

RESEARCH COMMUNICATION

Trends in the National Cancer Screening Program for Colorectal Cancer in the Republic of Korea, 2004-2009

Mi Jin Park¹, Kui Son Choi¹, Jae Kwan Jun¹, Hoo-Yeon Lee^{2*}

Abstract

Since 2004, the National Cancer Screening Program (NCSP) for colorectal cancer has provided annual screening by fecal immunochemical test (FIT) for individuals aged 50 years or older in the Republic of Korea. This study was conducted to investigate trends in the participation rate of the NCSP for colorectal cancer overall and according to gender, age and health insurance type. Therefore, we analyzed participation, positivity, and follow-up rates according to these factors. Overall participation rates for the NCSP for colorectal cancer increased from 10.5% in 2004 to 26.2% in 2009. FIT positivity rates decreased from 7.9% in 2004 to 7.1% in 2009. Follow-up rates among FIT-positive participants decreased from 64.5% in 2004 to 39.4% in 2009. Although the participation rate increased each year during the study period, it remained low compared with that of other countries. The FIT positivity rate decreased, however it was relatively high compared with that of other countries. Intervention is essential to raise participation rates, maximize adherence to screening recommendations, and to make certain that all population subgroups reap the benefits of screening. Also, these data suggest that structured and standardized quality improvement activity is essential to high quality for FIT in the NCSP for colorectal cancer screening in Korea.

Key words: Colorectal cancer – national cancer screening program – participation rate - Korea

Asian Pacific J Cancer Prev, 12, 3489-3493

Introduction

Based on evidence that screening reduces both the incidence and mortality rate of colorectal cancer (Mandel et al., 1993; Bureau of Health Promotion, 2008; Levin et al., 2008; Whitlock et al., 2008; Hundt et al., 2009; Smith et al., 2010), national guidelines in several nations now recommend regular colorectal cancer screening for average-risk individuals aged 50 years or older using one or more of the following methods: annual fecal occult blood test, double-contrast barium enema (DCBE) every 5 years, or colonoscopy every 10 years (Ciatto et al., 2007; Choi et al., 2010; Smith et al., 2010). Several Asian countries such as in Japan, Korea, Taiwan, and Singapore have established national colorectal cancer screening programs (Saito, 2006; Bureau of Health Promotion 2008; Sung et al., 2008; Lee et al., 2010). In 2004, the Republic of Korea introduced a nationwide program for colorectal cancer screening within the framework of the National Cancer Screening Program (NCSP). The target population included Medical Aid recipients and National Health Insurance (NHI) beneficiaries with a contribution below 30%. In 2005, the target population was expanded to include NHI beneficiaries with a contribution below

50% (Choi et al., 2010; Kim et al., 2011).

Within the framework of the NCSP for colorectal cancer, men and women 50 years of age or older receive an invitation letter from the Ministry of Health and Welfare and the NHI Corporation at the beginning of each calendar year. The NCSP for colorectal cancer provides an annual fecal immunochemical test (FIT) as the primary colorectal cancer screening method, and follow-up investigation in FIT-positive participants is conducted by either colonoscopy or DCBE. If the result of the DCBE is abnormal, follow-up by colonoscopy is recommended.

The aim of this study was to examine the trends in the participation rates of the NCSP for colorectal cancer from 2004 to 2009, in order to evaluate policies on cancer screening programs implemented at the national level to reduce the colorectal cancer burden.

Materials and Methods

Study population

Data were obtained from the NCSP database, which contains information on Medical Aid recipients and NHI beneficiaries invited to participate in the

¹National Cancer Control Institute, National Cancer Center, Goyang-si, ²Department of Social Medicine, College of Medicine, Dankook University, Cheonan, Korea *For correspondence: hylee@dankook.ac.kr

Table 1. Population Eligible for Fecal Immunochemical Test in the NCSP for Colorectal Cancer in Korea, 2004-2009

Variables	2004		2005		2006		2007		2008		2009		Change in PR 2004-2009
	TP (n)	PR (%)	TP (n)	PR (%)	TP (n)	PR (%)	TP (n)	PR (%)	TP (n)	PR (%)	TP (n)	PR (%)	
Total	2,265,379	10.5	3,473,958	15.5	4,406,700	15.7	4,344,708	18.0	4,640,365	21.2	4,625,557	26.2	15.7
Gender													
Female	1,295,566	10.2	1,897,086	15.8	2,343,739	16.4	2,318,963	18.7	2,457,324	21.9	2,474,922	27.3	17.1
Male	969,813	10.9	1,576,872	15.1	2,062,961	14.9	2,025,745	17.3	2,183,041	20.5	2,150,635	24.9	14.0
Age													
50-54	543,956	11.5	947,899	15.7	1,293,391	15.5	1,297,518	17.2	1,382,303	20.0	1,441,608	24.7	13.2
55-59	367,060	13.1	636,068	18.3	772,118	18.2	741,923	20.8	825,798	24.6	767,516	29.5	16.4
60-64	438,341	13.7	643,264	19.3	824,224	20.3	771,598	23.6	803,780	27.5	805,897	33.5	19.8
65-69	307,187	11.4	426,779	17.1	515,703	17.6	523,760	21.0	555,351	26.1	517,165	32.6	21.2
70-74	272,179	8.4	374,864	13.4	471,982	13.6	466,209	16.6	497,080	19.1	500,338	25.2	16.8
≥75	336,656	1.9	445,084	5.6	529,282	5.4	543,700	6.7	576,053	7.8	593,033	10.9	9.0
Health insurance type													
MAP	638,880	5.9	672,047	11.6	711,193	10.2	768,972	11.8	792,967	12.6	801,867	17.5	11.6
NHI	1,626,499	12.3	2,801,911	16.4	3,695,507	16.8	3,575,736	19.4	3,847,398	23.0	3,823,690	28.0	15.7

NCSP, National Cancer Screening Program; MAP, Medical Aid Program; NHI, National Health Insurance; TP, Target Population; PR, Participation Rate

Table 2. Trends in FIT Positivity Rates in the NCSP for Colorectal Cancer in Korea, 2004-2009

Variables	2004		2005		2006		2007		2008		2009	
	FIT-PP	FIT PR	FIT-PP	FIT PR	FIT-PP	FIT PR	FIT-PP	FIT PR	FIT-PP	FIT PR	FIT-PP	FIT PR
Total	18,734	7.9	41,211	7.7	55,789	8.1	59,081	7.6	73,581	7.5	85,872	7.1
Gender												
Female	9,165	7.0	20,056	6.7	26,932	7.0	28,275	6.6	34,342	6.4	40,972	6.1
Male	9,569	9.1	21,155	8.9	28,857	9.4	30,806	8.8	39,239	8.8	44,900	8.4
Age												
50-54	4,702	7.6	10,696	7.2	14,896	7.4	16,012	7.2	19,323	7.0	23,187	6.5
55-59	3,757	7.9	82,929	7.7	1,769	7.7	11,086	7.2	14,254	7.0	15,304	6.8
60-64	4,761	8.0	9,506	7.7	13,664	8.2	13,463	7.4	16,187	7.3	19,337	7.2
65-69	2,935	8.5	5,887	8.1	7,839	8.6	8,963	8.2	11,732	8.1	12,666	7.5
70-74	1,816	8.1	4,077	8.2	5,868	9.1	6,297	8.2	8,005	8.4	9,885	7.9
≥75	763	7.5	2,116	8.5	2,753	9.6	3,260	9.0	4,080	9.1	5,493	8.5
Health insurance type												
MAP	1,815	5.0	5,579	7.2	5,672	7.8	6,852	7.6	7,948	8.0	10,487	7.5
NHI	16,919	8.4	35,632	7.8	50,117	8.1	52,229	7.6	65,633	7.4	75,385	7.0

FIT, Fecal Immunochemical Test; NCSP, National Cancer Screening Program; MAP, Medical Aid Program; NHI, National Health Insurance; FIT-PP, FIT-Positive Participants; FIT PR, FIT Positivity Rate

NCSP. Participants of the NCSP for colorectal cancer were notified of FIT results (reported as ‘positive’ or ‘negative’), and FIT-positive participants were referred to follow-up. Follow-up testing was also performed within the framework of the NCSP for colorectal cancer, and participants could choose either DCBE or colonoscopy as their preferred follow-up test. The following information was gathered for FIT-positive participants: whether they had undergone follow-up through the NCSP for colorectal cancer before the end of the calendar year in which they were screened, and if so which follow-up test they underwent (DCBE or colonoscopy).

All analyses in the current study were restricted to men and women aged 50 years or older who were invited to participate in the NCSP for colorectal cancer between January 1, 2004 and December 31, 2009. Participation rates reported correspond to those of this population. The follow-up rate was defined as FIT-positive participants who underwent follow-up within the framework of the

NCSP for colorectal cancer.

Statistical analysis

Descriptive analyses were conducted by year. Participation rates and follow-up rates from 2004 to 2009 were analyzed by gender, age and health insurance type. Age was divided into subgroups (50–54, 55–59, 60–64, 65–69, 70–74, and ≥75 years). Type of health insurance was classified into Medical Aid and NHI. All statistical analyses were conducted using SAS statistical software (version 9.1; SAS Institute Inc., Cary, North Carolina).

Results

The number of individuals in the target populations invited to participate in the NCSP for colorectal cancer were: 2,265,379 in 2004; 3,473,958 in 2005; 4,406,700 in 2006; 4,344,708 in 2007; 4,640,365 in 2008; and 4,625,557 in 2009 (Table 1). In 2004, 10.5% of those invited accepted to participate in colorectal cancer

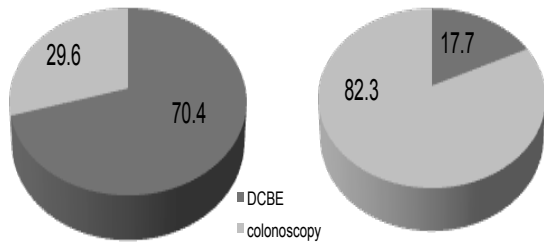


Figure 1. Proportion of Follow-up Testing Performed by Double Contrast Barium Enema and Colonoscopy in 2004 (a) and 2009 (b), NCSP for Colorectal Cancer in Korea

screening. Participation rates increased steadily each year during the study period, and in 2009, 26.2% accepted to participate in the program. Participants 60-69 years of age and NHI beneficiaries had a higher change in participation rates from 2004 to 2009.

Table 2 shows the trends in FIT positivity rates from 2004 to 2009. The overall FIT positivity rates decreased from 7.9% in 2004 to 7.1% in 2009. Men and participants aged 75 years or older showed higher FIT positivity rates (Table 2).

Table 3 shows the trends and proportion of follow-up testing among FIT-positive participants from 2004 to 2009. Overall, 64.5% of FIT-positive participants underwent follow-up testing by either DCBE or colonoscopy in 2004, and this rate decreased to 39.4% in 2009. Men and participants aged 50-54 years of age showed higher follow-up rates (Table 3). Among participants who underwent a follow-up test in 2004, 70.4% underwent DCBE, and 29.6% underwent colonoscopy (Figure 1a). In 2009, 17.7% underwent DCBE and 82.3% underwent colonoscopy (Figure 1b). Colonoscopy was more likely to be chosen as a follow-up test by men, and by younger participants.

Table 3. Trends and Proportion of Follow-Up Testing among FIT-Positive Participants in the NCSP for Colorectal Cancer in Korea, 2004-2009

Variables	2004			2005			2006			2007			2008			2009			CFR (%)	
	CFT (%)	DCBE (%)	SC (%)	CFT (%)	DCBE (%)	SC (%)	CFT (%)	DCBE (%)	SC (%)	CFT (%)	DCBE (%)	SC (%)	CFT (%)	DCBE (%)	SC (%)	CFT (%)	DCBE (%)	SC (%)		
Total	64.5	70.4	29.6	51.7	58.1	41.9	48.8	44.5	55.5	47.5	36.6	63.4	43.4	26.8	73.2	39.4	17.7	82.3	-25.1	
Gender																				
Female	64.7	71.6	28.4	51.5	59.8	40.2	47.6	45.8	54.2	46.5	38.4	61.6	43.0	28.0	72.0	39.0	18.4	81.6	-25.7	
Male	64.3	69.2	30.8	51.9	56.5	43.5	49.9	43.4	56.6	48.4	35.1	64.9	43.8	25.8	74.2	39.8	17.0	83.0	-24.5	
Age																				
50-54	68.3	67.4	32.6	56.9	54.6	45.4	54.4	41.0	59.0	52.7	31.3	68.7	48.1	22.4	77.6	43.2	14.6	85.4	-25.1	
55-59	66.2	69.4	30.6	54.2	54.3	45.7	51.9	41.8	58.2	50.6	34.4	65.6	46.9	24.0	76.0	41.9	15.9	84.1	-24.3	
60-64	66.1	70.1	29.9	52.3	59.4	40.6	49.3	44.1	55.9	48.0	38.1	61.9	44.1	27.3	72.7	41.0	17.4	82.6	-25.1	
65-69	61.9	73.1	26.9	48.2	61.3	38.7	44.1	48.2	51.8	45.4	39.8	60.2	40.6	31.9	68.1	37.4	20.8	79.2	-24.5	
70-74	56.8	75.0	25.0	43.6	64.2	35.8	41.2	53.5	46.5	39.3	44.9	55.1	36.4	34.0	66.0	33.9	23.0	77.0	-22.9	
≥75	49.9	79.8	20.2	37.4	74.5	25.5	32.9	59.0	41.0	30.6	51.5	48.5	28.1	37.4	62.6	25.7	26.9	73.1	-24.2	
Health insurance type																				
MAP	41.6	74.0	26.0	44.4	71.7	28.3	39.5	55.3	44.7	39.3	45.5	54.5	38.2	34.3	65.7	32.9	23.5	76.5	-8.7	
NHI	66.9	70.2	29.8	52.8	56.3	43.7	49.8	43.6	56.4	48.6	35.7	64.3	44.0	26.1	73.9	40.3	17.0	83.0	-26.6	

FIT, Fecal Immunochemical Test; NCSP, National Cancer Screening Program; DCBE, Double Contrast Barium Enema; MAP, Medical Aid Program; NHI, National Health Insurance; CFT, Completed Follow-up Test; SC, Colonoscopy; CFR, Change in follow-up rates from 2004 to 2009

Discussion

Participation rates increased continually from 2004 to 2009 in the NCSP for colorectal cancer, a nationwide population-based screening program in Korea, from 10.5% in 2004 to 26.2% in 2009. Although the participation rate increased every year, it is still low compared with that of Western countries: 59.2% in England in 2003, and 55.0% in Scotland in 2003 (UK Colorectal Cancer Screening Pilot Group, 2004; Grazzini et al., 2008). However, the observed participation rate was high compared with that of Asian countries: 17% in Japan in 2002, and 5% in Taiwan in 2005 (Saito, 2006; Bureau of Health Promotion, 2008). In particular, participation rates in the current study were lowest among underserved groups, such as Medical Aid recipients and individuals over 75 years of age.

In contrast to the increasing participation rates, there was a substantial decrease in follow-up rates among FIT-positive participants in the present study. Indeed, the follow-up rates were low compared with that of other Asian countries: 60% in Japan, and 58% in Taiwan (Saito, 2006; Bureau of Health Promotion, 2008).

Type of insurance could be a proxy indicator for income, leading to variations in screening rates in this study. This would be consistent with previously published literature reporting that low socioeconomic status and older age are barriers to colorectal cancer screening (Vernon, 1997; Seeff et al., 2004; Elston Lafata et al., 2005; Meissner et al., 2006). Indeed, some studies have shown the need for information on socioeconomic status to be routinely collected in screening programs, as it would facilitate the routine monitoring of screening coverage in different socioeconomic groups. This in turn could be used to inform policies to reduce disparity in coverage (Singh et al., 2004; Ward et al., 2004).

The follow-up rate in the present study was low

despite the fact that the Korean NCSP for colorectal cancer provided free follow-up testing for FIT-positive participants. There could be any number of reasons to explain why only about one-third of participants underwent recommended follow-up testing. Many studies have suggested that having access to a physician who performs follow-up testing was a powerful predictor of colorectal cancer screening (Cooper et al., 1997; Yabroff et al., 2005; Miglioretti et al., 2008; Pruitt, Shim et al. 2009; Singh et al., 2009). It may also be that physicians were hesitant to follow the physician's recommendation for a complete colon evaluation (Cooper et al., 1997; Yabroff et al., 2005; Singh et al., 2009).

Thus, we need to increase participant's knowledge and awareness of screening and physician's recommendation to the target population to increase the participation rate in cancer screening programs (Dolan et al., 2004; Singh et al., 2004; Ward et al., 2004; Klabunde et al., 2006). Attempts to promote cancer screening have generally targeted entire communities, e.g., mass-media campaigns about the national cancer screening system in Korea. Although this has proved useful, additional interventions that are more focused on the individual are required, such as in-person or telephone counseling, letters and reminders, or other individualized strategies, to increase participation and follow-up rates.

Another possible explanation for this spread is that, although the NCSP is a nationwide population-based screening program, tests performed outside the NCSP may have been missed, as the NCSP database does not include colonoscopy or DCBE tests carried out in the private sector, or conducted as a medical care service that is not part of screening. Therefore, if follow-up conducted in the private sector were included, we would expect the follow-up rate to increase. To confirm this, further studies on colorectal cancer screening rates and follow-up rates that include both participants of NCSP and outside the NCSP in Korea are needed.

In this study, although the rate of FIT-positive participants decreased from 2004 to 2009, it was still relatively high compared to previous studies. For example, in 2004, a pilot study in England reported a FIT positivity rate of 1.6% (UK Colorectal Cancer Screening Pilot Group, 2004). Other studies conducted in Asian countries found FIT positivity rates of 7.1% (Japan), and 4.1% (Taiwan) (Saito, 2006; Bureau of Health Promotion, 2008). Two randomized clinical trials in Korea found FIT positivity rates of 1.8% and 1.3% (Park, 2004; Kwon et al., 2007). This may be due partly to differences in the target populations of the studies; the NCSP for colorectal cancer invites all individuals aged 50 and over, regardless of whether they have symptoms, whereas the other study was a hospital-based study, recruiting people aged 40 years or over.

The high FIT positivity rate should be addressed, as it implies a number of high false-positive results. This would suggest that a structured and standardized guideline is essential to achieve high quality for FIT in

the NCSP for colorectal cancer in Korea. The program also needs to implement colorectal cancer screening guidelines, and an education and training program for medical staff, especially for FIT. Japan has had a cancer screening guideline in place since 2001, which was suggested by non-systematic and non-standardized reviewed research (Hamashima et al., 2008). Recently Japan re-established standardized guideline development for cancer screening, and colorectal cancer screening was consequently revised (Hamashima et al., 2008). The United States and the United Kingdom have also guidelines for colorectal cancer screening by FIT, and a quality control program that covers all colorectal screening modalities, training requirements, optimal techniques to complete examination, screening intervals, and recommendations for appropriate follow-up (West, 2001; Øvretveit and Gustafson, 2002; Winawer, 2007; Levin et al., 2008).

In 2008, Korea established Quality Evaluation of National Cancer Screening (QENCS) programs to improve the quality of the NCSP. QENCS programs for FIT evaluate all aspects of cancer screening including structure, process, and outcomes such as accuracy and satisfaction. The NCSP also developed and disseminated guidelines for colorectal cancer screening and quality control. However, the QENCS program was a pilot project that took place from 2008 to 2010, and it covered only a small number of screening units. The first terms of the QENCS program were completed in 2010. In the future, we need to study how these quality control efforts affect the accuracy colorectal cancer screening, especially FIT after adoption of QENCS including guidelines, education and training as a regular project. Accuracy according to the sub-type such as qualitative and quantitative FIT should be also evaluated to try and elucidate the reason behind high FIT positivity rates.

This study was conducted to investigate the overall trends in the participation rate of the NCSP for colorectal cancer, and for underserved groups according to gender, age or health insurance type. Intervention is essential to raise participation rates, maximize adherence to screening recommendations, and to make certain that all population subgroups reap the benefits of screening. Present efforts to increase participation rates should continue, but specialized strategies for different ages, genders and regions are also necessary. The importance of follow-up testing should also be emphasized, and high-quality screening should be provided in all health examination institutions through quality control or education.

References

- Bureau of Health Promotion, DOH (2008). 2007 Administrative Plan (Draft) Bureau of Health Promotion, DOH, Executive Yuan.
- Choi KS, Jun JK, Lee H-Y, et al (2010). Increasing uptake of colorectal cancer screening in Korea: a population-based

- study. *BMC Public Health*, **10**, 265.
- Ciatto S, Martinelli F, Castiglione G, et al (2007). Association of FOBT-assessed faecal Hb content with colonic lesions detected in the Florence screening programme. *Br J Cancer*, **96**, 218-21.
- Cooper GS, Fortinsky RH, Hapke R, et al (1997). Primary care physician recommendations for colorectal cancer screening: patient and practitioner factors. *Arch Intern Med*, **157**, 1946-50.
- Dolan NC, Ferreira MR, Davis TC, et al (2004). Colorectal cancer screening knowledge, attitudes, and beliefs among veterans: Does literacy make a difference? *J Clin Oncol*, **22**, 2617-22.
- Elston Lafata J, Williams LK, Ben-Menachern T, et al (2005). Colorectal carcinoma screening procedure use among primary care patients. *Cancer*, **104**, 1356-61.
- Grazzini G, Ciatto S, Cislighi C, et al (2008). Cost evaluation in a colorectal cancer screening programme by faecal occult blood test in the District of Florence. *J Med*, **15**, 175-81.
- Hamashima C, Saito H, Nakayama T, et al (2008). The standardized development method of the Japanese guidelines for cancer screening. *Jpn J Clin Oncol*, **38**, 288-95.
- Hundt S, Haug U, Brenner H (2009). Comparative evaluation of immunochemical fecal occult blood tests for colorectal adenoma detection. *Ann Intern Med*, **150**, 162-9.
- Kim Y, Jun JK, Choi KS, et al (2011). Overview of the National Cancer Screening Programme and the cancer screening status in Korea. *Asian Pacific J Cancer Prev*, **12**, 725-30.
- Klabunde CN, Schenck AP, Davis WW (2006). Barriers to colorectal cancer screening among Medicare consumers. *Am J Prev Med*, **30**, 313-9.
- Kwon JH, Choi MG, Suh JP, et al (2007). [The significance of fecal occult blood testing to screen for colon cancer]. *Korean Journal of Gastrointestinal Endoscopy*, **35**, 68-73. Article in Korean.
- Lee HP, Chew CT, Consigliere DT, et al (2010). Ministry of Health Clinical Practice Guidelines: Cancer Screening. *Singapore Med J*, **51**, 170-5.
- Levin B, Lieberman DA, McFarland B, et al (2008). Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *Gastroenterology*, **134**, 1570-95.
- Mandel JS, Bond JH, Church TR, et al (1993). Reducing mortality from colorectal cancer by screening for fecal occult blood. *N Engl J Med*, **328**, 1365-71.
- Meissner HI, Breen N, Klabunde CN, et al (2006). Patterns of colorectal cancer screening uptake among men and women in the United States. *Cancer Epidemiol Biomarkers Prev*, **15**, 389-94.
- Miglioretti DL, Rutter CM, Bradford SC, et al (2008). Improvement in the diagnostic evaluation of a positive fecal occult blood test in an integrated health care organization. *Med Care*, **46** (Suppl 1), S91-6.
- Øvretveit J, Gustafson D (2002). Evaluation of quality improvement programmes. *Qual Saf Health Care*, **11**, 270-5.
- Park DI (2010). The significance of fecal immunochemical test in National Cancer Screening Program. *Intestinal Research*, **8**, 200-1 (in Korean).
- Pruitt SL, Shim MJ, Dolan Mullen P, et al (2009). Association of area socioeconomic status and breast, cervical, and colorectal cancer screening: a systematic review. *Cancer Epidemiol Biomarkers Prev*, **18**, 2579-99.
- Saito H (2006). Colorectal cancer screening using immunochemical faecal occult blood testing in Japan. *J Med Screen*, **13**(Suppl 1), S6-S7.
- Seeff LC, Nadel MR, Klabunde CN, et al (2004). Patterns and predictors of colorectal cancer test use in the adult US population. *Cancer*, **100**, 2093-103.
- Singh H, Kadiyala H, Bhagwath G, et al (2009). Using a multifaceted approach to improve the follow-up of positive fecal occult blood test results. *Am J Gastroenterol*, **104**, 942-52.
- Singh SM, Paszat LF, Li C, et al. (2004). Association of socioeconomic status and receipt of colorectal cancer investigations: a population-based retrospective cohort study. *CMAJ*, **171**, 461-5.
- Smith RA, Cokkinides V, Brooks D, et al (2010). Cancer screening in the United States, 2010: a review of current American Cancer Society guidelines and issues in cancer screening. *CA Cancer J Clin*, **60**, 99-119.
- Sonnenberg A, Delco F, Inadomi JM (2000). Cost-effectiveness of colonoscopy in screening for colorectal cancer. *Ann Internal Med*, **133**, 573-84.
- Sung JY, Lau JYW, Young GP, et al. (2008). Asia Pacific consensus recommendations for colorectal cancer screening. *Gut*, **57**, 1166-76.
- UK Colorectal Cancer Screening Pilot Group (2004). Results of the first round of a demonstration pilot of screening for colorectal cancer in the United Kingdom. *BMJ*, **329**, 133.
- Vernon SW (1997). Participation in colorectal cancer screening: a review. *J Natl Cancer Inst*, **89**, 1406-22.
- Ward E, Jemal A, Cokkinides V, et al (2004). Cancer disparities by race/ethnicity and socioeconomic status. *CA Cancer J Clin*, **54**, 78-93.
- West E (2001). Management matters: the link between hospital organisation and quality of patient care. *Qual Health Care*, **10**, 40-8.
- Whitlock EP, Lin JS, Liles E, et al (2008). Screening for colorectal cancer: a targeted, updated systematic review for the US Preventive Services Task Force. *Ann Intern Med*, **149**, 638-58.
- Winawer SJ, Sherlock P (2007). Colorectal cancer screening. *Best Practice & Research: Clinical Gastroenterology*, **21**, 1031-48.
- Yabroff KR, Klabunde CN, Myers R, et al (2005). Physician recommendations for follow-up of positive fecal occult blood tests. *Med Care Res Rev*, **62**, 79.