Role of screening in cancer control

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Purpose of screening

- reduce mortality
- sometimes reduce incidence
- improve quality of life

Means of screening

- early diagnosis
- finding preinvasive lesions

WHO criteria

1. Important health problem
2. Acceptable treatment
3. Resources available
4. Preclinical phase
5. Screening test
6. Acceptable test
7. Natural history known
8. Treatment policy agreed
9. Cost acceptable

Sufficient criteria

- Objective is defined (in terms of health)
- Objective can be made quantitative
- There is scientific evidence on effect of screening on health

Health services activity e.g. routine screening

- There is an objective
- There is a chain of actions
- There is evidence on effect

Change in outocome is the objective.

Outcome in cancer screening is

- Length of life, mortality
- Quality of life, mastectomy

Infrastructure for Screening Programme

1. Population
2. Individuals
3. Coverage and attendance
4. Field facilities
5. Laboratory facilities
6. Quality control of 4 and 5
7. Facilities for confirmation
8. Facilities for treatment
9. Referral system
10. Evaluating and monitoring

Infrastructure provides the essential elements or the chain of actions of a screening programme

- It is causal chain
- Cf treatment chain
- Cf path of patient

The causal chain

- Effect assumes that each round and link works
- Diagnostics only is not sufficient
- The theory of screening is derived from the theory of health services research

Evidence is

- The effect of program on outcome
- Outcome is health
- Empirical research with scientific method

What is the scientific method that provides evidence for public health policy

Direct evidence, conclusive

- randomised allocation of screening within the routine

Indirect evidence, inconclusive

- time trends
- geographical differences
- screen detected cases
- test validity
- survival difference between localised and nonlocalised disease

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Evidence on effect

- Cervix cancer
- Breast cancer
- Colorectal cancer
- Prostate cancer

Evidence on effect

- Pap-test
- HPV-test
- Visual inspection
- Mammography
- FOBT
- PSA

Evidence on harm

- Overdiagnosis etc.
- Cost
- Lead time
- QoL

Finnish health services

- Responsibility of municipality
- More than 400 in number
- Size from 200 to 550 000
- Expenses subsidised by governement
- Guided and regulated less and less by governement

Screening as public health policy

- For cervical cancer since 1963
- For breast cancer since 1987
- For colorectal cancer since 2004

Smaller and smaller effects

1960’s	cervical cancer	80%
1980’s	breast cancer	30%
2000’s	colorectal cancer	20%
2020’s	prostate cancer	?%

What new in cervix cancer

Implementing new tests by randomised design

- automation, Papnet
- HPV-test, Hybrid capture II

Improvement in sensitivity or increase in overdiagnosis

What new in breast cancer

- digital mammography

Danger of uncontrolled implementation

What new in colorectal cancer

- First organized programme as public health policy
- Individual level randomised election of invitees

What new in prostate cancer

- Randomised screening trial of 80 000
- Test sensitivity high, episode sensitivity low
- Effect on mortality small
- Overdiagnosis large
- QoL unknown

What new in health policy

- Less regulation by government
- Less guidelines by government
- More competition between providers
- More freedom to elect by municipalities

Consequences of health policy

- More emphasis on cost
- Less emphasis on health
- Loss in effectiveness

Main characteristics of screening in Finland

- Organised programmes with high effectiveness and low cost
- Early implementation of public health policy before opportunistic screening is common
- An advanced infrastructure that allows active design and unbiased evaluation for outcome
- Implementation of the routine screening by experimental design with randomisation
- Change of technology (test) in the routine by experimental design with randomisation

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Deaths from cancer in the Nordic Countries in 2010-2015

Primary site	**Screening**		**Prevented**	
	No	**Yes**	**No**	**%**
Present				
Breast	5300	4300	1000	18
Cervix	1600	130	1500	91
Future				
Colorectum	8300	6900	1500	18
Prostate	5000	4100	900	18
All sites	69000	64000	4900	7

Life years gained per year in the Nordic Countries

Deaths avoided	4900
Life years gained	27000
Good Q LYG	21000

To screen or not to screen I

- Effect 7 per cent of all cancer deaths
- Effect one year prolongation in 1000 years of life
- Effect small but tried and tested
- Almost all interventions have at most a small effect in medicine

To screen or not to screen II

Harm is important

Benefit vs Harm (e.g. GQLYG)

- Evidence (data) is limited
- Theory is limited
- Values i.e. weights are biased
- Cost is not a primary issue

Organised programme

- More effective than the spontaneous one
- Produces less harm than the spontaneous one
- Can be evaluated (by randomised design)
- Can be stopped

If routine screening is started

- Organise a programme
- Find the evidence on effectiveness
  i.e. observation on reduced mortality
- Do not trust on indirect evidence
- Do not trust on nonexperimental evidence