Follow-Up Data and Machine Learning [Improve Mortality Predictions for Patients with Mechanical Circulatory Support](https://www.ahajournals.org/doi/pdf/10.1161/CIRCGEN.119.002877)

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**MAIN RESULTS**

Table 1: Patient characteristics selected for inclusion in the final mortality risk prediction model.

|  | | | **Hazard ratio (95% CI)** | |
| --- | --- | --- | --- | --- |
| **label** | **Number (%) missing values** | **Mean (SD) or Number (%)** | **Unadjusted** | **Adjusted** |
| *Pre-implant variables* | | | | |
| Patient age, years | 0 (0.00%) | 57.0 (12.9) | 1.35 (1.30, 1.41) | 1.21 (1.16, 1.26) |
| *Week 1 variables* | | | | |
| BUN, md/dL | 121 (0.96%) | 30.2 (20.8) | 1.40 (1.35, 1.45) | 1.06 (1.02, 1.10) |
| Platelet count | 94 (0.74%) | 219 (99.9) | 0.70 (0.67, 0.72) | 0.93 (0.89, 0.98) |
| *Month 1 variables* | | | | |
| Total bilirubin, mg/dL | 2,668 (21%) | 1.19 (2.69) | 1.32 (1.30, 1.35) | 1.15 (1.13, 1.18) |
| BUN, mg/dL | 319 (2.5%) | 22.9 (16.9) | 1.53 (1.48, 1.58) | 1.17 (1.13, 1.22) |
| Platelet count | 337 (2.7%) | 296 (108) | 0.66 (0.63, 0.68) | 0.88 (0.84, 0.92) |
| Intubated | 180 (1.4%) | 1119 (8.97%) | 3.76 (3.43, 4.13) | 1.33 (1.17, 1.52) |
| Right heart failure, INO | 139 (1.1%) | 2102 (16.8%) | 2.49 (2.30, 2.71) | 1.18 (1.07, 1.32) |
| Followup status: outpatient | 103 (0.81%) | 7229 (57.6%) | 0.44 (0.41, 0.48) | 0.81 (0.74, 0.88) |
| White blood cell count | 334 (2.6%) | 9.24 (4.16) | 1.21 (1.19, 1.23) | 1.10 (1.07, 1.13) |
| SGOT | 2,703 (21%) | 41.0 (149) | 1.09 (1.08, 1.10) | 1.02 (1.00, 1.05) |
| LDH | 2,719 (21%) | 399 (305) | 1.11 (1.09, 1.14) | 1.06 (1.03, 1.08) |
| NYHA 4: unable to carry on minimal physical activity | 3,674 (29%) | 1492 (16.6%) | 2.28 (2.08, 2.49) | 1.28 (1.17, 1.42) |
| Albumin, g/dL | 3,010 (24%) | 3.21 (0.63) | 0.74 (0.71, 0.76) | 0.95 (0.91, 0.98) |
| On dialysis | 201 (1.6%) | 771 (6.19%) | 3.73 (3.36, 4.14) | 1.06 (0.92, 1.21) |
| Norepinephrine prescribed since week 1 | 139 (1.1%) | 412 (3.29%) | 5.01 (4.37, 5.74) | 1.38 (1.17, 1.63) |
| Respiratory adverse event count | 0 (0.00%) | 0.14 (0.41) | 2.02 (1.91, 2.13) | 1.12 (1.02, 1.22) |
| Sodium, meq/L | 283 (2.2%) | 137 (3.97) | 1.01 (0.97, 1.05) | 0.98 (0.95, 1.01) |
| Days w/out respiratory adverse event | 0 (0.00%) | 0.96 (0.17) | 0.78 (0.76, 0.81) | 0.98 (0.94, 1.01) |
| Warfarin | 63 (0.50%) | 11444 (90.9%) | 0.38 (0.35, 0.42) | 0.82 (0.74, 0.92) |

Table 2: Incidence rates and ratios for patients classified as high or low risk at pre-implant and one month following implant of mechanical circulatory support device.

|  | **1-year Mortality risk classification** | | | |
| --- | --- | --- | --- | --- |
|  | **Low risk at both visits** | **High risk at pre-implant only** | **High risk at month 1 only** | **High risk at both visits** |
| *Overall* | | | | |
| Number (%) of patients | 9,136 (72%) | 1,256 (9.9%) | 1,234 (9.8%) | 1,029 (8.1%) |
| Number of events | 1,623 | 395 | 587 | 552 |
| Months of follow up | 180,808 | 27,506 | 17,997 | 14,971 |
| Incidence rate (95% CI) | 9.0 (8.5, 9.4) | 14 (13, 16) | 33 (30, 35) | 37 (34, 40) |
| Incidence ratio (95% CI) | 1 (ref) | 1.6 (1.4, 1.8) | 3.6 (3.3, 4.0) | 4.1 (3.7, 4.5) |
| *Patient profile 1: Critical cardiogenic shock* | | | | |
| Number (%) of patients | 1,102 (60%) | 226 (12%) | 239 (13%) | 284 (15%) |
| Number of events | 180 | 53 | 109 | 139 |
| Months of follow up | 19,750 | 3,795 | 3,168 | 3,385 |
| Incidence rate (95% CI) | 9.1 (7.8, 11) | 14 (11, 18) | 34 (28, 41) | 41 (35, 48) |
| Incidence ratio (95% CI) | 1 (ref) | 1.5 (1.1, 2.1) | 3.7 (2.9, 4.7) | 4.3 (3.5, 5.4) |
| *Patient profile 2: Progressive decline* | | | | |
| Number (%) of patients | 3,073 (70%) | 458 (11%) | 446 (10%) | 383 (8.8%) |
| Number of events | 519 | 159 | 212 | 207 |
| Months of follow up | 58,719 | 10,088 | 6,456 | 5,826 |
| Incidence rate (95% CI) | 8.8 (8.1, 9.6) | 16 (13, 18) | 33 (29, 37) | 36 (31, 41) |
| Incidence ratio (95% CI) | 1 (ref) | 1.8 (1.5, 2.1) | 3.7 (3.1, 4.3) | 4.0 (3.4, 4.7) |
| *Patient profile 3: Stable but inotrope dependent* | | | | |
| Number (%) of patients | 3,440 (77%) | 395 (8.8%) | 401 (8.9%) | 248 (5.5%) |
| Number of events | 620 | 122 | 196 | 125 |
| Months of follow up | 68,536 | 9,047 | 5,960 | 4,050 |
| Incidence rate (95% CI) | 9.0 (8.4, 9.8) | 13 (11, 16) | 33 (28, 38) | 31 (26, 37) |
| Incidence ratio (95% CI) | 1 (ref) | 1.5 (1.2, 1.8) | 3.7 (3.1, 4.3) | 3.4 (2.8, 4.1) |
| *Patient profile 4 or higher* | | | | |
| Number (%) of patients | 1,518 (78%) | 177 (9.0%) | 147 (7.5%) | 114 (5.8%) |
| Number of events | 302 | 61 | 69 | 81 |
| Months of follow up | 33,765 | 4,576 | 2,412 | 1,711 |
| Incidence rate (95% CI) | 8.9 (8.0, 10) | 13 (10, 17) | 29 (22, 36) | 47 (38, 58) |
| Incidence ratio (95% CI) | 1 (ref) | 1.5 (1.1, 2.0) | 3.2 (2.4, 4.1) | 5.3 (4.1, 6.8) |

Figure 1: Benchmark comparison of modeling algorithms.



**SUPPLEMENT**

Figure S1: Benchmark comparison modeling algorithms.

