**Entropy as an early predictor of Mortality after Cardiac Arrest**

**Sam Hamilton, Meghan Hutch, Ted Linghu**

**Introduction**

* *What is Approximate Entropy, why is it important*
* *Why is it important to study cardiac arrest and predict mortality*
* *Summary of our experiment*

**Methods**

To calculate Approximate Entropy, we identified patients who were admitted with at least 72 hours worth of data. For each physiologic measurement including respiratory rate (RR), heart rate (HR), mean arterial blood pressure (MAP), Oxygen Saturation (SpO2), and Temperature (Temp), we decided Size of the time series to be the median number of measurements for patients who had at least up to 68 – 72 hours worth of data.

**Results**

*Simple Demographics table [mortality, gender, median/mean age] – only keep the patients with full measurements or have a table showing both breakdowns*

**Entropy Settings**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **N (patients)** | **Size** | **Step** | **R** |
| RR | 195 | 80 | 1 | 0.20 |
| HR | 213 | 80 | 1 | 0.20 |
| MAP (BP) | 132 | 80 | 1 | 0.20 |
| SpO2 | 202 | 80 | 1 | 0.20 |
| Temp | 77 | 50 | 1 | 0.20 |

**[Table of median entropy, min, max, median, sd, var metrics]**

**[Logistic Regression Results]**

**Logistic Regression – Univariate Entropy Model**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure** | **N (patients)** | **OR** | **p-value** |
| RR | 195 | 0.63 | 0.368 |
| HR | 213 | 2.89 | 0.207 |
| MAP (BP) | 132 | 0.70 | 0.446 |
| SpO2 | 202 | 1.01 | 0.856 |
| Temp | 77 | 54.27 | 0.052 |

**Logistic Regression – Only Patients with Complete Values (n = 43)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure** | **N (patients)** | **OR** | **p-value** |
| RR | 43 | 0.13 | 0.163 |
| HR | 43 | 0.30 | 0.623 |
| MAP (BP) | 43 | 0.07 | **0.059** |
| SpO2 | 43 | 0.23 | 0.204 |
| Temp | 43 | 9244.65 | 0.02258\* |

**Logistic Regression – No missing Values Excluding Temperature**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure** | **N (patients)** | **OR** | **p-value** |
| RR |  |  |  |
| HR |  |  |  |
| MAP (BP) |  |  |  |
| SpO2 |  |  |  |
| Temp |  |  |  |

**Logistic Regression – Entropy All Combined**

**Logistic Regression Purposeful Selection with all entropy + other time series metrics**

**[Random Forest Results]**

**[Add Figures Boxplots, time series examples]**

**Discussion**

* *Sum up results*
* *Why is entropy important*
* *Why is predicting mortality important after cardiac arrest*
* *Our results show ApEn could be an important prognostic indicator… After cardiac arrest, clinical prognosis cannot be made until at least 72 hours after targeted temperature management [****Cite Consumer Health link below]****. ApEn may inform clinicians to patients who are more at risk and therefore, may better guide the clinical management and early intervention of life saving therapies*
* *Limitations of the study– few temperature measurements and frequent measurements overall 🡪 small sample sie.*

**References**

<https://consumer.healthday.com/general-health-information-16/doctor-news-206/for-some-care-may-be-withdrawn-too-soon-after-cardiac-arrest-645838.html>