



Screening for colorectal cancer; which test can we afford?

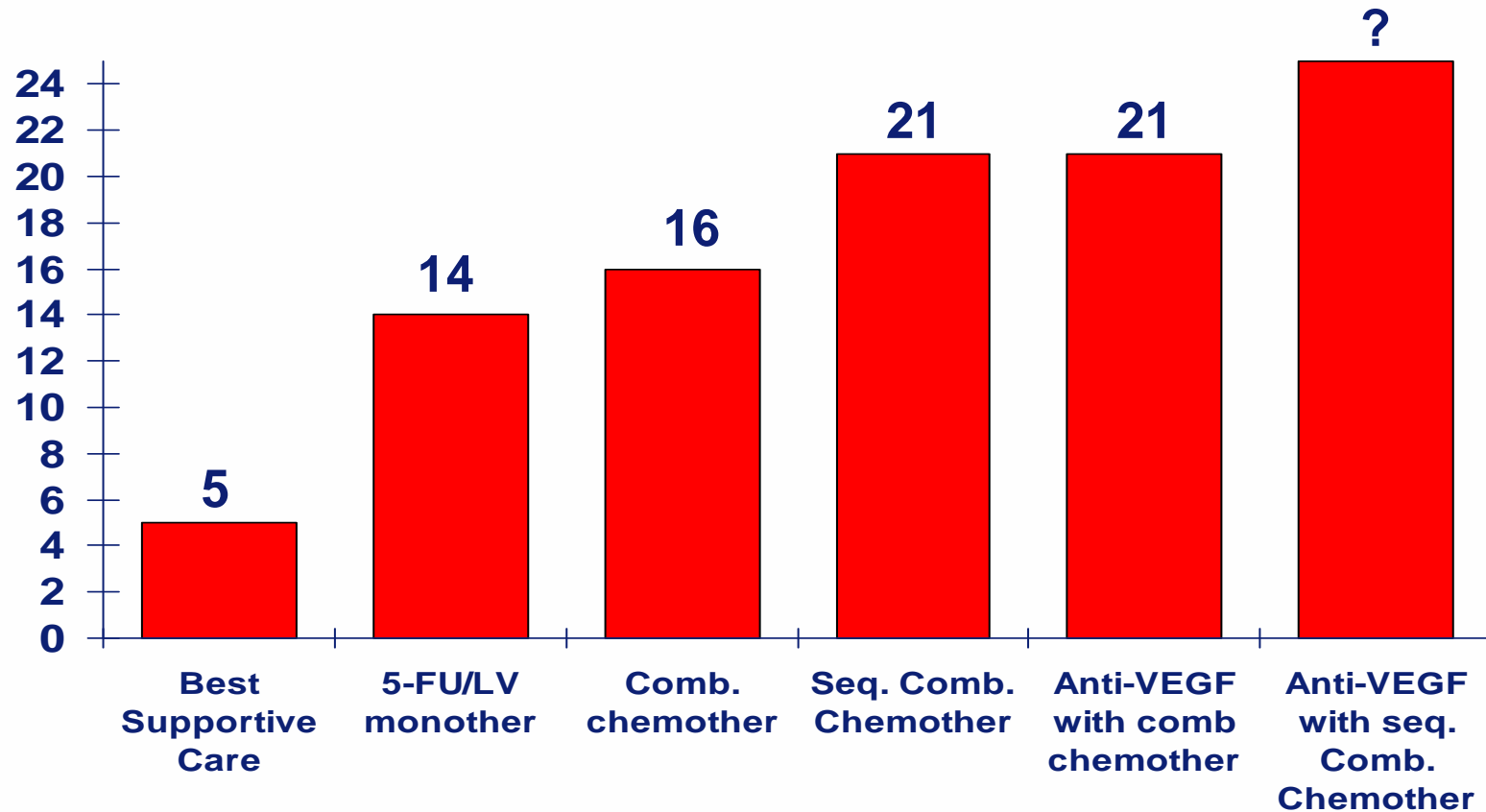
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Major achievements in the treatment of colorectal cancer (CRC)

- Improved surgery for primary and recurrent disease
 - Laparoscopic surgery
 - New techniques for rectal cancer
 - Surgery for metastases (liver, lung)
- Introduction of chemotherapy
 - For treatment of primary disease
 - For prevention and treatment of recurrent disease
- Use of radiotherapy for primary disease
 - Rectal cancer

Median survival of patients with metastatic CRC



Costs of adjuvant CRC chemotherapy

	Chemotherapy	Costs
1985	None	-
1995	5FU + leucovorin	\$ 6.500
2005	FOLFOX*	\$ 29.000
2010	<i>Sequential chemo + monoclonals**</i>	>\$ 50.000

*5FU + leucovorin + oxaliplatin

** cetuximab, bevacuzimab

Erasmus MC



Aballéa et al. Cancer 2007; 109: 1082-9

Costs of treatment for recurrent disease

	Recurrence	Treatment	Costs
1990	Local	Deviating stoma	\$ 4.000
	Distant	Supportive care	\$ 2.000
2007	Local	Surgery, Chemo	\$ 68.000
	Distant	Surgery, Chemo	\$ 60.000

Costs and diagnostic sensitivity of screening tests

	Costs (€)	Adenoma detection sensitivity	CRC detection sensitivity
iFOBT	5	2 - 5%	60%
Sigmoidoscopy	100	75 - 90%*	95%*
Colonoscopy	350	75 - 90%	95%

* Within the reach of the investigation

CRC screening, costs per life-year saved; literature data

	Costs (U\$)
iFOBT	6.300 – 19.700
Sigmoidoscopy	13.600 – 36.300
Colonoscopy	7.300 – 22.000

Khandker et al. Int J Technol Assess Health Care 2000; 16: 799

Frazier et al. JAMA 2000; 284: 1954

Sonnenberg et al. Ann Intern Med 2000; 133: 573

Vijan et al. Am J Med 2001; 111: 593

Theuer et al. Gastroenterology 2001; 120: 848

Song et al. Gastroenterology 2004; 126: 1270

Maciosek et al. Am J Prev Med 2006; 31: 80

The MISCAN model for the efficacy of cancer screening

- Microsimulation of Screening Analysis
- Semi-Markov model
- Validated against FOBT and endoscopy studies
 - National Polyp study
 - Large randomised FOBT trials (UK, US, Denmark)
- Also used for other cancer screening programs

CRC screening programs; assumptions on test interval and participation rate

	Test interval	Adherence
iFOBT	2 yrs	60%
Sigmoidoscopy	5 yrs	40%
Colonoscopy	10 yrs	30%

N=100.000, 50 yrs, followed till death
v Ballegooijen M, Loeve F, MISCAN model

Reduction of CRC incidence and mortality by different screening programs

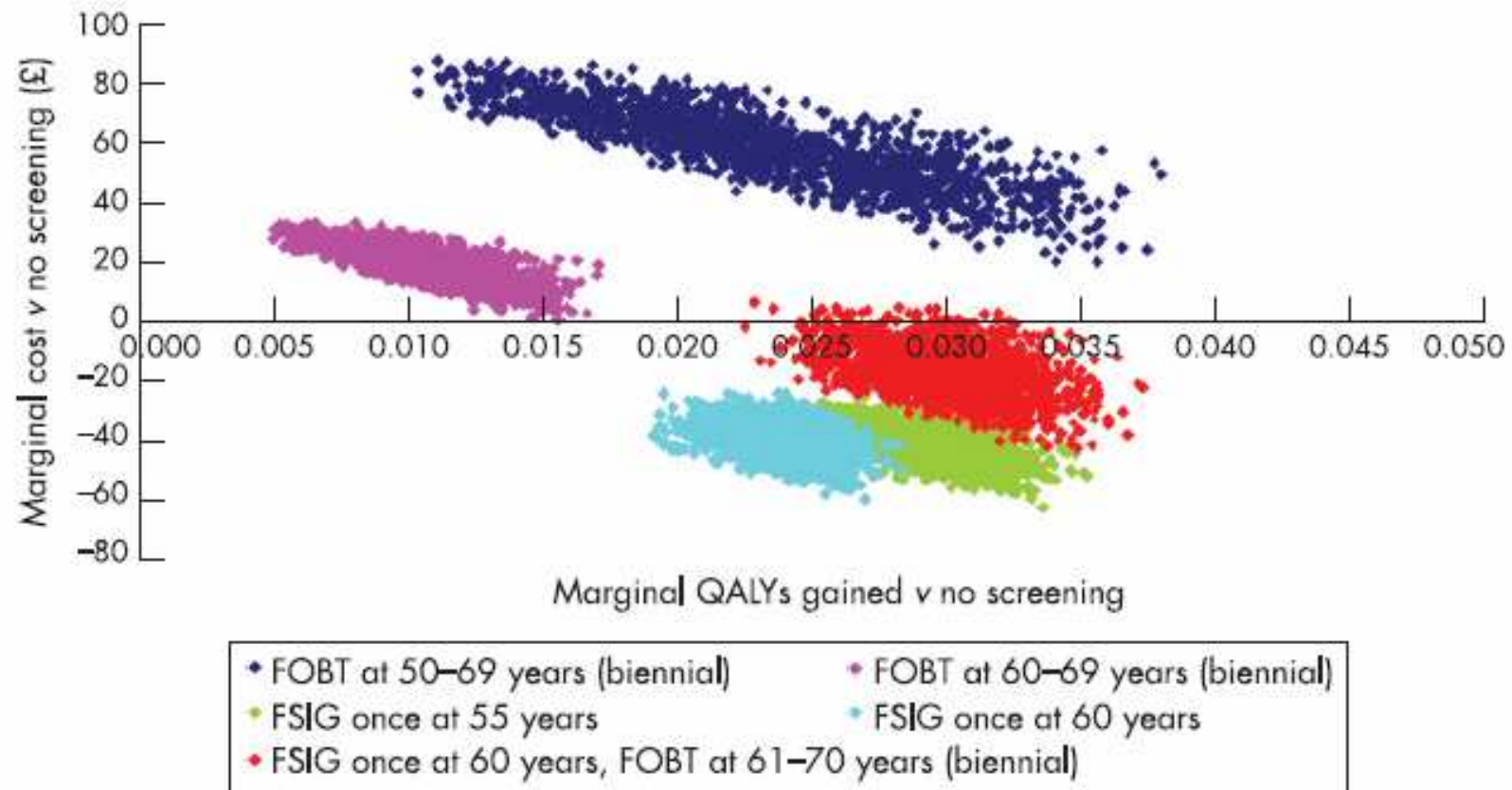
- Bi-annual FOBT screening with a relatively high adherence rate has a limited effect on CRC incidence
- Within the range of assumptions, sigmoidoscopy and colonoscopy programs have a similar, higher impact on CRC incidence
- The effect of all three programs on CRC mortality is similar

*N=100.000, 50 yrs, followed till death
v Ballegooijen M, Vogelaar I, MISCAN model*

Costs and yield of CRC screening

- Each of the three screening programs will lead to a net cost reduction in comparison with clinical care without screening
- This is due to the rise in treatment costs versus the stable costs of screening
- This means that initiation of a CRC screening program is predicted to be associated with net cost savings per prevented death and per life year saved

Cost-effectiveness for CRC screening vs no screening



Cost-efficacy of virtual-colonography

- Pro
 - Potentially higher participation rate may increase preventive effect of screening program

- Con
 - Costs per procedure similar to endoscopy
 - High (20 – 30%) need for subsequent colonoscopy
 - Costs for further diagnostics of extra-colonic findings

- Virtual colonoscopy, even with 100% sensitivity, will only be cost-effective compared to colonoscopy when costs are >40 - 55% less, or adherence >15 - 20% higher

Conclusions

- CRC screening with FOBT and endoscopy was for long cost-effective (i.e. costs < €35.000 / life-year saved)
- The rapid increase of CRC treatment costs improve the cost efficacy of a screening program with either FOBT or endoscopy or both
- Within the range of assumptions tested regarding adherence, screening costs, and treatment costs, CRC screening may in fact become cost-reductive, leading to net cost savings per prevented death and per life year saved.
- The cost efficacy of screening will further increase with upcoming CRC treatments

Conclusions

- With the rapid increase in costs for CRC treatment, the return on investment of screening is among adherent subjects higher with endoscopy than FOBT
- This favors EC-wide introduction of multi-modality CRC screening, aiming at optimal adherence with maximal use of invasive tests