

**EVIDENCE SUMMARY:  
PATIENT INFORMATION FOR THE NHS BOWEL  
CANCER SCREENING PROGRAMME**

Paul Hewitson, Chris Woodrow and Joan Austoker  
Cancer Research UK Primary Care Education Research Group  
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Fulwood House  
Old Fulwood Road  
Sheffield  
S10 3TH

Tel: 0114 271 1060

Fax: 0114 271 1089

Email: [info@cancerscreening.nhs.uk](mailto:info@cancerscreening.nhs.uk)

Website: [www.cancerscreening.nhs.uk](http://www.cancerscreening.nhs.uk)

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Email: [dh@prolog.uk.com](mailto:dh@prolog.uk.com)

Tel: 0300 123 1002

Fax: 01623 724 524

# CONTENTS

	<b>Page No</b>
PREFACE	v
<b>1. BOWEL CANCER: BACKGROUND INFORMATION</b>	<b>1</b>
1.1 Epidemiology of bowel cancer	1
1.2 Symptoms of bowel cancer	2
1.3 Screening for bowel cancer	2
1.4 Other common conditions	2
1.5 Risk factors	3
1.6 Hereditary risk	4
1.7 Other risk factors	4
1.8 Referral guidelines in England	5
<b>2. NHS BOWEL CANCER SCREENING PROGRAMME AND THE FAECAL OCCULT BLOOD TEST</b>	<b>7</b>
2.1 The NHS Bowel Cancer Screening Programme	7
2.2 Faecal occult blood test	7
2.3 Possible FOB results and actions	7
2.4 Outcomes of participating in screening	9
2.5 Research evidence	9
<b>3. DIAGNOSTIC INVESTIGATIONS</b>	<b>11</b>
3.1 The colonoscopy investigation	11
3.2 Double contrast barium enema	12
3.3 Outcomes of attending colonoscopy	13
3.4 Accuracy of colonoscopy	14
3.5 Benefits of colonoscopy	14
3.6 Risks of colonoscopy	14
3.7 Patient acceptance of colonoscopy	16
3.8 Other diagnostic investigations	16
<b>4. TREATMENTS FOR BOWEL CANCER</b>	<b>17</b>
4.1 Staging of cancer	17
4.2 Cancers detected by screening	17
4.3 Survival rates	17
4.4 Available treatments	18
4.5 Support for people diagnosed with bowel cancer	19

5.	FURTHER INFORMATION AND SUPPORT	21
5.1	NHS	21
5.2	National organisations (telephone)	21
5.3	National organisations (web sites)	21
	REFERENCES	22

## PREFACE

The aim of this document is to present a summary of the evidence used in the development of the NHS National Bowel Cancer Screening Programmes (BCSP) patient information materials (*Bowel Cancer Screening: The Facts* and *Bowel Cancer Screening: The Colonoscopy Investigation*). This document also aims to provide further information and sources of support for people who would like to know more about bowel cancer and bowel cancer screening.

Although the language in this document is somewhat technical, some people may find it a useful resource for helping them better understand screening for bowel cancer or as useful guide to further information sources.

The document has been compiled by Paul Hewitson, Chris Woodrow and Joan Austoker, Cancer Research UK Primary Care Education Research Group (PCERG), University of Oxford. It is based on a review completed in May 2006. Queries about the development of patient information materials should be addressed to the PCERG.

paul.hewitson@dphpc.ox.ac.uk  
joan.austoker@ceu.ox.ac.uk



# I. BOWEL CANCER: BACKGROUND INFORMATION

This section provides information about bowel cancer and people's risk of developing bowel cancer.

## I.1 Epidemiology of bowel cancer

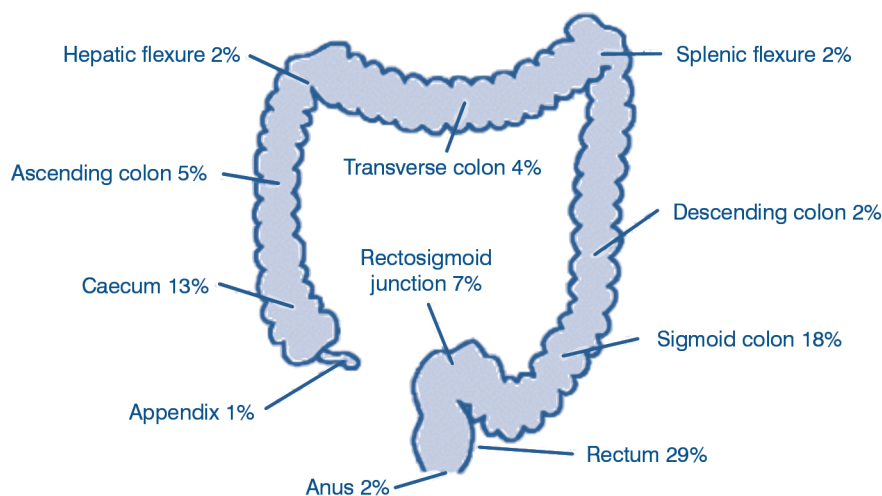
Bowel cancer is also known as colorectal cancer. Bowel cancer can also be called colon or rectal cancer, depending on the site where the cancer develops in the large bowel. It is the third most common cancer in the UK, with over 34 000 new cases of bowel cancer registered in 2002.<sup>1</sup> Bowel cancer is the second leading cause of cancer deaths in the UK, with over 16 000 people dying each year.<sup>1</sup>

The majority of bowel cancers (between 70% and over 90%) develop from benign adenomatous polyps lining the bowel wall.<sup>1-3</sup> An adenoma is a benign (non-cancerous) tumour. An adenocarcinoma is a malignant (cancerous) tumour originating in glandular tissue such as the large bowel. The adenoma–adenocarcinoma sequence, in which the benign polyp develops into bowel cancer, takes approximately 10 years (although it may be as long as 15 years before symptoms develop).<sup>4</sup> Approximately two-thirds (62%) of tumours develop in the colon, with remainder occurring in the rectum (Figure 1 and Table 1).<sup>1</sup>

For more information on adenocarcinomas and other types of bowel cancers, please see:

- CancerHelp UK: *Bowel cancer (colorectal cancer)* ([www.cancerhelp.org.uk/help/default.asp?page=2786](http://www.cancerhelp.org.uk/help/default.asp?page=2786))
- CancerBackup: *Cancer of the large bowel information centre* ([www.cancerbackup.org.uk/Cancertype/Bowelcolonrectum](http://www.cancerbackup.org.uk/Cancertype/Bowelcolonrectum)) or *Understanding cancer of the large bowel (colon and rectum)*.

Booklets are also available from CancerBackup by phoning the helpline on 0808 800 1234.



**Figure 1** Percentage distribution of cases by site within the large bowel.<sup>1</sup> Unspecified, 15%.

**Table 1** Percentage distribution of cases by site within the large bowel<sup>1</sup>

Large bowel	Cancer site	Prevalence (%)
Colon	Appendix	1
	Caecum	13
	Ascending colon	5
	Hepatic flexure	2
	Transverse colon	4
	Splenic flexure	2
	Descending colon	2
	Sigmoid colon	18
Rectum	Rectosigmoid junction	7
	Rectum	29
	Anus	2
Unspecified		15

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### 1.2 Symptoms of bowel cancer

Symptoms of bowel cancer include:

- rectal bleeding without any obvious reason
- persistent change in bowel habits, including looser stools or more frequent bowel motions
- abdominal pain, especially if severe
- lump in the abdomen
- anaemia.

The most common presenting symptoms of bowel cancer are rectal bleeding, change in bowel habit and anaemia.<sup>5</sup> Other symptoms, generally related to more advanced cancer, can include nausea, weight loss, abdominal pain and anorexia.<sup>5</sup> People who have these symptoms for more than four to six weeks should seek medical advice from their general practitioner. See section 1.8 for the referral guidelines for colorectal cancer.

### 1.3 Screening for bowel cancer

The screening test (see section 2.2) used in the NHS BCSP detects traces of blood in participants' stools (faeces). An abnormal screening test means that there is the suggestion of blood in the stool – it is not a diagnosis of bowel cancer. Other more common conditions can cause an abnormal screening test result.

### 1.4 Other common conditions

There are a number of other common medical conditions that may cause an abnormal screening test or symptoms of bowel disease, but are not bowel cancer. These can include:<sup>6</sup>

- *Haemorrhoids* (piles) refers to a condition in which the veins around the anus or lower rectum are swollen and inflamed. The most common symptom of haemorrhoids is bright red blood covering the stool, on toilet paper, or in the toilet bowl.
- *Irritable bowel syndrome* is a disorder characterised by cramping, abdominal pain, bloating, constipation and diarrhoea.
- *Diverticular disease* or *diverticulosis* occurs when small pouches (called diverticula) bulge outward through weak spots in the colon. Symptoms may include mild abdominal cramps, bloating and constipation. If the pouches become inflamed or infected, then diverticulitis occurs. This may cause abdominal pain and, rarely, bleeding from the back passage.

For more information on digestive disorders and other common bowel conditions see:

- Digestive Disorders Foundation (CORE): <http://www.digestivedisorders.org.uk/Default.aspx>
- National Digestive Diseases Information Clearinghouse (NDDIC): <http://digestive.niddk.nih.gov/index.htm>.

## **1.5 Risk factors**

In the UK, the lifetime risk of being diagnosed with bowel cancer is approximately 1 in 18 for males and 1 in 20 for females.<sup>1</sup>

### *1.5.1 Age*

The incidence of colorectal cancer increases with age, with over 80% of cases occurring in individuals aged over 60 years.<sup>7</sup> In younger people, the risk of developing colorectal cancer is very low, with the exception of people who have a hereditary predisposition to colorectal cancer (see below). The incidence of colorectal cancer in people between the ages of 45 and 55 years is approximately 25 per 100 000. The incidence rises sharply as age increases, with people aged over 75 years more than 10 times more likely to develop colorectal cancer (over 300 per 100 000).<sup>5</sup> The median age of diagnosis is over 70 years.<sup>6</sup>

### *1.5.2 Gender*

Colon cancer is equally common in men (35.9 per 100 000) and women (35.8 per 100 000), although rectal cancer is more common in men (24.5 per 100 000 compared with 16.8 per 100 000 in females).<sup>5</sup>

### *1.5.3 Family history*

People who have a family history of colorectal cancer are at a greater risk of developing the disease. It is estimated that approximately 20% of patients with bowel cancer that is not related to hereditary conditions or inflammatory bowel disease have some degree of familial risk without meeting all of the criteria for hereditary colon cancer.<sup>3,8</sup> People with either one first-degree relative affected by colorectal cancer before the age of 45 or two first-degree relatives affected at any age have an increased risk of developing colorectal cancer. For these individuals, the lifetime risk of developing colorectal cancer increases to 16–25% in males and 10–15% in females.<sup>9</sup>

### *1.5.4 Inflammatory bowel disease*

Colitis due to inflammatory bowel disease is associated with an increased risk of colorectal cancer, and the risk rises with the duration of the condition.<sup>5</sup>

### **1.6 Hereditary risk**

Upwards of 5% of all colorectal cancers develop as a result of hereditary cancer syndromes.<sup>5,10</sup> The two main forms are familial adenomatous polyposis (FAP) and hereditary non-polyposis colorectal cancer (HNPCC).<sup>8</sup>

FAP is an autosomal dominant disorder affecting about 1 in 10 000 individuals and accounts for approximately 1% of all bowel cancers.<sup>10</sup> FAP patients can develop hundreds (up to thousands) of colorectal adenomas (50% of patients by the age of 15, 95% by 35 years old).<sup>3</sup> Colorectal cancer will inevitably develop in people with FAP if left untreated, with the majority of cancers appearing by the age of 40.<sup>10</sup> People with FAP are usually offered prophylactic colectomy by adolescence or early adulthood.

HNPCC is also an autosomal dominant disorder and accounts for approximately 2–5% of colorectal cancers. Unlike FAP, the number of polyps appears to be no greater than in the general population, but the polyps grow more rapidly and progress to invasive cancer.<sup>10</sup> HNPCC will develop at an earlier age than in the general population (approximately 45 years old), with the cancers having distinctive pathological features.<sup>8</sup>

### **1.7 Other risk factors**

A number of other risk factors, including pre-existing bowel diseases and lifestyle factors, have been suggested as having a role in the development of colorectal cancer.

#### *1.7.1 Meat consumption*

Although the relationship between meat consumption and increased risk of bowel cancer remains controversial, two recent systematic reviews have suggested that there is a significant increased risk of colorectal cancer from eating excessive amounts of red or processed meats.<sup>11,12</sup>

#### *1.7.2 Lifestyle and exercise*

A recent review of case–control and cohort studies found a reduction in the risk of colorectal cancer associated with increased physical activity.<sup>13</sup> Another review that quantified the relationship between excess weight and the risk of developing cancer reported that there was a 15% relative increase in the risk of overweight people (body mass index (BMI) 25–30) for developing bowel cancer (33% relative increase for obese people with a BMI over 30).<sup>14</sup>

#### *1.7.3 Vegetable, fruit and fibre intake*

The relationship between bowel cancer and vegetable, fruit and fibre intake is also controversial. Two reviews have indicated that the dietary intake is not significantly associated with an increased risk of bowel cancer.<sup>15,16</sup> However, other studies suggest that people with a high intake of fibre<sup>17,18</sup> and a diet that is high in fruit/vegetables and low in meat products<sup>19</sup> are at decreased risk of developing bowel cancer.

## **1.8 Referral guidelines in England**

The National Institute for Health and Clinical Excellence (NICE) recommends urgent referral for patients:

- aged 40 years or older reporting rectal bleeding with a change of bowel habit towards looser stool and/or increased stool frequency persisting for six weeks or more
- aged 60 years and older with rectal bleeding persisting for six weeks or more without a change in bowel habit and without anal symptoms
- aged 60 years and older with change in bowel habit to looser stools and/or more frequent stools persisting for six weeks or more without rectal bleeding
- of any age with a right lower abdominal mass consistent with involvement of the large bowel
- of any age with palpable rectal mass (intraluminal and not pelvic; a pelvic mass outside the bowel would warrant an urgent referral to a urologist or gynaecologist)
- who are male of any age with unexplained iron deficiency anaemia and haemoglobin of 11 g/100 ml or lower
- who are non-menstruating females with unexplained iron deficiency anaemia and a haemoglobin of 10 g/100 ml or lower.



## 2. NHS BOWEL CANCER SCREENING PROGRAMME AND THE FAECAL OCCULT BLOOD TEST

The following section provides further information on the NHS Bowel Cancer Screening Programme and the screening test used to detect colorectal cancer.

### 2.1 The NHS Bowel Cancer Screening Programme

The NHS Bowel Cancer Screening Programme (NHS BCSP) offers bowel cancer screening every two years to all men and women in England aged 60–69. People aged over 70 years who would like to request a screening kit (once every two years) can call the freephone number 0800 707 6060. Participants in the programme are sent a screening test kit (see below) to be completed at home.

A pilot programme was undertaken to assess the feasibility of using biennial faecal occult blood (FOB) testing for population screening in the UK.<sup>20</sup> Three pilot screening rounds for 50- to 69-year-olds were completed in Coventry and Warwickshire in England, and Tayside, Grampian and Fife in Scotland. The first round of the pilot programme demonstrated that biennial FOB testing for population screening was feasible within the context of the NHS.<sup>20,21</sup>

### 2.2 Faecal occult blood test

The screening test used by the NHS BCSP is called the faecal occult blood (FOB) test. The FOB test aims to detect small amounts of blood in participants' stools, as traces of blood may be indicative of bowel cancer or bowel polyps. Participants in the NHS BCSP are required to send their completed FOB test through the post to be analysed by the laboratory.

The screening test is a guaiac test in which the participant smears small samples of stool (from three separate bowel motions) on to the FOB test card. The test card has three 'windows' (two 'spots' in each window are used per bowel motion) for the participant to place his or her smear. The sensitivity of the FOB test is improved by performing it on three separate occasions as bowel cancer (and bowel polyps) bleed intermittently.<sup>22</sup>

### 2.3 Possible FOB results and actions

People participating in the screening programme should receive their results within one week of their test. As bowel cancers and bowel polyps do not bleed all of the time,<sup>22</sup> it is possible that a participant will receive either an unclear result (one to four of the 'spots' suggest the presence of blood), a spoilt kit result (the FOB test is unreadable for particular reasons) or a technical failure (technical problem reading the kit in the laboratory). The possible results of the FOB test are shown in Table 2.

#### 2.3.1 Normal

A normal screening result means that no suggestion of blood has been found in the participant's FOB test. Participants will be offered screening again in two years' time, if they are under 70 years old. The fact that the FOB test was normal does not mean that the participant will not develop cancer in the future. Therefore, it is important that participants know the symptoms of bowel cancer and speak to their GP if symptoms occur.

**Table 2** Possible FOB test results and actions

<b>FOB test result</b>	<b>Explanation</b>	<b>Action</b>
Normal	0 abnormal spots	Participants are sent a discharge letter containing a list of the symptoms of bowel cancer to promote awareness. FOB test offered in two years if patient < 70 years
Unclear	1–4 abnormal spots	Participants are sent a covering letter and further kit. If the second kit result is abnormal or unclear, participants are offered a colonoscopy. If this is normal, people are asked to complete one further kit
Spoilt kit	Unreadable test kit	Participants are sent a covering letter and one further kit
Technical failure	Technical problem in laboratory	Participants are sent a covering letter and one further kit
Abnormal	5 or 6 abnormal spots	Participants are sent a covering letter giving a date for an appointment with a specialist screening practitioner not more than two weeks later and their GP is notified

### 2.3.2 *Unclear*

An unclear result means that a suggestion of blood was found in the participant's FOB test but that the result was not strong enough (between one and four abnormal spots only) to warrant an abnormal test result. Participants are asked to carry out the FOB test again, and, if the result is either 'unclear' or 'abnormal', they are requested to attend for colonoscopy. If the second FOB test is normal, participants are asked to complete a third FOB test.

### 2.3.3 *Spoilt kit*

A spoilt kit occurs when the kit is unreadable either because it has been completed incorrectly or because it has somehow been damaged during transfer to the laboratory. If this occurs, another screening kit is sent to the participant with a covering letter explaining what has occurred.

### 2.3.4 *Technical failure*

Rarely, a technical problem may occur when processing the kit in the laboratory. If this occurs, another screening kit is sent to the participant with a covering letter explaining what has occurred.

### 2.3.5 *Abnormal*

An abnormal screening result means that there is the suggestion of blood in the participant's FOB test. An abnormal screening result is not a diagnosis of cancer (a colonoscopy is required to diagnose colorectal cancer). However, participants with an abnormal result will receive information asking them to attend for a colonoscopy investigation.

## 2.4 Outcomes of participating in screening

The chances of a participant receiving a normal, unclear (including spoilt and technical failure) or abnormal (positive) result after attending screening are shown in Table 3. These figures are based on the results of the UK Colorectal Cancer Screening Pilot.<sup>20</sup>

Overall (including first and subsequent rounds of screening), the chance of having a normal result is 98% (or 98 per 100 people screened). It is estimated that only 3 per 1000 people screened will have an abnormal result after the first round of FOB testing. People who participate in further rounds of screening (due to an unclear, spoilt or technical failure result) have approximately a 1 in 4 to 1 in 5 (20–25 per 100 people screened) chance of receiving an abnormal result. It is important to note that only 1 in 10 people attending for a colonoscopy will be diagnosed with bowel cancer (see section 3.3).

## 2.5 Research evidence

To date, four major randomised controlled trials (which recruited in excess of 320 000 participants) and two controlled trials (recruiting over 110 000 participants) have reported on the relative reduction in colorectal cancer mortality due to FOB screening.<sup>23–28</sup>

A recent systematic review of these randomised and controlled trials of screening for colorectal cancer using the FOB test found that:

- regular bowel screening reduces the relative risk of dying from bowel cancer by 16% (range 11–22%)
- a subgroup analysis of these data suggested that for people having at least one FOB test, the relative risk of dying from colorectal cancer could be reduced by 25% (range 16–34%).<sup>29</sup>

The estimated relative reduction in mortality is based on participants aged between 45 and 80+ years. The subgroup analysis is based on a response rate of 83% (derived from participants in the randomised trials 'attending at least one screen').

**Table 3** Estimated outcomes of screened for overall, first round and further rounds of FOB testing

	FOB test result	Approximate chance of occurring
<i>Overall</i>	Normal	98 per 100 people screened
	Abnormal	2 per 100 people screened
<i>First round</i>	Normal	96 per 100 people screened
	Unclear <sup>1</sup>	4 per 100 people screened
	Abnormal	3 per 1000 people screened
<i>Further rounds<sup>2</sup></i>	Normal	75–80 per 100 people rescreened
	Abnormal	20–25 per 100 people rescreened

<sup>1</sup>Unclear FOB test result combines 'unclear', 'spoilt' and 'technical failure' results.

<sup>2</sup>Further rounds refers to participants who have received an unclear test result and repeat the FOB test (up to two times).



## 3. DIAGNOSTIC INVESTIGATIONS

This section provides further information concerning diagnostic investigations following an abnormal FOB test. For further information on the colonoscopy procedure see *Bowel Cancer Screening: The Colonoscopy Investigation* ([www.cancerscreening.nhs.uk](http://www.cancerscreening.nhs.uk)).

### 3.1 The colonoscopy investigation

Participants in the screening programme who receive an 'abnormal' result (or second 'unclear' result) are invited for a colonoscopy investigation. The purpose of a colonoscopy investigation is to examine the lining of the large bowel wall for the presence of bowel cancer or bowel (adenomatous) polyps.

A colonoscopy investigation involves a health professional inserting a colonoscope (a long, thin tube with a tiny camera on the end so that the colonoscopist can see the lining of the bowel on a monitor screen) into the rectum and guiding it around the large bowel. The colonoscope also includes attachments (a wire loop that can be passed down the colonoscope) that can remove tissue samples from the lining of the bowel wall. Sometimes these small tissue samples will be taken and analysed for any abnormal cells that might indicate cancer (called a biopsy). Most polyps can also be removed painlessly, using a wire loop passed down the colonoscope tube.

A complete colonoscopy occurs when the health professional is able to visualise the entire colon all the way to the caecum (where the small and large bowel meet). In certain cases, a complete colonoscopy may not occur. This may be due to either inadequate bowel preparation by the patient or the colonoscopist being unable to complete the investigation (because of either patient discomfort or difficulties with the colonoscope, such as 'looping').<sup>30</sup> In these circumstances, the colonoscopy investigation may need to be repeated. Adequate bowel preparation (complete emptying of the bowel by the participant through the use of dietary restrictions and a laxative taken the day before the investigation) is essential for improving the chances of having a complete colonoscopy (see section 3.1.2).

#### 3.1.1 Discussion with a specialist screening practitioner

Participants who are offered a colonoscopy will receive a full explanation by a specialist screening practitioner (SSP) (usually a specialist nurse) before they have the investigation. The SSP will also assess the participant's fitness for the procedure. Approximately 1 in 1000 people attending for colonoscopy will not be fit for the procedure.<sup>20</sup> These people are likely to be offered a double contrast barium enema instead (see section 3.2). Patients with a history of cardiovascular or respiratory problems or diabetes or who are currently on other medications (eg warfarin) will receive specialist advice from a health professional before the investigation.

#### 3.1.2 Before the investigation

Participants receive a full list of dietary restrictions and a bowel preparation medicine (a strong laxative) before the colonoscopy. The strong laxative is taken the day before the colonoscopy and will cause diarrhoea. After taking the laxative, participants are advised to stay close to a toilet and avoid travelling or going to work. If the bowel preparation is not completed properly (eg the bowels are not fully emptied), it may be necessary to repeat the colonoscopy as the health professional may not be able to visualise the lining of the bowel wall. Participants are also advised to arrange for someone to take them home after the colonoscopy investigation, as the sedative which may be given during the investigation may cause them to feel drowsy.

### 3.1.3 *During the investigation*

Participants are given a sedative before the investigation to help them relax. The sedative can be given either orally or intravenously. The sedative will make participants feel drowsy, but is not a general anaesthetic. Participants lie on their side and the health professional gently inserts the colonoscope via the anus and into the large bowel.

During the colonoscopy, air is passed down the colonoscope to allow the health professional to see the lining of the bowel wall more clearly. Participants may feel a bloating or cramping feeling in their abdomen. Some participants find having a colonoscopy uncomfortable, but most people do not report it to be painful (see section 3.7).

Sometimes a small tissue sample, called a biopsy, will be taken. Polyps can be painlessly removed using the wire loop that is passed down the colonoscope. Tissue samples are then checked for abnormal cells that may indicate cancer. The colonoscopy investigation should take between 30 and 45 minutes to complete. However, the entire procedure is likely to take longer given the need for the sedative to take effect, the time taken for colonoscopy itself and time after the procedure to recover.

### 3.1.4 *After the investigation*

If tissue samples were removed during the investigation then the results should be available within three weeks. The health professional will inform the participant immediately after the investigation if any tissue samples or polyps were removed. Most participants will be able to return home after staying in recovery for a short period, although some may need to stay longer if a polyp or tissue sample was removed. Although the sedative will make most participants feel quite pleasant and relaxed, it is advisable to have somebody who can take them home and stay with them until the effects of the sedative have worn off. After taking the sedative, participants are advised not to drive, operate machinery or drink alcohol for at least 24 hours. Participants are also advised to have someone present when the health professional discusses what happened during the investigation, as the sedative may make them unable to remember exactly what was said (due to drowsiness). See section 3.3 for more information on the outcomes of a colonoscopy.

## **3.2 Double contrast barium enema**

An individual who is not suitable for colonoscopy (generally due to pre-existing medical conditions) will be offered a double contrast barium enema (DCBE). Normal x-rays do not provide much information about the large bowel, so barium liquid (barium sulphate) is passed into the large bowel. Barium sulphate is a fine, white, odourless (non-poisonous) powder that when mixed into a liquid coats the inside of the large bowel to allow x-rays to be viewed more clearly. The aim is to line the large bowel to the end of the caecum (where the small and large bowel meet) with the barium liquid.

Prior to the procedure, participants receive a full list of dietary restrictions and a bowel preparation medicine (a strong laxative). It is important that the large bowel is fully emptied before the procedure. In some cases participants are given mild sedatives before the procedure. The health professional will ask the participant to lie on his or her side and will insert a small tube into the rectum. The barium liquid is passed through the tube and into the large bowel. Some participants will be asked to move into different positions (to help with the flow of the barium liquid). In addition, air may be passed down the tube and into the large bowel to push the barium liquid further towards the caecum (participants may feel a bloating or cramping feeling in their abdomen). Several x-rays are taken of the large bowel with the participant in different positions. The procedure takes between 15 and

30 minutes. Participants can generally go home soon after the procedure. Some people may still have stomach cramps and are advised to stay close to a toilet. The barium sulphate will make the participant's faeces turn white (or pale) for a day or so after the procedure.

Complications of DCBE are very rare and are generally occur in people with pre-existing medical conditions. The chance of perforation of the bowel wall during DCBE is approximately 1 in 25000 (0.0041%).<sup>31</sup> However, DCBE identifies only polyps or potential bowel cancers; a colonoscopy is required to take a tissue sample for biopsy to confirm the presence of cancer. Low sensitivity and the need for colonoscopy to evaluate positive test results are disadvantages of barium enema.<sup>32</sup>

For further information about DCBE see:

- Patient UK: *Barium enema* ([www.patient.co.uk/showdoc/27000480/](http://www.patient.co.uk/showdoc/27000480/)).

### 3.3 Outcomes of attending colonoscopy

There are three main outcomes associated with a complete colonoscopy (these results are detailed in Table 4). Patients should receive the results of their colonoscopy investigation within three weeks.

#### 3.3.1 Normal result

No cancer or polyps were detected during the colonoscopy investigation. About half of the people who attend colonoscopy (approximately 5 in 10) will receive a normal result.<sup>20</sup> As there is a small chance that the colonoscopy may miss a cancer, a normal result does not guarantee that the participant does not have and never will develop bowel cancer. Bowel cancer screening will be offered to the participant again in two years' time.

#### 3.3.2 Polyp(s) detected

A bowel polyp (or more than one polyp) was detected during the colonoscopy. In most cases, the polyp will be removed from the bowel wall and an analysis (biopsy) for the presence of cancer will be performed. Approximately 4 in 10 people who attend for colonoscopy will have polyps identified/removed during their investigation.<sup>20</sup> If polyps are removed, the participant will be informed of this after the investigation. People who have polyps removed will be classified into one of three categories depending on the number and size of identified polyps (small polyps are those under 1 cm in diameter; large polyps are 1 cm or greater in diameter). The categories are high risk, intermediate risk and low risk. People in the high risk group have five or more small polyps or three or more large polyps. People in the high risk group are offered a colonoscopy again in 12 months, followed by another colonoscopy three years later. People in the intermediate risk group have three or four small polyps or at least one large polyp. People in the intermediate risk group are offered

**Table 4** Results of colonoscopy investigation and estimated chance of occurring<sup>20</sup>

Result of colonoscopy	Estimated chance of occurrence
Normal result	5 in 10 people attending
Polyps detected	4 in 10 people attending
Cancer detected	1 in 10 people attending

another colonoscopy investigation in three years' time. People in the low risk group have one or two polyps and are offered FOB testing again in two years' time.

### 3.3.3 Cancer detected

This means that a sample of tissue was removed during colonoscopy and, after analysis, was shown to be cancerous. Approximately 1 in 10 people who attend for colonoscopy will be identified as having bowel cancer. The stage of bowel cancer is very important in providing an indication of the patient's relative chance of survival (see sections 4.1 and 4.2). For example, a person with stage A bowel cancer has an 85–95% chance of survival at five years, while someone with stage D cancer has less than a 10% chance of survival at five years.

## 3.4 Accuracy of colonoscopy

Colonoscopy is viewed as the 'gold standard' for investigating the large bowel.<sup>33</sup> Although there are no randomised trials directly assessing the efficacy of the procedure, colonoscopy is viewed as the most sensitive and specific method for detecting bowel cancer and polyps.<sup>34</sup> The ability of colonoscopy to visualise the entire large bowel suggests that it is preferable to flexible sigmoidoscopy in detecting distal (right-sided) cancers and polyps.<sup>35</sup>

A recent review of polyp miss rates determined by tandem or 'back-to-back' colonoscopy (patients undergoing two colonoscopies in the same day) reported that up to 1 in 5 polyps are missed at colonoscopy.<sup>36</sup> However, large polyps (1 cm or larger and the more likely polyp type to progress to cancer) were far less likely to be missed (2 in 100) than smaller polyps (1 in 4).<sup>36</sup>

## 3.5 Benefits of colonoscopy

The benefits of colonoscopy include the detection of bowel cancer and the removal of bowel polyps. If bowel cancer is detected at an early stage (Dukes stage A), there is an 85–95% chance of survival at five years after diagnosis (see section 4.3).<sup>1</sup>

The removal of adenomatous polyps during colonoscopy has been shown to reduce the incidence of bowel cancer<sup>37,38</sup> by reducing the risk of developing bowel cancer in the future.

## 3.6 Risks of colonoscopy

Overall, colonoscopy is viewed as a relatively safe procedure. However, as colonoscopy is an invasive diagnostic investigation, there are associated risks. Complications of colonoscopy can include an incomplete colonoscopy, side effects from the sedative medication or complications due to therapeutic manipulation of the colonoscope. Complications related to the manipulation of the colonoscope are more likely to occur during polypectomy (removal of polyps or tissue for biopsy). The risk of these complications is reduced if polypectomy is not performed during the investigation. The risks of colonoscopy are based on a review of the available literature (Table 5).

### 3.6.1 Incomplete colonoscopy

This can occur when the participant does not perform the bowel preparation correctly (incorrect preparation can result in the health professional not being able to see the bowel wall during the colonoscopy), if the procedure has to be stopped because of patient discomfort or if the health professional cannot manoeuvre the colonoscope to the end of the large bowel (either due to an obstruction in the bowel or for other reasons).<sup>39</sup>

**Table 5** Summary of publications reporting colonoscopy complications and associated rates of complications

Reference	Bleeding	Perforation
Alexander (England) <sup>20</sup>	1% (1 in 100)	0.1% (1 in 1000)
Alexander (combined) <sup>20</sup>	0.6% (1 in 150)	0.05% (1 in 2000)
Bowles et al. (2004) <sup>39</sup>	0.4% (1 in 250)	0.13% (1 in 600)
Kavic et al. (2001) <sup>30</sup>	0.26% (1 in 400)	0.2% (1 in 500)
Robinson et al. (1999) <sup>40</sup>	0.07% (1 in 1400)	0.3% (1 in 330)
Wexner et al. (2001) <sup>41</sup>	0.07% (1 in 1400)	0.07% (1 in 1400)

### 3.6.2 Side effects of sedation

Serious complications due to sedation are rare, but can include respiratory depression or arrest.<sup>30</sup> The risks associated with sedation are varied and dependent on patient characteristics and the type of medication used for sedation.

### 3.6.3 Bleeding

Bleeding can occur after the colonoscopy investigation. Slight bleeding from the back passage after a colonoscopy is normal, especially after a polyp or tissue sample is removed from the bowel wall. However, heavy bleeding is generally indicative of a more serious problem, and people experiencing this after colonoscopy should seek medical advice (from the screening unit). Heavy bleeding is more likely to occur after polyps or a tissue sample have been removed. The estimated risk of heavy bleeding is approximately 1 in every 150 colonoscopies.

### 3.6.4 Perforation

Perforation occurs when the bowel wall is ruptured during the colonoscopy investigation. Although surgery is often required to repair perforations, in selected patients the condition can resolve with conservative treatment provided the perforation is small and peritonitis does not develop.<sup>30</sup> Perforation is more likely to occur after polyps or a tissue sample was removed. The estimated risk of perforation is approximately 1 in every 1500 colonoscopies.

### 3.6.5 Death

In extremely rare cases, colonoscopy can be fatal. Generally, the risk of death caused by a colonoscopy examination is related to pre-existing comorbidities in patients (such as respiratory diseases or cardiovascular diseases) or advanced bowel disease, rather than directly to complications caused by the procedure.

Based on a review of publications reporting complications of colonoscopy,<sup>20,30,39–42</sup> the estimated risk of death for the NHS BCSP was determined to be approximately 1 in every 10 000 colonoscopies. It is important to note that this figure is an estimate only, and a more precise figure will be available in the future (based on ongoing reporting of complications of colonoscopy following an abnormal screening result in the NHS BCSP). Reported death rates for colonoscopy are highly variable, as

there are a limited number of good publications available and it is often difficult to determine if colonoscopy was the main contributing factor in a patient's death. For example, in a prospective audit of 9223 colonoscopies conducted in the UK, colonoscopy may have been a factor in the death of approximately 1 in 1500 patients.<sup>39</sup> However, there were no deaths attributable to colonoscopy reported in the Nottingham randomised trial<sup>40</sup> and only one death reported in a prospective analysis of 13580 colonoscopies.<sup>41</sup> There were no deaths attributable to colonoscopy in the England bowel screening pilot study.<sup>20</sup>

### **3.7 Patient acceptance of colonoscopy**

In general, patient acceptance of the colonoscopy investigation is quite high. However, there is some variability between people in terms of the pain or discomfort caused by the procedure. Approximately 7 in 10 people report that the procedure is either not painful or only slightly painful. About 3 in 10 people report that the procedure is fairly painful or worse (although only about 1 in 20 people report that the procedure is very or extremely painful).<sup>43-45</sup> As sedatives are administered to patients before the procedure, any pain or discomfort felt by the patient during the procedure is likely to be temporary, with many people having only a vague recollection of the procedure.

### **3.8 Other diagnostic investigations**

Two other forms of diagnostic investigation for bowel cancer are currently being reviewed by the NHS. These are flexible sigmoidoscopy and computed tomography (CT) colonography (virtual colonoscopy).

#### *3.8.1 Flexible sigmoidoscopy*

Flexible sigmoidoscopy is similar to colonoscopy but examines the sigmoid colon and rectum, where approximately two-thirds of bowel cancers arise.<sup>46</sup> The benefits of flexible sigmoidoscopy are suggested to include reduced mortality and possibly increased cost-effectiveness and patient acceptability.<sup>47,48</sup> However, limitations of the procedure are that it does not examine the proximal colon (where up to one third of all bowel cancers occur), requires considerable time and expertise and can detect only approximately 70% of cancers and polyps at best.<sup>48</sup> An ongoing randomised trial assessing the feasibility of a single flexible sigmoidoscopy for bowel cancer screening is due to report soon.<sup>46</sup>

#### *3.8.2 CT colonography*

At present, CT colonography is still under investigation as a potential diagnostic tool for bowel cancer. This new form of whole colon examination is suggested to be as sensitive in detecting bowel cancers and large polyps as colonoscopy but may be safer<sup>49</sup> and more acceptable to patients.<sup>45</sup> However, there are no randomised controlled trials assessing the effectiveness of CT colonography, and issues surrounding the cost-effectiveness and safety of the procedure<sup>50</sup> are still to be resolved. A trial ('CT colonography, colonoscopy or barium enema for diagnosis of colorectal cancer in older symptomatic patients') is currently investigating the role of CT colonography for use in the NHS BCSP.

## 4. TREATMENTS FOR BOWEL CANCER

The following section provides information on the staging of bowel cancer and the available treatments for bowel cancer. Treatments for bowel cancer differ in effectiveness depending on their location (either the colon or the rectum).

### 4.1 Staging of cancer

Bowel cancer is often staged according to the Dukes system. Cancer staging refers to how far the cancer has spread from the bowel. On average, about 1 in 10 people attending for a colonoscopy will be diagnosed with large bowel cancer (see section 4.2).<sup>20</sup>

- *Stage A* cancer is very early stage cancer and the rate of survival after treatment is high. Stage A means that the cancer is growing in the innermost lining of the colon or rectum.
- *Stage B* means that the cancer has grown into the muscle layer of the colon or rectal wall.
- *Stage C* means that the cancer has spread into the lymph nodes around the large bowel.
- *Stage D* is the more advanced stage of cancer and means that the cancer has spread from the large bowel to another part of the body.

The TNM (tumour, nodes, metastases) system is becoming increasingly prominent for staging of bowel cancer. For more information on the TNM system see CancerHelp UK: *More about bowel cancer staging* ([www.cancerhelp.org.uk/help/default.asp?page=5913](http://www.cancerhelp.org.uk/help/default.asp?page=5913)).

### 4.2 Cancers detected by screening

The Dukes stages for bowel cancers detected by the pilot programme are shown in Table 6.<sup>20</sup>

The stage of cancer is important because the type of treatment, and often the effectiveness of treatment, is usually based on how far a cancer has spread (see below).

### 4.3 Survival rates

As with many other forms of cancer, the outcome of bowel cancer depends on the site of diagnosis (either colon or rectum) and how far the cancer has advanced at the time of diagnosis. At present in the UK, survival rates are around 45% at five years after diagnosis,<sup>5</sup> although the five year survival rate is strongly associated with the stage of diagnosis (Table 7).

**Table 6** Cancers detected at stage by screening.<sup>20</sup>

Dukes stage	Cancers detected (%)
Presumed A (polyp)	17
A	25
B	26
C	25
D	2
Other unstaged	5

**Table 7** Five year survival rates by Dukes stage<sup>1</sup>

Dukes stage	Overall five year survival (%)
A	85–95
B	60–80
C	30–60
D	< 10

Note that five year survival does not mean that people have only five years to live after treatment. Instead, five year survival is a standard form of reporting the results of research trials and denotes the percentage of people still alive at the end of the five year period.

It is important to note that these statistics are only a guide. For example, some cancers will develop more slowly or more rapidly than others diagnosed at the same Dukes stage.

#### 4.4 Available treatments

The type of treatment that patients receive is partly based on the location of the tumour and how advanced the tumour has developed. There are three main types of treatments available.

##### 4.4.1 Surgery

Approximately 80% of people with colorectal cancer undergo surgical resection.<sup>5,51</sup> The most appropriate type of surgery is dependent on the stage and location of the bowel cancer. The main aim of surgery is to remove the cancer using one of the following techniques.

##### *Local excision*

If the cancer is found at an early stage, the surgeon may insert a tube into the rectum and up into the bowel to cut the cancer out (called local excision). This means that the surgeon does not need to cut through the abdominal wall.

##### *Resection*

If the cancer is more advanced, the surgeon may perform a partial colectomy (removing the piece of bowel that contains the cancer and a small amount of healthy tissue around it) and the two ends of the bowel are then joined together (an anastomosis). The lymph nodes near to the bowel are also removed as this is one of the first places bowel cancer will spread.

##### *Resection and colostomy*

If the surgeon is unable to rejoin the two sections of bowel, one end of the bowel is attached to the abdominal wall. This is known as a colostomy and the opening of the bowel on the abdominal wall is called a stoma (a bag is worn over the stoma to collect faeces). Often the colostomy is not permanent and can be reversed a short time after the operation (approximately 1 in 8 people will have a permanent colostomy).<sup>52</sup>

Although the surgeon may remove all the cancer visible at the time of the operation, some patients may receive 'adjuvant' therapy (adjuvant means alongside) involving either radiotherapy or chemotherapy to kill any cancer cells that may be left.

#### 4.4.2 Radiotherapy

Radiation therapy (radiotherapy) is a cancer treatment that uses high energy x-rays (or other types of radiation) to kill cancer cells, while doing as little harm as possible to normal cells. Radiotherapy is usually used to treat rectal cancer and may be used before surgery (neoadjuvant radiotherapy to reduce the size of the tumour) or after surgery (adjuvant radiotherapy to kill any cancer cells that may have been left behind after the operation). External radiotherapy refers to the use of a specialised x-ray machine that sends radiation towards the cancer from outside the body. Internal radiotherapy refers to a radioactive substance sealed in seeds, wires or catheters that are placed in or near the cancer. A meta-analysis of individual patient data has found that a combination of radiotherapy and surgery reduces local recurrence of rectal cancer compared with surgery alone.<sup>5</sup>

#### 4.4.3 Chemotherapy

Chemotherapy is a cancer treatment that uses anticancer (called cytotoxic) drugs to kill the cancer cells or make them less active. Chemotherapy is not recommended for stage A bowel cancers.<sup>3</sup> Some patients with more advanced cancers receive chemotherapy after surgery (adjuvant chemotherapy) to kill any cancer cells left behind after the operation that may cause a recurrence of the cancer. Chemotherapy given before surgery (neoadjuvant chemotherapy) is generally for rectal cancer and aims to reduce the size of the tumour before the operation.

For more information about treating bowel cancer, see:

- CancerBackup: *Treatment for large bowel cancer* ([www.cancerbackup.org.uk/Cancertype/Bowelcolonrectum/Treatment/Treatmentoverview](http://www.cancerbackup.org.uk/Cancertype/Bowelcolonrectum/Treatment/Treatmentoverview)) or *Understanding cancer of the large bowel (colon and rectum)* (booklet available from CancerBackup helpline: 0808 800 1234)
- CancerHelp UK: *Bowel cancer (Colorectal cancer)* ([www.cancerhelp.org.uk/help/menuforhistopic.asp?page=2786](http://www.cancerhelp.org.uk/help/menuforhistopic.asp?page=2786)).

### 4.5 Support for people diagnosed with bowel cancer

In addition to the medical and physical challenges associated with treatment of the disease, colorectal cancer patients may have added concerns and challenges. Support and resources are available to help people cope with the emotional and practical challenges associated with living with, and receiving treatment for, bowel cancer.

For more information concerning support services for bowel cancer, contact:

- Beating Bowel Cancer: nurse advisory service (email [nurse@beatingbowelcancer.org](mailto:nurse@beatingbowelcancer.org) or phone 08450 719301 or visit the website at [www.beatingbowelcancer.org](http://www.beatingbowelcancer.org))
- Bowel Cancer UK: Bowel Cancer Advisory Service (phone 0800 840 3540 or visit the website at [www.bowelcanceruk.org.uk](http://www.bowelcanceruk.org.uk))
- CancerHelp UK: Cancer Information Nurses (phone 0808 800 4040).



## 5. FURTHER INFORMATION AND SUPPORT

The following section provides further information produced or endorsed by other organisations about bowel cancer. The patient materials available for the internet resources section have been reviewed for their quality by researchers at the CRUK-PCERG.

### 5.1 NHS

- NHS Bowel Cancer Screening Programme helpline: 0800 707 6060
- NHS Cancer Screening Programmes web site: [www.cancerscreening.nhs.uk](http://www.cancerscreening.nhs.uk)
- NHS Direct: 0845 4647 or [www.nhsdirect.nhs.uk](http://www.nhsdirect.nhs.uk).

### 5.2 National organisations (telephone)

- Beating Bowel Cancer: 08450 719300
- Bowel Cancer UK: 0800 840 3540
- Cancerbackup: 0808 800 1234
- CancerHelp UK: 0808 800 4040.

### 5.3 National organisations (websites)

- Beating Bowel Cancer: [www.beatingbowelcancer.org](http://www.beatingbowelcancer.org)
- Bowel Cancer UK: [www.bowelcanceruk.org.uk](http://www.bowelcanceruk.org.uk)
- Cancerbackup: Cancer of the large bowel information centre ([www.cancerbackup.org.uk/Cancertype/Bowelcolonrectum](http://www.cancerbackup.org.uk/Cancertype/Bowelcolonrectum))
- CancerHelp UK: *Bowel Cancer (Colorectal Cancer)* ([www.cancerhelp.org.uk/help](http://www.cancerhelp.org.uk/help)).

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