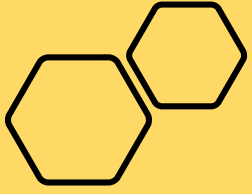
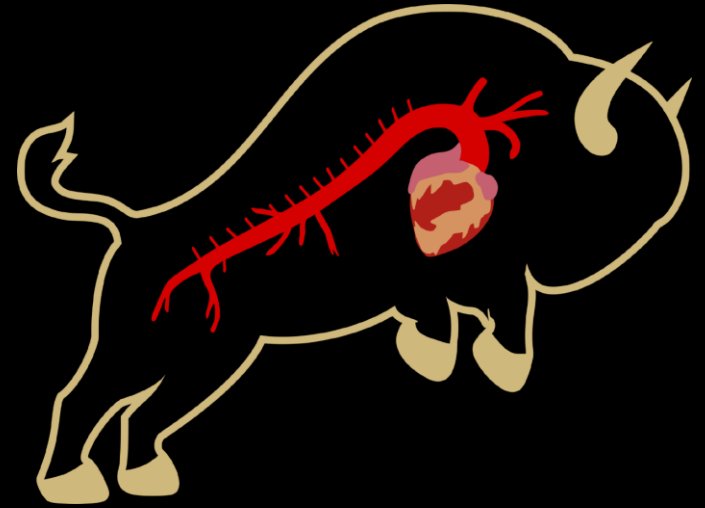
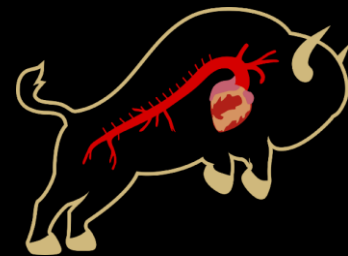
A stylized anatomical illustration of a human head and neck in profile, facing right. The illustration is rendered in a dark olive green color against a black background. Overlaid on the neck and chest area is a red anatomical diagram of the heart and its major arteries, including the aorta and pulmonary artery. The text is centered over the heart area.

**Enhancing Surgical Outcomes:
A Machine Learning Model to
Anticipate Stroke After
Hemiarch Surgery**



No disclosures





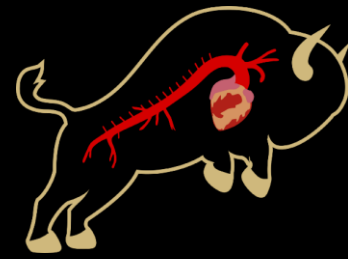
Introduction

- Although surgical and cerebral perfusion techniques have improved, postoperative stroke remains a devastating outcome after hemiarach surgery.
- With the development of machine learning comes the opportunity to better predict risk factors for postoperative morbidity.

Aim



- To better predict at risk patients, we developed a machine learning algorithm to assess preoperative and operative risk factors associated with postoperative stroke following hemiarth surgery.



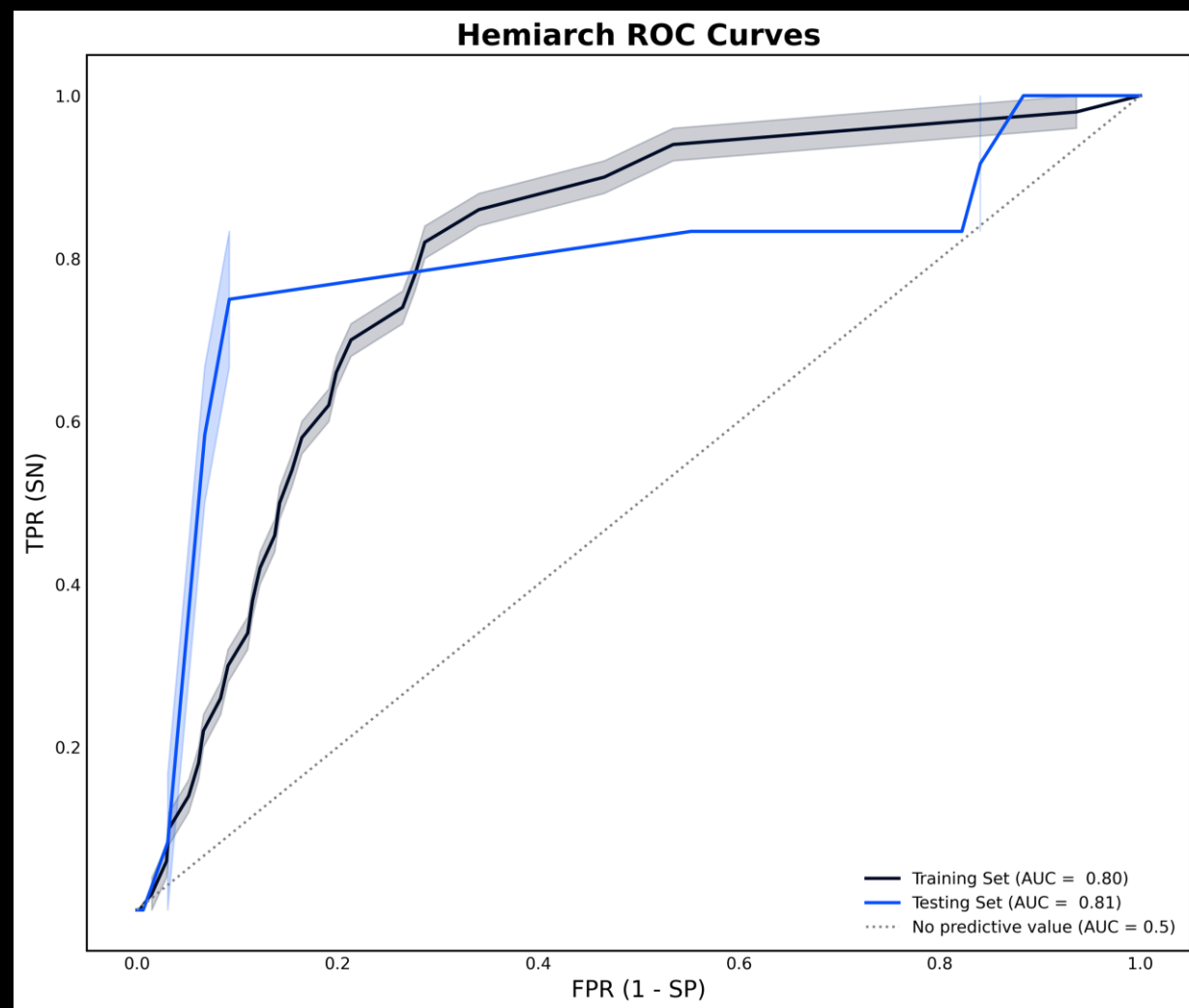
Methods

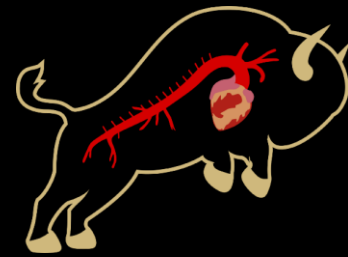
- Retrospective review of all adult patients undergoing hemiarth surgery from June 2009 to October 2022 (n = 602).
- 64 input parameters were identified from the index hospitalization, including 24 demographic characteristics as well as 8 preoperative and 32 intraoperative variables.
- Patients were randomly divided into training (70%) and testing (30%) sets.
- Various eXtreme Gradient Boosting (XGBoost) models were constructed to predict postoperative stroke in the CTICU.
- Model performance was evaluated using accuracy, Brier score, and AUC-ROC.
- SHapley Additive exPlanation (SHAP) beeswarm plot was created to elucidate the impact of individual features on the predictions generated by the XGBoost model.



Results

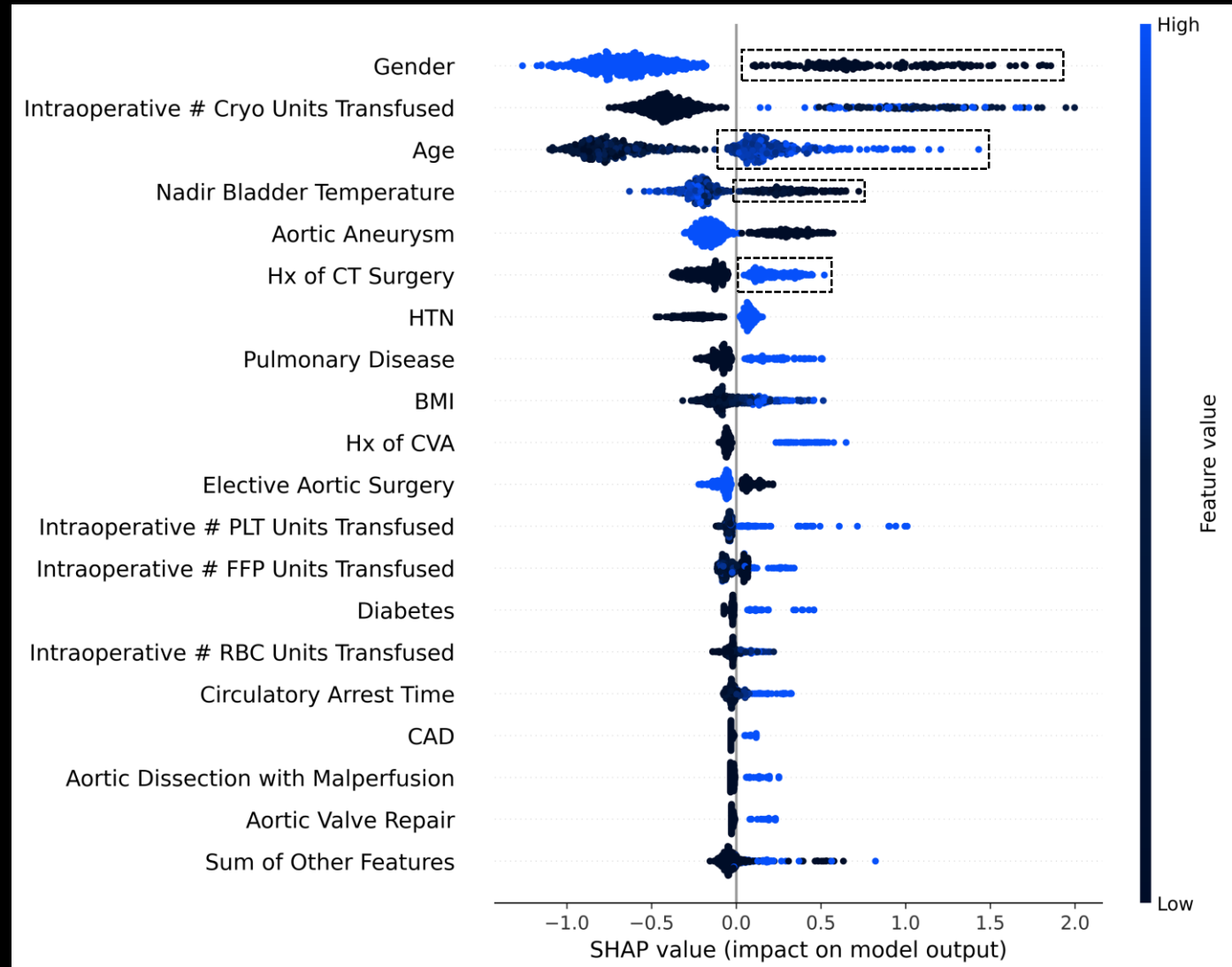
- Postoperative stroke was noted in 31 patients (5.1%).
- The final XGBoost model demonstrated a cross-validation accuracy of 96% (also 96% on the testing set) and was well-calibrated as evidenced by the low Brier score of 0.04.
- Final model performance:
 - Training Set: AUC-ROC 0.80
 - Testing Set: AUC-ROC 0.81



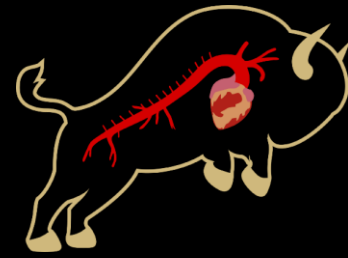


Results

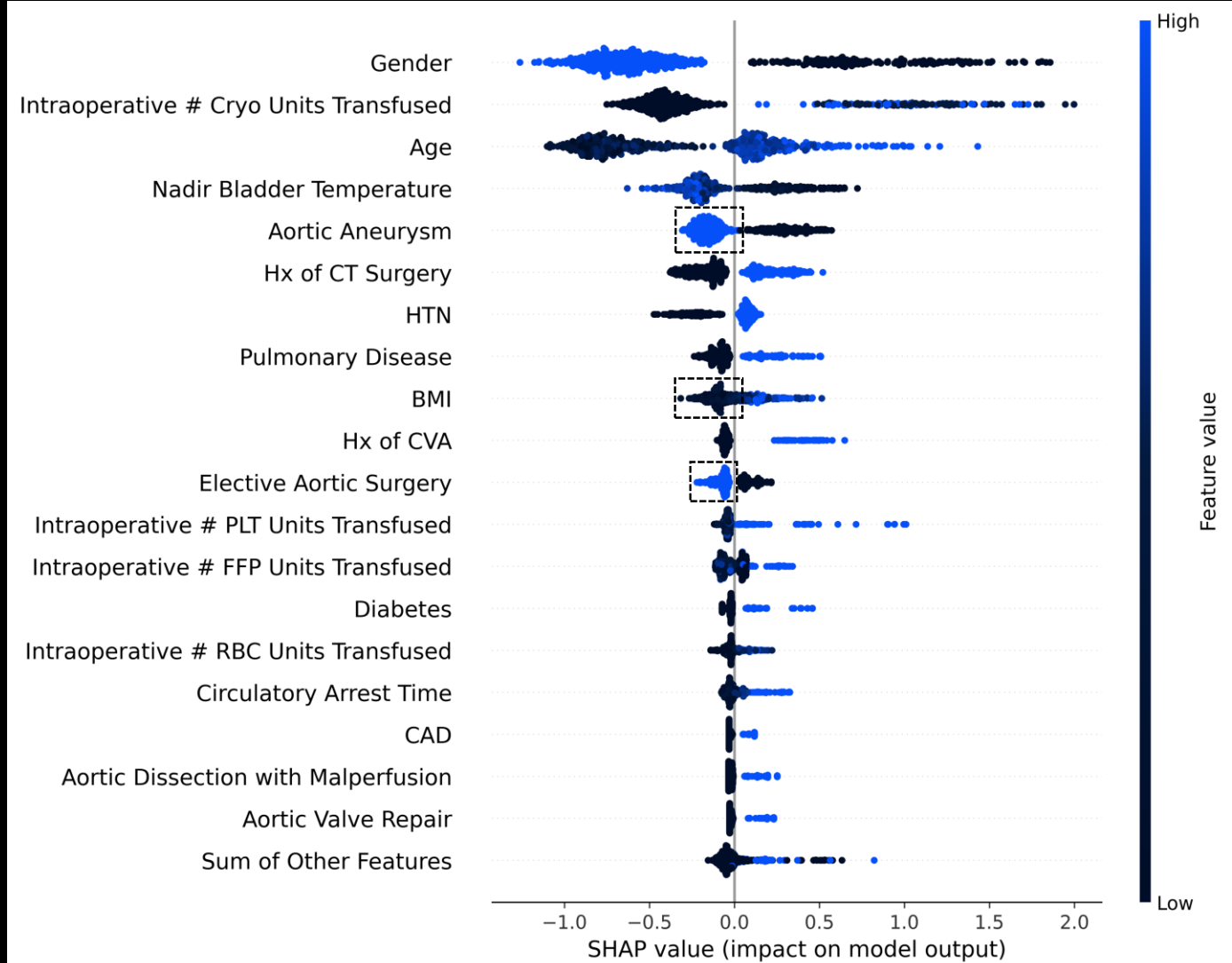
- Increased risk of stroke:
 - Female sex
 - Older age
 - Reduced nadir bladder temperature
 - History of CT surgery

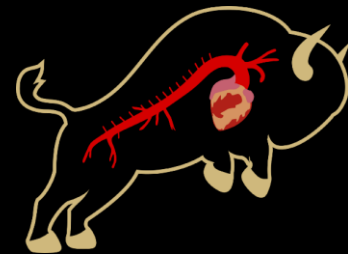


Results



- Decreased risk of stroke:
 - Aortic aneurysm without dissection
 - Lower BMI
 - Elective aortic surgery





Conclusions

- Our model demonstrated excellent accuracy in predicting postoperative stroke after hemiarth surgery.
- Reduced stroke occurrences at higher nadir bladder temperatures could imply improved myocardial protection with normothermic cardioplegia in certain patients undergoing aortic procedures.
- Further research using broad ML models:
 - Females at increased risk of stroke
 - Protective effect of aortic aneurysms without dissection (diminished inflammatory response from less extensive intraoperative tissue handling?)

Questions???

