EPIDEMIOLOGY, BIG DATA AND PRECISION MEDICINE
SESSION TITLE: NEXT GENERATION IN CVD RISK PREDICTION

Abstract 17154: Machine Learning Outperforms ACC/AHA CVD Risk Calculator in MESA Offering new opportunities for Short-Term Risk Prediction and Early Detection of the Vulnerable Patient

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Abstract

Introduction: Machine learning (ML) is poised to revolutionize healthcare. Current national guidelines for prediction and prevention of atherosclerotic cardiovascular disease (ASCVD) use ACC/AHA Pooled Cohort Equation Risk Calculator which relies on traditional risk factors and linear statistical models. Unfortunately, this approach yields a low level of sensitivity and specificity. The low sensitivity results in missing high-risk individuals who need intensive therapy and the low specificity results in millions of people unnecessarily recommended drugs such as statin. We aimed to utilize Machine Learning (ML) to create a more accurate predictor of ASCVD events and whom to recommend statin.

Methods: We developed and validated a ML Risk Calculator based on Support Vector Machines (SVMs) using the latest 13-year follow up dataset from MESA (Multi-Ethnic Study of Atherosclerosis) of 6,459 participants who were free of cardiovascular disease at baseline. We provided identical input to the ACC/AHA and ML risk calculators and compared their accuracy. We also validated the ML model in another longitudinal cohort: the Flemish Study on Environment, Genes and Health Outcomes (FLEMENGHO).

Results: According to the ACC/AHA Risk Calculator and a 7.5% 10-year risk threshold, 46.0% would be recommended statin. Despite this high proportion, 23.8% of the 480 “Hard CVD” events occurred in those not recommended statin, resulting in sensitivity (Sn) 0.76, specificity (Sp) 0.56, and AUC 0.71. In contrast, ML Risk Calculator recommended statin to 11.4%, and only 14.4% of “Hard CVD” events occurred in those not recommended statin, resulting in Sn 0.86, Sp 0.95, and AUC 0.92. Similar results were seen in prediction of “All CVD” events.

Conclusions: The ML Risk Calculator outperformed the ACC/AHA Risk Calculator by recommending less drug therapy, yet missing fewer events. Additional studies are underway to validate the ML model in other cohorts and to explore its ability in predicting short-term (1-5 years) events with additional biomarkers including imaging. Machine learning is paving the way for early detection of asymptomatic high-risk individuals destined to a CVD event in the near future, the Vulnerable Patient.

Footnotes

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