

# **Artificial Intelligence Predicts Coronary Artery Bypass Graft Outcomes Using a Single Surgical Note**

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## **Abstract**

### *Background*

The role of artificial intelligence (AI) in healthcare predictive analytics continues to evolve. This study evaluated the capability of AI in predicting outcomes after coronary artery bypass grafting (CABG) using a single preoperative surgical note.

### *Methods*

The most recent preoperative surgical intake notes of 1,738 patients who received an isolated CABG from July 1, 2014 to November 1, 2022 at a single institution were analyzed. The primary outcome was the Society of Thoracic Surgeons defined composite outcome of operative mortality or major morbidity (MM). AI methods included 2 convolutional neural networks (CNN): 1) TextCNN, and 2) AttnToNumCNN, a derivative of TextCNN that extracts numerical values during the embedding phase via multi-headed attention and local context. Predictive performance was measured using 10-fold cross-validation and averaged across the hold-out sets.

### *Results*

A total of 567 (32.6%) patients had MM following CABG. TextCNN achieved a median AUC of 0.796 (IQR: 0.781-0.813). AttnToNumCNN demonstrated a median AUC of 0.822 (IQR: 0.805-0.842), which permutation tests indicated was a significant improvement compared to

TextCNN ( $p=0.03$ ). SHAPLeY analyses indicate that the model learns to associate the terms “aki”, “acute kidney injury”, and “fistula placement” with MM. A correlation analysis of the numerical embeddings indicates that the model learns to incorporate both number magnitude and local context to derive semantic similarities.

### *Conclusion*

AI methods can be used to predict outcomes after CABG using a single preoperative note. These findings may be relevant to discussions regarding the potential role of AI in registry reporting and quality improvement.