

REVIEW

Review of the evidence for a colorectal cancer screening programme in elderly people

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Abstract

Colorectal cancer is a major public health issue, contributing to 16,000 UK deaths per year, most of these in the elderly population. A new NHS screening programme for colorectal cancer in people over 60 is being introduced across the country throughout 2009. The aim of this research was to review the current literature on colorectal cancer screening and determine how much of the evidence for screening is applicable to elderly people. MEDLINE database was searched for articles published between 1990 and 2007, using search terms of colorectal neoplasms, mass-screening, faecal occult blood, colonoscopy and sigmoidoscopy. Articles for inclusion were limited to those in English and those including older adults. The results showed that evidence for colorectal cancer screening in general has been well researched. However, little was found specifically on screening for elderly people, or looking at the different benefits and limitations in older people compared to younger people. Very few health agencies suggested an upper age limit for screening. In conclusion, there is very little research on screening for colorectal cancer specifically in elderly people, although many health authorities advise such screening. The health needs of an older population are different to those of middle-aged people and at present the screening programmes do not appear to reflect this.

Keywords: *elderly, colorectal, cancer, screening, review*

Introduction

Colorectal cancer is a major public health issue. The lifetime probability that a person will develop colorectal cancer is ~6% and it contributes to 16,000 UK deaths per year.

The chance of developing colorectal cancer increases with age, being rare <50 years. The incidence per 100,000 in 55–59 year olds is 102.6 for men and 76.7 for women; in 70–74 year olds it is 320.5 for men and 226.9 for women. In people >85 years, the incidence rises to 497.6 per 100,000 men and 391.5 per 100,000 women [1].

These figures are for people at average risk, defined as asymptomatic individuals over 50 with no personal or family history of colorectal cancer, no adenomatous polyps and no inflammatory bowel disease [2]. Most cases occur in such people, with just 1% of all colorectal cancers caused by inherited polyposis syndromes.

The overall 5-year survival rate with colorectal cancer is ~52%. However, survival is very dependent on the time of

diagnosis—the 5-year survival rate for people with localized disease is 84%, while for people with distant metastases is 6% [3]. Currently, 34% of cases are detected, while the cancer is still localized [4]. This suggests that screening to enable earlier detection would have a positive impact on survival rates.

Screening programmes are already in place for some sections of the population and this paper will focus on the current evidence for screening in elderly people at average risk of developing the disease. This paper aims to review the current literature on screening for colorectal cancer, particularly its application in elderly people, and to discuss the implications of these findings.

Methods

Medline database was used to search for abstracts published from 1990 to 2007 inclusive using Medical Subject Headings (MeSH) to select search terms. Methodological filters used

were English language and humans. The key search terms were colorectal neoplasms, mass-screening, faecal occult blood, colonoscopy and sigmoidoscopy. Articles only on children, adolescents and young or middle-aged adults were excluded.

In total, 251 abstracts were eligible according to search criteria, and attempts were made to obtain all full articles. Two were not obtained. Very few articles dealt with colorectal cancer screening only in elderly people. Most abstracts included several different adult age groups, including elderly people, but did not analyse this group's needs separately. Several articles made some distinction between elderly people and the rest of the population. All articles where data or discussion included people >70 years were included, whether or not they dealt with this population as a distinct group.

Results

Several issues related to colorectal cancer screening in general will be discussed first. These topics were the prominent themes in most of the papers and an important background in assessing screening for elderly people.

The sequence of development of colorectal cancer

More than 95% of colorectal cancers develop from benign adenomatous polyps, [5] with malignant transformation usually requiring 10–35 years [6]. Therefore, early detection of these adenomas may be a good basis for screening. However, autopsy studies of people dying from causes other than colorectal cancer have found an incidence of benign colon adenomas ranging from 20% to ~50%. These studies also showed that most adenomas do not undergo malignant change, and at 80 years, the prevalence of adenomas is 75% [3]. By screening for polyps, people who may otherwise have died from unrelated causes may undergo invasive intervention for a condition they would not have developed.

Some screening tests simply detect bleeding from an adenoma, but this is an unpredictable event and does not necessarily indicate either the size of the polyp or how long it has been present: important factors in the risk of malignant transformation.

The criteria for implementation of a screening programme

The purpose of screening for colorectal cancer is to identify people who are at sufficiently high risk for development and dying from it to warrant intervention. The case for screening can be examined using World Health Organization guidelines for criteria for implementation of screening programmes [7], summarized as

1. The condition should be an important health problem.
2. A test should be available.
3. The test should be acceptable to the population.
4. Diagnostic facilities should be available.
5. The disease should have a latent stage.

6. The natural history of the disease should be understood.
7. Treatment should be available.
8. There should be a policy for whom to treat.
9. The cost of finding a case should be economically balanced in relation to medical expenditure as a whole.
10. Case finding should be a continuous process.

Facilities for diagnosis and treatment of colorectal cancer are available in the UK. There are several tests available with varying levels of sensitivity, safety and specificity and with differing levels of acceptability to people. There is a latent stage of the disease, and a well-recognized adenoma–carcinoma sequence in the natural history of large bowel cancer. The cost of treating people with colorectal cancer is fairly high £4,500 per person [8] which is comparable to other similar health problems in the older population in the UK.

Advantages and disadvantages of screening tests available for colorectal cancer

Several tests are available for screening for colorectal cancer. The advantages and disadvantages of these tests, along with any special considerations for their use in screening in elderly people, are summarized in Table 1.

Current screening recommendations

In practice, the screening tests mostly undertaken are FOBT, sigmoidoscopy and colonoscopy.

The UK NHS Bowel Screening Programme [15] currently offers screening every 2 years to everyone aged 60–69. People >70 can request a kit, but are not sent one automatically. An explanatory letter and the FOBT test are sent by post and people who return samples can expect results within 2 weeks.

This programme expects 98% of participants to get a normal result and continue routine screening. Two percent will be offered colonoscopy and 4% may initially get an unclear result and are advised to repeat the test. The predicted outcomes are that for every 1,000 people completing FOBT, ~20 will have a positive FOBT and be offered colonoscopy. Of these 20, 16 are expected to have the colonoscopy, and of them 8 are likely to have nothing abnormal detected, 6 are likely to have one or more polyps and 2 are likely to have a colorectal cancer.

The procedure for follow-up and removal of polyps depends on their number and size. It is recommended that if the person is low risk (defined as one or two small—i.e. under 1 cm—adenomas) they have another FOBT in 2 years; if they are intermediate risk (three or four small adenomas or an adenoma over 1 cm) they have three yearly colonoscopy surveillance until they have had two negative examinations; and if they are high risk (five or more adenomas or three or more adenomas of which at least one is 1 cm or bigger) they have colonoscopy after 12 months, followed colonoscopy every 3 years until they have had two negative examinations.

Recommendations differ slightly in the USA, where the American Cancer Society guidelines [16] for the standard screening for colorectal cancer recommends that people >50

Table 1. Summary of the screening tests for colorectal cancer

| Test | Advantages of test | Disadvantages of test | Considerations in screening elderly |
|---------------------------------|---|--|--|
| Faecal occult blood test (FOBT) | <ul style="list-style-type: none"> Can be carried out at home and is non-invasive High specificity (98%) Can detect tumours throughout the large bowel Acceptable to population—in five large controlled trials of FOBT in Europe and the USA compliance ranged from 53.8% to 75.2% [9] When evaluated in large-scale, long-term randomized controlled trials FOBT reduced mortality from colorectal cancer by about 16%. Repeating positive FOBT may reduce the need for follow-up colonoscopies—a study in Gothenburg found that the FOBT is positive in 5.9% of people initially but when repeated it reduced to 1.9% [10] | <ul style="list-style-type: none"> Low predictive value of the positive test (5–10%), as it simply detects bleeding and there are many other causes of bleeding Low sensitivity (50%), as not all cancers bleed. Lowenfels suggests that FOBT misses about half of all malignant large bowel tumours and most polyps [8] May be less effective for the detection of right-sided tumours Positive FOBT is followed up by colonoscopy which may cause physical health problems Positive FOBT may cause unnecessary anxiety. Certain foods (e.g. red meat) and medications (e.g. aspirin) may give a false positive result, so must be avoided for 3 days before the test | <ul style="list-style-type: none"> Diverticular disease is the most common cause of gastrointestinal bleeding and is more common in elderly people. It affects two-thirds of people >80 Colonic angiodysplasia is a common cause of gastrointestinal bleeding particularly affecting people >65 years Anticoagulant therapy increases risks of bleeding and is more commonly used in elderly people |
| Colonoscopy | <ul style="list-style-type: none"> Entire colon can be visualized Any lesions seen can be biopsied at the time of colonoscopy Adenomatous polyps can be removed before they become malignant Biopsies can be taken Cheaper than colonoscopy Does not require full-bowel preparation or sedation Risk of perforation about half that of colonoscopy [13] | <ul style="list-style-type: none"> Sedation and full-bowel preparation are necessary Risk of perforation of 1–2 per 1000 procedures. Macafee <i>et al.</i> suggest that colonoscopic screening of the UK population at age 60 would cause over 500 haemorrhages, 150 perforations and 50 deaths per year [11] Expensive. Only detects cancers in the rectosigmoid area Invasive procedure, with risk of perforation | <ul style="list-style-type: none"> Differences in opinion as to whether elderly people are more at a risk of complications. Ure <i>et al.</i> conclude that 'advanced age does not, by itself, confer increased risk to the procedure' [12], whereas Gatto <i>et al.</i> conclude 'risks of perforation increase in association with increasing age' [13] |
| Flexible sigmoidoscopy | <ul style="list-style-type: none"> Does not require full-bowel preparation or sedation Risk of perforation about half that of colonoscopy [13] | <ul style="list-style-type: none"> Only detects cancers in the rectosigmoid area Invasive procedure, with risk of perforation | <ul style="list-style-type: none"> Elderly people at greater risk of perforation [13] |
| Double-contrast barium enema | <ul style="list-style-type: none"> Entire colon can be visualized by x-rays taken after barium enema given and the colon pumped with air | <ul style="list-style-type: none"> Invasive procedure Lesions detected then require colonoscopy Lesions detected require colonoscopy Different studies report sensitivities ranging from 39% to 93% [14] Results currently only available from small-scale studies | <ul style="list-style-type: none"> Not used in screening |
| Virtual colonoscopy | <ul style="list-style-type: none"> Non-invasive, as involves radiological examination of colon with CT or MRI | <ul style="list-style-type: none"> Lesions detected then require colonoscopy Lesions detected require colonoscopy Different studies report sensitivities ranging from 39% to 93% [14] Results currently only available from small-scale studies | <ul style="list-style-type: none"> Not enough evidence for use in screening |
| DNA stool examination | <ul style="list-style-type: none"> Sensitivity high (over 90% for cancer, 80% for polyps over 1 cm diameter) Specificity high (over 90%) | <ul style="list-style-type: none"> Results currently only available from small-scale studies | <ul style="list-style-type: none"> Not enough evidence for use in screening at present |

at average risk carry out annual FOBT at home, or have a double-contrast barium enema every 5–10 years or have a sigmoidoscopy on an annual basis. If any of these methods result in a positive test, they should be followed by colonoscopy. A screening colonoscopy every 10 years is another recommendation. Updated guidelines suggest that annual FOBT should be combined with flexible sigmoidoscopy to increase the benefits of both tests [3].

Evidence for the benefits of screening for colorectal cancer

Several randomized controlled studies have been carried out which provide evidence that screening with FOBT every other year significantly reduces colorectal cancer mortality [17]. These studies were carried out in MN, USA; Nottingham, UK and Furen, Denmark. The Minnesota study had 15,587 participants and 15,394 controls aged between 50 and 80 years; the Nottingham study had 76,466 participants and 76,384 controls aged between 45 and 74 years; and the Furen study had 30,967 participants and 30,966 controls aged between 45 and 75 years [18]. The results of these studies showed the compliance rate of 89.9% in biennial screening and mortality reduction of 33% (18-year follow-up) in Minnesota; the compliance rate of 59.6% in biennial screening and mortality reduction 13% (11-year follow-up) in Nottingham; and the compliance rate of 67.0% in biennial screening and mortality reduction 18% (follow up 13 years) in Furen.

The English Bowel Cancer Screening Pilot [15] was set up to assess the feasibility of introducing a national colorectal cancer screening programme based on FOBT into the NHS. Pilot studies took place in two English Health Authorities and one Scottish Health Board. A total of 478,250 men and women aged 50–69 were invited for screening. The uptake of FOBT was 56.8%. The overall rate of positive tests was 1.9% and the rate for detecting cancer was 1.62 per 1,000 people screened. Following this, the NHS bowel cancer screening programme was introduced in England in July 2006 and is expected to cover the whole country by 2009.

It is important to assess reasons why people did not take up the screening test. Common reasons given included ‘not really at risk of developing cancer’ (31%) and ‘too young’ (22%). Also, 19% said that the test sounded unpleasant, 5% thought the test could be dangerous, 6% said they did not have time to do the test and 13% said they wanted much more information before considering screening [19]. This all indicates that better explanations of the test are needed, although this may not affect the overall uptake.

How much of this evidence is also applicable to elderly people?

Very few articles focused specifically on screening in elderly people, and none looked at the benefits and limitations of screening in people over 70 as compared to other defined age groups. Few articles discussed an upper age limit for screening or gave advice on screening guidelines in elderly people specifically.

One paper reviewed the guidelines for colorectal screening from many different health agencies, including Canadian Task Force on Preventative Health Care, US Preventative Services Task Force, American Society of Colon and Rectal Surgeons, American Cancer Society, American Academy of Family Physicians and American College of Gastroenterology. None of these agencies suggest an upper age limit for screening, although most suggest beginning at 50. The exception was the Institute for Clinical Systems Improvement, which recommends FOBT screening between ages 50 and 80 [20].

The UK Colorectal Cancer Screening Pilot excluded people >70 years of age because of a fall-off in uptake over this age in the Nottingham trial of FOBT screening. A review of this pilot scheme [21] points out that ‘it is worth noting that if an age cut-off of 69 years (as chosen for the England programme) rather than 74 years had been used in the Furen trial of faecal occult blood screening, 25% of detectable cancers would have been missed’. Other papers describe an age range for screening and the number of lives saved within this age range but do not give a break down of how many of those people fall into the upper age range. For example, ‘of 10,000 50-year-old men at average risk screened, an annual faecal occult blood test and an air-contrast barium enema every 5 years until the men are 75 years of age will make the difference between life and death from colorectal cancer for ~200 men’ [1]. As many programmes stop at the age of 70 years, it would be useful to know how many of these lives were in the 70–75 age group.

Lieberman [22] recommended that screening begin at 50–55 years, and, when considering healthy individuals >70 or 75 years of age who have had previously negative screening tests ‘... At what point do we say that an individual has such a low risk of developing colon cancer as to make further screening unnecessary? Currently, there are no data that directly address this question’.

There is conflicting opinion on whether colonoscopy is more likely to cause complications in elderly people. Ure *et al.* conclude that ‘advanced age does not, by itself, confer increased risk to the procedure’ [12], but along with Yoong and Heymann, who agreed that ‘age alone should not preclude a patient from colonoscopy’ [23], found that there were more likely to be technical challenges during the procedure in elderly people, meaning that fewer tests could be completed in this age group. Other researchers disagree—Rabeneck *et al.* conclude that older age is ‘independently associated with colonoscopy-related bleeding and perforation’ [24].

Ko and Sonnenberg point out that ‘... potential for screening-related complications was greater than estimated benefit in some population subgroups aged 70 years and older’ [25]. This applies to some elderly people with either benign polyps, or adenomas very early in transformation, who due to age or other co-morbidities are unlikely to live long enough to be affected by the disease.

Some articles also questioned whether an upper limit for screening should be imposed due to the costs of screening older people for fewer years of life saved. For example,

'Currently there exists no age limitation for colorectal cancer screening and it is questionable whether health care systems should provide rules concerning age limitation in elderly people' [26].

It has been suggested that it may be less useful to class people >70 as a group with similar health needs in the same way that, for example, 40–50 year olds might be grouped. Crespi *et al.* [27] suggest '...a total colonoscopy should then be carried out, even in the event of a negative occult blood test and in the absence of symptoms, between the ages of 55 and 62. It may be repeated after the age of 70 in cases in which life expectancy is still high'.

One author stated that people >70 years of age were less likely to complete the FOBT than people <70 years [28] although exact figures and likely reasons for this difference were not given.

Discussion

This review looked at all available articles concerning screening for colorectal cancer in people over the age of 70 years. There were few articles which dealt exclusively with colorectal cancer screening in elderly people.

This is surprising given that elderly people are the most likely to suffer from this disease. However, as the screening tests all have potential complications and some are designed to detect polyps many decades before they become malignant, this may have an impact on the suitability of these tests in different age groups.

It seems that there are several issues which need further investigation. Firstly, national guidelines need to be developed on whether there is an age limit after which colorectal screening is considered inappropriate. If polyps take over 10 years to undergo malignant transformation, then the risks of colonoscopy may not be justified in, for example, a 90-year-old with other co-morbidities who is more likely to die of other causes before the polyp undergoes malignant transformation. However, life expectancy is increasing, so if an upper age limit is advised, guidelines would need to be regularly reviewed. For older people to make an informed decision, it is important that they are told about the time course of the disease. At present, none of the countries with a national screening programme give an indication of an age limit.

Secondly, if an older person chooses to have a screening test, should the advice given to them on follow-up if a polyp were detected be different to that given to younger people? Most of the dangers of colonoscopy are from the removal of polyps. This should be part of informed consent and explained to people along with current knowledge about the time course of the disease. The ethics of detecting a potentially malignant adenoma and then advising the patient not to act on this knowledge are, however, complex.

Thirdly, the compliance rates appear to be lower in elderly people and this needs addressing. This alone should not be ground for assuming that it is not worth offering the test to

them or that they do not want the test. FOBT may present additional difficulties for elderly people as they may be less able to read instructions due to eyesight problems and their living conditions and medications may mean that they are unable to change their diet appropriately for FOBT.

Another issue to consider is an individual's screening history. If someone has had negative FOBTs for many years does this mean they are very likely to continue to have negative tests and are not particularly susceptible to polyps? If so, perhaps the guidelines should recommend reduced frequency of testing after a certain number of negative tests.

Conclusion

In conclusion, colorectal cancer is a major health problem in many countries, including the UK. Screening tests are available and much is known about the benefits and side effects of these tests, allowing people to make an informed choice over whether to participate in a screening programme. However, many national programmes recommend screening simply to all people >50 years and do not take into account changes in the incidence of the disease, and possible changes in the complication rates with age. Elderly people are the most likely to suffer from this disease, yet most screening programmes make no mention of any specialist advice or services for them, and many trials and programmes begin to exclude or less actively recruit people over a certain age without, at present, much evidence to justify such practice. More research is needed into the differing requirements of a screening test for older people, both in terms of the actual test used and clear advice on whether screening tests are recommended until the end of life or whether there is a point at which the risks begin to outweigh the benefits, either for most people over a certain age or for those in whom tests have so far proved negative.

Key points

- Evidence for the benefits and complications of screening methods for colorectal cancer are well known.
- National screening programmes have been implemented in the UK and other countries. Most of these programmes define an age at which to begin screening but not an age at which screening practices should be reviewed again.
- Elderly people are at greater risk of colorectal cancer than other age groups but there are no clear guidelines or recommendations on a specific screening programme for the elderly population, which given their increased susceptibility to the disease, but also decreased likelihood to benefit from preventative measures several decades before the likely onset of symptoms, is an area which would benefit from further research.

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