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Artificial intelligence framework for predictive cardiovascular and stroke risk assessment models: A narrative review of integrated approaches using carotid ultrasound

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Abstract

Recent findings: Cardiovascular disease (CVD) is the leading cause of mortality and poses challenges for healthcare providers globally. Risk-based approaches for the management of CVD are becoming popular for recommending treatment plans for asymptomatic individuals. Several conventional predictive CVD risk models based do not provide an accurate CVD risk assessment for patients with different baseline risk profiles. Artificial intelligence (AI) algorithms have changed the landscape of CVD risk assessment and demonstrated a better performance when compared against conventional models, mainly due to its ability to handle the input nonlinear variations. Further, it has the flexibility to add risk factors derived from medical imaging modalities that image the morphology of the plaque. The integration of noninvasive carotid ultrasound image-based phenotypes with conventional risk factors in the AI framework has further provided stronger power for CVD risk prediction, so-called "integrated predictive CVD risk models."

Purpose: of the review: The objective of this review is (i) to understand several aspects in the development of predictive CVD risk models, (ii) to explore current conventional predictive risk models and their successes and challenges, and (iii) to refine the search for predictive CVD risk models using noninvasive carotid ultrasound as an exemplar in the artificial intelligence-based framework.

Conclusion: Conventional predictive CVD risk models are suboptimal and could be improved. This review examines the potential to include more noninvasive image-based phenotypes in the CVD risk assessment using powerful AI-based strategies.

Keywords: 10-Year risk; Artificial intelligence-based risk assessment; Atherosclerosis; Cardiovascular disease; Integrated models; Statistical risk calculator; Stroke.

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