

# EUROPREVENT

## AMSTERDAM 8. – 10. MAI 2014

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### Global Cardiovascular Health

Amsterdam er en herlig by for kongress om våren, selv om det regnet mye under EuroPREvent 2014. Kongressen ble i år arrangert for 9. gang. Det var lett å finne et hyggelig hotell i nærheten av kongressenteret, slik at man kunne slentre langs kanalene på veg til og fra og bli sugd inn i den helt spesielle atmosfæren som Amsterdam byr på. Her presenteres noen glimt fra kongressen som fortjener flere norske deltakere med interesse for forebygging av hjerte-karsykdom.

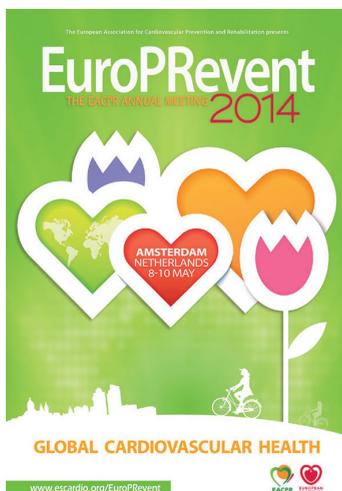
Kongressen arrangeres av ESC-grenen «The European Association for Cardiovascular Prevention and Rehabilitation», eller EACPR, som også utgir tidsskriftet European Journal of Preventive Cardiology. Dette aktuelle tidsskriftet har en stadig økende impact factor, 3,9, og er rangert som nr. 30 av 124 tidsskrifter innenfor området «Cardiac & Cardiovascular Systems». Da jeg refererte fra denne kongressen i 2012 var impact factor bare 2,6.

Slagordet for årets kongress var «Global Cardiovascular Health», og mange sesjoner var viet til dette temaet. EuroPREvent er en meget internasjonal kongress med 1200 deltakere fra 80 land, og kongressarrangøren ser det som viktig å bidra til et internasjonalt samarbeid med tanke på å forebygge hjerte-karsykdommer. WHO fokuserer nå på at NCD (non-communicable diseases eller ikke-smittsomme sykdommer) som inkluderer hjerte-karsykdommer, nå er den viktigste dødsårsaken ikke bare i

vestlige land, men også i mange utviklingsland. FN og WHO har sammen formulert et mål om å redusere prematur dødelighet av NCD og spesielt hjerte-karsykdommer med 25 % innen 2025. Norge ga i mai 2012 støtte til en denne beslutningen i Verdens helseforsamling i FN om å redusere prematur dødelighet av ikke-smittsomme sykdommer, og som ledd i en nasjonal oppfølging av dennes målsetningen, nedsatte Helsedirektoratet på oppdrag fra Helse- og omsorgsdepartementet en ekspertgruppe som utarbeidet et grunnlagsdokument for nasjonal oppfølging. WHO angir at målet primært skal nås gjennom forebyggende tiltak rettet mot de felles underliggende faktorene tobakk, usunt kosthold, inaktivitet og skadelig bruk av alkohol. Lenke til dokumentet finnes her: <http://helsedirektoratet.no/publikasjoner/reduksjon-i-ikke-smittsomme-sykdommer-nasjonal-oppfolging-av-whos-mal/Sider/default.aspx>

Kongressens nederlandske arrangører av EuroPREvent deltok i en underskriftskampanje om et tobakksfritt samfund der man ba alle kongressdeltakerne undertegne et opprop som skulle sendes EU-parlamentet. Oppropet var en oppfordring om å innføre såkalt plain packaging eller nøytral innpakning for alle tobakksvarer i EU, slik flere land har innført, blant annet Australia.

EuroPREvent arbeider aktivt for å rekruttere yngre kongressdeltakere og tilbyr ulike nettverksmuligheter for de unge. Det er tilbud både for dem som holder på med stt PhD-arbeide, og for dem som er kommet til postdoktornivå i sin forskning. I tillegg til



Young investigator award, var det en egen sesjon for yngre forskere som har disputert med tanke på å skape nye nettverk (Research after your PhD – special networking session). Det var også egne masterklasser om vitenskapelige metoder for å utføre studier i forebyggende kardiologi.

Om lag 50 % av alle 850 innsendte abstrakt ble akseptert. Mange av de muntlige foredragene fra innsendte abstrakt var integrert i andre sesjoner med inviterte foredragsholdere. Ett av de norske abstraktene (G Egeland) ble presentert muntlig og publiseres her, sammen med de 12 norske abstraktene som ble presentert som poster.

Posterne var ordnet tematisk i grupper på 10 og ble presentert kort for en mentor og publikum. Det fungerte utmerket og var en fin måte å løfte fram nyheter på. Hver mentor valgte så ut den beste posteren i sin gruppe, og disse fikk merkelappen «Judges Choice» og ble så presentert i et eget område. To av de norske posterne (E. Sulo og T. Karlsen) ble nominert til «Judges Choice». Trine Karlsen fikk også pris for en av de 15 beste posterne på hele kongressen. Det var to inviterte norske kardiologer blant foredragsholderne: Sverre Kjeldsen hadde et innlegg om behandling hos hypertonikere med atrieflimmer, og Erik Ekker Solberg hadde et innlegg om behovet for et register over plutselig hjertedød hos idrettsutøvere. Neste EuroPrevent-kongress holdes i Lisboa, Portugal, 14.-16. mai 2015.

## Prisutdeling til norsk artikkel - Highly Cited Paper Award

Som redaktør og referent undret jeg meg på om jeg skulle delta på avslutningssesjonen siste dag. Da var det begynt å bli litt skrint i rekkene, og det fristet kanskje mer å gå ut i byen. Men jeg holdt ut. Under prisutdelingen skulle man dele ut priser for de 3 mest siterte originalartiklene i European Journal of Preventive Cardiology de siste to årene. Retningslinjer og den slags ble utelukket, da de ofte siteres mye og ikke regnes som



Figur 1. Referenten mottar pris for mest siterte artikkel på vegne av Jan Mannsverk. Jan Mannsverks prisartikkel har følgende referanse: Jan Mannsverk, Tom Wilsgaard, Inger Njølstad, Laila Arnesdatter Hopstock, Maja-Lisa Løchen, Ellisiv B. Mathiesen, Dag S. Thelle, Knut Rasmussen og Kaare Harald Bønnaa. Age and gender differences in incidence and case fatality trends for myocardial infarction: a 30-year follow-up. *The Tromsø Study. Eur J Prev Cardiol* 2012;19:927-34.

original forskning i denne sammenhengen. Og sannelig: Overlege og PhD-student Jan Mannsverk og medforfatteres artikkel fra Tromsømiljøet var en av de tre artiklene som var mest sitert og fikk pris. Artikkelen som er fra Tromsøundersøkelsen, ble publisert i 2012 og er blitt sitert 13 ganger allerede. Den er spesielt blitt lagt merke til, fordi den som eneste norske artikkel omhandler incidens av klinisk validerte hjerteinfarkt og case fatality over 30 år med vekt på kjønnsforskjeller. Man fant at mens incidensen hos alle menn og hos kvinner over 80 år gikk ned i denne tidsperioden, så økte incidensen for kvinner mellom 35 og 79 år. Case fatality ble redusert likt for begge kjønn gjennom perioden. Prisutdelingen annonserte vinneren og ba forfatter eller en medforfatter stige opp på scenen. Jeg var den eneste fra forfattergruppen til stede og mottok stolt prisen.

## Det er aldri for sent å starte trening

David Matelot fra Rennes i Frankrike presenterte en studie med gode nyheter for godt voksne hjerteferiske menn som planlegger å begynne å trene, men ikke er kommet helt i gang enda. Uansett hvilken alder de startet å trene, om det var før eller etter 40 år, så hadde relativt intensiv utholdenhetstrening i form av sykling eller jogging samme gunstige effekter på hjertet. Både

fitness, maksimum oksygenopptak, hjertefrekvens og ekkokardiografiske parametere ble målt både i hvile og ved submaksimal anstrengelse og sammenlignet mellom gruppene og med en gruppe menn som ikke drev noen form for trening.

## Fedmeepidemien ruller inn over Europa

Laura Webber fra National Heart Forum i London var nominert til Young Investigator Award, og hun presenterte en studie om den sannsynlige utviklingen av fedmeepidemien i Europa i 2030 basert på tilgjengelige prevalenstall i 53 europeiske land og statistiske modeller som også omfattet sannsynlige negative effekter på hjerte-karsykdommer. Fedme (BMI > 30) hos kvinner ble anslått å bli høyest i Irland (47 %) og lavest i Romania (10 %) i 2030. Tilsvarende tall for menn i disse landene var 58 % og 10 %. Fedme ble diskutert som en multifaktoriell sykdom der forebyggende tiltak er avgjørende, og det gjelder ikke minst politiske og markedsregulerende grep som vil bli viktige for å snu den bekymringsfulle trenden.

## Sportskardiologi

Rajay Narain fra London presenterte i interessant studie med en konklusjon som antakelig er noe kontroversiell. Som kjent har flere land innført rutinemessig screening av topp-idrettsutøvere med tanke på å forebygge plutselig hjertedød. De støtter seg på amerikanske og ESCs retningslinjer, der alle unge som konkurrerer på høyt nivå, anbefales screening av egne symptomer og sykehistorie, sykdom i nærmeste familie, klinisk undersøkelse og EKG. Denne studien omfattet ikke bare toppatleter, men var en befolkningsstudie som inkluderte 12.000 personer mellom 14 og 35 år der bare 13 % var toppatleter. Screening kostet 35 pund per person. 9 % ble videre undersøkt med ekkokardiografi, og 2,7 % (323 personer) ble undersøkt videre etter ekkokardiografi.

Hos 16 % av disse fant man en kardiologisk sykdom, og de vanligste var arytmier, klaffesykdom og kardiomyopati. Det konkluderes med at kostnaden er liten tatt i betraktning gevinsten som er å forebygge altfor tidlig plutselig hjertedød.

## Hypertensjonsbehandling ved komorditet

P. Nilsson fra Sverige gjennomgikk retningslinjer for behandling av hypertensjon ved diabetes. Han viste til de europeiske retningslinjene fra 2013 som anbefaler målverdier på 140/85 mm Hg, at alle medikamenter er likestilt og at man skal starte når systolisk blodtrykk er over 160 mm Hg. Som regel er det nødvendig med flere medikamenter for å nå behandlingsmålet. Han pekte også på at det mangler kunnskap om betydningen av arteriestivhet hos disse pasientene.

G. Wuerzner fra Sveits snakket om betydningen av å følge

nyrefunksjonen ved GFR hos alle hypertonicere. Han viste til en Cochranegjennomgang fra 2010 som anbefaler fysisk aktivitet ved kombinert hypertensjon og nysesvikt, men uten at man har sikker evidens for at aktivitet bidrar til å snu en ugunstig utvikling for nyrefunksjonen. Han viste også til en enkelt studie som kunne tyde på at redusert saltinntak på under 2 g per dag kan være gunstig for nyrene. Når det gjelder renal denervasjon i hypertensjonsbehandling, venter man på resultater av større studier, men det kan se ut som effekten på blodtryksreduksjonen er avhengig av nyrefunksjonen.

Sverre Kjeldsen fra Oslo pekte på at opptil 90 % av atrieflimmerpasienter har hypertensjon, og viste til flere studier som tyder på at angiotensin II-blokkere er gunstige for disse pasientene både når det gjelder å forebygge hjertesvikt og slag.

T. Kahan snakket om hjertesvikt hos hypertonicere og understreket at hos disse pasientene er det ikke blodtrykket,



men hjertesvikten som er det primære å behandle, og at man heller skal se bort fra det å nå et spesielt behandlingsmål for blodtrykket. Han hevdet også at ACE-hem-

mere og angiotensin II-blokkere er likestilte hos disse pasientene, men at de ikke bør kombineres pga. risiko for nyresvikt.

## NORSKE ABSTRAKT PÅ EUROPAPREVENT I AMSTERDAM

### Sex differences in predictors of ischemic stroke: Cohort Norway and Cardiovascular Disease in Norway (CVDNOR) Study

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#### Eneste norske abstrakt-foredrag

Purpose: Gender differences may exist in the risk factors and clinical presentation of stroke. Further, the importance of dyslipidemia as a predictor of ischemic stroke is not consistent in the literature. We, therefore, evaluated sex differences in the ability of non-fasting HDL-cholesterol, nonHDL-cholesterol and triglycerides to predict fatal and nonfatal ischemic stroke in a prospective population-based cohort in Norway (Cohort Norway).

Methods: A total of 140,790 men and women free of cardiovascular disease assessed between 1994-2003 were followed, an average of 11.5 years, through Dec 2009 by record linkages to Cause of Death Register and hospital discharge diagnoses available from the Cardiovascular Disease in Norway (CVDNOR) Study, 1994-2009. Cases of ischemic stroke were identified by ICD-9 Codes 433 and 434 and by ICD-10 Codes I63 (excluding I63.6). Age-adjusted and multivariable survival analyses were conducted separately for men and women in Cox proportional hazard analyses. Multivariable models included conventional risk factors: baseline age, smoking, systolic and diastolic blood pressure, diabetes, and non-fasting glucose, and time since last meal.

Results: For 66,982 men, 1,835 developed ischemic stroke (2.74%), and for 73,808 women, 1,382 (1.87%) developed ischemic stroke. In age-adjusted analyses, nonHDL-cholesterol and triglyceride deciles were positively and significantly associated with ischemic stroke for both men and women (P-trend <0.001). The highest decile of nonHDL-cholesterol was associated with a hazard ratio

(HR) of 1.5 (95% CI 1.1-2.0) in men and women. The highest decile of triglycerides was associated with a HR of 1.5 (95%CI 1.2-2.0) and 2.2 (95% CI 1.6-2.9) for men and women, respectively. The presence of an at-risk HDL-cholesterol (<1.0 mmol/L for men and <1.3 mmol/L for women) was associated with a HR of 1.2 (95% CI 1.1-1.4) and 1.3 (95% CI 1.2-1.5) for men and women, respectively. In multivariable analyses, however, nonHDL-cholesterol was not a significant predictor of risk for both men and women, while triglycerides remained positively and HDL-cholesterol inversely related to risk of ischemic stroke only in women. Results were not altered in additional analyses considering body mass index or waist girth, or psychological variables.

Conclusions: Gender differences emerged in risk factors, with HDL-cholesterol and triglyceride levels being important in the prediction of ischemic stroke in women but not men.

### Use of different look-back periods in defining incident acute myocardial infarction (AMI) have an impact on observed rates and time trends: a CVDNOR project

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Purpose: A common method to define an incident AMI is by using a fixed period backwards in time (look-back period [LP]) to look for previous AMI hospitalizations. If no such events are found the current AMI is considered incident. Due to lack of data, investigators often use relatively short LPs. Here we investigate the effect of different LPs (up to 10 years) in AMI incidence rates and time trends during 2004-2009 in Norway.

Methods: A total of 291,338 AMI events in individuals  $\geq$ 25 years during 1994-2009 were identified. Incident AMIs were defined for the time period 2004-2009 using LPs of 10, 8, 7, 5 and 3 years, with 10 years as the gold standard. For each LP we calculated; a) age-standardized rates and b) trends in AMI rates (incidence rate ratios (IRR) between 2009 and 2004).

Results: Influence of LP on age-standardized rates

In men 25-64 years, LPs of 7, 5 and 3 years resulted in 3%, 5% and 8% (all  $p < 0.01$ ) higher rates compared to a LP of 10 years. In men 65+ years, LPs of 8, 7, 5, and 3 years resulted in 3%, 5%, 9% and 14% (all  $p < 0.01$ ) higher rates compared to a LP of 10 years.

In women 25-64 years, a LP of 3 years resulted in 4% ( $p = 0.02$ ) higher rates compared to a LP of 10 years. In women 65+ years, LPs of 8, 7, 5 and 3 years resulted in 2%, 3%, 6% and 11% higher rates (all  $p < 0.01$ ) compared to a LP of 10 years.

Influence of LP in trends of age-standardized rates

In adults 25-64 years we observed no statistically significant differences in trends of incident AMIs using a LP of 10 years compared to shorter LPs.

In men 65+ years, the reduction in AMI incidence rates between 2004 and 2009 was 9.3% (IRR=0.907; 95% CI 0.874-0.940) for a LP of 10 years. The reduction was smaller for a LP of 5 years (8.6% versus 9.3%;  $p = 0.01$ ) and 3 years (8.3% versus 9.3%;  $p = 0.05$ ).

In women 65+ years, we observed a reduction of 9.1% (IRR=0.909, 95% CI: 0.876 - 0.944) in AMI incidence rates from 2004 to 2009 for a LP of 10 years. The reduction was significantly smaller when using a LP of 5 years (7.8% versus 9.1%;  $p = 0.02$ ) and 3 years (7.4% versus 9.1%;  $p = 0.03$ ).

Conclusions: Compared to a LP of 10 years, the use of shorter LPs yields higher AMI incidence rates in both men and women and underestimate changes in rates (the magnitude of the decline in AMI incidence rates) among adults 65+ years.

## Country of the month, European networking in preventive cardiology

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Rationale: After publication of the 2012 version of the European guidelines on prevention of

cardiovascular diseases (CVD) in clinical practice efforts have been directed towards implementation of the guidance, but audits (EUROASPIRE IV) have shown that there is much room for improvement.

Aim: to create a European web-based interactive network for CVD implementation and thereby stimulate cross-country collaboration in educational and scientific projects.

Model: The network of national CVD prevention coordinators is one of the important tools for the EACPR to stimulate implementation of the CVD guidelines, especially through spreading knowledge about successful local preventive campaigns which at present seldom are known beyond the national borders.

Started in October 2013, each second month the national coordinators from two different nations present an overview of CVD prevention in their country on the «Prevention in your country» web section, where the «country of the month» initiative is hosted. By opening an interactive map of Europe on the ESC/EACPR website the reader will find the contact data of the national coordinator, a link to the national society of cardiology and a summary of CVD prevention in the country.

Links to six pdf files will lead to detailed information on the structure of health care in the country, risk factor status in the population, stakeholders and actors in delivering preventive care, a description of the practice of prevention and rehabilitation. Ongoing campaigns, educational efforts and other activities can be found at the site with links to the different activities. Finally, the plans for extending implementation in the future are presented.

Progress: at the occasion of EuroPrevent 2014 Turkey, Israel, Iceland, Germany, Ireland, the Netherlands, Sweden and Estonia will have their data presented on the website and for the next two years the site will include over 25 countries. Furthermore, the site will be extended with a concise overview of the core data where the reader will be able to compare implementation activities between countries.

Conclusions: the Country of the Month project might develop as a bridge building initiative between European nations in the implementation of preventing cardiovascular disease.

## Echocardiographic findings in elderly men by cardiovascular screening before exercise training

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**Methods:** The need of preparticipating cardiovascular screening in elderly athletes has to be determined. In conduction with an investigation of the effect of antioxidants on muscle growth and strength induced by resistance exercise in elderly men not exercising on a regular base, we performed screening including medical history, physical examination, 12 leads-ECG, routine 2-D/doppler- echocardiography, carotid duplex imaging and bicycle exercise test. Given the vigorous exercise program, exclusion criteria were any symptoms or findings indicating significant cardiovascular disease. Participants were recruited through advertising in the local newspaper and were asked not to suffer from any cardiovascular symptoms or diseases at present.

**Results:** 68 men at mean age 68.2 (+/- 5.8) years were randomly selected to participate in the study.

Known cardiovascular disorders (CVD) at baseline included treated hypertension in 25%, CAD in 2.9%, PAD in 2.9%, TIA/stroke in 2.9%, atrial fibrillation in 2.9% and aortic ascendens aneurysm in 2.9%. 7 of 68 participants (10.3 %) were excluded from study based on echocardiographic findings (upper part of table). Others, insignificant abnormalities demanding prospective controls are given in the lower part of table.

**Conclusions:** In a cohort of assumed healthy, elderly, norwegian males echocardiographic screening revealed abnormal findings in 41.2 % of attendees. In 10.3% these findings were not compatible with vigorous exercise training. Pre-participating screening including routine echocardiography in this populations can be useful and may prevent cardiovascular complications.

## The association between statin therapy and circulating and urinary levels of one-carbon metabolites and B vitamers among patients with suspected angina pectoris

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**Purpose:** High plasma levels of one-carbon metabolites, such as homocysteine, choline, betaine and dimethylglycine, are related to an unfavourable prognosis among patients with established cardiovascular disease (CVD). Moreover, altered urinary and plasma levels of betaine and dimethylglycine have been observed among patients with diabetes, the development of which is associated with statin therapy. Whereas statin treatment lower plasma total homocysteine (tHcy) levels, data on the relationship between statin use and other one-carbon metabolites are scarce. We studied cross-sectional associations between statin therapy and such metabolites in plasma and urine among 4163 patients with suspected stable angina pectoris. Levels of circulating B-vitamers according to statin treatment were also explored, due to their close relationship with one-carbon metabolism.

**Methods:** Differences between patients receiving statins and those who did not were assessed by linear median and logistic regression. Non-linear associations between the equipotent statin dose (ESD) and the levels of the various metabolites were studied by generalized additive models. All statistical models were adjusted for age, gender, fasting status, previous CVD, hypertension, diabetes, body mass index, estimated glomerular filtration rate and vitamin supplementation.

**Results:** 3024 (72.6%) patients were taking statins, the majority of whom using either simvastatin (45.1%), atorvastatin (35.2%) or pravastatin (14.4%). Multivariate analyses showed that patients who used a statin had significantly higher plasma betaine and dimethylglycine, but lower plasma tHcy levels (all  $P < 0.001$ ), when compared to those who did not use a statin. Similar associations were observed when stratifying statin users according to treatment with either simvastatin, atorvastatin or pravastatin. Among statin users, there was a strong positive relationship between the ESD and plasma betaine levels ( $P < 0.001$ ), whereas a positive association with plasma choline was borderline significant ( $P = 0.08$ ). Despite no overall linear relationship between plasma tHcy and the ESD, increased plasma tHcy was seen among those who used very high statin doses ( $P > 0.001$ ). A

weak inverse relationship was seen between the ESD and plasma riboflavin ( $P=0.02$ ).

Urinary choline levels were slightly lower among statin users ( $P=0.04$ ), but did not relate to the ESD.

Conclusions: Statin therapy may influence one-carbon metabolism, and in particular the status of metabolites in the choline oxidation pathway. Our findings prompt further investigation into non-lipid related effects by statins.

## **Trends in rates of revascularization procedures after an acute myocardial infarction (AMI) during 1994-2009 in Norway: a CVDNOR project**

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### **Best poster in the group**

Purpose: To explore nationwide trends in rates of percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) in men and women hospitalized for an AMI during 1994-2009.

Methods: All hospitalizations with an AMI diagnosis in individuals 25-85 years were obtained. Age-standardized rates of PCIs and CABGs were calculated by direct standardization using 10-year strata and the age distribution of hospitalizations in year 2009 as the standard population. Time trends in PCI and CABG rates were analyzed by joinpoint regression analyses and results expressed as annual percentage change (APC) in rates and 95% confidence intervals (CIs). Relative differences between genders were explored using Poisson regression analysis and expressed as age-adjusted incidence rate ratios (IRR).

Results: 162,200 individuals (65% men) experienced 200,143 AMIs (65.5% in men), with an average of 1.23 events/person. Mean age (SD) at the event was 67.4 (12.2) years in men and 73.4 (10.3) in women. PCI was performed within 28 days in 19% of men and 11.8% of women, while CABG was performed within 8 weeks in 5.7% of men and 3.3% of women.

In men, PCI rates doubled yearly during 1994-2000 (APC=113% [95%CI, 84-147]). The increase continued through 2004 (APC=30% [95% CI, 22-39]) but was modest during 2004-2009 (APC =5% [95% CI, 3-7]). In women, PCI rates increased markedly during 1994-2001

(APC=80% [95% CI, 56-108]) and less so during 2001-2005 (APC=20% [95% CI, 9-31]) while rates remained stable during 2005-2009. In men, CABG rates increased during 1994-2002 (APC=24% [95% CI, 19-29]) and less so during 2002-2007 (APC=12% [95% CI, 5-18]) but rates remained stable during the last three years. In women, most of the increase in CABG rates was observed during 1994-2002 (APC=24% [95% CI, 18-30]) while a modest increase was observed during 2002-2009 (APC=4% [95% CI, 0.3-7]).

Gender differences: During 1994-2009, women had 21% lower age-adjusted PCI rates than men (IRR=0.79; 95% CI, 0.76-0.81) with sex differences observed throughout the study period ( $p=0.11$  for interaction between sex and year). Women also had 37% lower age-adjusted CABG rate compared to men (IRR=0.63; 95% CI, 0.60-0.66). The observed difference in age-adjusted rates had a tendency to widen during the last years of the study period ( $p=0.052$  for interaction between sex and year).

Conclusions: During the period 1994-2009, important changes were observed in age-adjusted rates of PCI and CABG utilization in Norway. However, regardless of time period, women were less likely to undergo PCI or CABG while hospitalized for an AMI

## **Role of arteriosclerotic plaque burden by carotid duplex imaging in cardiovascular screening before exercise training in elderly, assumed healthy men**

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Methods: The need of preparticipating cardiovascular screening in elderly athletes has to be determined. In conduction with an investigation of the effect of antioxidants on muscle growth and strength induced by resistance exercise in elderly men not exercising on a regular base, we performed screening including medical history, physical examination, 12 leads-ECG, routine 2-D/doppler- echocardiography, carotid duplex imaging and bicycle exercise test. Given the vigorous exercise program, exclusion criteria were any symptoms or findings indicating significant cardiovascular disease. Participants were recruited through advertising in the local newspaper and were asked not to suffer from any cardiovascular symptoms or diseases at present.

Results: 68 men at mean age of 68.2 ( $\pm 5.8$ ) were randomly selected to participate in the study.

Distribution and proportion of plaque burden and other arteriosclerotic findings are given in table I. No participants with normal carotid duplex imaging revealed any other arteriosclerotic disorder.

Conclusions: In a cohort of elderly, norwegian males without established overt cardiovascular symptoms or diseases preparticipating cardiovascular screening with normal carotid duplex imaging seems to exclude other significant arteriosclerotic disorders.

## Associations between physical activity and palpitations

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Purpose: Endurance training has recently been associated with higher prevalence of atrial fibrillation. This may also apply to those who practice vigorous leisure time physical activity in the general population. However, only a handful studies have examined habitual physical activity in relation to development of atrial fibrillation and palpitations. The aim of this study was to examine the association between leisure time physical activity and palpitations in a general population.

Methods: A population-based cohort of 19 172 men and women aged 12-69 years who attended the third Tromsø study in 1986-87 were included in this study. Leisure time physical activity (four levels), smoking habits, and diabetes status were assessed by a self-administered questionnaire. Weight, height, and systolic blood pressure were measured with standard procedures at the examination. Presence of palpitations was measured with the question: «Have you noticed sudden changes in your pulse rate or heartbeat in the past year?». Associations were determined by multiple logistic regression. Analyses were performed for the total population and stratified by sex.

Results: Mean age was 37 years (SD 11.28). Prevalence of palpitations decreased with increasing physical activity ( $P < 0.001$ ), as shown in Table 1. When adjusted for sex, age, body mass index, smoking, systolic blood pressure, and diabetes, the risk of palpitations decreased with increasing activity level ( $P < 0.001$ ). The most active subjects had 32% lower risk of palpitations than the sedentary ( $P < 0.001$ ) (Table 1). Associations remained when stratifying by sex.

Conclusions: Our data from a general population showed that the risk of palpitations decreased as physical activity level increased. Further studies are warranted to examine whether these findings also apply to atrial fibrillation.

## High incidence of arteriosclerosis in assumed healthy, elderly men detected by cardiovascular screening before exercise training

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Methods: The need of preparticipating cardiovascular screening in elderly athletes has to be determined. In conduction with an investigation of the effect of antioxidants on muscle growth and strength induced by resistance exercise in elderly men not exercising on a regular base, we performed screening including medical history, physical examination, 12 leads-ECG, routine 2-D/doppler- echocardiography, carotid duplex imaging and bicycle exercise test. Participants were recruited through advertising in the local newspaper and were asked not to suffer from any cardiovascular symptoms or diseases at present.

Results: 68 men at mean age of 68.2 ( $\pm 5.8$ ) years were randomly selected to participate in the study.

Baseline risk factors for CVD included hereditarily history of premature CHD in 25%, a mean BMI of 26, mean total cholesterol of 6.3mmol/l, mean HDL-cholesterol of 1.4 mmol/l, current and former smokers status in 9%/42%, treated hypertension in 25%, renal dysfunction in 2.9%, but no diabetes mellitus.

Known cardiovascular disorders embraced [UK1] CAD in 2.9%, PAD in 2.9%, TIA/stroke in 2.9%, atrial fibrillation in 2.9% and aortic ascendens aneurysm in 2.9%.

Distribution and proportion of different types of arteriosclerosis are given in table I.

Conclusions: In a cohort of elderly, norwegian males without established overt cardiovascular symptoms or diseases, screening revealed a high degree of different types of arteriosclerotic manifestations. Preparticipating cardiovascular screening in this populations can be useful and may prevent cardiovascular complications

## Cardiovascular findings in assumed healthy elderly men by screening before vigorous exercise training

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**Methods:** The need of preparticipating cardiovascular screening in elderly athletes has to be determined. In conduction with an investigation of the effect of antioxidants on muscle growth and strength induced by resistance exercise in elderly men not exercising on a regular base, we performed screening including medical history, physical examination, 12 leads-ECG, echocardiography, carotid duplex imaging and (maximal) bicycle exercise test. Given the vigorous exercise program, exclusion criteria were any symptoms or findings indicating significant cardiovascular disease. Participants were recruited through advertising in the local newspaper and were asked not to conceal cardiovascular symptoms or diseases.

**Results:** 68 men at mean age of 68 (+/- 5.8) years were randomly selected to participate in the study. All conducted the screening tests. Baseline risk factors and cardiovascular disorders (CVD) included a mean BMI of 26, total cholesterol of 6.3mmol/l. HDL-cholesterol of 1.4 mmol/l, current and former smokers status in 9%/42%, treated hypertension in 25%, CAD in 2.9%, PAD in 2.9%, TIA/stroke in 2.9%, atrial fibrillation in 2.9% and aortic ascendens aneurysm in 2.9%.

Based on abnormal test results requiring further investigations or treatment, 18 of 68 attendees (26.5%) were excluded from the exercise study. The remaining participants fulfilled the exercise study without any cardiovascular complications.

**Conclusions:** In a cohort of elderly, norwegian males without established overt cardiovascular symptoms or diseases, cardiovascular screening revealed disorders or abnormal tests findings not reconcilable with vigorous, resistance exercise training in 26.5% of attendees.

Preparticipating cardiovascular screening in this populations can be useful and may prevent cardiovascular complications.

## **Safety of the CO-rebreathing blood volume method in patients with coronary artery disease**

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*En av Best poster award winners*

**Purpose:** To investigate the safety of the improved carbon monoxide (CO) re-breathing method for measuring total blood volume (BV) and hemoglobin mass (Hb-mass) in patients with stable coronary artery disease (CAD). The major concern with the method is that the increased in CO bound to hemoglobin (COHb%) will induce myocardial ischemia and arrhythmias. **METHOD:** 18 patients with stable CAD (16 men, 2 women) having participated in outpatient cardiac rehabilitation was recruited (Age 62±7 years, Body weight 82±11 kg, 23±6 months since diagnosis, myocardial infarct (n=12), hypertension (n=7), percutaneous coronary intervention (n =12), coronary artery bypass grafting (n=6). Before, during and up-to 2 hours after the test, EKG, blood pressure, arterial oxygen saturation, COHb%, and heart function was measured. 24 hours after the test patients met for blood sampling and COHb% and Troponin-T measured. **Results:** COHb% increased from 1.5±0.4% to 5.9±0.6% after the test, and COHb% decreased to 4.6±0.5% and 1.3±0.4%, 2 and 24hr after the test. Resting heart rate, stroke volume, cardiac output and ejection fraction was 63±11 beats/min, 93.9±16.5 ml/beats, 5.84 ± 1.00 L, 48.5 ± 5.7 % respectively before the test. During and 10 minutes after the test the parameters was not significantly different from baseline. 16 patients were in sinus rhythm during the 2-hour observation period, and 2 patients registered short periods with atrial fibrillation. Systolic and diastolic blood pressure was 143±16 mmHg and 86±7 mmHg before the test and gradually decreased during the two-hour observation period to 132±8 and 79±10mmHg (p £ 0.05). Troponin-T was normal (<10 ng/L) in 14 patients and slightly elevated in 3 patients (11, 12 and 14 ng/L) 24 hours after the test. Mean BV, Erythrocyte volume (EV) and Hb-mass was 5.97±0.79 L, 2.42±0.44 L and 825±164 grams respectively. Relative to body mass BV and Hb-mass was 73.7±10.9 ml×kg<sup>-1</sup> and 10.1 ± 1.9 g×kg<sup>-1</sup> respectively, and in correspondence with reference values for normal untrained subjects. **CONCLUSION:** The improved CO-rebreathing test for measuring total BV and HB-mass did not negatively affect resting cardiovascular function in this selection of stable CAD patients when COHb% increased to ~6%. This indicates that the method is safe to perform in stable CAD patients.

## **The effects of a low-carbohydrate-high-fat diet on the triad of atherogenic dyslipidaemia**

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**Purpose:** Low carbohydrate diets are widely used to manage obesity and the metabolic

syndrome. However concerns have been raised about possible dyslipidaemia caused by the increase in dietary fat in these diets. The aim of this study was to examine the effects of a low-carbohydrate-high-fat diet (LCHF) on the triad of atherogenic dyslipidaemia, low HDL cholesterol, small dense LDL and increased triglycerides, in obese individuals.

**Methods:** 22 obese (BMI = 28 kg/m<sup>2</sup>; fat percentage > 20% for men and 28% for women) and sedentary, but otherwise healthy individuals were put on an ad libitum LCHF diet for 10 weeks during which physical activity level was kept unchanged. Changes in bodyweight and -composition was analysed and lipids and lipoproteins were measured at baseline and follow-up, both enzymatically and by nuclear magnetic resonance (NMR).

**Results:** Ad libitum energy intake declined from 2591±675 kcal to 1752±382 kcal (p<0.001) resulting in a 7.4% weight reduction from 102.0±14.7 kg to 94.1±13.8 kg (p<0.001). The weight reduction was accompanied by a significant reduction in both total fat percentage and android fat measured by DEXA. Mean dietary composition in percentage of total energy intake was 4±2 % carbohydrates, 71±6% fat and 24±5% protein. After 10 weeks on the diet we observed an increase in total cholesterol from 4.98±0.86 to 5.55±1.76 mmol/l (p=0.025), LDL cholesterol from 3.33±0.69 to 3.92±1.61 mmol/l (p=0.012) and HDL cholesterol from 1.23±0.36 to 1.32±0.33 mmol/l. The ratio between the apolipoproteins B to A1 and between total cholesterol to HDL cholesterol however, did not change significantly. Triglycerides was reduced by 28.9% from 1.15±0.65 to 0.77±0.30 mmol/l (p<0.001). The NMR analysis showed no significant changes in the number of LDL particles, while there were significant changes in LDL subclasses. Large LDL particles increased by 85.4% (p=0.003) while we observed a 79.1% reduction in small LDLs. Further we found a 23.8% reduction in total VLDL and chylomicron particles and the VLDL size was reduced by 11.2% (p<0.001).

**Conclusions:** A weight reducing low-carbohydrate-high-fat-diet resulted in a significant increase in both LDL and HDL cholesterol and a major reduction in triglycerides. While there was no change in the number of LDL particles, we observed a shift from small dense LDL particles towards the larger less dense particles. We conclude that a low-carbohydrate-high-fat diet may positively alter atherogenic dyslipidaemia in obese individuals.

## Feasibility of an outpatient cardiac rehabilitation program in primary care. The Norwegian Ullevaal model.

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Maximal peak oxygen uptake (VO<sub>2</sub>max) is regarded as the gold standard for assessing aerobic capacity. In earlier observational studies, one metabolic equivalent (MET; 1 MET ~3.5 ml/kg/min) increase in aerobic capacity translates to a 12-13% improvement in survival in men with and without coronary heart disease and a 17 % improvement in survival in women. Based on these results, it appears that exercise based cardiac rehabilitation (CR) programs gives at least 3.5 ml/kg/min improvements in VO<sub>2</sub>max are beneficial.

**Purpose:** Outcomes evaluation is a critical component in outpatient CR. The goal of this project was to evaluate an exercise based CR program (the Norwegian Ullevaal model) regarding the characteristics of the participants, their exercise capacity and health-related quality of life (HRQoL) to help facilitate quality improvement in primary care.

**Methods:** The Oslo Heart EX study is an ongoing cohort study including all cardiac patients referred for out-patient CR in a primary care clinic in Oslo. A one-group follow-up design was used. The main efficacy variable is the change in VO<sub>2</sub>max as a primary prognostic measure of successful rehabilitation. HRQoL was measured by self-report using the COOP/WONCA questionnaire.

**Preliminary results:**

First data collection includes pre- and post outcomes from 99 patients referred to exercise based CR, two times per week in 12 weeks. Mean age was 56 ±9 years, 85% were men. Mean resting blood pressure at baseline was 132±20 mm Hg systolic and 80±11 med mer Hg diastolic. BMI, 26.6±3.5 and resting heart rate 70±3.5. Training habits (hours per week) before cardiac event were 0,85±1

The patients showed clinical improvement in VO<sub>2</sub>max from 30±7 ml/kg/min at baseline to 34±8 after CR and in all health-related quality life domains (physical functioning, mental health, performance of daily activities, overall health, and perceived improved health).

**Conclusions:** Our findings suggest that the Norwegian Ullevaal model is a feasible and effective model for CR in primary care.