Prognostic Impact of Carotid Plaque Imaging using Total Plaque Area added to SCORE2 in middle-aged subjects

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Introduction

The SCORE2 risk calculator has been extended to include non-fatal cardiovascular events (myocardial infarction and stroke).

We performed a joint German and Swiss (central Europe) cohort study in subjects aged 40-65 years.

Does SCORE2 outperform other risk prediction algorithms used in Germany and Switzerland (PROCAM, SCORE) regarding calibration, discrimination and reclassification, and does carotid plaque per se or integrated into posttest risk calculations into SCORE2 add additional prognostic information?

Methods

We used the cohort method in order to detect cardiovascular events and used medical imaging (total carotid plaque area, TPA) compared to coronary / cardiovascular risk equations as predictors.

The primary endpoint was a composite of acute myocardial infarction or stroke. The secondary endpoint included the primary endpoint plus PTCA, CABG and coronary artery disease.

For NRI calculations we calculated sensitivity and specificity of TPA tertiles and derived posttest risk calculations for SCORE2 using the Bayes theorem.

The NRI is defined as a proportion P as follows:

NRI= P(up|event) – P(down|event) + P(down|non-event) – P(up|non-event).

The null hypothesis for NRI = 0 is tested using z statistic following McNemar asymptotic test for correlated proportions.

We used Cox proportional-hazards regression after adjustment for clinical variables and risk algorithms both for MACE and ASCVD.

Results

There were 2’842 primary care subjects and events for primary outcome (MACE) was 41 AMI and 16 STROKES (total 57 MACE), additional events were 21 CABG, 41 PTCA and 35 CAD (adding another 97 events to the total of events of 154 ASCVD cases) during FU of 5.9 years

Baseline characteristics were as follows:

	TYPE OF OUTCOME								
Patient characteristics	**MACE**		**ASCVD (A)**		**NO ASCVD (NA)**		**p A vs NA**	**ALL**	
N	57		154		2688			2842	
Male (%)	54	92	141	94	1636	60	<0.00001	1765	62
Female (%)	3	8	13	6	1068	40	<0.00001	1081	38
Age + SD	55	6	55	6	50	8	<0.0001	50	8
Smoker, %	32	56	72	47	537	20	<0.00001	609	21
BP mm Hg, systolic + SD	139	20	133	18	125	15	<0.0001	125,7	15,5
BMI + SD	27	4	27	4	26	4	NS	26	4
Lipids									
Cholesterol + SD, mmol/l	6,3	1,1	6,3	1,1	6,0	1,1	<0.01	6,0	1,1
HDL + SD, mmol/l	1,3	0,3	1,3	0,3	1,5	0,4	<0.0001	1,5	0,4
LDL+ SD, mmol/l	4,1	0,9	4,1	0,9	3,7	0,9	<0.0001	3,7	0,9
Triglyceride + SD, mmol/l	1,8	1,3	2,0	1,3	1,6	1,1	<0.0001	1,6	1,1
Imaging									
TPA + SD, mm2	127	98	134	85	39	47	<0.0001	42	54
Risk algorithms									
PROCAM + SD %	13	8	13	9	4	6	<0.0001	5	6
PROCAMcvd + SD %	16	9	16	10	6	7	<0.0001	6,0	8,0
SCORE + SD, %	3,8	3,0	3,0	2,0	1,2	1,5	<0.0001	1,3	1,6
SCORE2 + SD, %	9	4	8	4	4	3	<0.0001	5,0	3,0
SCORE2ptp + SD, %	21	10	22	10	6	8	<0.0001	7,0	9,0

Cox proportional Hazards model using risk algorithms and posttest risk cate0gories of SCORE2 for MACE and ASCVD

	Coefficients and Standard Errors for MACE					
Covariate	b	SE	Wald	P	Exp(b)	95% CI of Exp(b)
SCORE2	0,2506	0,03684	46,2794	<0,0001	1,2848	1,1953 to 1,3810
SCORE2ptpCode=2	2,1516	0,6371	11,4043	0,0007	8,5989	2,4666 to 29,9769
SCORE2ptpCode=3	2,1977	0,6374	11,8879	0,0006	9,0044	2,5816 to 31,4071

Excluded variables: PROCAM, PROCAMcvd, SCORE

	Coefficients and Standard Errors for ASCVD					
Covariate	b	SE	Wald	P	Exp(b)	95% CI of Exp(b)
PROCAMcvd	0,01936	0,01077	3,2288	0,0724	1,0195	0,9982 to 1,0413
SCORE	-0,1455	0,06178	5,5499	0,0185	0,8646	0,7660 to 0,9758
SCORE2	0,2397	0,0478	25,1415	<0,0001	1,2708	1,1572 to 1,3957
SCORE2ptpCode=2	2,1097	0,3932	28,7926	<0,0001	8,2459	3,8156 to 17,8202
SCORE2ptpCode=3	2,552	0,3892	42,9891	<0,0001	12,833	5,9843 to 27,5200

Excluded variables: PROCAM

Conclusion

SCORE2, like SCORE, performs well in categorizing patients with events as medium- or high risk when compared to PROCAM. Additional information regarding calibration and discrimination of SCORE2 compared to PROCAM and SCORE was small. The addition of the TPA-Bayes criterion to SCORE2 as well as TPA itself outperformed risk models without incorporation of TPA regarding MACE and ASCVD. TPA contains important clinical information beyond SCORE2 and should be used jointly in order to allocate preventive resources as soon and as personalised as possible.

References

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