Assessment of obstructive coronary artery disease prevalence using a clinical prediction model: validation and extension in 4,888 patients of the Austrian CARDIIGAN cohort

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Introduction

Predicting obstructive coronary artery disease (CAD) in patients involves a thorough assessment of symptoms and risk factors before an invasive coronary angiography (CA) is performed. To avoid as many unnecessary invasive and expensive procedures as possible, a good estimation of disease probability would be very helpful in the pre-selection process.

In the latest ESC guidelines on the management of patients with stable CAD, pre-test probability assessment was advocated. Recently a prediction model (Genders, et al) was presented based on age, sex, symptoms, diabetes, hypertension, dyslipidaemia, and smoking. We aimed to validate this model and extend it.

Material and methods

In the prospective Coronary Artery disease Risk Determination In Innsbruck by diaGnostic ANgiography (CARDIIGAN) cohort, 4,888 patients with suspected CAD and without other cardiac disease were included; all had an elective angiography. The individual chance of an obstructive CAD (defined here as a stenosis of minimally 50% diameter in at least one major coronary artery) was calculated. Performance of the model was evaluated through the ability to discriminate (with the c statistic, comparable to the area under the ROC curve) and calibration. For missing data multiple imputation was applied and model updating done with multivariable logistic regression modelling.

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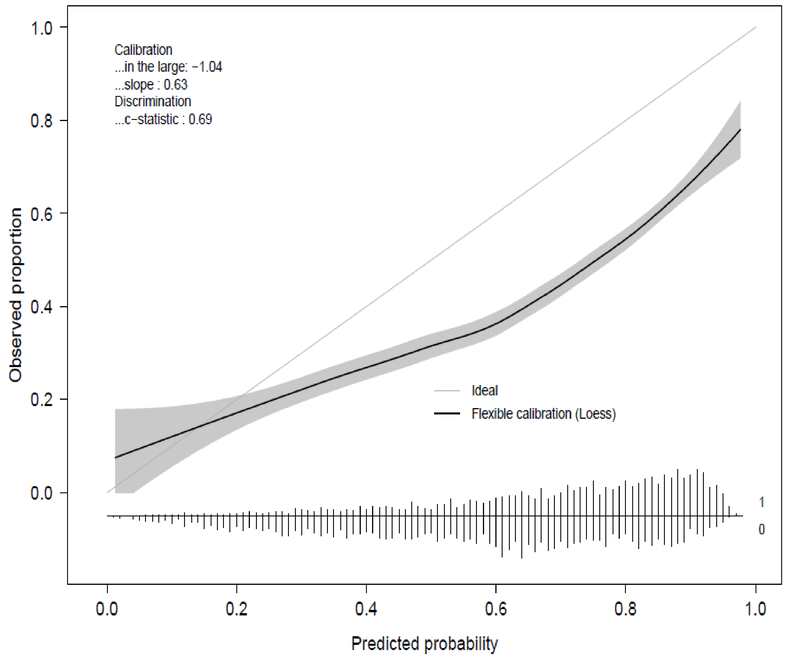
Results

Of all the CARDIIGAN patients, 2,127 (44%) were diagnosed with obstructive CAD. This group consisted of more men, was on average older, and had a higher rate of chest pain complaints than those without CAD. Also, diabetes, hypertension, and smoking occurred more frequently. Applying the data on the previously proposed model resulted in c=0.69 (95% CI 0.67 to 0.70), lower than the c=0.79 at model development. The calibration was rather modest, with a lower than expected prevalence and smaller than expected effects of the diagnostic markers. In short, particularly among high-risk patients there was an over-prediction of risk. The addition of laboratory markers led to the extended model, containing HDL and LDL cholesterol, fibrinogen, and C-reactive protein, with better discrimination (c=0.72, 95% CI 0.71 to 0.74, improvement p<0.001).

Calibration plot predicted probability against observed proportion of CAD (≥50% stenosis) for the "clinical model" of Genders, et al, including the frequency distributions of the cases (upward) and the non-cases (downward)



Conclusion

Among consecutive Austrian patients with suspected CAD referred for elective CA, the prediction model had a somewhat worse performance to diagnose obstructive CAD. There are indications that this is influenced, among others, by the type of patient group on which the model is applied. After model updating with traditional and newer cardiovascular risk factors there was some improvement. Overall, the findings emphasise the complexity of pre-selection ahead of invasive coronary angiography.

The authors declare that there is no conflict of interest.

References

Alber HF, Wanitschek MM, de Waha S, et al. High-density lipoprotein cholesterol, C-reactive protein, and prevalence and severity of coronary artery disease in 5641 consecutive patients undergoing coronary angiography. *Eur J Clin Invest* 2008;38:372-380

Genders TS, Steyerberg EW, Hunink MG, et al. Prediction model to estimate presence of coronary artery disease: retrospective pooled analysis of existing cohorts. *Br Med J* 2012;344:e3485

Steyerberg EW. *Clinical prediction models: a practical approach to development, validation, and updating*. New York: Springer, 2009

Task Force Members, Montalescot G, Sechtem U, et al. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. *Eur Heart J* 2013;34:2949-3003