Recalibration of the Framingham functions to the Chinese population improved coronary heart disease risk estimates

Liu J, Hong YL, D'Agostino RB Sr., et al. **Predictive value for the Chinese population of the Framingham CHD risk assessment tool compared with the Chinese Multi-Provincial Cohort Study.** JAMA. 2004;291:2591-9.

QUESTION

In patients without coronary heart disease (CHD), how does the recalibration of the Framingham functions compare with the performance of the functions derived from the Chinese Multi-provincial Cohort Study [CMCS] for determining the absolute risk for CHD?

METHODS

Design: Cohort study to validate and recalibrate a previously derived prediction rule.

Setting: 16 centers from 11 provinces in China.

Patients: 30 121 patients (age range 35 to 64 y) without CHD comprised the CMCS validation cohort. Exclusion criteria were a clinical history of myocardial infarction (MI) or angina pectoris. The derivation cohort consisted of 5251 white patients (age range 30 to 74 y) without CHD from the Framingham Heart Study.

Description of prediction guide: The predictive ability of the Framingham functions was assessed for 6 risk factors (age, blood pressure [BP], smoking, diabetes, total cho-

lesterol [TC], and high-density lipoprotein cholesterol [HDL-C]) in predicting CHD events in the CMCS cohort. The CMCS patients were divided into deciles of 10-year CHD risk predicted by the CMCS functions, the original Framingham functions, and Framingham functions that were recalibrated using the mean values of risk factors and mean CHD incidence rates of the CMCS cohort. A Cox regression model was used to predict the absolute 10-year risk for CHD.

Outcomes: CHD events (acute MI, sudden death, and other coronary deaths).

MAIN RESULTS

CHD events occurred in 273 patients (5.2%) in the derivation group, and 191 patients (0.6%) in the validation group. The relative risk for CHD was similar in Chinese and Framingham patients in all risk factor categories except for age, TC level 200 to 239 mg/dL (5.18 to 6.19 mmol/L), HDL-C level < 35 mg/dL (0.91 mmol/L) in men, and smoking in women. However, the original Framingham functions overestimated the absolute CHD risk in the CMCS cohort for

both men and women. Recalibration of the Framingham functions did not affect discriminatory ability but improved the performance of the Framingham functions in the CMCS cohort so that the largest difference between the actual and predicted rate after recalibration in the 10th decile in men was 15% vs 17% for the adjusted Framingham functions.

CONCLUSIONS

In patients without coronary heart disease (CHD), the original Framingham functions overestimated the absolute risk for CHD for CMCS patients. The recalibration of the Framingham functions to reflect the lower incidence of CHD in the Chinese population improved CHD risk estimates.

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COMMENTARY

The Framingham risk function is the gold standard of global CHD risk evaluation. During the past decade, it has become obvious that the Framingham algorithm has limitations in applicability to populations that differ from the original North American cohort. Several studies have shown that the Framingham risk function overestimates absolute CHD risk in Italian (1), Danish (2), and German (3) populations. The study by Liu and colleagues adds the Chinese population to this list.

The authors, however, documented that adjusting the Framingham risk functions to reflect the lower absolute risk of CHD in the Chinese population improves the accuracy of its predictions. This is good news because it shows that the primary CHD risk factors operate similarly in vastly disparate populations.

A word of caution: Even after recalibration, the area under the receiver-operating characteristic curve remains < 0.80, which indicates only fair discriminatory function. As a result, more work has to be done to improve the risk assessment of asymptomatic patients.

The study by Liu and colleagues confirms that calibrating the predictive value of individual CHD risk factors is essential for comparing diverse populations as well as for studies within these populations.

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