Update on life-style and cardiovascular prevention

The approach to the problem

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Genes

Social and demographic factors (both parents and own)

Physical and social environments; policies (e.g. taxation, workplace regulation); industries (e.g. advertising, lobbying)

Intra-uterine environments

Personality

Mental state

Lifestyle

Health related fitness (cardiopulmonary fitness, morphological fitness, muscle fitness; biomarkers, type 2 diabetes)

CVD
Prevention (Different strategies)

**Person based strategies**
- **High risk strategy: Intervention among persons with known risk factors**
  - Initiative (health system), responsibility (person)
- **Mass Campaigns**
  - Information about healthy lifestyle
  - Initiative (health system), responsibility (person)

**Structural (contextual) strategies**
- Health promoting regulations ("Make the right choices the easy choices")
- Initiative and responsibility: The political/administrative level
Which are the tools?

- Personal counselling and treatment
- General information to the people
- Changing the context for the population

*But do we agree on what we want to change?*
Life style

- Healthy food
- Daily low intensity activity

Mandatory

- Enjoyment/fun
  - Alcohol
  - Tobacco
  - Soft drinks/candy
  - Junk food
  - Marathon running
  - Etc.

  - Not mandatory for staying alive
  - Can be nice
  - Do you harm when you exaggerate

Food and daily activity is necessary in a society – Enjoyment should be regulated
Physical inactivity

What are we talking about?
What disappeared during the last 50 years?
  Fitness centres?
  Marathon running?
  Daily activity?
What appeared?
  Sedentarism
Sedentarism 
prospective epidemiological studies

Katzmarzyk, MSSE 2009

FIGURE 1—Kaplan–Meier survival curve for all-cause mortality across categories of daily sitting time in 17,013 men and women 18–90 yr of age, in the Canada Fitness Survey, 1981–1993. Log-rank $\chi^2 = 174.4$, $df = 4$, $P < 0.0001$. The sample sizes across the categories were 3022 (17.8%), 6652 (39.1%), 4379 (25.7%), 2138 (12.6%), and 822 (4.8%), for the categories of almost none of the time, one fourth of the time, half of the time, three fourths of the time, and almost all of the time, respectively.
Unhealthy diet
High intake of salt, red meat, processed meat, saturated fat, trans-fat, and refined grains and sugar

Main problem: HFSS-”food”
”Food” constructed in laboratories as the right mixture of fat, salt and sugar

From soft drinks, over cakes to fast foods. Stimulate the dopamine system in the brain

HFSS-”food” is the target!
High risk strategy

Identify the persons at risk

- Systematic or opportunistic screening

Motivational interviewing

- Empowerment - many theories on behaviour
- It works sometimes on the individual level
- Linear deterministic or “chaos”? 

Problems

- Very few people follow the guidelines
- New high risk persons
- Stigmatisation – ”blame the victim”
- Systematic screening?
The "Charts" section allows you to have graphical displays of your patient's risk evaluation on the date of the examination. The "Intervention" section consolidates the advices given to the patient according to the date of the examination. The "Guidelines" section includes doctor advices based on the European Guidelines on CVD Prevention.

The patient printout gives an excellent overview of your patient's personal CVD risk profile. Simply click on the icon below and proceed to printing.

**Patient printout**

**Charts**

**Intervention**

**Guidelines**

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**Your 10-year risk of fatal cardiovascular disease is 2% : Low risk**

<table>
<thead>
<tr>
<th>Examination Date</th>
<th>Age</th>
<th>Systolic Blood Pressure</th>
<th>Cholesterol</th>
<th>Smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/08/2005</td>
<td>44</td>
<td>165 mmHg</td>
<td>6 mmol/L</td>
<td>No</td>
</tr>
</tbody>
</table>

(≈ 225 mg/dl)

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**Absolute CVD Risk**

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

(1) : Your current risk : 2%
(2) : Your risk at age 60 : 9%
(3) : Your risk if you achieve your treatment goal : 1%

**Contribution of risk factors to total risk**

- Systolic Blood Pressure (65%)
- Cholesterol (35%)

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**Comments**

Please add any information relevant to your patient's condition. They will be automatically added to the patient's printout.

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**www.heartscore.org**

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**Add this exam to the patient history**
Screening and health counselling

Less than 10 % of a population has an ideal heart health

S Ebrahim 2011
(Systematic Cochrane review)

Conclusion:
No effect of systematic health screening on mortality from coronary heart disease

Figure 3  Meta-analysis of trials of multiple risk factor interventions: coronary heart disease mortality. Abbreviations, see Fig. 2 legend.
High risk strategy
(individually counselling and treatment)

- Can be of benefit for the individual person/patient
- But is has no effect on a population level
- Does it increase social inequality?
Development in social inequality
(ideal heart health in women in Denmark)

Figure 2 Proportion (%) of women with ideal cardiovascular health divided by years of education

Ideal heart health: No established CVD, no diabetes, non-smokers, BMI < 25 kg/m², BP ≤ 120/80 mmHg with no antihypertensive treatment and TC ≤ 5 mmol/l (193 mg/dl) with no LLT
Information to the citizen

Health authorities

Information on

Alcohol
Tobacco
Diet
Physical activity

Healthy life

Corporations

Commercial

Each time health authorities use one € on information, corporations use 10 € on commercials.
What are we trying to influence

“It’s not reasonable to expect people to change behaviour, when the surroundings does not encourage or directly oppose such changes” (Schmid 1995)

We need to take the environment into account!
Structural (contextual) strategies

What is it?
- Fiscal measures (i.e. taxes and subsidies)
- International, national and regional policies
  - Smoke-free policies, rules for marketing, food production
- Environmental changes

Who are responsible
- Global level (WHO, WTO, EU)
- National levels (government department, health authorities, health agencies)
- Regional level (authorities, such as for traffic planning, outlets, schools, built environment)

Who are not interested?
- Disease promoting corporations
Good

Structural (contextual) strategy

Bad

G. Rose: A small shift in the risk of disease across a whole population can lead to greater reduction in disease burden than a large shift among those persons already at risk.
Salt intake & blood pressure

85 % of the salt comes from processed food

Salt intake varies from 6 to 15 g/d (high in Poland)

WHO: 5 g/d; reduction of 3 g/d ➔ 14-20,000 fewer death of CVD in UK

How to regain physical activity?

Change environment ➔ facilitate PA in daily life
- Re-allocate road space (lanes)
- Create enhancing places in cities for movements
- Linkage of different sites
- Staircase visible – not elevators
- Design school playgrounds

Pricing
- Road-user charge; higher parking fees; cheaper public transportation

Breaks in sitting time
Decline in acute myocardial infarction after smokefree laws

<table>
<thead>
<tr>
<th>Study Name</th>
<th>ES (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy (4 regions)</td>
<td>0.86 (0.83, 0.92)</td>
<td>10.70</td>
</tr>
<tr>
<td>Helena, MT</td>
<td>0.60 (0.21, 0.99)</td>
<td>0.26</td>
</tr>
<tr>
<td>Piedmont, Italy</td>
<td>0.89 (0.81, 0.98)</td>
<td>7.51</td>
</tr>
<tr>
<td>Scotland</td>
<td>0.83 (0.82, 0.86)</td>
<td>12.41</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>0.82 (0.76, 0.89)</td>
<td>8.65</td>
</tr>
<tr>
<td>Saskatoon, Canada</td>
<td>0.87 (0.84, 0.90)</td>
<td>11.85</td>
</tr>
<tr>
<td>Rome, Italy</td>
<td>0.89 (0.85, 0.93)</td>
<td>11.01</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.89 (0.81, 0.97)</td>
<td>7.86</td>
</tr>
<tr>
<td>Pueblo, CO (18 mos)</td>
<td>0.73 (0.64, 0.82)</td>
<td>5.82</td>
</tr>
<tr>
<td>New York State</td>
<td>0.80 (0.80, 0.80)</td>
<td>12.97</td>
</tr>
<tr>
<td>Bowling Green, OH</td>
<td>0.61 (0.55, 0.67)</td>
<td>7.29</td>
</tr>
<tr>
<td>Pueblo, CO (36 mos)</td>
<td>0.59 (0.49, 0.70)</td>
<td>3.66</td>
</tr>
<tr>
<td>Overall (I-squared = 90.0%, p = 0.000)</td>
<td>0.81 (0.78, 0.85)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis.
Alcohol

**Pricing**
- 10% rise → 5.1% reduction (4.6-8.0)

**Restriction**
- Age-limits with consequences
- Drink-driving strategies

**Advertising**
- Regulation

**Regional level**
- Policies in schools, workplaces etc.
- Number of outlets and reduction in hours of sale

**Education of children/adolescents:**
Very little or no effect
Conclusion

- It is not a natural law that cardiovascular diseases are still the leading cause of morbidity and mortality in the world.
- It calls for a collaboration between politicians, administrative authorities and health professionals.
- We need a “triple” approach to handle the situation:
  - Healthy environments (“health in all policies”)
  - Neutral information – regulate advertising
  - Health professionals to support, monitor and do the individual counselling
  - Industry should be kept in “arms length”
Thank you
Is Homer Simpson physical active?

Yes (according to health authorities)
Mortality of heart disease in Poland

Effect of lowering saturated fat?

**Before 1990:**
Animal fat subsidies

**After 1990:**
No fat subsidies
Cheap vegetable oils (rapeseed)
More fruit

Mortality ratios for ischaemic heart disease plus atherosclerosis and arterial diseases, with estimates of butter and vegetable fats and oils (kg/person/year) and of exotic fruits (kg/person/quarter) available for consumption by quarter from 1970 to 1994. Data for years are plotted to mid-year and for quarters to mid-quarter. Mortality ratios are age standardised.

Zatonski et al, BMJ 1998
Healthy diet policies are effective

- High intake of salt, red meat, processed meat, saturated fat, trans-fat, and refined grains and sugar

- Salt $\rightarrow$ Hypertension $\rightarrow$ CVD
  - Finland: 14 g $\rightarrow$ 8 g/day

- Saturated fat $\rightarrow$ cholesterol $\rightarrow$ CVD

- Sugar $\rightarrow$ Fatness $\rightarrow$ Diabetes $\rightarrow$ CVD

- Food *High in saturated Fat, Salt and Sugar – HFSS food*
Theories on behaviour

- Individual (more than 60 theories)
  - Health belief model
  - Theory of reasoned action
  - Theory of planned behaviour
  - Chaos theory

- Lokal environment

- Politics on all levels (from EU to local municipalities)

- Commercial interests
Blood Pressure & CHD risk vs. numbers of deaths
(13.5 years follow-up in 855 men aged 50 Wilhelmson)

Prevalence %

Risk %

Deaths (n)

BP distribution

DEATHS

Risk %

BP

60

40

30

20

10

0

0 10 20 30 40

Deaths

Risk

110 120 130 140 150 160

Systolic BP

Blood Pressure & CHD risk vs. numbers of deaths
(13.5 years follow-up in 855 men aged 50 Wilhelmson)
Example: Blood pressure
High risk strategy

Prevalence %

BP distribution

if BP > 140 mmHg
Identify & treat

BP

Systolic BP

110 120 130

0 10 20 30

160
The population strategy

Shifting BP distribution

fewer BP >140 mmHg to treat
Chaos theory

Are changes linear, deterministic processes under total control from the individual?

This is challenged by chaos theoreticians

- Changes happen in major leaps
- Not planned, but sudden indskydelser
- Changes are related to knowledge, attitudes, beliefs, personality, self confidence etc etc
- Small changes in each parameter ➔ sudden changes
- Bio statistics: 3, 4, 5 and 10 way interactioner ➔ unpredictable results

Keep on challenging your patients – you never know when the opening for changes occur.
Modifiable risk factors for CVD

- **Unhealthy diet**
  - High intake of salt, red meat, processed meat, saturated fat, *trans*-fat, and refined grains and sugar
  - Main problem: HFSS-”food”

- **Smoking**
  - Both passive smoking and smoking

- **Physical inactivity**
  - Including sedentarism

- **Alcohol**
  - Excess amount of alcohol
Prevention
(classification of strategies)

High risk strategies
• Intervention in persons with known risk factors

Population based strategies
– Campaigns
  • Inform the population of healthy life style
– Structural/environmental strategies
  • Health promoting regulations (“Make the right choices the easy choices”)
Is it enough with 30 minutes of moderate-to-vigorous physical activity, in a time with increasing sedentarism?

Maybe we have not hit the bottom yet – further technological improvements can make it even worse.
Udvikling af iskæmisk hjertesygdom

Gener og opvækst
→ Sociale forhold
→ Livsstil
→ Biologiske mål
→ IHD

Levevilkår
→ Helbred
Overall aim

To reduce incidence of cardiovascular diseases and total mortality in the population by means of a high risk strategy focusing on life-style intervention
Inter99 investigation

61,301 persons aged 30-60

Invited for screening
13,016

Control group
48,258

High risk: counselling individually and in groups

Low risk: followed by questionnaires

5,000 Followed by questionnaires

Follow up in central registries

Baseline investigation (1999-2001) 1 year 3 years 5 years 10 years
Screening and instant health counselling

High risk defined according to: family history, lifestyle, BMI, blood pressure, and cholesterol

Health counselling talks: “motivational interviewing”, “stages of changes”
Counselling in groups

- Six times during ½ a year
- 2 hours per session
- 14-20 persons in each group
- Baseline and after one and three years
Effect after five years on life-style and general health

- Smoking
- Alkohol
  - Binge drinking
- Diet
  - Saturated fat
  - Vegetables/fruit
- Physical activity
- Mental health

So – it was a success?
What have we compared?

13,000 were invited
6,784 came
4,874 fullfilled

48,000 in the control group
5,000 controls had a questionnaire
Successful life style change
## Who participated?

<table>
<thead>
<tr>
<th></th>
<th>Education (RR)</th>
<th>Income (RR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base-line</td>
<td>1.56 (1.47-1.66)</td>
<td>1.32 (1.24-1.40)</td>
</tr>
<tr>
<td>1 year</td>
<td>1.33 (1.22-1.46)</td>
<td>1.08 (0.98-1.20)</td>
</tr>
<tr>
<td>3 years</td>
<td>1.26 (1.15-1.38)</td>
<td>1.28 (1.15-1.43)</td>
</tr>
<tr>
<td>5 years</td>
<td>1.39 (1.26-1.52)</td>
<td>1.23 (1.08-1.41)</td>
</tr>
</tbody>
</table>

Indexes for inequality: "The summary effect of the ordered educational and income participation distribution, which take into account the size of the education and income groups (Mackenbach 1997)"

M. Binder, 2012
10 years incidence of ischemic heart disease

HR = 1.04 (0.95-1.14)
Adjusted for age, sex, ethnicity, education, cohabitation
10 years incidence of stroke

HR = 0.99 (0.88-1.12)

Adjusted for age, sex, ethnicity, education, cohabitation
10 years incidence of cardiovascular diseases (ischemic heart disease & stroke)

HR = 1.01 (0.94-1.10)

Adjusted for age, sex, ethnicity, education, cohabitation
HR = 1.00 (0.91-1.09)

Adjusted for age, sex, ethnicity, education, cohabitation
Conclusion

Health screening and counselling on lifestyle does not reduce cardiovascular disease or total mortality in the general population

Because we do not reach those who are in the highest need?

Future research
- Screening and counselling in subgroups?

Concentrate on structural changes in society – they work
  - Jørgensen T, Eur J Prev Cardiol 2012
  - Mozaffarian D, Circulation 2012