Reviewing Machine Learning Models' Accuracy to Predict Outcomes in CABG Cases: A Systematic Review

Saputra MR, Nugroho MP, Christian RM

Abstract

Background: Coronary artery disease following a coronary artery bypass graft procedure frequently faces many challenges. For the past decades, fellow surgeons have researched prediction models to anticipate any outcomes that arise following a CABG procedure. With advancing technologies in the medical field, artificial intelligence is slowly becoming an assistant for cardiac surgeons in tasks involving objective calculations or scoring. This study will review the accuracy of machine learning algorithms developed to predict any outcomes in CABG cases.

Methods: A search through PubMed up to September 2025 resulted in machine learning based outcomes prediction models for CABG cases for this review. The results were screened using the PRISMA method and included based on the main topic of this review.

Results: Predicted results were varied across articles for CAD patients following a CABG procedure. Almost all models used sex, age, anthropometry, and comorbidities as the base data for processing. The most used models across all articles were Naïve Bayes, K-Nearest Neighbor, and Random Forest. Predictions resulting from the prediction models were evaluated for their accuracy using various methods, but the most commonly used one was the Area Under the Receiver Operating Characteristic (AUROC). The AUROC score of the models ranged from 0.661 to 0.931 after being evaluated.

Discussion: AI usage in the medical field has been seen as a controversial topic, especially when physicians use it as a model to determine a diagnosis or a condition. What it excels at is data processing using an algorithm that has been developed into recent machine learning and deep learning models. Looking at the reviewed results, its accuracy in data processing is improving. Although it is not as accurate as fellow surgeons in terms of predicting outcomes, it without a doubt saves more time and may give precautions to surgeons before conducting a CABG procedure. Through all machine learning models reviewed, each result may give cardiac surgeons a head start to prepare for any outcomes predicted, especially conditions that require massive preparation beforehand. This not only gives cardiac surgeons efficiency in determining patients' outcomes but also gives more convenience as it is less likely to have to be double-checked. Despite their accuracy not reaching 100%, machine learning models for predicting CABG outcomes show a promising future. Many new machine learning model research have been published with acceptable accuracy and will be developed further as more data is inputted into the models.

Conclusion: Machine learning models' accuracy in processing medical data to predict any possible outcomes following a CABG procedure. However, it can not replace an evaluation from a professional in terms of accuracy. Instead, it offers more convenience, less human error, and less time-consuming while maintaining 0.661 to 0.931 AUROC score. The accuracy will only rise in the future as new developments of the models are implemented and more data is inputted. Without a doubt, machine learning prediction models can be a very useful tool, giving both efficiency and convenience while maintaining acceptable accuracy.