

NORSKE ABSTRAKTER PÅ EUROPREVENT I MALAGA

European Journal of Preventive Cardiology (April 2017) 24 (Supplement 1)

The exercise induced CRP response is reproducible when measured one year apart

*O Kleiven¹, M Bjorkavoll-Bergseth¹, T Melberg¹, OE Skadberg², B Auestad³, S Orn¹,
¹Stavanger University Hospital, Cardiology - Stavanger - Norway, ²Stavanger University Hospital, Dept. of biochemistry - Stavanger - Norway, ³University of Stavanger - Stavanger - Norway*

Introduction: C-reactive protein (CRP) increases following strenuous physical exercise. The cause and reproducibility of this increased inflammatory response is largely unknown.

Purpose: 1) To assess the magnitude and reproducibility of the CRP response following repeated strenuous physical exercise in healthy middle aged recreational cyclists that participated in the same race in both 2013 and 2014. 2) Identify the major determinants of the exercise induced CRP response, and describe factors that led to

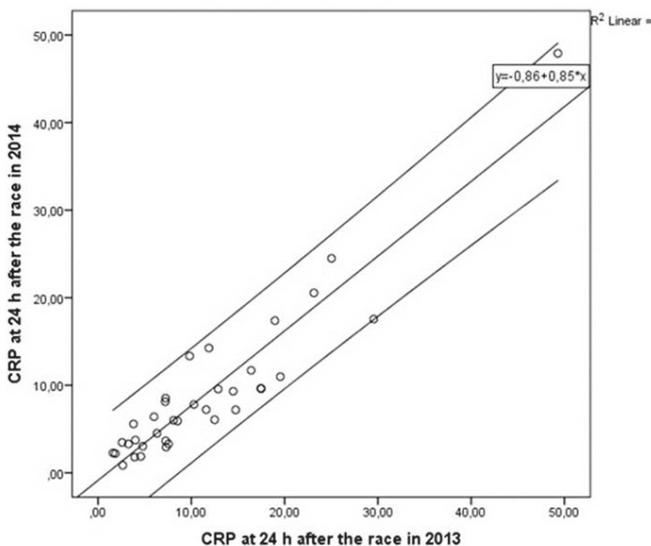
significant changes in this response to exercise over a one year time frame.

Methods: A total of 47 healthy individuals, 45.4±8.7 years of age, 37 (78.7 %) males, that participated in the same 91 km mountain bike race in both 2013 and 2014, were included in this prospective, comparative study. Blood samples, rest ECG and physical examination were acquired 24 hours prior to, and at 3 and 24 hours following both races. Values are reported as median and interquartile range.

Results: There was a highly significant ($p < 0.001$) increase in CRP from baseline to 24 hours following the competition in both 2013 and 2014: 0.8 (0.5-1.6) - 9.3 (4.6-16.3) mg/L versus 0.8 (0.4-1.5) - 6.7 (3.3-10.7) mg/L. Race conditions were less demanding in 2014, and the study cohort finished the race 0.5 (0.3-0.6) h faster in 2014 compared with 2013. However, adjusting for differences in race condition, 36 of 47 subjects had the same race performance in the two races (± 10 percent); only 3 subjects did worse in 2014.

There was a highly significant correlation between CRP measured at 24 hours following the race both years, and especially when the 36 participants with similar performance were studied: $r = 0.85$, $p < 0.001$. In multivariate regression models, race time was an independent predictor of CRP levels acquired 24 h after the race in both 2013 and 2014.

Conclusion: The major predictor of exercise induced CRP increase is physical fitness; in this study determined by race time. The CRP response is reproducible under similar circumstances assessed one year apart.



Can traditional risk factors explain the higher risk of cardiovascular disease in South Asians compared to Europeans in Norway and New Zealand?

KS Rabanal¹, HE Meyer¹, GS Tell², J Iglund², R Pylypchuk³, S Mehta³, B Kumar⁴, AK Jenum⁵, RM Selmer¹, RT Jackson³, ¹Norwegian Institute of Public Health - Oslo - Norway, ²University of Bergen - Bergen - Norway, ³The University of Auckland - Auckland - New Zealand, ⁴Oslo University Hospital - Oslo - Norway, ⁵University of Oslo - Oslo - Norway

Introduction: Immigrants from South Asia have increased risk of cardiovascular disease (CVD) compared to Europeans. The reasons for this excess risk are unclear, and the role of traditional risk factors is unsettled. The prospective relations between risk factors and subsequent CVD in South Asian populations have been scarcely studied. Purpose The purpose of this study was to examine ethnic differences between South Asians and Europeans living in Norway and New Zealand in the risk of having a first CVD event, and to examine whether traditional risk factors (blood pressure, lipids, diabetes and smoking) could explain any such difference. Our purpose was also to describe the prospective relation between cardiovascular risk factors and subsequent first CVD events in South Asians and Europeans.

Methods: We used data from two different cohorts; a Norwegian (Cohort of Norway, n=16 606) and a New Zealand cohort (PREDICT-CVD, n=129 449) with information about ethnicity, cardiovascular risk factors and subsequent CVD through linkages with hospital registry data and causes of death registers in both countries. The two cohorts were analyzed separately. We used Cox proportional hazards regression to calculate hazard ratios (HRs) for CVD in South Asians versus Europeans and to study the prospective relation between risk factors and subsequent first CVD.

Results: South Asians in both Norway and New Zealand had higher total cholesterol /high density lipoprotein ratio and higher diabetes prevalence at baseline than Europeans, but lower levels of systolic blood pressure and smoked less (especially women). The cardiovascular risk factors were in general positively associated with CVD in both ethnic groups, across gender and country. South Asians of both genders in Norway and New Zealand had increased risk of CVD compared to the European majority populations being 87-92% higher in the Norwegian cohort and 42-75% higher in the New Zealand cohort. After having adjusted for blood pressure, lipids, diabetes and smoking, South Asians in both countries remained at having significantly increased risk of CVD with hazard ratios (HRs)

for South Asians vs Europeans in the Norwegian cohort being 1.57; 95% CI 1.19-2.07 in men and 1.76; 95% CI 1.09-2.82 in women and HRs for South Asians vs Europeans in the New Zealand cohort being 1.64; 95% CI 1.43-1.88 in men and 1.39; 95% CI 1.11-1.73 in women.

Conclusion: Differences in distribution of cardiovascular risk factors seemed to explain some, but not all, of the excess risk of CVD in South Asians compared to Europeans in Norway and New Zealand.

Association between dietary fat intake and coronary heart disease in middle-aged and senior adults. The Hordaland Health Studies (HUSK).

TR Haugsgjerd¹, GM Egeland¹, SE Vollset¹, O Nygaard², G Sulo¹, K Bjoernevik¹, GS Tell¹, ¹University of Bergen, Department of Global Public Health and Primary Care - Bergen - Norway, ²Haukeland University Hospital, Department of Heart Disease - Bergen - Norway

Background: The association between type of dietary fat and the risk of coronary heart disease (CHD) remains debatable. Several risk factors for coronary heart disease (CHD) have been observed to be less pronounced among senior adults than among middle-aged adults given the importance of advancing age as a key risk factor for CHD, but age-differences in the importance of dietary intakes have not been evaluated.

Purpose: To investigate the association between different dietary fat intakes and incident CHD in middle-aged and senior adults.

Methods: We included in the analyses 5517 men and women aged 47-49 (N=2995) and 71-74 (N=2522) years participating in the Hordaland Health study (HUSK) without history of CHD who completed a 169-item food frequency questionnaire in 1997-99 (baseline). They were followed until 31 December 2009 for a coronary event (either hospitalization or death due to CHD). The associations between type of dietary fat and CHD were explored using Cox regression analysis. Results are provided as hazard ratio (HR) and 95% confidence intervals (CI). We modeled isocaloric substitution analysis to evaluate the effect of substituting part of the total energy intake from one dietary source with a different dietary source. Analyses were adjusted for age, gender, diabetes, hypertension, physical activity, smoking, body mass index and cholesterol intake.

Results: During a median follow-up of 10.9 years, we documented 112 incident cases in the middle-aged population and 492 incident cases among senior adults. In the middle-aged adults, a higher

intake of monounsaturated fatty acids (MUFA) was significantly associated with reduced risk of CHD (HR for the highest versus the lowest quintile 0.46, 95% CI: 0.24-0.90). P trend for intake of MUFA in the middle-aged population was 0.01. Saturated fat (SFA) and polyunsaturated fat (PUFA) intake was not associated with the risk of CHD in either senior adults or middle-aged adults. An isocaloric substitution with 5% of energy intake from MUFA for 5% of energy intake from SFA (HR: 0.57, 95% CI: 0.34 - 0.95), PUFA (HR: 0.56, 95% CI: 0.34 - 0.94), protein (HR: 0.57, 95% CI: 0.34 - 0.95) or carbohydrates (excluding sugar) (HR: 0.50, 95% CI: 0.31 - 0.79) was associated with a lower CHD risk in the middle-aged population. No significant results were found among senior adults. Conclusions - In this Norwegian population we observed that a higher intake of MUFA was associated with a decreased risk of CHD in the middle-aged population. Based on our modeled substitution analysis, it seems that substitution of different macronutrients with MUFA may be associated with a lower CHD risk in the middle-aged population.

Screening for total cholesterol in pharmacies is suitable to identify individuals with high cholesterol levels

K Svendsen¹, I Tønning Royseth², LT Morch-Reiersen³, M Gjeitung Byfuglien⁴, KW Garstad³, D Jacobs⁵, V Telle-Hansen², K Retterstøl¹, ¹University of Oslo, Nutrition - Oslo - Norway, ²Oslo and Akershus University College - Oslo - Norway, ³Boots Norway AS - Oslo - Norway, ⁴Mills DA - Oslo - Norway, ⁵University of Minnesota, School of Public Health - Minneapolis - United States of America

Introduction: One of the targets in the World Health Organization action plan for prevention of non-communicable diseases is to reduce premature death of cardiovascular disease (CVD) by 25% by 2025. Familial hypercholesterolemia (FH) is characterized by high total cholesterol (TC) and increased risk of premature CVD. In Norway, there is no monitoring system for high TC, and the prevalence of high TC in the Norwegian population is currently unknown.

Aim: Exploring TC levels, prevalence of high TC and possible FH in a screening in Norwegian pharmacies and possible outcomes of identifying high TC levels.

Methods: Complimentary measurements of TC were offered in 148 pharmacies one week in each of 2012 and in 2014. Participants were not using any lipid lowering medication and were ≥ 18 years. TC was obtained non-fasting using a finger-prick capillary blood sample and background data was collected through questionnaires. Six

and 12 months after the screening we contacted individuals with measured TC of ≥ 7.8 mmol/L and sent them a questionnaire aiming to explore possible outcomes of identify a high TC level.

Results: In total 21,145 individuals (31% men) measured TC and responded to a questionnaire covering background information. Self-reported body mass index, educational level and smoking prevalence in the present study corresponded with values in the general Norwegian population. Mean TC level was 5.6 mmol/L, and 60% had TC above the satisfactory level of 5 mmol/L. Further, 74 % of women and 73 % of men ≤ 40 years had never measured their cholesterol before. The corresponding values for individuals >40 years were 26 % for women and 29 % for men. In total 218 individuals had TC ≥ 7.8 mmol/L and we reached 99 of them after the screening to explore if knowledge of having a high TC level had provoked any preventive behavior. On average 45% of those with TC ≥ 7.8 mmol/L reported that their GP had measured TC again and 12% had started lipid lowering medication after the screening. More than 50% of those with TC ≥ 7.8 mmol/L reported increased motivation to eat a healthier diet. Further, we identified 337 with TC levels justifying the performance of a genetic FH screening according to current Norwegian age-specific recommendations.

Conclusions: Screening for TC in pharmacies was successful in several ways: Identifying that 60% of the population had mean cholesterol level above the recommended 5 mmol/L, identifying individuals with high TC (≥ 7.8 mmol/L), and provoking motivation to eat healthier and initiation of lipid lowering medication after the screening.

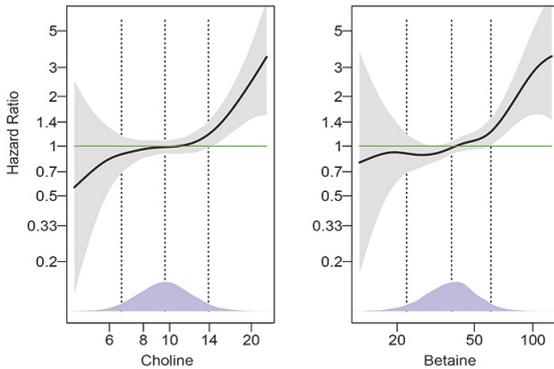
Plasma choline and betaine and risk of incident atrial fibrillation: the Hordaland Health Study

H Zuo¹, PM Ueland², O Nygaard², SE Vollset¹, GS Tell¹, ¹University of Bergen, Department of Global Public Health and Primary Care - Bergen - Norway, ²University of Bergen, Department of Clinical Science - Bergen - Norway

Background: Higher intakes of choline and betaine have been shown to be associated with reduced inflammation and decreased plasma homocysteine in healthy adults, and high homocysteine levels may be associated with the presence of persistent atrial fibrillation (AF). However, it is unknown whether plasma choline and betaine are associated with AF risk.

Purpose: To investigate the associations of plasma choline and betaine with risk of incident AF.

Methods: We conducted a prospective analysis of the Hordaland Health Study in 6949 adults without known AF at baseline (1998-99). The participants were followed via linkage to



the CVDNOR project and the Cause of Death Registry. Hazard ratios (HRs) and 95% confidence intervals (CIs) were calculated using Cox proportional hazards analyses. Results: A total of 552 participants (320 men and 232 women) developed AF over a median follow-up period of 10.9 years. Baseline plasma choline and betaine were significantly associated with AF risk in models adjusted for covariates. The multivariate-adjusted HR (95% CI) for log-transformed choline and betaine was 1.65 (1.11-2.45) and 1.68 (1.23-2.31), respectively. Age, gender and smoking status didn't modify the associations.

Conclusions: Plasma choline and betaine were associated with significantly increased risks of AF. Further studies are needed to confirm the findings.

Trends in the risk of early and late-onset heart failure as an adverse outcome of acute myocardial infarction: a CVDNOR project

G Sulo¹, J Igland¹, O Nygaard², SE Vollset¹, MEbbing³, CH Cerqueira⁴, GM Egeland³, T Jorgensen⁴, GS Tell¹, ¹University of Bergen, Department of Public Health and Primary Health Care - Bergen - Norway, ²Haukeland University Hospital, Department of Heart Disease - Bergen - Norway, ³Norwegian Institute of Public Health, Department of Health Registries - Bergen - Norway, ⁴Research Centre for Prevention and Health - Capital Region - Denmark

Background: Heart failure (HF) constitutes a serious complication of acute myocardial infarction (AMI). It marks a negative turning point in its clinical course as it leads to frequent hospitalizations and poor prognosis. From this perspective, changes over time in the incidence of HF have a major burden on health care systems. Purpose: To explore trends in the risk of HF among patients with incident AMI using the

nationwide cohort of patients hospitalized in Norway during 2001-2009.

Methods: In total, 69 372 patients aged 25-84 years were hospitalized with an incident AMI in Norway during 2001-2009. They were followed for an episode of HF occurring either during the incident AMI hospitalization (defined as early-onset HF) or within one year after discharge from the incident AMI (defined as late-onset HF). Logistic regression and competing risk regression models were used to explore trends in early and late-onset HF respectively; overall and by age group (25-69 years and 70-84 years) In all analyses, the year of the incident AMI hospitalization (AMI year) was the independent variable. Models were adjusted for gender, age, established coronary heart disease, diabetes mellitus, hypertension, renal failure, chronic obstructive pulmonary disease, valvular heart disease and atrial fibrillation.

Results: Overall, 17.1% of patients had early-onset HF. The early-onset HF rates increased by 2.3% per year (odds ratio=1.023; 95% CI: 1.015-1.031), entirely influenced by increases of 5.9% per year among younger patients (25-69 years) given that HF rates did not change significantly among older patients (70-84 years). Among 47 673 AMI patients discharged alive, without early-onset HF, 5.4% experienced late-onset HF during the follow up. The risk of late-onset HF declined annually by 6.3% per year (subhazard ratio=0.937; 95% CI: 0.921-0.954). The decline was statistically significant in both age groups (6.8% and 5.9% among younger and older patients respectively).

Conclusions: HF occurring during the AMI hospitalization accounts for the majority of HF cases and is characterized by unfavorable trends in the incidence. The negative trends were confined to younger adults. In contrast, the incidence of HF following AMI discharge (late-onset HF) declined over the study period contributed by positive changes in both younger and older adults.

Salt intake assessed by 24-hour urine excretion in the Tromsø Study 2015-2016

HE Meyer¹, L Johansson¹, AE Eggen², K Holvik¹, ¹Norwegian Institute of Public Health - Oslo - Norway, ²UiT The Arctic University of Norway - Tromsø - Norway

Purpose: Reduction of salt (NaCl) intake is a major initiative in the prevention of hypertension at the population level, and constitutes one of the targets in the WHO global action plan on prevention of non-communicable diseases. There are ongoing salt reduction initiatives in a number of countries. In order to monitor salt reduction

programs, the estimation of salt intake in the population is fundamental. Measuring sodium excretion in 24-hour urine (corresponding to approximately 90% of sodium intake) is the most valid method, and recommended by the WHO. The alternative use of sodium content in spot urine samples is challenged by a large variation in urine sodium during the day, but algorithms have been developed in order to predict salt intake based on spot urine samples. The main purpose of the current study was to assess salt intake in the adult population by 24-hour urine excretion of sodium in the Tromsø study.

Methods: The seventh wave of the population-based Tromsø study in Northern Norway was carried out during 2015-2016 (participation rate pt. 64 percent). In a random sub-sample of 496 men and women aged 40-69 years, the participants were instructed to collect all urine during a 24-hour period. They also provided a spot urine sample. Urinary concentrations of sodium, potassium and creatinine were determined. Daily excretion of sodium was calculated by multiplying urinary sodium concentration by the total volume of urine, and then multiply by 2.5 to obtain an estimate of daily salt (NaCl) intake. We also used data on age, sex, measured weight and measured body height in order to calculate the estimated sodium excretion based on a formula developed by Toft et al. utilizing sodium and creatinine from spot urine in combination with the predicted 24-hour creatinine excretion based on age, weight and height [1].

Results: Samples of 24-hour urine from 241 men and 252 women aged 40-69 years were included. Mean urine volume was 1744 (\pm 591) ml. Sodium excretion was 178 mmol/day in men and 129 mmol/day in women, corresponding to a daily mean (standard deviation) intake of 10.2 (\pm 4.0) grams of salt per day in men and 7.4 (\pm 2.7) grams of salt per day in women. The sodium-potassium molar ratio was 1.86 in men and 1.79 in women. We will also present results for predicted salt excretion based on spot urine samples.

Conclusion: The estimated salt intake in adult men was considerable higher than in adult women. The intake is comparable to recent data from other western population and lower than historic data. However, especially in men, it is considerable higher than the recommended intake, currently being 6 g/day for adults.

Ref: 1. Toft U, Cerqueira C, Andreasen AH, Thuesen BH, Laurberg P, Ovesen L, Perrild H, Jorgensen T (2014) Estimating salt intake in a Caucasian population: can spot urine substitute 24-hour urine samples? *European journal of preventive cardiology* 21 (10):1300-1307. doi:10.1177/2047487313485517

Effectiveness of a lifestyle intervention on left ventricular cardiac function in childhood obesity

C Bjork Ingul¹, K Dias², AE Tjonna¹, T Follestad³, M Hosseini¹, A Timilsina¹, SM Hollekim-Strand¹, p Cain⁴, GM Leong⁵, J Coombes², ¹Department of Circulation and Medical Imaging, Medical Faculty, NTNU - Trondheim - Norway, ²University Of Queensland, School of Human Movement and Nutrition Sciences - Brisbane - Australia, ³Norwegian University of Science and Technology, Department of Public Health and General Practice - Trondheim - Norway, ⁴The Wesley Hospital - Brisbane - Australia, ⁵University Of Queensland, Institute for Molecular Bioscience - Brisbane - Australia

Background: Pediatric obesity confers deleterious changes on cardiac structure and myocardial function. Regular exercise can ameliorate cardiac dysfunction observed in pediatric obesity.

Purpose: We aimed to evaluate the efficacy of high intensity interval training (HIIT), moderate intensity continuous training (MICT) and nutrition advice for ameliorating cardiac function.

Methods: 100 lean (11.5 \pm 2.4 years, 51.0% female, Tanner stage 2) and 99 obese children (12.0 \pm 2.3 years, 53.5% female, Tanner stage 2.50) were included. Obese children were randomised into one of three 12-week interventions, 1) HIIT [n=33, 4x4-min bouts at 85-95% maximum heart rate (HRmax), 3 times/week] and nutrition advice, 2) MICT [n=32, 44 mins at 60-70% HRpeak, 3 times/week] and nutrition advice, and 3) nutrition advice only [n=34]. A full resting echocardiogram was conducted.

Results: Obese children had significantly lower indexed LV volumes, systolic and diastolic function compared to lean controls (Table). Exercise stimulated significant improvements in both systolic and diastolic function, but only HIIT increased end-diastolic volume (EDV), stroke volume (SV) and ejection fraction (EF) (Table).

Conclusions: A twelve-week exercise intervention, specifically HIIT, was highly effective in improving a reduced LV cardiac function during rest among obese children.

Can exercise improve reduced right ventricle function in obese children?

C Bjork Ingul¹, K Dias², AE Tjonna¹, T Follestad³, M Hosseini¹, A Timilsina¹, SM Hollekim-Strand¹, PSW Davies⁴, GM Leong⁵, J Coombes², ¹Department of Circulation and Medical Imaging, Medical Faculty, NTNU - Trondheim - Norway, ²University Of Queensland, School of Human Movement and Nutrition Sciences - Brisbane - Australia, ³Norwegian University of Science and Technology, Department of Public Health and General Practice - Trondheim - Norway, ⁴University Of Queensland, Childrens Nutrition Research Centre - Brisbane - Australia, ⁵University Of Queensland, Institute for Molecular Bioscience - Brisbane - Australia

Background: Obesity in children can result in subclinical early changes in right ventricle (RV) systolic and diastolic function as well as in RV structure compared to lean controls. Lifestyle intervention with weight loss has shown potential to reverse the effects of obesity on RV diastolic function.

Purpose: The aim of the study was to evaluate if exercise in addition to diet could reverse subclinical, abnormalities in RV myocardial function and diastolic filling.

Methods: 99 obese (12.0 ± 2.3 years, 53.5 % female, Tanner stage 2.50) and 100 lean controls (11.5 ± 2.4 years, 51 % female, Tanner stage 2,) were included. The obese children were randomised into one of three 12-week interventions, 1) high intensity interval training (HIIT) [n = 33, 4 x 4-min bouts at 85 – 95 % maximum heart rate (HRmax), interspersed with 3 min of active recovery at 50 – 70 % HRmax, 3 times/week] and nutrition advice, 2) moderate intensity continuous training (MICT) [n = 32, 44 mins at 60 – 70 % HRpeak, 3 times/week] and nutrition advice, and 3) nutrition advice only [n = 34]. A full resting echocardiogram was conducted.

Results: Obese children had significantly lower RV systolic (S') and diastolic (e') tissue Doppler velocities, lower longitudinal global strain (GLS) and strain rate (GSR) compared to lean counterparts (Table). Exercise significantly improved S', e', GLS and GSR. HIIT improved e' and GLS significantly more than MICT (Table).

Conclusions: Reduced systolic and diastolic RV function in obese children could be improved by a 12-week lifestyle intervention. However, HIIT was superior compared to MICT and restored the impaired RV function. Diet alone had no effect.

Variable	Lean		Obese		HIIT vs. MICT		HIIT vs. nutrition		MICT vs. nutrition	
	Mean±SD	Mean±SD***	Mean±SD***	Mean±SD***	EMD	95% CI	P	EMD	95% CI	P
Resting heart rate (BPM)	70±11	78±12***	78±12***	78±12***	2	-2 to 7	0.30	-1	-6 to 3	0.59
V̇a O _{2peak} (ml/kg/min)	52.0±8.4	31.6±5.5***	31.6±5.5***	31.6±5.5***	2.3	-0.1 to 4.6	0.06	4.1	1.7 to 6.4	0.001
S' (cm/s)	10.2±1.5	8.6±1.3***	8.6±1.3***	8.6±1.3***	0.3	-0.2 to 0.9	0.24	1.0	0.5 to 1.6	<0.001
e' (cm/s)	18.1±2.5	15.1±2.2***	15.1±2.2***	15.1±2.2***	0.7	-0.4 to 1.8	0.20	1.5	0.5 to 2.7	0.007
Global strain (%)	-20.0±2.5	-17.1±3.0***	-17.1±3.0***	-17.1±3.0***	-1	-2.1 to 0.0	0.05	-1.7	-2.8 to -0.6	0.002
Global strain rate (s ⁻¹)	-1.0±0.2	-0.9±0.2***	-0.9±0.2***	-0.9±0.2***	-0.03	-0.1 to 0.03	0.35	-0.1	-0.17 to -0.03	0.004
EDVi (mL/m ²)	83.3±15.5	64.6±19.1***	64.6±19.1***	64.6±19.1***	4.8	-2.1 to 11.7	0.76	5.5	-1.4 to 12.3	0.12
EF (%)	62.5±6.3	57.0±8.2***	57.0±8.2***	57.0±8.2***	4.0	0.1 to 8.0	0.04	6.2	2.3 to 10.1	0.002
Stroke volume index (mL/m ²)	54.8±11.3	39.9±9.1***	39.9±9.1***	39.9±9.1***	6.8	2.7 to 10.9	0.001	6.9	2.7 to 11.1	0.001
Cardiac output (L/min)	5.3±1.6	5.5±1.4	5.5±1.4	5.5±1.4	-0.1	-0.7 to 0.6	0.80	0.0	-0.7 to 0.6	0.91
E/e'	5.3±1.0	6.4±1.3*	6.4±1.3*	6.4±1.3*	-0.03	-0.12 to 0.07	0.55	-0.06	-0.16 to 0.04	0.24
E'/A	2.1±0.5	1.9±0.5***	1.9±0.5***	1.9±0.5***	-0.08	-0.2 to 0.04	0.20	-0.01	-0.13 to 0.12	0.12

Obese vs. lean *p<0.05, ***p<0.001; EMD, estimated mean difference; CI, confidence interval, S' systolic tissue velocity, e' early diastolic tissue velocity

	Lean controls	Obese	HIIT vs. MICT			HIIT vs. nutrition			MICT vs. nutrition		
Variable			EMD	95%CI	P-value	EMD	95%CI	P-value	EMD	95%CI	P-value
Resting heart rate (bpm)	70±11	78±12***	2	-2 to 7	0.30	-1	-6 to 3	0.59	-3	-8 to 1	0.12
S' (cm/s)	14.4±2.1	13.1±2.1***	0.7	-0.4 to 1.8	0.20	1.2	0.1 to 2.3	0.03	0.5	-0.6 to 1.6	0.40
e' (cm/s)	16.9±3	14.8±2.8***	2.1	0.5 to 3.6	0.009	2.2	0.7 to 3.8	0.005	0.2	-1.4 to 1.7	0.83
A' (cm/s)	8.3±2	9.3±2.8**	1.1	-0.3 to 2.4	0.12	1.1	-0.3 to 2.4	0.12	0	-1.4 to 1.4	0.99
GLS (%)	-25.2±5.6	-20.3±4.8***	-3	-5.5 to -0.5	0.02	-4.3	-6.9 to -1.7	0.001	-1.3	-3.8 to 1.2	0.31
GSR (1/s)	-1.4±0.5	-1.2±0.4***	-0.1	-0.3 to 0.1	0.46	-0.4	-0.6 to -0.2	0.001	-0.3	-0.5 to -0.1	0.005
TAPSE mm	24.3±4	23.5±4.2*	0.6	-1.3 to 2.6	0.53	1.2	-0.8 to 3.1	0.25	0.5	-1.4 to 2.4	0.60
E/A tricuspid	1.9±0.5	1.8±0.5	0.1	-0.2 to 0.3	0.59	0.1	-0.1 to 0.4	0.39	0	-0.2 to 0.3	0.74

Medical and psychosocial factors and blood pressure control in coronary patients

E Sverre¹, K Peersen², J E Otterstad², E Gjertsen¹, L Gullestad³, T Moum⁴, E Husebye¹, T Dammen⁴, J Munkhaugen¹, ¹Drammen Hospital - Drammen - Norway, ²Vestfold Hospital - Tonsberg - Norway, ³Oslo University Hospital - Oslo - Norway, ⁴University of Oslo - Oslo - Norway

Background: Blood pressure (BP) control in coronary patients is poor. Understanding the determinants of BP control is important for modeling tailored interventions to improve BP control.

Purpose: To explore associations between medical and psychosocial (study) factors and poor BP control in a representative sample of coronary patients from routine clinical practice.

Methods: A cross-sectional study used logistic and linear regression analysis to explore the association between study factors and BP in 1012 patients, mean age 62.0 (SD 9.4) years, hospitalized with myocardial infarction and/or a coronary revascularization procedure. Data were collected from hospital records, a comprehensive self-report questionnaire, clinical examination, and blood samples after 2-36 (median 16) months follow-up. Poor BP control was defined as >140/90 mmHg (>140/80 mmHg in diabetics).

Results: At follow-up, poor BP control was found in 46% of all patients. The prescription rate of BP lowering drugs at the index coronary event was 93%. On average, patients with poor BP control used 2.0 (SD 1.2) BP lowering drugs, and only 28% used ≥3 drugs. In age and sex adjusted analyses, poor BP control was significantly associated with diabetes (Odds ratio

(OR) 2.7, 95% Confidence interval (CI) 1.9-3.8), hypertension reported in the hospital record (OR 1.8, 95% CI 1.4-2.4), body mass index >30 kg/m² (OR 1.6, 95% CI 1.3-2.2), non-participation in cardiac rehabilitation (OR 1.3, CI 1.1-1.7) and increasing age (OR 1.04, 95% CI 1.02-1.05, per year), whereas only a trend was observed for male sex. Depression registered in the medical records at index event was significantly inversely related to poor BP control (OR 0.5, 95% CI 0.3-0.9). No significant associations were found for other psychosocial factors, low socioeconomic status, self-reported low drug adherence, somatic co-morbidity, or poor illness and risk perception. Increasing age (Unstandardized Beta (B) 0.5, p<0.001), and BMI > 30 kg/m² (B 3.4, p<0.01), were associated with increasing systolic blood pressure in continuous age and sex adjusted analyses, while depression registered in the medical records (B -5.5, p<0.02), Hospital Anxiety and Depression (HADS), Anxiety score ≥11, (B -6.7, p<0.02) and HADS Depression score ≥11 (B -3.1, p<0.02) were inversely associated with systolic BP.

Conclusions: Intensified anti-hypertensive treatment, increased referral to and participation in cardiac rehabilitation, and strategies to manage obesity emerge as the major factors to address in order to improve BP control in coronary patients.

Effect of obesity and lifestyle intervention on cardiac function in children during exercise stress test

C Bjork Ingul¹, K Dias², AE Tjonna¹, T Follestad³, M Hosseini¹, SM Hollekim-Strand¹, PSW Davies⁴, p Cain⁵, GM Leong⁶, J Coombes², ¹Department of Circulation and Medical Imaging, Medical Faculty, NTNU - Trondheim

- Norway, ²University Of Queensland, School of Human Movement and Nutrition Sciences - Brisbane - Australia, ³Norwegian University of Science and Technology, Department of Public Health and General Practice - Trondheim - Norway, ⁴University Of Queensland, Childrens Nutrition Research Centre - Brisbane - Australia, ⁵The Wesley Hospital - Brisbane - Australia, ⁶University Of Queensland, Institute for Molecular Bioscience - Brisbane - Australia

Background: Impaired resting cardiac function among obese children can be even more pronounced during exercise testing and exercise testing can unmask subclinical cardiac dysfunction. Even though studies have shown that both weight loss and exercise can improve reduced resting function, no study in obese children has demonstrated improved cardiac function during maximal exercise testing.

Purpose: If lifestyle intervention in obese children can improve cardiac function during maximal exercise testing.

Methods: 99 obese (12.0 ± 2.3 years, 53.5 % female, Tanner stage 2.50) and 100 lean controls (11.5 ± 2.4 years, 51.0 % female, Tanner stage 2) were included. Obese children were randomised into one of three 12-week interventions, 1) High intensity interval training (HIIT) [n = 33, 4 x 4-min bouts at 85 - 95 % maximum heart rate (HRmax), 3 times/week] and nutrition advice, 2) moderate intensity continuous training (MICT) [n = 32, 44 mins at 60 - 70 % HRpeak, 3 times/week] and nutrition advice, and 3) nutrition advice only [n = 34]. Exercise stress echocardiography was performed on a stationary cycle ergometer in an upright position. The exercise protocol started at 25 W with 25 W increments every three minutes until HRmax or participant no longer was able to maintain a constant cadence.

Results: During peak stress, cardiac function was impaired among the obese children with lower peak systolic tissue velocity (S') and stroke volume index (SVi) compared to lean counterparts. Only the combined exercise and nutrition interventions improved cardiac systolic function during peak stress.

Conclusions: Obese children exhibit cardiac reductions during peak stress. Both exercise interventions were equally effective to improve cardiac function during peak stress, but diet alone had no effect.

Variable	Lean controls		Obese		HIIT vs. MICT		95% CI		p		HIIT vs. nutrition		95% CI		p		MICT vs. nutrition		95% CI		p		
	Mean±SD	Mean±SD	Mean±SD	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI	EMD	95% CI
V TM O _{2peak} (ml/kg/min)	52.9 ± 8.4	161 ± 22	31.6 ± 5.5***	2.3	-0.1 to 4.6	0.06	0.06	1.7 to 6.4	0.001	1.8	-0.5 to 4.1	1.8	-0.5 to 4.1	0.12	0.12	1.8	-0.5 to 4.1	1.8	-0.5 to 4.1	0.12	0.12	1.8	-0.5 to 4.1
Peak heart rate (BPM)	14.8 ± 1.2	162 ± 21	13.1 ± 2.2***	0	-9 to 10	0.86	0.86	-11 to 8	0.78	-2.0	-11 to 7	-2.0	-11 to 7	0.63	0.63	-2.0	-11 to 7	-2.0	-11 to 7	0.63	0.63	-2.0	-11 to 7
S' (cm/s)	9.0 ± 3.1	14.8 ± 1.2	8.9 ± 2.7	0.1	-0.7 to 1.0	0.77	0.77	0.2 to 1.8	0.02	0.9	0.0 to 1.7	0.9	0.0 to 1.7	0.04	0.04	0.9	0.0 to 1.7	0.9	0.0 to 1.7	0.04	0.04	0.9	0.0 to 1.7
E/e'	1.5 ± 0.3	14.8 ± 1.2	1.5 ± 0.3	-0.01	-0.17 to 0.15	0.87	0.87	-0.21 to 0.11	0.52	-0.04	-0.19 to 0.11	-0.04	-0.19 to 0.11	0.63	0.63	-0.04	-0.19 to 0.11	-0.04	-0.19 to 0.11	0.63	0.63	-0.04	-0.19 to 0.11
V TM m _{ax} V _{DOT} (m/s)	24.4 ± 5.5	14.8 ± 1.2	22.9 ± 5.3*	0.1	0.0 to 0.3	0.14	0.14	0.2 to 0.5	<0.001	0.2	0.0 to 0.3	0.2	0.0 to 0.3	0.03	0.03	0.2	0.0 to 0.3	0.2	0.0 to 0.3	0.03	0.03	0.2	0.0 to 0.3
V TM T _{1DOT} (cm)	54.6 ± 16.8	14.8 ± 1.2	38.8 ± 13.4***	0.1	-0.06 to 0.26	0.21	0.21	-0.4 to 5.2	0.10	1.9	-0.8 to 4.6	1.9	-0.8 to 4.6	0.17	0.17	1.9	-0.8 to 4.6	1.9	-0.8 to 4.6	0.17	0.17	1.9	-0.8 to 4.6
SVi (mL/m ²)	11.6 ± 4.6	14.8 ± 1.2	11.4 ± 4.7	0.1	-0.1 to 0.2	0.41	0.41	0.09 to 0.41	0.003	0.14	0.0 to 0.3	0.14	0.0 to 0.3	0.07	0.07	0.14	0.0 to 0.3	0.14	0.0 to 0.3	0.07	0.07	0.14	0.0 to 0.3
CO (L/min)	11.6 ± 4.6	14.8 ± 1.2	11.4 ± 4.7	0.1	-0.1 to 0.2	0.41	0.41	0.0 to 0.3	0.07	0.1	-0.1 to 0.3	0.1	-0.1 to 0.3	0.31	0.31	0.1	-0.1 to 0.3	0.1	-0.1 to 0.3	0.31	0.31	0.1	-0.1 to 0.3

Obese vs. lean *p<0.05, ***p<0.001; EMD, estimated mean difference; CI, confidence interval

Long-term changes in systolic blood pressure predict risk of atrial fibrillation in a general population cohort study

E Sharashova¹, T Wilsgaard¹, I Njolstad¹, EM Mathiesen², LA Hopstock³, J Ball⁴, B Morseth¹, M-L Lochen¹, UiT The Arctic University of Norway, Department of Community Medicine - Tromsø - Norway, ²UiT The Arctic University of Norway, Department of Clinical Medicine - Tromsø - Norway, ³UiT The Arctic University of Norway, Department of Health and Care Sciences - Tromsø - Norway, ⁴NHMRC Centre for Research Excellence to Reduce Inequality in Heart Disease, Institute for Health Research - Melbourne - Australia

Background: Although cardiovascular mortality rates have declined dramatically in the world over the last two decades, age-standardized mortality rates from atrial fibrillation (AF) increased by 100%. Elevated systolic blood pressure (SBP) is one of the key clinical risk factors for AF; however the association between long-term changes in SBP and the risk of AF in the general population has not been extensively examined.

Purpose: To assess the association between long-term individual changes in SBP and the risk of incident AF in a large sample of men and women from the general population.

Methods: This is a large population-based longitudinal study. We included men and women who attended two surveys conducted in 1986-87 and in 1994-95, were aged 20 years or older, were not pregnant during examinations, had no missing values, and were free of AF by 1994-95 (n=14,784). Long-term changes in SBP were calculated as a difference between the two surveys' measurements and divided into quintiles. Participants were followed up for incident AF throughout December 31, 2013. We used Cox regression to estimate hazard ratios of AF in relation to long-term changes in SBP adjusted for mean values of SBP and other cardiovascular risk factors.

Results: During 20 years of follow-up 720 (9.6%) men and 307 (4.2%) women developed AF. We found an independent association between long-term change in SBP and the risk of AF in men, but not in women. In men the association was U-shaped: substantial decrease in SBP increased risk of AF by 41%, substantial increase in SBP increased the risk by 37% (Table). Additional adjustment for change in hypertension status and in blood pressure treatment had virtually no effect on the associations.

Conclusions: Both long-term increase and increase in SBP in men from the general population was associated with increased future risk

of AF. Long-term individual changes in SBP may provide additional prognostic information.

Change in SBP, mmHg	Men	Women
<-4	1.41 (1.10; 1.81)	0.83 (0.55; 1.25)
-4 to 1	1.22 (0.93; 1.60)	1.00 (0.66; 1.51)
2 to 7	1.00	1.00
8 to 15	1.13 (0.88; 1.46)	0.92 (0.63; 1.33)
>15	1.37 (1.08; 1.75)	1.01 (0.72; 1.41)

**Adjusted for mean SBP, age, resting heart rate, body mass index, total cholesterol, high-density lipoprotein cholesterol, triglycerides, physical activity, and change in smoking.*

Effect of secondary prevention: low density lipoprotein cholesterol and lipid-lowering drug use after first-ever myocardial infarction, by sex and age

L Hopstock¹, AE Eggen¹, ML Lochen¹, EB Mathiesen², I Njolstad¹, T Wilsgaard¹, ¹UiT The Arctic University of Norway, Department of Community Medicine - Tromsø - Norway, ²UiT The Arctic University of Norway, Department of Clinical Medicine - Tromsø - Norway

Background: One of four acute myocardial infarction (MI) hospitalizations in Norway are recurrent events, despite high reported prevalence of medical treatment at hospital discharge. Improvement in patient care will increase cardiovascular health and quality of life, and reduce society costs, therefore studies of treatment compliance and effect in the Norwegian population is needed.

Purpose: We investigated the change in low density lipoprotein (LDL) cholesterol levels after first-ever MI among participants in a Norwegian cohort study.

Methods: 10,325 participants attending the population-based Tromsø Study in 1994-95 were followed for first-ever MI up to the next screening in 2007-08. Non-fasting blood samples were collected and analyzed with standard methods. LDL cholesterol was estimated using Friedewald's formula. Information on lipid-lowering drug (LLD) use was collected via questionnaires. We used linear regression models to investigate sex and age differences in LDL cholesterol change between baseline (pre-MI) and second screening (post-MI).

Results: A total of 395 participants (32% women) had a first-ever MI during follow-up (>3 months before their second screening) and valid lipid measurements at both screenings. Mean LDL cholesterol (SD) was 4.93 (1.10) and 4.66 (0.99) mmol/L at baseline and 2.77 (1.02) and 2.52 (0.89) mmol/L at second screening,

in women and men, respectively. Virtually none used LLD at baseline, and LLD use prevalence at second screening was 86% in women and 92% in men. Mean decrease in LDL cholesterol was -2.14 mmol/L (SD 1.09), with no sex or age differences ($p=0.8$ for sex and $p=0.9$ for age).

Conclusion: Overall, in this population MI patients achieved the previous treatment goals (LDL cholesterol 2.6 mmol/L) for prevention of recurrent events. There is a need for further research on the effect of secondary prevention after MI including adherence with recently published guidelines.

Leisure time physical activity initiated by employer and its health effects. A 15-month follow-up study

*M Skogstad¹, Ø Skare¹, LK Lunde¹, B Ulvestad¹,
¹National Institute of Occupational Health,
Dept. Occupational Medicine and Epidemiology - Oslo - Norway*

Background: To study the possible health benefits of 8 weeks of unsupervised physical activity (PA) initiated by employer.

Purpose: To elucidate any changes in blood pressure, resting heart rate (RHR) and blood biomarkers related to cardiovascular health (glycosylated hemoglobin, lipids, C-reactive protein and seven inflammatory biomarkers) immediately after an eight-week PA program and at 15 months follow-up. We obtained maximal oxygen uptake (VO₂max) before and after the PA program.

Methods: In a road maintenance enterprise a motivational, unsupervised, 8-week physical activity program started in autumn 2014 and was repeated in autumn 2015. The PA program included individual registration of steps (accelerometer) and participation in teams that competed internally. We collected background data, self-reported levels of PA and objective health measures at baseline, after the PA program, and finally after 15 months. One hundred and twenty one (78 men and 43 women), 103 and 97 workers were included at baseline and at the first and second follow-up, respectively. Self-reported physical activity were registered using the categories 1) physically active ≤ 1 time per week, 2) 2-3 times per week and 3) ≥ 4 times per week.

Results: With ≤ 1 time per week as reference, exercising 2-3 times per week at baseline was associated with higher levels of VO₂max. During the 8-week follow-up 52 % of the participants reported an increase in daily PA. VO₂max increased with 2.8 mL \cdot 153; kg⁻¹ 153; min⁻¹ (95%CI= 1.4, 4.3) while total cholesterol and LDL were reduced by 0.12 mmol/L and 0.13mmol/L, respectively (95%CI=-0.22,-0.01 and -0.22,-0.04). In addition, biomarkers of inflammation,

decreased substantially during the 8-week follow-up. After the 15 month follow-up the subjects reported a total of 239 (SD=251) and 126 (SD=136) min of weekly moderate and high PA, respectively. HbA1c, IL-6 and CRP were reduced significantly at the final follow-up of 0.06 (95% CI -0.11,-0.01), -0.25 (95%CI -0.46,-0.04) and -0.39 (95% CI -0.75, 0.01), mostly among white-collar workers.

Conclusions: This study shows that exercise several times a week among workers in road maintenance is associated with increased VO₂max, lower blood pressure, a more favorable lipid status and lower inflammation compared to lower weekly activity. Mostly pronounced among highly educated, a reduction of HbA1c, CRP and IL6 was found one year after termination of an exercise program over 8 weeks launched by employer. The study suggests that employer initiated, unsupervised physical activity could have considerable health benefits for the participating employees.

Coronary risk factor control associated with cardiac rehabilitation programs is dependent on their contents, duration and participation rate

*K Peersen¹, E Sverre², T Dammen³, L Gull-estad⁴, J Munkhaugen², JE Otterstad¹,
¹Hospital of Vestfold Trust, Department of Cardiology - Tønsberg - Norway, ²Drammen Hospital, Department of Medicine - Drammen - Norway, ³University of Oslo, Department of Behavioral Sciences in Medicine - Oslo - Norway, ⁴Oslo University Hospital, Department of Cardiology, Oslo University Hospital Rikshospitalet - Oslo - Norway*

Background: Coronary risk factor control in Europe is far from optimal, and there are huge variations in the nature of coronary rehabilitation (CR) programs offered to patients with coronary heart disease (CHD). The present study explores risk factor control and drug adherence in coronary patients who attended two clinically implemented CR programs with different content, duration and participation rate.

Methods: In a cross-sectional study 1127 Norwegian patients (83% participation rate, 21 % women, mean age 62 years) hospitalized with acute myocardial infarction and/or a revascularisation procedure attended a clinical visit and completed a questionnaire on medical and psychosocial factors after 2-36 (median 16) months follow-up. The hospital of Vestfold provides comprehensive, multi-disciplinary CR lasting for up to 6 months, while the hospital of Drammen provides a mainly exercise based CR lasting for 6 weeks.

Results: The participation rate in CR Vestfold was 407/135 patients (75 %) as opposed to 103/482 (18%) in CR Drammen. At follow-up, CR attendees at the hospital of Drammen practiced physical activity ≥ 2 -3 times per week significantly more than non-attendees (76% vs. 64%, $P=0.032$). In Vestfold physical activity was also significantly more prevalent in CR-attendees (75% vs. 65%, $p=0.032$) than non-attendees. In addition attendees in Vestfold had a higher prevalence of smoking cessation (54% vs. 29%, $p=0.002$), and self-reported medication adherence was more often acceptable (94% vs. 87%, $p=0.027$). No differences in BMI < 30 kg/m², blood pressure $< 140/90$ mmHg, LDL-cholesterol < 1.8 mmol/l or HbA1C in diabetic patients were found between CR attendees and non-attendees in the two hospitals. But when LDL-cholesterol used as a continuous outcome, the levels were lower among CR attendees than non-attendees (2.03 mmol/l versus 2.25 mmol/l $p = 0.012$) in Vestfold, but not in Drammen.

Conclusions: The hospital practicing the most comprehensive CR program had a much higher participation rate and a better lifestyle risk factor control than the hospital with a less comprehensive CR and lower participation rate. However, coronary risk factor control after attending CR is still poor and better understanding of barriers for optimal risk factor control is needed to further optimize CR in routine clinical practice.

Medical and psychosocial factors and blood pressure control in coronary patients

E Sverre¹, K Peersen², J E Otterstad², E Gjertsen¹, L Gullestad³, T Moum⁴, E Husebye¹, T Dammen⁴, J Munkhaugen¹, ¹Drammen Hospital - Drammen - Norway, ²Vestfold Hospital - Tonsberg - Norway, ³Oslo University Hospital - Oslo - Norway, ⁴University of Oslo - Oslo - Norway

Background: Blood pressure (BP) control in coronary patients is poor. Understanding the determinants of BP control is important for modeling tailored interventions to improve BP control.

Purpose: To explore associations between medical and psychosocial (study) factors and poor BP control in a representative sample of coronary patients from routine clinical practice.

Methods: A cross-sectional study used logistic and linear regression analysis to explore the association between study factors and BP in 1012 patients, mean age 62.0 (SD 9.4) years, hospitalized with myocardial infarction and/or a coronary revascularization procedure. Data were collected from hospital records, a comprehensive self-report questionnaire, clinical examination, and blood samples after 2-36 (median 16)

months follow-up. Poor BP control was defined as $> 140/90$ mmHg ($> 140/80$ mmHg in diabetics).

Results: At follow-up, poor BP control was found in 46% of all patients. The prescription rate of BP lowering drugs at the index coronary event was 93%. On average, patients with poor BP control used 2.0 (SD 1.2) BP lowering drugs, and only 28% used ≥ 3 drugs. In age and sex adjusted analyses, poor BP control was significantly associated with diabetes (Odds ratio (OR) 2.7, 95% Confidence interval (CI) 1.9-3.8), hypertension reported in the hospital record (OR 1.8, 95% CI 1.4-2.4), body mass index > 30 kg/m² (OR 1.6, 95% CI 1.3-2.2), non-participation in cardiac rehabilitation (OR 1.3, CI 1.1-1.7) and increasing age (OR 1.04, 95% CI 1.02-1.05, per year), whereas only a trend was observed for male sex. Depression registered in the medical records at index event was significantly inversely related to poor BP control (OR 0.5, 95% CI 0.3-0.9). No significant associations were found for other psychosocial factors, low socioeconomic status, self-reported low drug adherence, somatic co-morbidity, or poor illness and risk perception. Increasing age (Unstandardized Beta (B) 0.5, $p < 0.001$), and BMI > 30 kg/m² (B 3.4, $p < 0.01$), were associated with increasing systolic blood pressure in continuous age and sex adjusted analyses, while depression registered in the medical records (B -5.5, $p < 0.02$), Hospital Anxiety and Depression (HADS), Anxiety score ≥ 11 , (B -6.7, $p < 0.02$) and HADS Depression score ≥ 11 (B -3.1, $p < 0.02$) were inversely associated with systolic BP.

Conclusions: Intensified anti-hypertensive treatment, increased referral to and participation in cardiac rehabilitation, and strategies to manage obesity emerge as the major factors to address in order to improve BP control in coronary patients.

Marital status and out-of-hospital coronary deaths in Norway, 1995-2009 - a CVDNOR project

E Llanaj Sulo¹, O Nygaard², SE Vollset¹, J Igland¹, G Sulo¹, GS Tell¹, ¹University of Bergen, Department of Public Health and Primary Health Care - Bergen - Norway, ²Haukeland Hospital, Institute of Medicine, University of Bergen, Department of Heart Disease - Bergen - Norway

Purpose - Living arrangement is an important dimension of social isolation and has been associated with coronary heart disease (CHD). Most CHD deaths occur outside hospitals, mostly at home. They could potentially be prevented by increasing public awareness on cardiac symptoms. However, no information is available on the role of cohabitant's support during a heart attack. We aimed at exploring the potential link between

marital status and OHCD risk in Norwegian individuals aged 60-79 years.

Methods – Information on OHCD during 1995-2009 among Norwegian residents aged 60-79 years was retrieved from the Norwegian Cause of Death Registry. Information on marital status was retrieved from Statistics Norway and categorized into 'married', 'divorced/separated or widowed' and 'unmarried'. History of prior CHD was obtained from the Cardiovascular disease in Norway (CVDNOR) project. Data on the total Norwegian population aged 60-79 years stratified by year, age (1-year strata), gender, marital status and education was obtained from the Population Registry and used as the population at risk in calculating OHCD rates. We excluded from the analyses individuals <60 years due to the fact that an important proportion of this age category live with a partner, without being married and are registered as 'unmarried'. The upper age limit (79 years) was chosen based on explanatory analyses showing that a substantial proportion of elderly >80 years die in nursing homes. The association between marital status and risk of OHCD was explored using Poisson regression analysis comparing married individuals with 'widowed/divorced/separated' and 'unmarried' categories. Models were adjusted for age, year of death, prior CHD and level of education. Results were expressed as incidence rate ratios (IRR) and 95% CI.

Results – 24,901 individuals aged 60-79 years died from CHD outside hospitals; of whom 69% were men [mean age, 71.5 (5.5) years] and 31% women [mean age, 73.4 (5.1) years]. Among those who died, single individuals were younger, had lower education and more often previous history of CHD compared to married individuals. In men, the excess OHCD risk was 79% (IRR=1.79; 95% CI: 1.73-1.85) for widowed/divorced/separated individuals and 109% (IRR=2.09; 95% CI: 2.01-2.18) higher for unmarried individuals compared to married. In women the risk of OHCD was 49% (IRR=1.49; 95% CI: 1.43-1.56) and 108% (IRR=2.08; 95%CI: 1.92-2.05) higher in widowed/divorced/separated and unmarried compared to married category. Conclusion – The risk of OHCD was higher among individuals who were not living with a partner compared to married individuals with the highest risk among those who had never been married. Our findings support an independent role of social support, beyond that of education, in OCHD. Further studies are needed to evaluate this association in a broader age group and identify mechanisms involved.

Long-term success of cardiac rehabilitation in primary care

B B Nilsson¹, PL Lunde², EKN Scheele², V Ritschel², E Jarstad², HK Groggaard³, ¹University of Oslo, Institute of Health and Society - Oslo - Norway, ²Norwegian Research Center for Active Rehabilitation - Oslo - Norway, ³Oslo University Hospital - Oslo - Norway

Exercise capacity is a strong predictor of survival in patients with and without coronary artery disease. Based on earlier observational studies, it appears that exercise based cardiac rehabilitation (CR) programs which gives at least 3.5 ml/kg/min improvements in VO₂peak are beneficial. Long-term results on VO₂peak after CR are rare.

Purpose: To evaluate long-term outcome of a 12-week outpatient CR in a specialized primary care clinic in Oslo. A total of 164 consecutive patients (80 after acute coronary syndrome, 55 after coronary artery bypass graft and 29 after cardiac valve or aortic surgery) attending a 12-week high-intensity group-based CR program (the Norwegian Ullevaal model). At entry, end, and one year after completion of the program patients were evaluated with a cardiopulmonary exercise test (VO₂peak), weight, body mass index, blood pressure, self-reported exercise habits and HRQoL (the COOP-WONCA questionnaire).

Results: Long-term outcomes are available for 104 patients (63%). Mean age was 55 ± 9 years, 86,5 % were men. VO₂peak improved significant from program entry (32,6 ± 7,7 ml/kg/min) to program end (36,7 ± 8,9 ml/kg/min) (p<0.001) and improved further at follow up (37,5 ± 9,4 ml/kg/min) (p<0,002). COOP-WONCA were significant improved in all domains (p<0.001) in addition to a clinical significant improvement in the domains; «physical improvement» and «change in health» from entry to one year after intervention. It was, however, a ceiling effect of the questionnaire regarding daily activities and social activities.

Conclusion: One year after completion of outpatient exercisebased CR with the Norwegian Ullevaal model, the patients still exercised (mean 2.4±1,2 times per week) and had improved or maintained their VO₂peak and HRQoL.