  0 (0.0%)  0 (0.0%)  557 (91.9%)  49 (8.1%) | 0.371 |
|  | Hematocrit Range  Unknown  <21%  21-35 (female) or 21-39 (male)  36-48 (female) or 40-50 (male)  >48 (female) or >50 (male) | 0 (0.0%)  56 (3.6%)  1431 (92.0%)  66 (4.2%)  2 (0.1%) | 0 (0.0%)  41 (3.0%)  1266 (92.4%)  61 (4.5%)  2 (0.1%) | 0 (0.0%)  15 (8.1%)  165 (89.2%)  5 (2.7%)  0 (0.0%) | 0.009 | 0 (0.0%)  29 (3.1%)  876 (92.3%)  43 (4.5%)  1 (0.1%) | 0 (0.0%)  27 (4.5%)  555 (91.6%)  23 (3.8%)  1 (0.2%) | 0.626 |
|  | Hemoglobin Range, g/dL  Unknown  <7.0  7.0-11.9 (female) or 7.0-13.4 (male)  12.0-16.0 (female) or 13.5-17.0 (male)  >16.0 (female) or >17.0 (male) | 0 (0.0%)  25 (1.6%)  1453 (93.4%)  76 (4.9%)  1 (0.1%) | 0 (0.0%)  16 (1.2%)  1282 (93.6%)  71 (5.2%)  1 (0.1%) | 0 (0.0%)  9 (4.9%)  171 (92.4%)  5 (2.7%)  0 (0.0%) | 0.003 | 0 (0.0%)  13 (1.4%)  887 (93.5%)  48 (5.1%)  1 (0.1%) | 0 (0.0%)  12 (2.0%)  566 (93.4%)  28 (4.6%)  0 (0.0%) | 0.801 |
|  | INR Range  Unknown  <0.9  0.9 - 1.2  1.3 - 2.0  >2.0 | 2 (0.1%)  0 (0.0%)  1350 (86.8%)  177 (11.4%)  26 (1.7%) | 2 (0.1%)  0 (0.0%)  1220 (89.1%)  131 (9.6%)  17 (1.2%) | 0 (0.0%)  0 (0.0%)  130 (70.3%)  46 (24.9%)  9 (4.9%) | <0.001 | 2 (0.2%)  0 (0.0%)  833 (87.8%)  95 (10.0%)  19 (2.0%) | 0 (0.0%)  0 (0.0%)  517 (85.3%)  82 (13.5%)  7 (1.2%) | 0.128 |
|  | Lactate Range, mmol/L  Unknown  <0.5  0.5-1.6 (arterial) or 0.5-2.2 (venous)  1.7-4.0 (arterial) or 2.3-4.0 (venous)  >4.0 | 13 (0.8%)  1 (0.1%)  867 (55.8%)  620 (39.9%)  54 (3.5%) | 13 (0.9%)  1 (0.1%)  763 (55.7%)  553 (40.4%)  40 (2.9%) | 0 (0.0%)  0 (0.0%)  104 (56.2%)  67 (36.2%)  14 (7.6%) | 0.013 | 13 (1.4%)  0 (0.0%)  541 (57.0%)  367 (38.7%)  28 (3.0%) | 0 (0.0%)  1 (0.2%)  326 (53.8%)  253 (41.7%)  26 (4.3%) | 0.010 |
|  | Platelet Count Range, 109/L  Unknown  <50  50-149  150-400  >400 | 1 (0.1%)  9 (0.6%)  939 (60.4%)  596 (38.3%)  10 (0.6%) | 1 (0.1%)  3 (0.2%)  816 (59.6%)  541 (39.5%)  9 (0.7%) | 0 (0.0%)  6 (3.2%)  123 (66.5%)  55 (29.7%)  1 (0.5%) | <0.001 | 1 (0.1%)  5 (0.5%)  602 (63.4%)  336 (35.4%)  5 (0.5%) | 0 (0.0%)  4 (0.7%)  337 (55.6%)  260 (42.9%)  5 (0.8%) | 0.034 |
|  | Potassium Range, mmol/L  Unknown  <3.5  3.5-5.0  5.1-6.0  >6.0 | 0 (0.0%)  35 (2.3%)  1422 (91.4%)  94 (6.0%)  4 (0.3%) | 0 (0.0%)  32 (2.3%)  1259 (91.9%)  75 (5.5%)  4 (0.3%) | 0 (0.0%)  3 (1.6%)  163 (88.1%)  19 (10.3%)  0 (0.0%) | 0.118 | 0 (0.0%)  21 (2.2%)  882 (92.9%)  44 (4.6%)  2 (0.2%) | 0 (0.0%)  14 (2.3%)  540 (89.1%)  50 (8.3%)  2 (0.3%) | 0.066 |
|  | Sodium Range, mmol/L  Unknown  <136  136-146  147-155  >155 | 0 (0.0%)  97 (6.2%)  1398 (89.9%)  56 (3.6%)  4 (0.3%) | 0 (0.0%)  83 (6.1%)  1250 (91.2%)  37 (2.7%)  0 (0.0%) | 0 (0.0%)  14 (7.6%)  148 (80.0%)  19 (10.3%)  4 (2.2%) | <0.001 | 0 (0.0%)  56 (5.9%)  860 (90.6%)  31 (3.3%)  2 (0.2%) | 0 (0.0%)  41 (6.8%)  538 (88.8%)  25 (4.1%)  2 (0.3%) | 0.819 |
|  | White Blood Cell Count Range, 109/L  Unknown  <4  4-10  11-20  >20 | 0 (0.0%)  10 (0.6%)  467 (30.0%)  963 (61.9%)  115 (7.4%) | 0 (0.0%)  9 (0.7%)  416 (30.4%)  853 (62.3%)  92 (6.7%) | 0 (0.0%)  1 (0.5%)  51 (27.6%)  110 (59.5%)  23 (12.4%) | 0.096 | 0 (0.0%)  7 (0.7%)  307 (32.3%)  572 (60.3%)  63 (6.6%) | 0 (0.0%)  3 (0.5%)  160 (26.4%)  391 (64.5%)  52 (8.6%) | 0.105 |