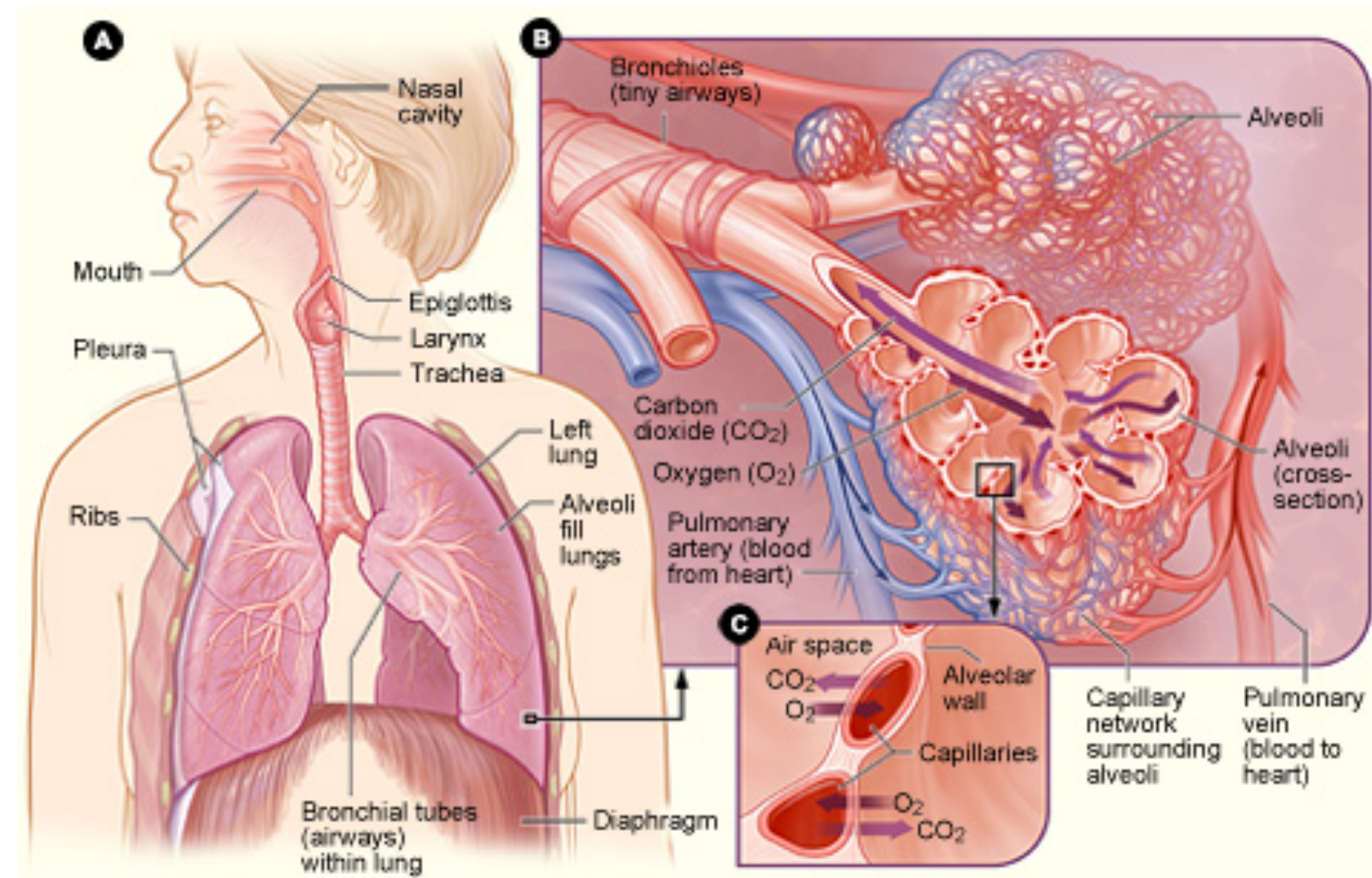


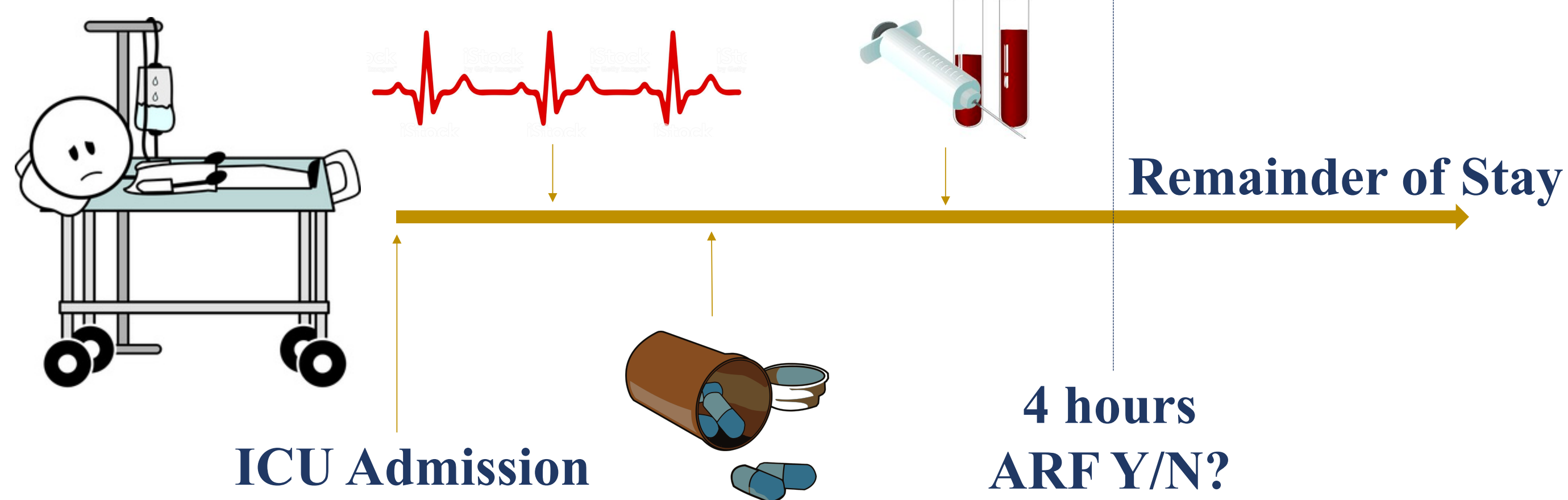
Motivation

Acute Respiratory Failure (ARF)

- Leading cause of admission to the ICU in the US
- 2 million hospitalizations per year in the US
- ~35% in-hospital mortality for patients who receive a ventilator



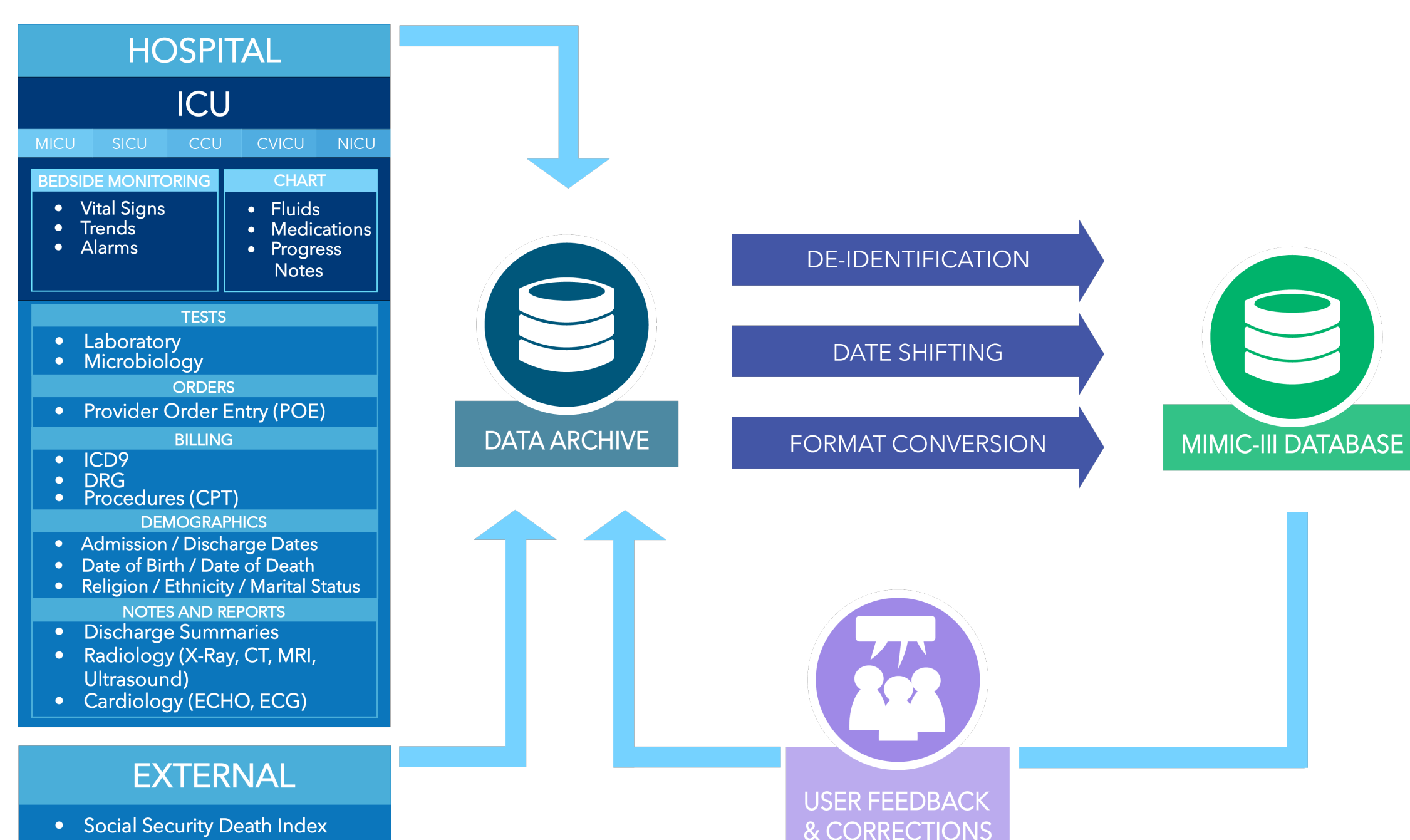
Objective



Background

MIMIC-III Data

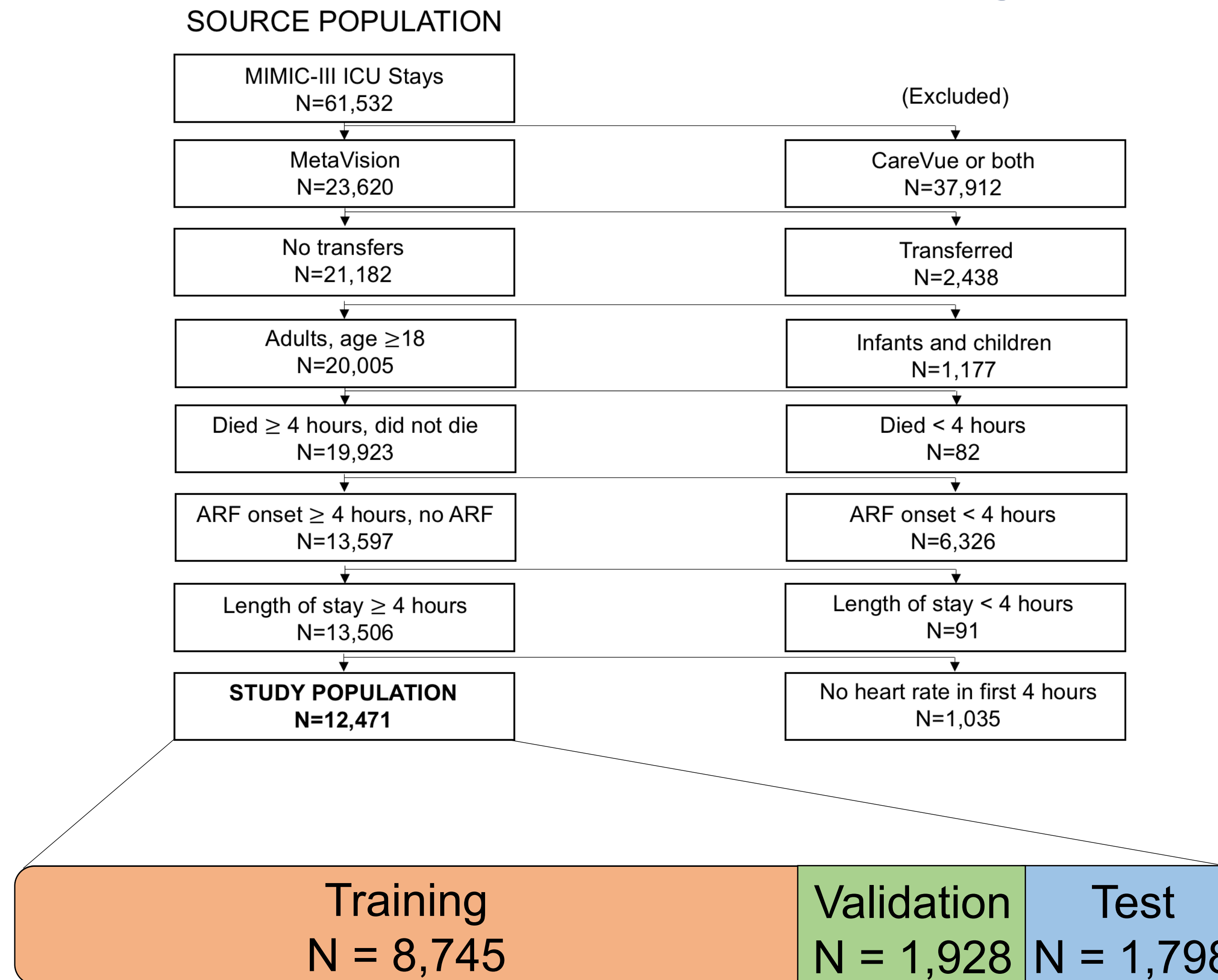
- ~40,000 patients admitted to the ICU
- Beth Israel Deaconess Medical Center in Boston, MA from 2001-2012



Methods

Study Population

- Patient was identified as having ARF if they received mechanical ventilation or had PEEP setting recorded

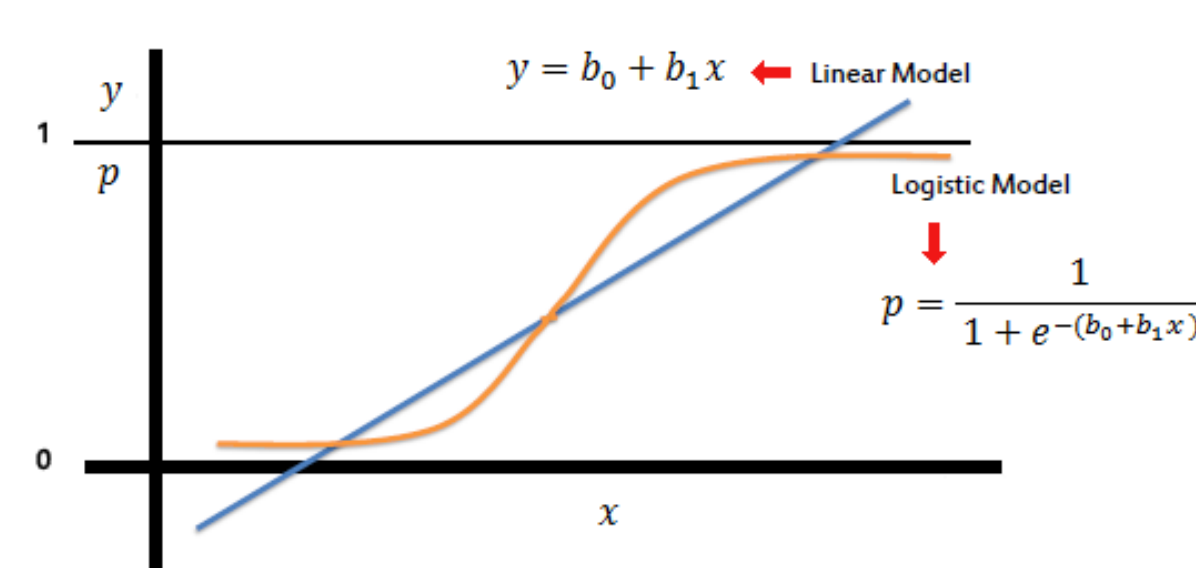


Data Processing

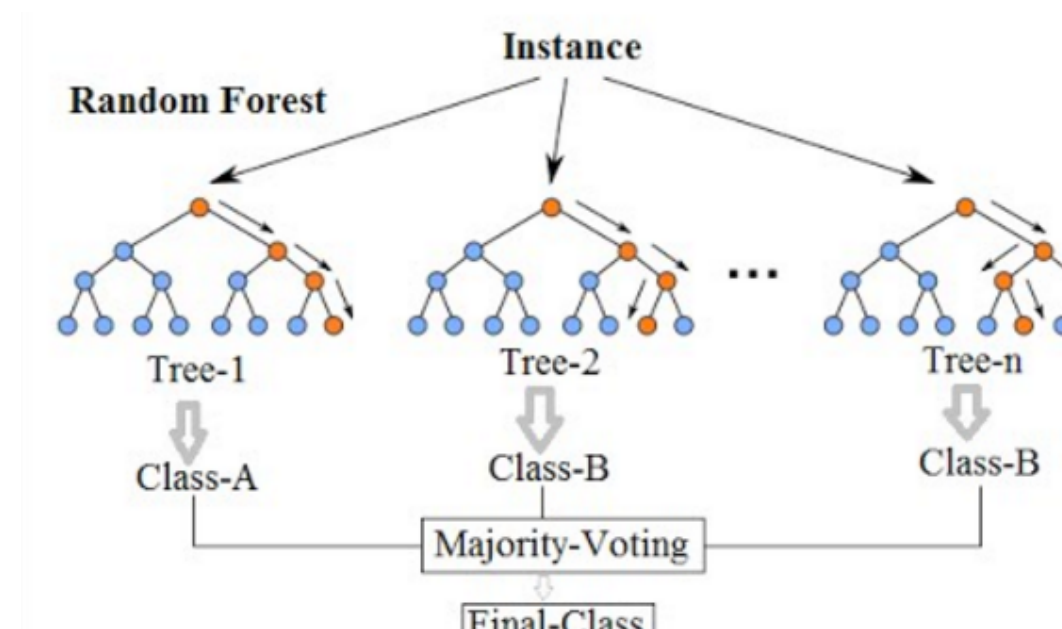
- Included demographics, vitals, fluids, lab measurements, medications and procedures
- Quartile time series for variables with multiple measurements
- Medications and labs treated as binary

Statistical Methods

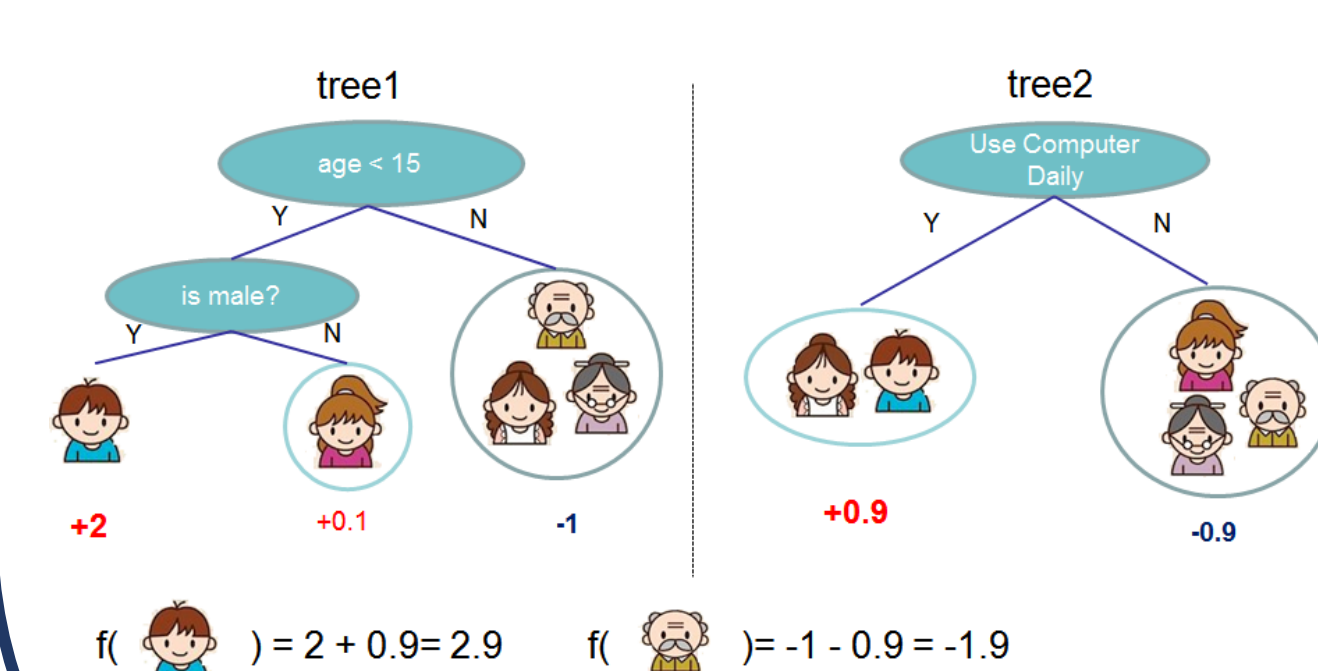
Logistic Regression



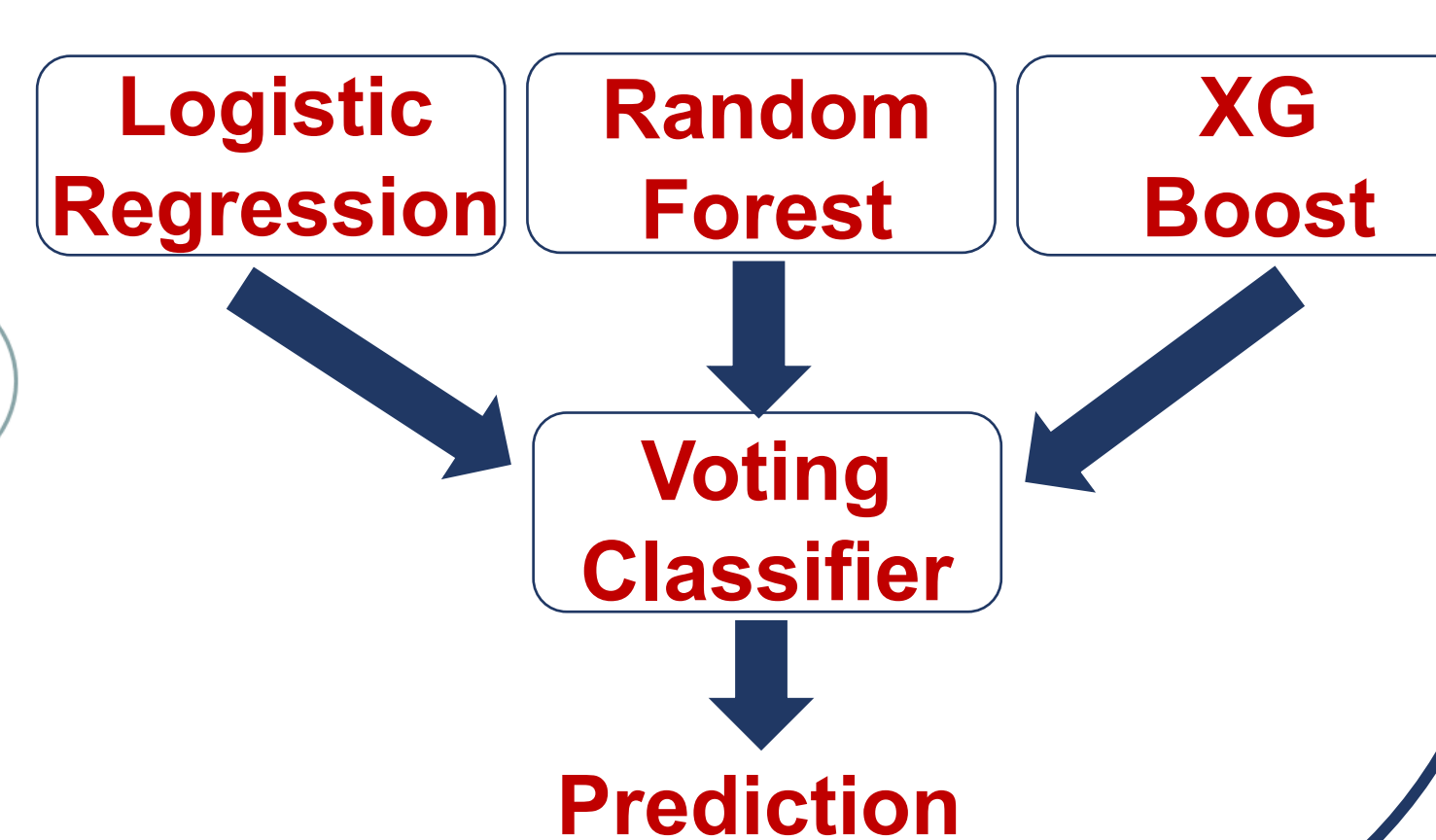
Random Forest



XGBoost



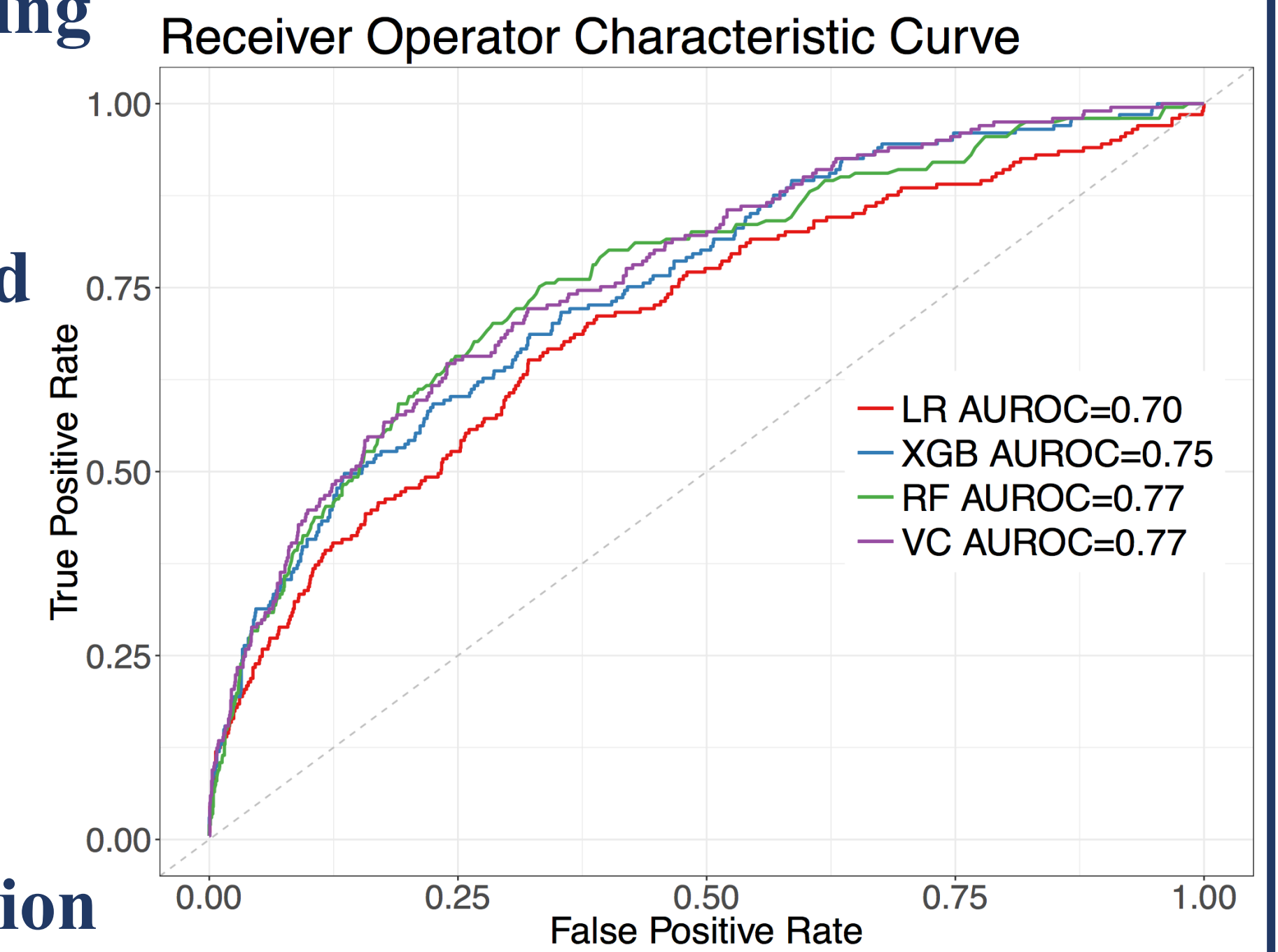
Ensemble Classifier



Results

Validation Data Set

- Fit model on training data, tuned parameters on validation data and analyzed performance on hold-out test set
- Used a 2 hour prediction gap to ensure prediction and not identification

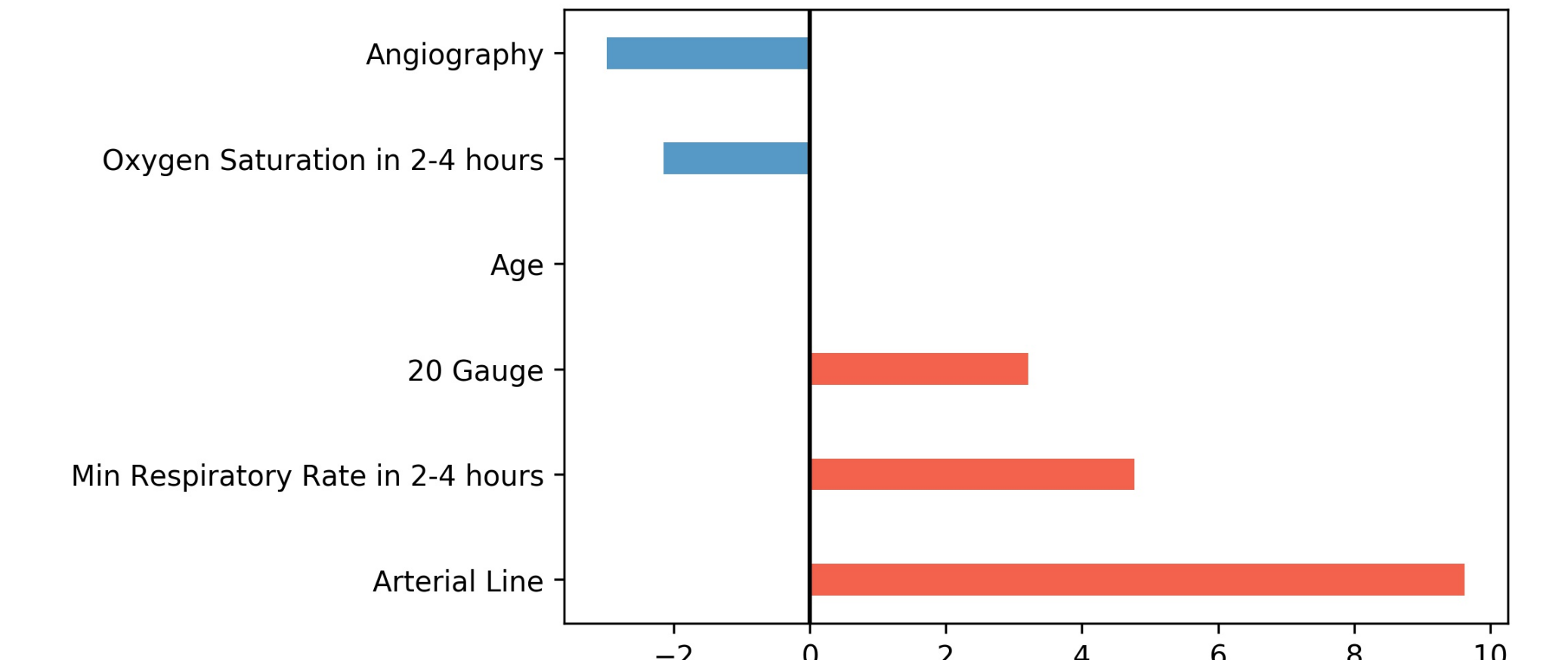


Analysis

Model Comparison / Interpretability

Model	AUROC (CI)
Logistic Regression	0.704 (0.661-0.747)
XGBoost	0.752 (0.715-0.788)
Random Forest	0.765 (0.728-0.797)
Ensemble	0.768 (0.733-0.802)

Logistic Regression Coefficients



Conclusions

- XGBoost, Random Forest capture nonlinear trends
- Data cleaning crucial for interpretable models

References

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- Images taken from web. See authors for citations.

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