Supplemental Table 5. Summary of Key Model Design Features

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| **Approach or Technique Used** | **Purpose** | **Details** |
| Random Effects | Allow the association between vital signs and mortality to vary by diagnosis group | Slope and intercept of each vital sign type varies by diagnosis group |
| Non-linear modeling | Allow for select continuous variables to have a flexible, non-linear relationship with mortality | Continuous variables fit with four degrees of freedom within a generalized additive model framework |
| Feature exclusion | Limit documentation burden and risk of measurement error through intentional omission of variables that improve model accuracy but are challenging to capture reliably.  | Urinary output is an example of a feature excluded from the model despite contribution to model accuracy.  |
| Summary statistics for model features | Minimize impact of outliers and improve representation of patient status | Predominantly rely on mean and a measure of variability to represent inputs (over first 24 hours of the ICU stay) |
| Clinical expert driven diagnostic categories | Mitigate risk of misclassification of diagnoses.  | Physician and nurse experts in documenting primary reason for ICU admission reviewed available admission diagnoses and identified those at increased risk for misclassification. Diagnoses were collapsed to reduce subjectivity in selection of admission diagnosis.  |
| Last GCS value of day 1 | Limit influence of post-operative and temporary sedation on GCS status | The sedation post-operative patients are often admitted to the ICU with can lead to falsely low GCS values which would also influence a 24 hour average value. By using the last value of the first 24 hours, the influence is reduced and is more likely to represent the actual neurological status of the patient.  |

GCS = Glasgow Coma Scale