



REDUCTION OF COLORECTAL CANCER INCIDENCE BY ENDOSCOPIC SCREENING: EMPIRICAL EVALUATION AND COMPARISON OF ALTERNATIVE SCREENING STRATEGIES

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Background. Colorectal cancer (CRC) is among the leading cancer causes of death in many developed countries. Its slow development from treatable precancerous lesions opens promising avenues of early detection and prevention by various screening examinations. There is strong evidence from various case-control studies that endoscopic screening examinations of the large bowel (sigmoidoscopy, colonoscopy), which offer the possibility of immediate removal of precancerous lesions, can strongly reduce CRC occurrence and mortality. However, empirical data regarding optimal age, time intervals and numbers of screening examinations are scarce.

Methods. In a population-based case-control study, the history of endoscopic screening examinations was compared between 386 patients with a first diagnosis of CRC and 344 controls aged 50-79. Personal interviews were conducted based on a standardized questionnaire. Cases and controls were compared with respect to previous endoscopic screening exams. The impact of various screening strategies on CRC occurrence within the age range affected by screening was quantified by odds ratios and their 95% confidence intervals. The impact of different screening strategies on the proportion of clinically manifest CRC cases that might be prevented within the whole age range covered (i.e., 50 to 79) was estimated according to various levels of compliance between 100% and 25%.

Table 1: Risk reduction according to screening strategy

Screening strategy	No. of Cases		No. of Controls		Risk reduction		
	Number of endoscopies	age(s) at index group	ref. group	index group	ref. group	OR (95% CI)*	within age range
1	50	13	262	22	185	0.48 (0.21-1.11)	50-79
1	55	11	244	31	158	0.23 (0.10-0.54)	55-79
1	60	8	203	21	128	0.24 (0.08-0.66)	60-79
1	65	8	151	13	90	0.28 (0.09-0.87)	65-79
1	70	8	101	8	64	0.40 (0.12-1.42)	70-79
2	50, 60	10	262	34	185	0.23 (0.10-0.56)	50-79
2	55, 65	13	244	35	158	0.21 (0.09-0.46)	55-79
2	60, 70	13	203	24	128	0.25 (0.11-0.61)	60-79
3	50, 60, 70	15	262	37	185	0.23 (0.11-0.51)	50-79

* odds ratio (95% confidence interval), adjusted for gender, age, family history of colorectal cancer, school education, marital status, smoking, alcohol consumption, and participation in general health examination

Results. For all screening schemes except those with a single endoscopy around age 50 or 70, a strong risk reduction of 70-80% was estimated (table 1). The strongest risk reduction (79%) was estimated for the scheme with two repeated screening exams around ages 55 and 65. Almost the same risk reduction appears to be possible with a single screening at either age 55 or 60. However, these screening schemes would be without any benefit for subjects below age 55 or age 60, respectively, whereas as strong a risk reduction may be achieved from age 50 on with two screenings at ages 50 and 60. Compared to the latter scheme, addition of a third screening exam at age 70 appears to provide no additional benefit. On the other hand, risk reduction appears to be much less pronounced with a single screening endoscopy at age 50.

Table 2: Estimated reduction of numbers of patients diagnosed with colorectal cancer between ages 50-79 according to screening strategy and level of compliance

Screening strategy	Number of endoscopies	age(s) at endoscopies	Compliance			
			100%	75%	50%	25%
1	50		52%	39%	26%	13%
1	55		72%	54%	36%	18%
1	60		63%	47%	31%	16%
1	65		46%	35%	23%	12%
1	70		26%	20%	13%	7%
2	50, 60		77%	65%	48%	26%
2	55, 65		74%	64%	48%	27%
2	60, 70		62%	51%	38%	21%
3	50, 60, 70		77%	67%	52%	30%

A single screening endoscopy at age 70 could only prevent about one out of four of all cases between ages 50 and 79 even in case of 100% compliance. This proportion would be reduced to about 7% with a compliance of 25% (table 2). A single screening endoscopy at ages 50 or 65 might prevent about twice as many cases. An even stronger impact may be achieved by screening schemes with a single endoscopy at age 55 or 60. The impact of screening could further be enhanced by schemes with two repeated screening exams at ages 50 and 60 or at ages 55 and 65. The advantage of the repeated screening schemes over the single screening schemes appears to be modest in case of 100% compliance, but may become substantial for levels of compliance to be expected in practice.

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