Screening men for prostate cancer and colorectal cancer: is practice evidence-based?

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Introduction: *Controversy persists about whether men should be screened for prostate cancer. On the other hand, the benefit of colorectal cancer screening has been proven for men starting at age 50. We aimed to examine the rate of exposure to previous screening tests for prostate cancer and colorectal cancer in a cohort of men living in Quebec.*
Materials and methods: *As part of an event promoting early prostate cancer detection, 347 men aged 50 to 69 without an established diagnosis of prostate cancer agreed to reply to questions in a previously validated questionnaire. The self-administered questionnaire, which asked about previous screening tests for prostate cancer and colorectal cancer, was completed on-site.*

Results: *Among men aged 50 to 69, previous exposure to a digital rectal examination (DRE), a prostate-specific antigen (PSA) test, a fecal occult blood test (FOBT), and sigmoidoscopy were reported by 132 men (62.9%), 73 men (34.8%), 37 men (17.6%), and 39 men (18.6%) , respectively. Across all age strata (< 50, 50-69, ≥ 70 years), PSA and DRE testing were highest in men aged 50 to 69 and were 2- to 3-fold higher than screening tests for colorectal cancer.*
Conclusions: *In this cohort of asymptomatic Canadian men, overall and age-stratified exposure to tests to detect colon cancer early is far from ideal. Conversely, far more men have been subjected to PSA testing and DRE. Patients should be informed of the benefits and risks of colorectal cancer screening and PSA testing.*

Key Words: prostate cancer, colorectal cancer, early detection, prevalence

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Introduction

It is expected that in 2007, prostate cancer will affect 26.9% of Canadian men; 22300 new cases are predicted and 4300 men are expected to die from this disease.[1] Since the introduction of the prostate-specific antigen (PSA) test in the late 1980s, the incidence of prostate cancer has increased, and there has been a shift towards diagnosis of cancer that is at an earlier stage and more localized, which is referred to as 'stage migration'.[2,3] Despite increasing indirect evidence of the value of

PSA tests to decrease prostate cancer-specific mortality,[4-6] controversy still exists about whether performing PSA tests to screen for prostate cancer leads to decreased mortality.[7,8] Consequently, the value of PSA testing as a screening tool remains controversial. Currently, the American Cancer Society recommends that a PSA test and digital rectal examination (DRE) should be offered to men annually starting at age 50.[9] The Canadian Urological Association, on the other hand, does not currently recommend that PSA tests be included as part of an annual medical evaluation for men in primary-care settings.

Screening for colorectal cancer using the fecal occult blood test (FOBT) has been shown to be effective in clinical studies.[10-12] In 2007, in Canada, it is expected that there will be 11400 cases of men newly diagnosed with colorectal cancer. This represents the third highest cancer incidence in men. In the same year, 4700 Canadian men are expected to die from this disease.[1] In randomized clinical trials, colorectal cancer screening tests have been shown to reduce colorectal cancer- specific mortality rates when screening starts in men at age 50.[13-16] Unlike the lack of agreement about PSA and DRE tests, current evidence suggests that sigmoidoscopy and FOBT should be performed every 5 to 10 and 1 to 2 years, respectively.[13-17]

If clinical practice reflects the evidence, colorectal cancer screening should be more common than prostate cancer screening. However, previous reports[17,18] have found that the opposite is true; men were up to 20% more likely to be screened for prostate cancer than for colorectal cancer.[17] The rate of screening for prostate cancer impacts not only on individual men and on medical practice, but it also has an impact on health economics — the costs of additional prostate biopsies and treatments versus lives saved. Given a finite health budget, screening for prostate cancer may limit other efforts, such as early detection of colorectal cancer or breast cancer, which are responsible for more years of life lost than prostate cancer. These findings are worrisome from a public health perspective and warrant an assessment in Canada.

We aimed to examine the exposure rates to screening tests for early detection of prostate cancer and colorectal cancer. We hypothesized that a similar pattern to that found in the United States exists in Canada. We looked at the rates of previous exposure to screening tests for early detection of prostate cancer and colorectal cancer in a cohort of men who volunteered to undergo evaluation for prostate cancer during an annual Prostate Cancer Awareness event.

Materials and methods

Data source

We analyzed data from the 2004 University of Montreal Prostate Cancer Awareness Days. This annual event is organized by a multidisciplinary group of urologists, oncologists, radiation oncologists, nurses, support staff, and nutrition experts from the Centre Hospitalier de l'Université den Montréal (CHUM). The goal of the event is to educate, inform, and raise public awareness about prostate cancer. Moreover, on-site early detection is offered in the form of PSA testing and DRE.

Study population

Of 366 men who attended the event, 347 men who did not have an established diagnosis of prostate cancer completed an on-site self-administered questionnaire that asked questions about previous exposure to tests for the early detection of prostate cancer and colorectal cancer. The questionnaire was based on a previously published format, which we modified for on-site use.[17] Briefly, all participants were asked whether and when they had previously had a PSA test, a DRE, a FOBT, or sigmoidoscopy. In further analyses, we counted DRE and PSA together as an early detection test for prostate cancer. It is important to note that DRE is not solely an early detection test for prostate cancer, but it may also serve as a test to detect lower rectal cancers. We report exposure rates to early detection tests, which may include men who were truly being screened or received a test in a case-finding scenario. Additional questionnaire sections addressed demographics and comorbid conditions.

Statistical analyses

We used chi-square statistics to compare proportions of men previously exposed to each early detection test. All analyses were performed using STATA version 7.0 (Stata Corp., College Station,Tex). All tests were two-sided with a significance level at 0.05.

Results

Table 1 shows the demographic characteristics of our cohort of 366 men. The median age was 54.8 years (33-80 years).

Of the men who answered the questionnaire, most men (90.2%) were French speaking, 226 (76.4%) were Caucasian, 153 (42.7%) were married, and 134 (40.8%) had an annual household income between 30001 and 75000 Canadian dollars. Most men (221; 63.3%) had a full-time job and 95 men (26.8%) had a college education.

TABLE 1. **Demographics of 366 participants in the 2004 University of Montreal Prostate Cancer Awareness Days**

Characteristic	Number of patients (%)
Mother tongue	
French	330 (91.4)
English	25 (6.9)
Other	6 (1.7)
Not reported	5 (1.4)
Ethnicity	
Caucasian	226 (76.4)
African-American	14 (4.7)
Other	56 (18.9)
Not reported	70 (19.1)
Marital status	
Married	153 (42.7)
Never married	108 (30.2)
Divorced	58 (16.2)
Separated	26 (7.3
Widower	13 (3.6)
Not reported	8 (2.2)
Matrimonial status	
Spouse or partner	210 (59.5)
In a significant relationship	36 (9.8)
Not in a significant relationship	107 (29.2)
Not reported	13(3.6)
Annual household income (Can $)	
0-30000$	108 (32.9)
30001-75000$	34 (40.8)
More than 75000$	86 (22.5)
Not reported	38 (10.4)
Education	
Elementary school	36 (10.1)
High school	86 (24.2)
High school graduate	73 (20.6)
College	95 (26.8)
College graduate	65 (18.3)
Not reported	11 (3.0)
Job status	
Full-time	221 (63.3)
Part-time	21 (6.0)
No job or disabled	27 (7.7)
Retired	80 (22.9)
Not reported	17 (4.6)
Comorbidity	
Diabetes	22 (6.0)
Heart attack, chest pain	28 (7.7)
Stroke	8 (2.2)
Amputation	2 (0.5)
Circulatory problems in legs or feet	32 (8.7)
Asthma, emphysema, breathing problems	37 (10.1)
Stomach ulcer, irritable bowel	32 (8.7)
Kidney disease	15 (4.1)
Major depression	23 (6.3)
Seizures	3 (0.8)
Alcoholism or alcohol problems	23 (6.3)
Drug problems	8 (2.2)
Not reported	0 (0)

Smoking was reported by 209 participants (57.1%). The most prevalent comorbidity was asthma, emphysema or other breathing problems (n = 37, 10.1%) followed by peripheral circulatory problems (n = 32, 8.7%).

Table 2 shows the rates of exposure to previous tests for early detection of prostate cancer and colorectal cancer. Information about age was missing in 20 participants leaving 347 patients with complete data.

TABLE 2. **Rates of exposure to previous screening tests for prostate cancer and colorectal cancer***

TABLE 2a. **Individual screening tests**

Age group	Number of patients	FOBT	Sigmoidoscopy	PSA test	DRE
< 50	110	15 (13.6%)	13 (11.8%)	9 (8.2%)	36 (32.7%)
50-69	210	37 (17.6%)	39 (18.6%)	73 (34.8%)	132 (62.9%)
≥ 70	26	4 (15.4%)	8 (30.8%)	7 (25.9%)	15 (55.5%)
All	346*	57 (16.4%)	61 (17.6%)	89 (25.6%)	184 (53.0%)

*among 346 men who participated in the 2004 University of Montreal Prostate Cancer Awareness Days
FOBT = Fecal occult blood test; PSA = Prostate specific antigen; DRE = Digital rectal examination

TABLE 2b. **Combined screening tests**

Age group	Number of patients	FOBT and/or Sigmoidoscopy	PSA and/or DRE
< 50	110	16 (14.5%)	40 (36.4%)
50-69	210	56 (26.7%)	132 (62.9%)
≥ 70	26	9 (34.6%)	14 (53.8%)
All	346*	81 (23.4%)	186 (53.8%)

*among 346 men who participated in the 2004 University of Montreal Prostate Cancer Awareness Days
FOBT = Fecal occult blood test; PSA = Prostate specific antigen; DRE = Digital rectal examination

Table 2a shows that previous exposure to DRE, PSA, FOBT, and sigmoidoscopy, were reported by 132 men (62.9%), 73 men (34.8%), 37 men (17.6%), and 39 men (18.6%), respectively, in the target population of men between 50 to 69 years of age. Chi square comparisons of FOBT or sigmoidoscopy versus DRE or PSA found statistically significant differences (all p-values ≤ 0.003). Among men younger than 50 years old, previous exposure to DRE, PSA, FOBT, and sigmoidoscopy were reported by 36 men (32.7%),

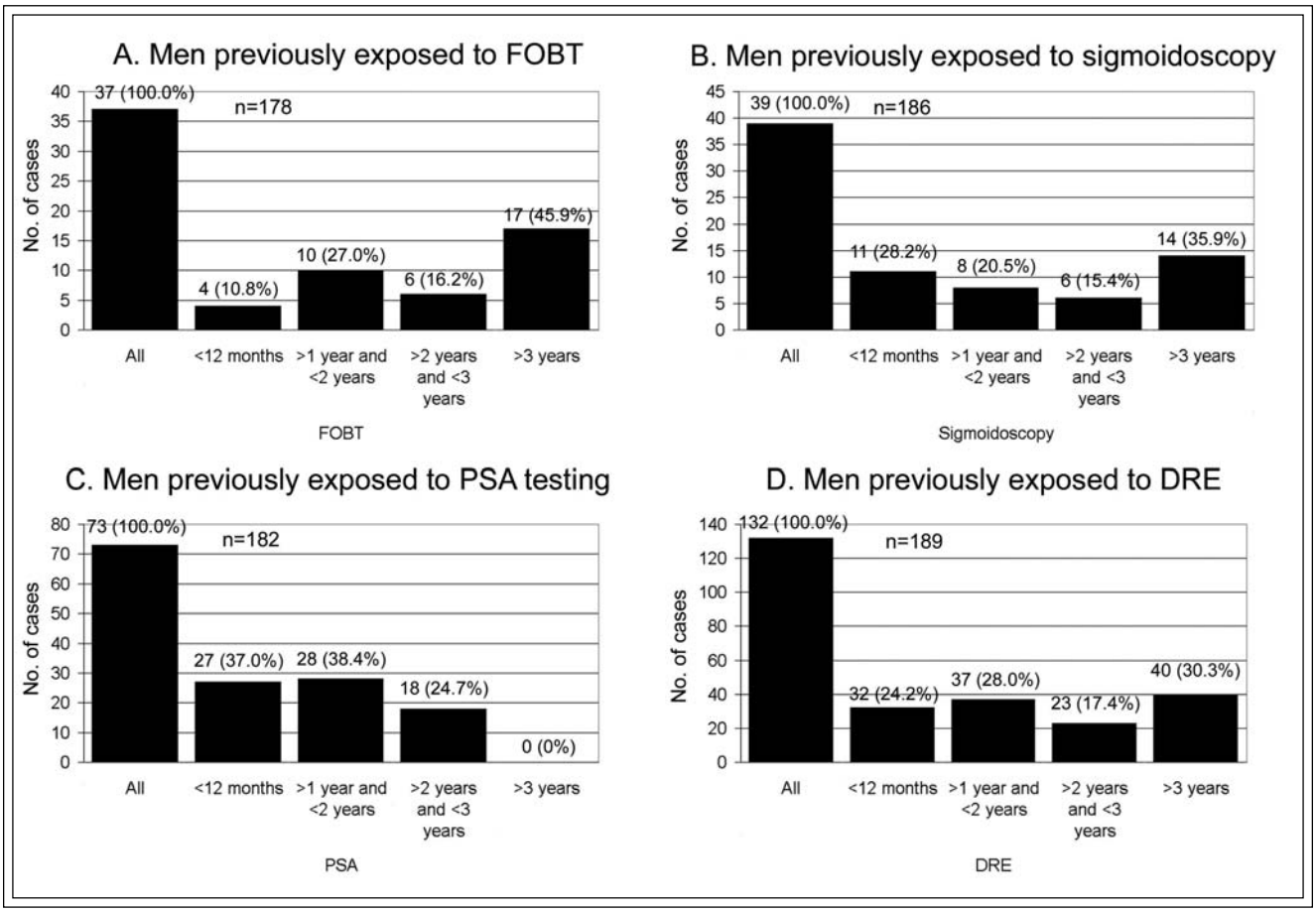

Figure 1a, b, c, d. Proportion of 50-69 year old men previously exposed to prostate cancer and colorectal cancer early detection efforts stratified by exposure time to last examination.
The x-axis shows the proportion of previously exposed men to each screening test. The y-axis shows the time range of last exposure to each screening test.
FOBT = Fecal occult blood test; PSA = Prostate specific antigen; DRE = Digital rectal examination

9 men (8.2%), 15 men (13.6%), and 13 men (11.8%), respectively. Among men older than 70 years old, 15 men (55.5%) were previously exposed to DRE, 7 men (25.9%) to PSA, 4 men (15.4%) to FOBT and 8 men (30.8%) to sigmoidoscopy. Among all men regardless of age, previous exposures to FOBT, sigmoidoscopy, PSA, and DRE were reported by 57 men (16.4%), 61 men (17.6%), 89 men (25.6%), and 184 men (53%), respectively; chi square comparisons of FOBT or sigmoidoscopy versus DRE or PSA found statistically significant differences($p < 0.001$). Overall, FOBT and sigmoidoscopy screening increased with age. Of all age strata, previous PSA and DRE testing was highest in men aged 50-69 years and was 2- to 3-fold higher than colorectal cancer screening.

Table 2b shows that one or both screening tests for colorectal cancer were performed in 81 men (23.4%), whereas one or both screening tests for prostate cancer were performed in 186 men (53.8%).

Figure 1 shows the previous exposure to each screening test in the 50- to 69-year- old men. Figures 1a and 1b show that most men had their last colorectal cancer screening test done some time more than 2 to 3 years earlier: 23 men (62.2%) had a FOBT and 20 men (51.3%) had a sigmoidoscopy. Figures 1c and 1d show that 52.3% of the men ($n = 95$) and 75.3% of the men ($n = 69$) were exposed to screening for prostate cancer in the form of DRE and PSA testing some time more than 2 to 3 years earlier.

Discussion

Our findings demonstrate that 23.4% of the men in our cohort were exposed to tests to detect colorectal cancer and 53.8% of the men underwent early detection tests for prostate cancer. The highest rates of exposure to prostate cancer screening tests were among men aged 50 to 69; their rates for exposure to previous PSA tests (34.8%) and DRE (62.9% were approximately 2- to 3-fold higher than rates for early detection tests for colorectal cancer. In addition, in this age group, the most recent exposure to early detection efforts more often focused on prostate cancer than on colorectal cancer. For example, during the previous 2 years, 75.4% of the men had undergone a PSA test and 52.2% of the men had undergone a DRE, but only 37.8% of the men had undergone a FOBT and 48.7% of the men had undergone sigmoidoscopy, Figure 1. The same trend was seen in younger (< 50) and older (> 70) individuals. In men younger than 50 years and in those older than 70 years, DRE (32.7%, 55.5%) and PSA (8.2%, 25.9%) exposure were up to 3- to 4-fold higher than colorectal cancer early detection examinations.

If evidence-based practice was followed, we would expect to find the opposite results: more individuals would be exposed to screening tests for colorectal cancer than for prostate cancer. Based on the current evidence, colorectal cancer screening tests should be most prevalent among men aged 50-69, who may derive the most benefit from early detection. It is an alarming public health issue that the overall rate of screening tests for colorectal cancer for men in this age group falls below what is ideal. Our findings may seem counterintuitive, however, they are consistent with results from the United States. Sirovich et al recently reported that in 49315 men over age 50, 75% had received a PSA screening examination but only 63% had received a screening test for colorectal cancer (FOBT or sigmoidoscopy). They also reported higher rates of up-to-date PSA tests (57%) compared to colorectal cancer screening (23%). In their cohort, previous exposure rates to PSA tests for prostate cancer screening increased with age; the highest rates (82%) were seen in men who were older than 80. The highest rates of exposure to FOBT and colonoscopy were reported for men between 70- and 79-years-old.[17] Carlos et al recently reported similar findings, where significantly more patients over 50 years received a PSA test than a colorectal cancer screening test ($p < 0.002$).[18] Our findings regarding exposure to previous early detection test for prostate cancer and colorectal cancer in Canadian men are comparable with these two recent studies from the United States and demonstrate an even more pronounced difference in favor of prostate cancer screening tests. This is particularly surprising in the Canadian equal-access healthcare system, where the use of diagnostic tests or early detection efforts is generally not discouraged and it is not associated with financial disincentives. However, this pronounced difference may also be explained by the fact that our reported proportions do not distinguish between men who were being screened and those who received a test in a case-finding scenario.

Although colorectal cancer screening reduces cancer-specific death rates,[10-16] FOBT and sigmoidoscopy are clearly not broadly applied in our cohort. Conversely, PSA tests and DRE are used more liberally. Compared to PSA or DRE tests, endoscopy and FOBT rates are performed between 2 to 3 times less often. This may actually represent a sufficient number of procedures, given the recommended time interval of every 5 to 10 and 1 to 2 years, respectively.[13-17] Despite increasing indirect evidence of the value of using the PSA test to screen for prostate cancer and to decrease prostate cancer-specific mortality [4-6] this is not universally

accepted.[7,8] The established benefit of colorectal cancer screening would be expected to result in widespread utilization. Thus, overall screening for colorectal cancer would be expected to be greater than for prostate cancer. However, the opposite is true for Canadian men.

Several explanations might account for the discrepancy between our findings and what would be expected according to evidence-based use of colorectal cancer or prostate cancer screening tests. Individual preference, motivation, and fear may contribute to different rates of exposure to cancer screening tests. These differences might occur at the patient level or physician level or both. These may be further compounded by fear of disease or medico-legal considerations. Moreover, men might accept a simple blood test or DRE more readily than they would accept an invasive procedure such as sigmoidoscopy. Additionally, the application route of the FOBT might represent an inconvenience to some men. In recent years, despite the advent of advertisements for colorectal cancer testing awareness of prostate cancer screening has increased more rapidly.[19] Prostate cancer prevalence rates are three times in higher than those for colorectal cancer in men over 40 years of age.[1] Therefore, men might perceive themselves to be at a higher risk of prostate cancer. Study limitations include the fact that the sample size (n = 346) was relatively small. Nonetheless, we showed a statistically significant difference in exposure rates to prostate cancer screening tests vs colorectal cancer screening tests for all men ($p < 0.001$) and for men age 50 to 69- years old, the target population ($p < 0.05$). Moreover, there may be a sampling bias in that participants of a Prostate Cancer Awareness Day may have more interest in prostate cancer than colorectal cancer. This may increase the rate of exposure to prostate cancer screening that was found. However, it could also be postulated that an informed, health-conscious and prevention-oriented individual would not only seek prostate cancer screening but would also seek colorectal cancer screening. Additionally, we applied a self-administered questionnaire which Hall[20] and colleagues compared to a medical record audit. They reported that recall bias could translate into an overestimation of the actual screening rate by 20%-50%. This bias should equally affect both types of screening tests, but perhaps men are more likely to remember the unpleasant experience of sigmoidoscopy or of FOBT, than the less unpleasant experience of a PSA blood test or an office-based DRE. Such selective recall would favor colorectal screening and within the current study would favor the null hypothesis. Therefore, it is unlikely that recall of prostate cancer screening tests was better than recall of colorectal cancer tests. Lastly, we were not able to assess men who chose not to participate in this questionnaire. Possibly, these individuals may have had different exposures to screening tests than those reported by the questionnaire participants.

Conclusions

In our cohort of asymptomatic Canadian men, the exposure rate to screening tests for colorectal cancer is less than ideal. In men aged 50 to 59, exposure to PSA and DRE screening tests for prostate cancer was more prevalent than exposure to sigmoidoscopy testing for colorectal cancer. These findings suggest that PSA testing is widely used despite the ongoing controversy about whether PSA screening reduces the rate of prostate cancer-specific mortality. Thus some men who are screened for prostate cancer might be exposed to unnecessary prostate cancer diagnosis and/or treatment. This is worrisome from a public health perspective. Finally, efforts for early detection of prostate cancer might induce anxiety and fear of a positive diagnosis. Taken together, these considerations are important and should prompt clinicians to inform patients of their risk of prostate cancer and the benefits and risks of screening. □

References

1. Canadian Cancer Society/National Cancer Institute of Canada: Canadian Cancer Statistics 2007.
2. Jemal A, Siegel R, Ward E, Murray T, Xu J, Thun MJ. Cancer statistics 2007. *CA Cancer J Clin* 2007;57:43-66.
3. Mettlin CJ, Murphy GP, Ho R, Menck HR. The National Cancer Database report on longitudinal observations on prostate cancer. *Cancer* 1996;77:2162-2166.
4. Labrie F, Candas B, Dupont A, Cusan L, Gomez JL, Suburu RE, Diamond P, Levesque J, Belanger A. Screening decreases prostate cancer death: first analysis of the 1988 Quebec prospective randomized controlled trial. *Prostate* 1999;38:83-91.
5. Candas B, Cusan L, Gomez JL, Diamond P, Suburu RE, Levesque J, Brousseau G, Belanger A, Labrie F. Evaluation of prostatic specific antigen and digital rectal examination as screening tests for prostate cancer. *Prostate* 2000;45:19-35.
6. Bartsch G, Horninger W, Klocker H, Reissigl A, Oberaigner W, Schonitzer D, Severi G, Robertson C, Boyle P; Tyrol Prostate Cancer Screening Group. Prostate cancer mortality after introduction of prostate-specific antigen mass screening in the Federal State of Tyrol, Austria. *Urology* 2001;58:417-424.
7. Hankey BF, Feuer EJ, Clegg LX, Hayes RB, Legler JM, Prorok PC, Ries LA, Merrill RM, Kaplan RS. Cancer surveillance series: interpreting trends in prostate cancer—part I: Evidence of the effects of screening in recent prostate cancer incidence, mortality, and survival rates. *J Natl Cancer Inst* 1999;91:1017-1024.
8. Feuer EJ, Merrill RM, Hankey BF. Cancer surveillance series: interpreting trends in prostate cancer—part II: Cause of death misclassification and the recent rise and fall in prostate cancer mortality. *J Natl Cancer Inst* 1999;91:1025-1032.

9. Smith RA, Cokkinides V, Eyre HJ. American Cancer Society Guidelines for the Early Detection of Cancer, 2005. *CA Cancer J Clin* 2005;55:31-44.
10. Mandel JS, Bond JH, Church TR, Snover DC, Bradley GM, Schuman LM, Ederer F. Reducing mortality from colorectal cancer by screening for faecal occult blood. Minnesota Colon Cancer Control Study. *N Engl J Med* 1993;328(19):1365-71. Erratum in: *N Engl J Med* 1993;329:672.
11. Kronborg O, Fenger C, Olsen J, Jorgensen OD, Sondergaard O. Randomised study of screening for colorectal cancer with faecal-occult-blood test. *Lancet* 1996;348:1467-1471.
12. Hardcastle JD, Chamberlain JO, Robinson MH, Moss SM, Amar SS, Balfour TW, James PD, Mangham CM. Randomised controlled trial of faecal-occult-blood screening for colorectal cancer. *Lancet* 1996;348:1472-1477.
13. Ransohoff DF, Sandler RS. Clinical practice. Screening for colorectal cancer. *N Engl J Med* 2002;346:40-44.
14. Winawer SJ, Fletcher RH, Miller L, Godlee F, Stolar MH, Mulrow CD, Woolf SH, Glick SN, Ganiats TG, Bond JH, Rosen L, Zapka JG, Olsen SJ, Giardiello FM, Sisk JE, Van Antwerp R, Brown-Davis C, Marciniak DA, Mayer RJ. Colorectal cancer screening: clinical guidelines and rationale. *Gastroenterology* 1997;112:594-642.
15. Winawer SJ, Zauber AG. Colonoscopic polypectomy and the incidence of colorectal cancer. *Gut* 2001;48:753-754.
16. Selby JV, Friedman GD, Quesenberry CP Jr, Weiss NS.A case-control study of screening sigmoidoscopy and mortality from colorectal cancer. *N Engl J Med* 1992;326:653-657.
17. Sirovich BE, Schwartz LM, Woloshin S. Screening men for prostate and colorectal cancer in the United States: does practice reflect the evidence? *JAMA* 2003;289:1414-1420.
18. Carlos RC, Underwood W 3rd, Fendrick AM, Bernstein SJ. Behavioral associations between prostate and colon cancer screening. *J Am Coll Surg* 2005;200:216-223.
19. Crawford ED, DeAntoni EP, Etzioni R, Schaefer VC, Olson RM, Ross CA. Serum prostate-specific antigen and digital rectal examination for early detection of prostate cancer in a national community-based program. The Prostate Cancer Education Council. *Urology* 1996;47:863-869.
20. Hall HI, Van Den Eeden SK, Tolsma DD, Rardin K, Thompson T, Hughes Sinclair A, Madlon-Kay DJ, Nadel M. Testing for prostate and colorectal cancer: comparison of self-report and medical record audit. *Prev Med* 2004;39:27-35.