

Appendix

The models used in this analysis were derived using pre-implant patient information from INTERMACS from January 2012-December 2015, for adults (over 18 years of age) who received their first primary continuous flow LVAD or LVAD and right ventricular assist device (RVAD) in combination (n=10,277). This time frame was chosen to include current generation continuous flow LVADs and contemporary approaches to patient care. Outcomes for mortality were chosen at 1, 3, and 12 months after primary LVAD implant.

Naïve Bayes (NB) models were derived for each time point of interest using a training dataset consisting of 80% of the records selected at random (using Weka test/train split function.) The remaining 20% of data was held aside as the test set for model validation. Continuous variables were discretized using either expert binning, equal frequency, or equal width binning to achieve the maximum information gain for each variable with respect to the model time point. Feature selection was performed using information gain on the training data. Models were learned using NB method in GeNie 2.2 (BayesFusion, Pittsburgh, PA). Each model was optimized by running 10-fold cross validation and removing or adding variables that had low diagnostic value (as measured in GeNie) until the area under the receiver operator characteristics curve (ROC AUC) was optimized. The final NB models had 28, 26, and 21 variables for the 1, 3, and 12-month outcomes, respectively, with 36 total unique variables. The resulting Bayesian models are illustrated in Supplemental material. Variables are color-coded according to 3 categories: demographics/patient status, medical history, and test results (laboratory, exercise and imaging).

The variables most associated with 1-month post-LVAD mortality, as assessed by diagnostic value, were concomitant RVAD implant, total number of events (as described in INTERMACS) during the implant hospitalization, low platelet count, high bilirubin levels, high aspartate aminotransferase level, and low INTERMACS profile. For the 3-month mortality model, the most associated variables were concomitant RVAD implant, older age, elevated blood urea nitrogen, low hemoglobin and low INTERMACS profile. Variables most associated with mortality at 12 months post-LVAD were old age, elevated blood urea nitrogen, low hemoglobin, device strategy (DT), and concomitant RVAD implant.

Though several variables impacted risk of mortality at all time points, there were some distinct variables for short-term mortality which were different from those predicting 1-year risk of mortality. These included lower INTERMACS profile, pre-operative ventilator dependence, hepatic and renal function. For 1-year mortality, unique variables were ischemic etiology, history of chronic renal disease and frailty.