

artery disease (CAD) in patients with typical chest pain undergoing diagnostic coronary angiography during hospitalization.

Methods: We studied retrospectively 589 patients admitted to our Cardiology Unit for chest pain that underwent to coronary angiography. According to ESC Guidelines on CV prevention we considered carotid arteries as normal if intima-media thickening <0.9 mm, with intima media thickness if >0.9 and <1.5 mm, with plaque when protrusion into the arterial lumen was >1.5 mm. During the coronary angiography we considered one, two or three vessel disease if coronary vessels had stenosis $>50\%$. Patients with a positive medical history for cardio and cerebrovascular disease and with positive biomarkers of myocardial infarction were excluded.

Results: Carotid ultrasound examination showed a 83% prevalence of asymptomatic carotid plaques. Coronary angiography showed that 6% of patients had normal coronary arteries, 24% had a coronary single vessel disease, 34% two vessels, whereas 36% showed the involvement of three vessels. The detection of carotid plaque was predominantly associated with the presence of angiographically diseased coronary arteries ($p=0.009$). Particularly, the presence of a carotid plaque with a diameter >2.1 mm ($p=0.0001$) was associated with a higher prevalence of coronary artery disease with a sensitivity of 61.3% and a specificity of 73.5%. Positive predictive value resulted 97.4% for 2.1 mm diameter. Dimensions of carotid plaques were significantly correlated with the complexity of coronary artery disease calculated by Syntax score ($p<0.0001$). Moreover bilateral carotid atherosclerosis was associated with coronary atherosclerosis too ($p<0.0001$). Besides the detection of carotid atherosclerosis was strongly correlated with the coronary artery disease itself (overall $p=0.008$).

Conclusions: Given the significant statistical correlation between the presence of carotid atherosclerosis and the severity of coronary artery disease (in terms of number of involved vessels), we believe that the evaluation of Doppler ultrasound of carotid arteries might provide the clinician additional informations about the global cardiovascular risk of the patients with typical chest pain and negative markers of acute coronary syndrome. Moreover, the presence of carotid atherosclerotic plaque may be predictive of coronary atherosclerosis and its severity.

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Low to moderate alcohol consumption is not associated with a reduction in cardiovascular events - The danish nurses' cohort study

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Background: Consistent observational study findings show low to moderate alcohol consumption to be associated with risk reductions in cardiovascular diseases (CVD). Direct causality remains unknown, and studies addressing lifestyle and psychosocial confounders are lacking.

Objectives: To investigate associations between alcohol consumption and CVD outcomes and explore potential confounding by health, lifestyle- and psychosocial factors in a female population.

Methods: 20-year follow-up cohort study inclusive of 18,942 Danish female nurses in the ages of 44 to 93 years. Questionnaire reported alcohol consumption was linked to Danish nationwide registers on cause-specific hospital admissions, causes of death and vital status. Associations between weekly alcohol consumption and CVD outcomes, along with all-cause mortality, were assessed using Cox proportional hazards models with and without adjustment for confounders.

Results: Initial assessment of the composite endpoint of MI, stroke and CVD mortality revealed significant risk reductions by weekly alcohol consumption of 1–7 (HR=0.86, 95% CI: 0.77–0.97) and 8–14 (HR=0.79, 95% CI: 0.69–0.91) units; however, adjustment for confounding eliminated the associations to non-significant levels (1–7 units: HR=0.93, 95% CI: 0.72–1.20) (8–14 units: HR=0.92, 95% CI: 0.70–1.21). Likewise, for all-cause mortality, low to moderate alcohol consumption was initially associated with risk reductions (1–7 units: HR=0.82, 95% CI: 0.77–0.88) (8–14 units: HR=0.81, 95% CI: 0.74–0.88), which attenuated in the adjusted model (1–7 units: HR=0.88, 95% CI: 0.77–1.02) (8–14 units: HR=0.86, 95% CI: 0.73–1.00). Alcohol consumption was not significantly associated with the separate endpoints of MI and stroke.

Conclusion: Adjusting for health, lifestyle- and psychosocial factors eliminated the beneficial association between alcohol consumption and CVD outcomes in a female population.

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The influence of a normal myocardial perfusion SPECT on prescription of preventive cardiovascular medications and patients adherence

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Background: Abnormal SPECT myocardial perfusion imaging (SPECT-MPI) denotes obstructive coronary artery disease (CAD) and is predictive of cardiovascular events. Conversely, a normal scan is associated with a low short-term risk. An abnormal SPECT-MPI has been shown to lead to intensified medical therapy

and improved patient adherence. We hypothesized that a normal SPECT-MPI in subjects without known CAD, would lead to a less intensive preventive therapy.

Methods: A retrospective cohort study that included all subjects without known CAD, who had their first SPECT-MPI scan at our center between 1997–2008. Baseline characteristics, prescription filling of aspirin and statins within 1 year from SPECT-MPI and health status were retrieved from the computerized systems of our HMO. Medication non-adherence was defined as $<50\%$ retrieval. We compared subjects with normal scans (summed stress score - SSS <2) to those with an abnormal scan. Parsimonious cox regression model was utilized to assess multiple variables associated with the risk of myocardial infarction and cardiac mortality within 8 years after SPECT-MPI and with 1-year drug cessation.

Results: 11,642 subjects had a normal SPECT-MPI, and in comparison to subjects with abnormal scan ($n=6892$) were predominantly female (57% vs. 25%, $p<0.001$), younger (64 ± 11 vs. 66 ± 11 , $p<0.001$) and were less likely to be smokers (13% vs. 16%, $p<0.001$). Statin and aspirin use at 1-year post-scan were both increased in the study group in comparison to the pre-scan period (51% vs. 42% pre-scan for statin, and 50% vs. 42% for aspirin, $p<0.001$ for both). A similar trend was observed among subjects with an abnormal scan. An abnormal scan was associated with an increased 8-year risk for adverse events in comparison to a normal scan (HR-1.9, $p<0.001$).

Conclusions: In contrast to our hypothesis, a normal scan result, with its associated low short-term CVD risk, did not lead to less intensified preventive medical therapy. This observation might imply overuse of aspirin without evidence based data in this group of patients.

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

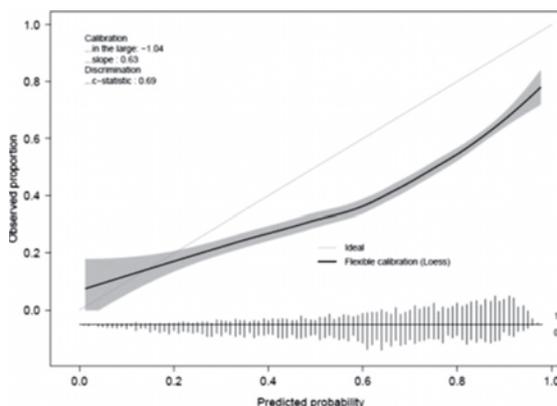
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Predicting obstructive coronary artery disease (CAD) in patients involves a thorough assessment of symptoms and risk factors (including possibly results of non-invasive imaging modalities or stress tests) before an invasive coronary angiography (CA) is performed. To avoid unnecessary invasive and expensive procedures, a good estimation of disease probability among patients with suspected CAD 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 was presented based on age, sex, symptoms, diabetes, hypertension, dyslipidaemia, and smoking. Our aim was to validate this model and extend it with laboratory measures among patients in a high prevalence setting.

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 selected. Patients had an elective angiography from 2004 to 2008. Information on demographic data, medical history, symptoms, cardiovascular risk factors including laboratory measurements and results of invasive CA, and further management decisions were recorded. We were thus able to calculate the individual chance of an obstructive CAD (defined here as a stenosis of minimally 50% diameter in at least one major coronary artery). 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.

Of all the study 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



Calibration plot (95% confidence band)

model resulted in $c=0.69$ (95% CI 0.67 to 0.70), much lower than the $c=0.79$ at model development. When corrected for case-mix the expected discrimination was higher ($c=0.80$). 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 overprediction 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 $p=0.00$).

Among Austrian patients with suspected CAD referred for elective CA, the prediction model has a somewhat worse performance to diagnose obstructive CAD. This also applied after model updating with traditional and newer cardiovascular risk factors, thus emphasising the complexity of pre-selection ahead of invasive coronary angiography.

PREDICTING OUTCOMES IN CARDIAC VASCULAR DISEASE

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Predicting incident heart failure in elderly hypertensive patients: the ANBP2 study

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Purpose: Although the risk factors for heart failure have been reported, there is no well validated algorithm to predict incident heart failure diagnosis. This study aims to develop a multivariable risk prediction model for predicting 10-year risk of incident heart failure diagnosis in elderly hypertensive patients.

Methods: The derivation cohort included 6083 participants aged 65–84 years at baseline (1995–2001) followed for a median of 10.8 years in the Second Australian National Blood Pressure Study (ANBP2). Cox proportional hazards models were used to develop the risk prediction models. Bootstrap resampling variable selection method was used to determine the number of times a variable significantly predicted the outcome in the multivariate analysis. Akaike and Bayesian information criterion and C-statistics were used to select the parsimonious model among candidate models. Performance of the final model was evaluated using discrimination, calibration and goodness-of-fit.

Results: Incident heart failure was diagnosed in 373 (6.13%) participants. The final multivariable model included age, male sex, obesity, pre-existing diabetes, pre-existing cardiovascular disease (other than hypertension), average visit-to-visit systolic blood pressure variation, current, and past smoking. All risk factors were associated with increased risk of heart failure (Table 1). The model has optimism-corrected C-statistics of 0.70 and good calibration (goodness-of-fit $\chi^2=3.228$, $P=0.919$).

Table 1. Predictive model for incident HF

Predictor	β (SE) (BC)	HR (95% CI) (BC)	P-value
Age, per year	0.11 (0.01)	1.11 (1.09, 1.14)	0.000
Sex, Male	0.54 (0.12)	1.72 (1.37, 2.20)	0.000
Obese	0.50 (0.12)	1.65 (1.23, 2.06)	0.000
Pre-existing CVD*	0.48 (0.11)	1.61 (1.28, 1.97)	0.000
Average systolic BP variation, per mmHg	0.04 (0.007)	1.04 (1.03, 1.06)	0.000
Pre-existing diabetes	0.51 (0.16)	1.66 (1.19, 2.29)	0.002
Current smoker	0.24 (0.12)	1.27 (1.00, 1.58)	0.039
Past smoker	0.51 (0.21)	1.66 (1.09, 2.47)	0.016

BC: bias corrected after 1000 bootstrap resamples, SE: standard error of β , HR: hazard ratio, CI: confidence interval, BP: blood pressure. *At baseline or during follow-up.

Conclusion: The risk equation, consisting of clinical variables readily accessible in primary and community care settings, allows reliable prediction of 10-year incident heart failure in elderly hypertensive patients. Its application in elderly hypertensive patients in the community needs to be studied.

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External validation of the Redin-SCORE in a contemporary cohort of outpatients with advanced heart failure

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Background: There are many tools to stratify the prognosis of patients with heart failure (HF), however most of them are not usually validated in other populations to prove their real clinical utility. Recently, the Redin-SCORE was proposed to predict 1-month and 1-year risk of HF-readmission of ambulatory patients.

Purpose: To validate the Redin-SCORE in a contemporary cohort of outpatients with advanced HF.

Methods: A cohort of 240 ambulatory patients with HF was prospectively followed in a tertiary HF clinic during the 2012–2014 period. The discrimination ability was validated using the C-statistics. The Redin-SCORE used six variables: left signs of HF, heart rate higher than 70 beats/min, hemoglobin less than 120/130 g/L

(women/men), NT-ProBNP higher than 1000 ng/L, estimated GFR less than 60 ml/min/m² and atrial size higher than 26 mm/m².

Results: Table resumes the main characteristics of both populations. Compared with the Redin-SCORE sample, patients of the validation group showed: a) less history of ischemic heart disease, b) less prevalence of diabetes, c) higher rates of atrial fibrillation, and d) better left ventricular ejection fraction. The 1-month (5.4 vs 3.1%; $p=0.055$) and 1-year (29.5 vs 16.9%; $p<0.001$) HF readmission rates were higher in the validation cohort, but only the last reached statistically significant difference. The C-statistics for 1-month and 1-year risk remained consistent after the application of homogeneity test (0.77 vs 0.72, $p=0.477$; 0.70 vs 0.66, $p=0.417$, respectively).

Clinical characteristics

	Redin-SCORE (N=2507)	Validation cohort (N=240)	p-value
Age, years	66.7 (12.9)	66.6 (13.3)	0.911
Male, n (%)	1731 (69%)	165 (69%)	0.924
Ischemic heart disease, n (%)	1192 (48%)	76 (32%)	<0.001
Hypertension, n (%)	1700 (68%)	175 (73%)	0.132
Diabetes, n (%)	1058 (42%)	85 (35%)	0.037
Atrial fibrillation, n (%)	589 (24%)	91 (38%)	<0.001
Estimated GFR <60 ml/min/m ² , n (%)	1127 (45%)	105 (44%)	0.704
III NYHA class, n (%)	983 (39%)	99 (41%)	0.537
LVEF, mean (SD)	35.7 (14.6)	40.6 (17.2)	<0.001
1-month HF-readmission rate, n (%)	78 (3.1%)	13 (5.4%)	0.055
1-year HF-readmission rate, n (%)	424 (16.9%)	70 (29.5%)	<0.001

Conclusions: The Redin-SCORE is a useful tool to predict the short- and long-term risk of HF-readmission after the external validation in a more complex cohort of advanced HF outpatients.

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Poor heart failure symptom response is associated with an increased risk of death and emergent healthcare utilization

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Background: Self-care is a vital component of heart failure (HF) management. Self-care behaviors in HF include components such as maintenance (i.e. treatment adherence/symptom monitoring), management (i.e. the self-initiated response to symptoms) and consulting behaviors (i.e. consulting a provider when symptoms occur).

Purpose: To identify distinct patterns of HF self-care that would be associated with clinical outcomes.

Methods: We examined HF self-care behaviors and clinical outcomes in a cohort of 459 Italian patients with HF. Self-care maintenance and management were measured using the Self-Care of HF Index and consulting behaviors were measured using a subscale of the European HF Self-care Behavior Scale. One year after enrollment we contacted patients/caregivers to collect data on patient outcomes. We used latent class mixture modeling to identify distinct patterns of HF self-care behaviors and Cox proportional hazard modeling to estimate the association between patterns of self-care and all-cause mortality or emergency room visit for HF as a composite endpoint.

Results: Most patients were male (55%) and in NYHA class I/II (54%). The average age of the sample was 71.8 years. We identified 3 patterns of self-care: (1) Poor symptom response behaviors (worst in all behaviors; $n=151$ (32.9%)); (2) good symptom response (best at all behaviors; $n=112$ (24.4%)); and (3) asymptomatic (no symptoms and average self-care maintenance; $n=196$ (42.7%)). Over 1 year, 30% of participants died and 30% required emergency care for HF. Patients with poor symptom response had the highest event risk (event rate = 76.8%). After adjusting for other factors observed to be different across groups, patients with a good symptom response had a much lower event risk compared with those who had a poor symptom response (event rate = 55.4%; adjusted hazard ratio=0.59 (0.39–0.90), $p=0.01$). There was no difference in event risk comparing patients with poor symptom response and those who were asymptomatic at baseline (event rate = 65.3%).

Conclusions: HF patients who are poor in self-care are at higher risk for death or emergency room visits. Routine clinical assessment of self-care behaviors and more interventions targeting improving self-care is advocated to improve outcomes in patients with HF.

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