

Comparison of machine learning methods and scoring systems in predicting MACE risk

Murat Ersel^{1*} , Oktay Yıldız² , Sümeyra Ordu Kuş² , Mehmet Ragıp Aktemur³ 

1. Professor, Department of Emergency Medicine, Ege University Medical Faculty, İzmir, Türkiye

2. Department of Computer Engineering, Gazi University Engineering Faculty, Ankara, Türkiye

3. Department of Emergency Medicine, Aliğa State Hospital, İzmir, Türkiye

Correspondence to: Murat Ersel

*Professor, Department of Emergency Medicine, Ege University Medical Faculty, İzmir, Türkiye.

Email: murat.ersel@gmail.com

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Background: Machine learning (ML) models analyze various risk predictors to accurately estimate patients' risk. In many trials ML models were tested for prediction of mortality and MACE risk for chest pain patients within 30 days. We aimed to compare different ML models and HEART and TMACS score performance in terms of short-term prediction of mortality and MACE in chest pain patients.

Methods: This retrospective study utilized a dataset created from a prospectively acquired database, which included data of consecutive patients aged 18 years and older and presented to the ED with chest pain or symptoms indicative of ischemia (such as right or left arm pain, sweating, and nausea). The total number was 888, after applying the exclusion criteria, 328 patients were excluded, resulting in a final sample size of 560 patients. The exclusion criteria included a diagnosis of ST elevation myocardial infarction, chronic renal failure, pericarditis, pneumonia, pulmonary embolism, pneumothorax, aortic dissection, and pericardial tamponade. The data of 560 patients were used for both training and testing for ML models.

Results: The highest AUC value for prediction of 30-day MACE belonged to the LR ML model with (0.860), and followed by SVM (0.840), which are higher than HEART score AUC value (0.827) and similar to T-MACS scores (0.851). Even for 30-day mortality prediction, LR has the highest AUC value (0.950) (HEART: 0.929, T-MACS: 0.875). While HEART, K-NN, and SCM have 100% recall for mortality, LR has a recall of 0,998, with its balanced structure and highest AUC value; LR seems to be the most preferable ML algorithm by clinical use to predict 30-day mortality.

Conclusion: Our LR ML model showed better AUC values for 30-day mortality than HEART scores, and SVM model found to be better than all models and scoring systems to predict the 30-day MACE. Our findings suggest that these models could potentially be integrated into electronic patient records to better assess the risk of mortality and MACE.

Keywords: Chest pain, mortality, MACE, T-MACS, HEART, machine learning.