Colorectal cancer screening in Health Examination Centers
Evaluation in 50-74-year-old subjects between 1998 and 2003

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SUMMARY

Objectives — The aim of this study was to describe the results of colorectal cancer screening performed in the Health Examination Centers of the French general health insurance system.

Methods — The population consisted of 1 262 833 subjects (52.6% men) aged 50 to 74 years old who attended periodic health consultations from 1998 to 2003 in 89 Health Examination Centers in France. Subjects with increased risk for colorectal cancer and subjects with a positive fecal occult blood test (Hemoccult II®) were invited to undergo colonoscopy. Subsequent follow-up and diagnostic data were collected.

Results — Prior screening practices for colorectal cancer (recent colonoscopy or fecal occult blood test, local screening campaign) were noted in 18% of the subjects attending Health Examination Center consultations. High risk for colorectal cancer (familial or personal factor) without ongoing surveillance or prior screening was observed in 3% of the study population. A fecal occult blood test was proposed to 79% of the population and of them, 89% effectively performed the test: 3.2% of tests were positive. A follow-up protocol was initiated for 63,357 subjects. A colonic exploration was performed in 69% of high-risk subjects and enabled detection of cancer in 85 and adenomas in 1683. A colonic exploration was performed in 88% of subjects with a positive fecal occult blood test and enabled detection of 674 cancers (positive predictive value of fecal occult blood test (PPV) = 4.7%) including 174 Dukes A, and 2618 adenomas (PPV = 18%) including 776 adenomas measuring more than 10 mm (PPV = 5.4%).

Conclusion — This study confirms the importance of implementing organized screening practices within Health Examination Centers before undertaking a generalized screen campaign targeting the entire French population.

Introduction

In France, about 15% of all patients with cancer have colorectal cancer (CRC). In 2000, 36,500 new cases were detected and nearly 16,500 people died of CRC. Depending on the localization, the 5-year survival ranges from 49% to 53% [1]. When diagnosed early, precancerous lesions are potentially curable, with preserved life expectancy, and resection of adenomas has a preventive effect. Screening for colorectal cancer has thus become a major public health objective [2]. Organized screening campaigns for CRC, already under way in 23 administrative districts in France, is being extended to other districts in 2006 [3].

The operating program of the Health Examination Centers of the French general health insurance system, promulgated by decree on July 20, 1992 [4], includes free periodic health examinations for all beneficiaries and their dependants. More than 650,000 health examinations are performed annually in 89 Health Centers in France. These health examinations are modulated as a function of the subject’s age, gender, and risk factors using standard procedures to guarantee harmonious practices. Since 1993, all 89 Health Centers included routine screening for CRC as part of the health examinations using standard practices established as a function of risk for CRC in compliance with the ANAES consensus conference recommendations [5].
We report the results of organized screening for CRC as conducted by the French Health Examination Centers for the period 1998-2003 following the recommendations of the Consensus Conference. We collected data on participation and management practices and noted the characteristic features of cancers and adenomas detected.

**Patients and methods**

**Study population**

The present results concern the population of subjects who had a health examination in one of the 89 Health Centers Examination during the period 1998-2003. This population included 1,262,833 individuals aged 50-74 years. Age and gender distributions are given in table I.

**Methodology**

Screening tests for CRC were proposed for all subjects consulting the Health Centers. The screening test was either a fecal occult blood test (Hemoccult II$^\text{®}$) or colonoscopy as indicated by the level of risk determined at the periodic examination using the consensus conference criteria [5]. Subjects with a high risk of CRC — defined as presence of a personal risk factor (history of CRC or adenoma measuring > 1 cm, adenoma with a villous component, chronic inflammatory bowel disease (ulcerative colitis or Crohn’s disease) or a familial risk factors (first degree relative with CRC before the age of 65 years or two first degree relatives with CRC irrespective of age at diagnosis) — and who were not currently followed for that risk were advised to have a colonoscopy.

A fecal occult blood test was proposed to all subjects aged 50-74 years with a medium risk of CRC, excepting those who had had a normal total colonoscopy during the last five years, those who had a fecal occult blood test at an earlier health examination performed in the center, and those residing in districts where an organized screening campaign for CRC had been or was being implemented.

**Health examination follow-up protocol**

Subjects with a high risk of CRC not under current medical follow-up for that risk or subjects with a medium risk who had a positive fecal occult blood test were invited to consult their primary care physician with the objective of undergoing a colonoscopy. These subjects were beneficiaries of a special health examination follow-up protocol entirely financed by the health insurance system. This follow-up protocol was designed to enable feedback to the Health Center of information collected within the next six months by the primary care physician. Information collected concerned management practices (colonoscopy or not, date of the colonoscopy procedure, quality of the colon preparation, level reached during the colonoscopy) and the results of complementary examinations (presence or not of polyps with size and type, or cancer or not with stage/localization/treatment). This data collection protocol contributed to an audit of Health Center activities (CRC screening practices and other activities). If the subject did not have a primary care physician, test results were sent directly to the subject who was advised to consult a physician.

**Data collected**

Data collected during the periodic health examination and via the health examination follow-up protocol were entered into the Health Examination Center database (SAGES) for automatic processing. Information on level of risk of CRC and any prior colonoscopy was recorded by the examining physician during the periodic health examination.

Fecal occult blood tests (Hemoccult II$^\text{®}$) were performed in compliance with the standard technical guidelines published by Cetol [6] which are the same as used for the screening campaigns conducted in the different administrative districts.

The primary care physician (or the patient) addressed information collected during the health examination follow-up protocol to the Health Center where data were recording in the database using a precise coding system established by standard guidelines [6].

The rate of positive fecal occult blood tests was defined as the proportion of positive tests among persons who effectively participated in the screening tests. The positive predictive value (PPV) of fecal occult blood test screening in patients with medium or high risk was defined as the proportion of subjects with cancers or adenomas detected among the population of subjects who underwent a colonoscopy.

**Results**

**Screening practices**

CRC screening practices performed in the population of subjects attending Health Examination Centers for the period 1998-2003 are presented in figure 1.

Screening tests for CRC were not performed in 18.3% of subjects aged 50-74 years because they had recently undergone colonoscopy or had a fecal occult blood test or because they resided in a district where a CRC screening campaign was being conducted. High risk of CRC (related to a familial or personal factor) and absence of ongoing surveillance for such risk was found in 2.9% of the study population. A health examination follow-up protocol was initiated for these subjects. A fecal occult blood test was proposed for the other subjects, i.e. 78.8% of the participating population. Among the subjects invited to have a fecal occult blood test, 89.3% effectively performed the test; 3.2% of the tests were positive. A health examination follow-up protocol was initiated for 26,108 subjects with a positive fecal blood test, i.e. 2.1% of the target population.

In all, a health examination follow-up protocol was initiated for 5% of the subjects aged 50-74 years who had a health examination at Health Examination Centers during the period 1998-2003, i.e. 63,357 persons who were invited to consult their general practitioner and subsequently underwent colonoscopy.

**Subsequent management of subjects with a health examination follow-up protocol**

The information feedback obtained via the health examination follow-up protocol is presented by level of risk and by gender in table II.

Exploitable feedback was obtained for 50% of subjects with a high risk of CRC. This rate was higher (63%) among medium risk subjects whose follow-up protocol was initiated because of a positive fecal occult blood test ($P < 0.001$) and varied 1 and 2% between men and women in both high and medium-risk subjects ($P < 0.001$ and $P < 0.01$ respectively). The rate of exploitable feedback increased with age. In the high-risk subjects, the rate was 43% for the 50-54 years age group and 59% for the > 70 years age group in men ($P < 0.001$) and 42% and 58% respectively in women ($P < 0.001$). In the medium-risk subjects, the corresponding rates were 58% and 63% for men ($P = 0.02$) and 59% and 64.5% for women ($P < 0.001$).

According to available data, colonic exploration, generally colonoscopy (95% of subjects), was performed more frequently among medium-risk subjects with a positive fecal occult blood test than in high-risk subjects (88% vs 69%, $P < 0.001$). Age and gender did not affect the proportion of subjects undergoing colonoscopy.

**Results of colonic explorations**

Colonic explorations did not disclose any anomaly in 54% of high-risk subjects and in 41% of medium-risk subjects ($P < 0.001$).

**Abbreviations:**

CRC : Colorectal cancer
SAGES : Système automatique de gestion des examens de santé (automatic system for managing health examination)
Table I. – Distribution of subjects by age and gender compared with the general population according to the French National Statistics Agency (INSEE).

<table>
<thead>
<tr>
<th></th>
<th>MEN</th>
<th></th>
<th>WOMEN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>General population %</td>
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<tr>
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<td>209 577</td>
<td>31.5</td>
<td>28.3</td>
<td>190 948</td>
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<td>55-59 yrs</td>
<td>172 383</td>
<td>25.9</td>
<td>19.5</td>
<td>148 613</td>
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<td>60-64 yrs</td>
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<td>20.6</td>
<td>18.7</td>
<td>118 125</td>
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<tr>
<td>65-69 yrs</td>
<td>98 231</td>
<td>14.8</td>
<td>18.1</td>
<td>94 143</td>
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<tr>
<td>70-74 yrs</td>
<td>47 576</td>
<td>7.2</td>
<td>15.4</td>
<td>46 647</td>
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<td>Total</td>
<td>664 357</td>
<td>100</td>
<td>100</td>
<td>598 476</td>
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Colorectal cancer was detected in 85 high-risk subjects, i.e. in less than 1% of those explored, with no significant difference by gender. Colorectal cancer was detected in 674 medium-risk subjects (5% of those explored), including 174 with Dukes A cancers. An adenoma was detected in 13.3% of the subjects in the high-risk group and in 18% in the medium-risk group. Adenomas measuring more than 10 mm were observed more often in subjects who had a positive fecal occult blood test (Table II).

The prevalence of cancers and adenomas was higher among men than among women (P < 0.001) and increased significantly with age (P < 0.02).

Discussion

The Health Examination Centers of the French general health insurance system have participated in CRC screening programs...
for more than 15 years. The Health Center physician counsels subjects whose familial or personal history suggests a high or very high risk of CRC to have a colonoscopy if they were not currently under regular surveillance. If the subject has an medium risk, a fecal occult blood test is performed during the health examination [7]. If this test is positive, colonoscopy is recommended. Since 1998 [ANAES consensus conference] it is recommended to renew the fecal occult blood test every two years [5].

Screening should be conducted under strict conditions respecting indispensable precautions detailed in the operating procedures for district campaigns. Thus in order to maintain screening quality, the Cetaf published guidelines for harmonious reading of the fecal occult blood test used in Health Screening Centers (Hémoccult II®) and for implementing recommendations for district campaigns [6].

Between 1998 and 2003, these practices concerned more than 1,260,000 beneficiaries aged 50-74 years of the French health insurance system. Three percent of the persons attending Health Screening Center consultations had a high risk of CRC without ongoing surveillance; a fecal occult blood test was performed for 79%. In 1996-1997, before implementation of organized screening, a fecal occult blood test was performed in 93% of persons attending Health Screening Center consultations [7]. As generalized screening becomes more widespread, the proportion of subjects examined at Health Centers who would benefit from a fecal occult blood test will decline. It will however be important to check whether or not persons residing in a district with an organized screening campaign actually had the test or not, and if not to invite them to participate.

The participation rate for the fecal occult blood test was 89% among medium-risk subjects. This is a particularly high rate compared with the 43% to 62% reported in earlier French surveys [8-10]. Since all Health Center examinations are conducted on a voluntary basis, the information delivered with the test would probably explain the satisfactory participation rate. The rate of participation in bi-annual screening tests sent by mail would also be favored by patient awareness of the importance of screening, which is reinforced by the health examination; in the population attending Health Center consultations, the participation was greater than 58% after three campaigns [11], a rate which is considered as acceptable for achieving a reduction in CRC-related mortality to the order of 14-18% [12-14]. The way the test is presented, the physicians’ personal implication and role, and the quality of physician training are important determinants of population participation in a CRC screening program [15]. The positive rate for the fecal occult blood test was 3.2%, which is within the range recommended for a selective test performed in a large population [5].

The satisfactory participation rate for the screening test is however insufficient to evaluate the efficacy of the program. It is also important to determine whether a colonoscopy was performed after a positive fecal occult blood test or after discovery of high or very high risk factors in subjects not already under regular surveillance. Despite the specific follow-up protocol insti-

<table>
<thead>
<tr>
<th>Table II – Follow-up of subjects after indication for colonoscopy.</th>
<th>Suite d’examen de santé en cas d’indication d’une coloscopie.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of risk</strong></td>
<td><strong>High risk subjects</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Men</strong></td>
</tr>
<tr>
<td></td>
<td><strong>N</strong></td>
</tr>
<tr>
<td>Follow-up protocol initiated (N)</td>
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<tr>
<td>Feedback</td>
<td>10 028</td>
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<tr>
<td>Colorectal exploration (a)</td>
<td>6 748</td>
</tr>
<tr>
<td>colonoscopy (b)</td>
<td>6 620</td>
</tr>
<tr>
<td>Results of colorectal explorations</td>
<td></td>
</tr>
<tr>
<td>Polyps (no details) (b)</td>
<td>737</td>
</tr>
<tr>
<td>Non adenomatous polyps (b)</td>
<td>720</td>
</tr>
<tr>
<td>Adenomas (b)</td>
<td>1 087</td>
</tr>
<tr>
<td>adenomas &lt; 10 mm</td>
<td>580</td>
</tr>
<tr>
<td>adenomas ≥ 10 mm</td>
<td>141</td>
</tr>
<tr>
<td>adenomas (size not detailed)</td>
<td>366</td>
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<tr>
<td>Cancers (b)</td>
<td>42</td>
</tr>
<tr>
<td>Dukes A</td>
<td>14</td>
</tr>
<tr>
<td>Dukes B</td>
<td>5</td>
</tr>
<tr>
<td>Dukes C</td>
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<tr>
<td>metastatic</td>
<td>1</td>
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<tr>
<td>type not detailed</td>
<td>22</td>
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</tbody>
</table>

(a) Percent of exploitable responses.
(b) Percent of performed colorectal explorations.
The present results do not of course mean that the subjects did not seek care after the health examination but they do not allow an exhaustive evaluation of subsequent follow-up. This difficulty in collecting information should incite a common reflection about our data collection system which should be more comprehensive. Any interpretation of the management figures presented here must take into consideration this methodological limitation.

There is also the question of the 3% of the examined persons who had a high risk of CRC but were not followed regularly. This finding recalls that of a survey conducted in Alsace (Haut Rhin) in 2002 which highlighted general practitioners’ unawareness concerning the consensus conference recommendations and the consequent lack of harmonious practices [17]. This emphasizes the importance of information or training on CRC screening designed for health care professionals. It is often difficult to obtain detailed information about the subjective notion of a history of CRC or adenomatous polyps; this topic should be explored systematically during consultations in order to determine the level of risk of CRC.

In our study, the acceptability of colonoscopy was satisfactory since the procedure was performed in 84% of subjects with a positive fecal occult blood screening test and for whom information feedback was available. This is in agreement with the rate reported for various populations [16] or during biannual screening programs [11] and is generally comparable with screening campaign rates [8, 18]. However if the number of subjects who underwent a colonoscopy is compared with the number of subjects counseled to consult for follow-up examinations after a positive fecal occult blood test, the rate was only 55% which is lower than that observed in the SUVIMAX study where 65% of subjects with a positive test had a colonoscopy [19]. It can be recalled that a 90% rate of colonoscopic procedures after a positive screening test is one of the criteria used to evaluate the quality of a CRC screening program. Among the subjects classified in the high risk category and for whom there was feedback from the follow-up protocol, the rate of colonoscopy was only 67%.

The low rate of information feedback and the insufficient quality of the information collected, which did not enable precise disease codification, jeopardized the estimate of the positive predictive value. Nevertheless, the rough estimate gave a positive predictive value of 4.7% for a positive fecal occult blood test to predict CRC and 6% to predict adenomas measuring more than 10 mm. These results are comparable with those observed in earlier studies conducted in Health Centers where the follow-up rate was close to 90% [7, 11, 16]. These positive predictive values are however lower than those observed in other surveys in France or other countries [8, 12, 13, 17]. The differences could be related to the particular population consulting Health Centers: lower prevalence, different age structure, younger than the general population with a lower incidence of CRC than the general population (for example 7.2% of the men aged 70-74 years in our population while the rate is 15.4% in the general population).

The positive predictive value of screening, based on the notion of high or very high risk without follow-up for adenomas measuring more than 10 mm and cancer was 2.3%. This is a very low value compared with that in the medium-risk population. It could be related to a lack of specificity of the notion of risk with numerous classification errors, perhaps by excessive precaution or by lack of information. It also highlights the usefulness of screening with a fecal occult blood test. This rate raises the question of digestive endoscopy practices in France: a recent survey [20] demonstrated that for more than one million colonoscopies performed in 2004, 30% were part of a cancer screening procedure, the majority in subjects with a familial history (8 out of 10 cases) and more rarely a positive fecal occult blood test (1 out of 10 cases).

In conclusion, our study, based on data collected prior to the implementation of local screening campaigns in the different administrative districts in France, presents findings obtained during standardized health examinations. The results highlight the precursor role of Health Screening Centers for organized CRC screening, both in medium and high-risk populations. These findings give insight into future large-scale programs to be conducted throughout France.

ACKNOWLEDGEMENTS - The authors thank the staff of the French Health Examination Centers for recruiting the population and collecting data.

REFERENCES


