

Colorectal Cancer Screening

Key Points

- Colorectal cancer is a disease in which cells in the colon or rectum become abnormal and divide without control, forming a mass called a tumor (see Question 1).
- The exact causes of colorectal cancer are not known. However, studies show that certain factors increase a person's chance of developing colorectal cancer (see Question 2).
- Health care providers may suggest one or more tests for colorectal cancer screening, including a fecal occult blood test (FOBT); sigmoidoscopy; regular, or standard, colonoscopy; virtual colonoscopy; double contrast barium enema (DCBE); or digital rectal exam (DRE) (see Question 4).
- People should talk with their health care provider about when to begin screening for colorectal cancer, what tests to have, the benefits and risks (potential harms) of each test, and how often to schedule appointments (see Question 5).
- New methods, such as the genetic testing of stool samples, to screen for colorectal cancer are under study (see Question 8).

1. What is colorectal cancer?

Colorectal cancer is a disease in which cells in the colon or rectum become abnormal and divide without control, forming a mass called a tumor. (The colon and rectum are parts of the body's digestive system, which takes up nutrients from food and water, and stores solid waste until it passes out of the body.)

Colorectal cancer cells may also invade and destroy the tissue around them. In addition, they may break away from the tumor and spread to form new tumors in other parts of the body.



Colorectal cancer is the third most common type of non-skin cancer in men (after prostate cancer and lung cancer) and in women (after breast cancer and lung cancer). It is the second leading cause of cancer death in the United States after lung cancer. Although the rate of new colorectal cancer cases and deaths is decreasing in this country, more than 145,000 new cases were diagnosed and more than 49,000 people died from this disease each year over the past 5 years (1).

2. **Who is at risk of developing colorectal cancer?**

The exact causes of colorectal cancer are not known. However, studies have shown that certain factors are linked to an increased chance of developing this disease (2–11), including the following:

- **Age**—Colorectal cancer is more likely to occur as people get older. Although this disease can occur at any age, most people who develop colorectal cancer are over age 50.
- **Polyps**—Polyps are abnormal growths that protrude from the inner wall of the colon or rectum. They are relatively common in people over age 50. Most polyps are benign (noncancerous), but experts believe that the majority of colorectal cancers develop in polyps known as adenomas. Detecting and removing these growths may help prevent colorectal cancer. The procedure to remove polyps is called a polypectomy.

Some individuals may be genetically predisposed to develop polyps. Familial adenomatous polyposis, or FAP, is a rare, inherited condition in which hundreds of polyps develop in the colon and rectum. Because individuals with this condition are extremely likely to develop colorectal cancer, they are often treated with surgery to remove the colon and rectum in an operation called a colectomy. Rectum-sparing surgery may also be an option. In addition, the Food and Drug Administration (FDA) has approved an anti-inflammatory drug, celecoxib, for the treatment of FAP. Doctors may prescribe this drug in combination with surveillance and surgery to manage FAP.

- **Personal history**—A person who has already had colorectal cancer is at an increased risk of developing colorectal cancer a second time. Also, research studies have shown that some women with a history of ovarian, uterine, or breast cancer have a higher than average chance of developing colorectal cancer.
- **Family history**—Close relatives (parents, siblings, or children) of a person who has had colorectal cancer are somewhat more likely to develop this type of cancer themselves, especially if the family member developed the cancer at a young age. If many family members have had colorectal cancer, the chances increase even more.

- **Ulcerative colitis or Crohn colitis**—Ulcerative colitis is a condition that causes inflammation and sores (ulcers) in the lining of the colon. Crohn colitis (also called Crohn disease) causes chronic inflammation of the gastrointestinal tract, most often of the small intestine (the part of the digestive tract that is located between the stomach and the large intestine). People who have ulcerative colitis or Crohn colitis may be more likely to develop colorectal cancer than people who do not have these conditions.
- **Diet**—Some evidence suggests that the development of colorectal cancer may be associated with high dietary consumption of red and processed meats and low consumption of whole grains, fruits, and vegetables. Researchers are exploring what role these and other dietary components play in the development of colorectal cancer.
- **Exercise**—Some evidence suggests that a sedentary lifestyle may be associated with an increased risk of developing colorectal cancer. In contrast, people who exercise regularly may have a decreased risk of developing colorectal cancer. Also see the National Cancer Institute (NCI) Fact Sheet *Physical Activity and Cancer: Questions and Answers* at <http://www.cancer.gov/cancertopics/factsheet/physical-activity-qa> on the Internet.
- **Smoking**—Increasing evidence from epidemiologic studies suggests that cigarette smoking, particularly long-term smoking, increases the risk of colorectal cancer.

3. What is screening, and why is it important?

Screening is checking for health problems before they cause symptoms.

Colorectal cancer screening can detect cancer; polyps; nonpolypoid lesions, which are flat or slightly depressed areas of abnormal cell growth; and other conditions.

Nonpolypoid lesions occur less often than polyps, but they can also develop into colorectal cancer (12).

If colorectal cancer screening reveals a problem, diagnosis and treatment can occur promptly. In addition, finding and removing polyps or other areas of abnormal cell growth may be one of the most effective ways to prevent colorectal cancer development. Also, colorectal cancer is generally more treatable when it is found early, before it has had a chance to spread.

4. What methods are used to screen people for colorectal cancer?

Health care providers may suggest one or more of the following tests for colorectal cancer screening:

- **Fecal occult blood test (FOBT)**—This test checks for hidden blood in fecal material (stool). Currently, two types of FOBT are available. One type, called guaiac FOBT, uses the chemical guaiac to detect heme in stool. Heme is the iron-containing

component of the blood protein hemoglobin. The other type of FOBT, called immunochemical FOBT, uses antibodies to detect human hemoglobin protein in stool (13–15). Studies have shown that FOBT, when performed every 1 to 2 years in people ages 50 to 80, can help reduce the number of deaths due to colorectal cancer by 15 to 33 percent (13–15).

- **Sigmoidoscopy**—In this test, the rectum and *lower* colon are examined using a lighted instrument called a sigmoidoscope. During sigmoidoscopy, precancerous and cancerous growths in the rectum and lower colon can be found and either removed or biopsied. Studies suggest that regular screening with sigmoidoscopy after age 50 can help reduce the number of deaths from colorectal cancer (14). A thorough cleansing of the lower colon is necessary for this test.
- **Colonoscopy**—In this test, the rectum and *entire* colon are examined using a lighted instrument called a colonoscope. During colonoscopy, precancerous and cancerous growths throughout the colon can be found and either removed or biopsied, including growths in the upper part of the colon, where they would be missed by sigmoidoscopy. However, it is not yet known for certain whether colonoscopy can help reduce the number of deaths from colorectal cancer. A thorough cleansing of the colon is necessary before this test, and most patients receive some form of sedation.
- **Virtual colonoscopy** (also called computerized tomographic colonography)—In this test, special x-ray equipment is used to produce pictures of the colon and rectum. A computer then assembles these pictures into detailed images that can show polyps and other abnormalities. Because it is less invasive than standard colonoscopy and sedation is not needed, virtual colonoscopy may cause less discomfort and take less time to perform. As with standard colonoscopy, a thorough cleansing of the colon is necessary before this test. Whether virtual colonoscopy can reduce the number of deaths from colorectal cancer is not yet known.
- **Double contrast barium enema (DCBE)**—In this test, a series of x-rays of the entire colon and rectum are taken after the patient is given an enema with a barium solution and air is introduced into the colon. The barium and air help to outline the colon and rectum on the x-rays. Research shows that DCBE may miss small polyps. It detects about 30 to 50 percent of the cancers that can be found with standard colonoscopy (14).
- **Digital rectal exam (DRE)**—In this test, a health care provider inserts a lubricated, gloved finger into the rectum to feel for abnormal areas. DRE allows examination of only the lower part of the rectum. It is often performed as part of a routine physical examination.

Scientists are still studying colorectal cancer screening methods, both alone and in combination, to determine how effective they are. Studies are also under way to clarify the potential risks, or harms, of each test. See Question 5 for a table outlining some of

the advantages and disadvantages, including potential harms, of specific colorectal cancer screening tests.

5. How can people and their health care providers decide which colorectal cancer screening test(s) to use and how often to be screened?

Several major organizations, including the U.S. Preventive Services Task Force (a group of experts convened by the U.S. Public Health Service), the American Cancer Society, and professional societies, have developed guidelines for colorectal cancer screening. Although some details of their recommendations vary regarding which screening tests to use and how often to be screened, all of these organizations support screening for colorectal cancer.

People should talk with their health care provider about when to begin screening for colorectal cancer, what tests to have, the benefits and harms of each test, and how often to schedule appointments.

The decision to have a certain test will take into account several factors, including the following:

- the person’s age, medical history, family history, and general health;
- the accuracy of the test;
- the potential harms of the test;
- the preparation required for the test;
- whether sedation is necessary during the test;
- the follow-up care after the test;
- the convenience of the test; and
- the cost of the test and the availability of insurance coverage.

The following table outlines some of the advantages and disadvantages, including potential harms, of the colorectal cancer screening tests described in this fact sheet.

| Advantages and Disadvantages of Colorectal Cancer Screening Tests | | |
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| Test | Advantages | Disadvantages |
| Fecal Occult Blood Test (FOBT) | <ul style="list-style-type: none"> • No cleansing of the colon is necessary. • Samples can be collected at home. • The cost is low compared with other colorectal cancer screening tests. | <ul style="list-style-type: none"> • This test fails to detect most polyps and some cancers (13, 15). • False-positive results (the test suggests an abnormality when none is present) are possible (13, 15). |

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| | <ul style="list-style-type: none"> • FOBT does not cause bleeding or tearing/perforation of the lining of the colon. | <ul style="list-style-type: none"> • Dietary restrictions and changes, such as avoiding meat, certain vegetables, vitamin C, iron supplements, and aspirin, and increasing fiber consumption, are often recommended for several days before a guaiac FOBT. These restrictions and changes are not required for immunochemical FOBT. • Additional procedures, such as colonoscopy, may be necessary if the test indicates an abnormality. |
| Sigmoidoscopy | <ul style="list-style-type: none"> • This test is usually quick, with few complications. • For most patients, discomfort is minimal. • In some cases, the doctor may be able to perform a biopsy (the removal of tissue for examination under a microscope by a pathologist) and remove polyps during the test, if necessary. • Less extensive cleansing of the colon is necessary with this test than for a colonoscopy. | <ul style="list-style-type: none"> • This test allows the doctor to view only the rectum and the lower part of the colon. Any polyps in the upper part of the colon will be missed. • There is a very small risk of bleeding or tearing/perforation of the lining of the colon (16). • Additional procedures, such as colonoscopy, may be necessary if the test indicates an abnormality. |
| Colonoscopy | <ul style="list-style-type: none"> • This test allows the doctor to view the rectum and the entire colon. • The doctor can perform a biopsy and remove polyps or other abnormal tissue during the test, if necessary. | <ul style="list-style-type: none"> • This test may not detect all small polyps, nonpolypoid lesions, and cancers, but it is one of the most sensitive tests currently available. • Thorough cleansing of the colon is necessary before this test. |

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| | | <ul style="list-style-type: none"> • Some form of sedation is used in most cases. • Although uncommon, complications such as bleeding and/or tearing/perforation of the lining of the colon can occur (16). |
| Virtual Colonoscopy | <ul style="list-style-type: none"> • This test allows the doctor to view the rectum and the entire colon. • This is not an invasive procedure, so there is no risk of bleeding or tearing/perforation of the lining of the colon. | <ul style="list-style-type: none"> • This test may not detect all small polyps, nonpolypoid lesions, and cancers (17, 18). • Thorough cleansing of the colon is necessary before the test. • If a polyp or nonpolypoid lesion 6 to 9 millimeters in size or larger is detected, standard colonoscopy, usually immediately after the virtual procedure, will be recommended to remove the polyp or lesion or perform a biopsy (19, 20). |
| Double Contrast Barium Enema (DCBE) | <ul style="list-style-type: none"> • This test usually allows the doctor to view the rectum and the entire colon. • Complications are rare. • No sedation is needed. | <ul style="list-style-type: none"> • This test may not detect some small polyps and cancers (14). • Thorough cleansing of the colon is necessary before the test. • False-positive results are possible. • The doctor cannot perform a biopsy or remove polyps during the test. • Additional procedures are necessary if the test indicates |

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| | | an abnormality. |
| Digital Rectal Exam (DRE) | <ul style="list-style-type: none"> • Often part of a routine physical examination. • No cleansing of the colon is necessary. • The test is usually quick and painless. | <ul style="list-style-type: none"> • The test can detect abnormalities only in the lower part of the rectum. • Additional procedures are necessary if the test indicates an abnormality. |

6. Do insurance companies pay for colorectal cancer screening?

Insurance coverage varies. People should check with their health insurance provider to determine their colorectal cancer screening benefits. Because virtual colonoscopy is a fairly new procedure, reimbursement policies may be more uncertain than for other types of screening. Medicare covers several colorectal cancer screening tests for its beneficiaries. Specific information about Medicare benefits is available on the Medicare Web site at <http://www.medicare.gov/health/overview.asp> on the Internet.

7. What happens if a colorectal cancer screening test shows an abnormality?

If a screening test finds an abnormality, the health care provider will perform a physical exam and evaluate the person’s personal and family medical history. Additional tests may be ordered. These tests may include x-rays of the gastrointestinal tract, sigmoidoscopy, or, most often, colonoscopy (see Question 4). The health care provider may also order a blood test called a CEA assay to measure carcinoembryonic antigen, a protein that is sometimes detected in greater amounts in patients with colorectal cancer. If an abnormality is found during a sigmoidoscopy, a biopsy or polypectomy may be performed during the test, and a colonoscopy may be recommended. If an abnormality is found during a standard colonoscopy, a biopsy or polypectomy is performed to determine whether cancer is present. If an abnormality is detected during virtual colonoscopy, most patients would be referred for a standard colonoscopy the same day.

8. Are new tests under study for colorectal cancer screening?

Genetic testing of stool samples is being studied as a possible way to screen for colorectal cancer (15, 21, 22). The lining of the colon is constantly shedding cells into the stool. Testing stool samples for genetic alterations that occur in colorectal cancer cells may help doctors find evidence of cancer or precancerous growths. Research conducted thus far has shown that this kind of test can detect colorectal cancer in people already diagnosed with this disease by other means. However, more studies are needed to determine whether this type of test can accurately detect colorectal cancer or precancerous polyps in people who do not have symptoms.

Information about ongoing clinical trials that are studying methods for colorectal cancer screening can be found in NCI's clinical trials database. This database can be searched by visiting <http://www.cancer.gov/clinicaltrials/search> on the Internet. You may also contact NCI's Cancer Information Service (see contact information below) for assistance in searching the clinical trials database or for other cancer information needs.

Selected References

1. American Cancer Society (2008). *Cancer Facts and Figures 2008*. Atlanta, GA: American Cancer Society. Retrieved August 10, 2008, from <http://www.cancer.org/downloads/STT/2008CAFFfinalsecured.pdf>.
2. Hill LB, O'Connell JB, Ko CY. Colorectal cancer: Epidemiology and health services research. *Surgical Oncology Clinics of North America* 2006; 15(1):21–37.
3. Schatzkin A, Mouw T, Park Y, et al. Dietary fiber and whole-grain consumption in relation to colorectal cancer in the NIH-AARP Diet and Health Study. *The American Journal of Clinical Nutrition* 2007; 85(5):1353–1360.
4. Koushik A, Hunter DJ, Spiegelman D, et al. Fruits, vegetables, and colon cancer risk in a pooled analysis of 14 cohort studies. *Journal of the National Cancer Institute* 2007; 99(19):1471–1483.
5. Gonzalez CA. The European Prospective Investigation into Cancer and Nutrition (EPIC). *Public Health Nutrition* 2006; 9(1A):124–126.
6. Norat T, Bingham S, Ferrari P, et al. Meat, fish, and colorectal cancer risk: The European Prospective Investigation into Cancer and Nutrition. *Journal of the National Cancer Institute* 2005; 97(12):906–916.
7. Howard RA, Freedman DM, Park Y, et al. Physical activity, sedentary behavior, and the risk of colon and rectal cancer in the NIH-AARP Diet and Health Study. *Cancer Causes and Control* 2008; 19(9):939–953.
8. Friedenreich C, Norat T, Steindorf K, et al. Physical activity and risk of colon and rectal cancers: The European Prospective Investigation into Cancer and Nutrition. *Cancer Epidemiology, Biomarkers and Prevention* 2006; 15(12):2398–2407.
9. Samad AK, Taylor RS, Marshall T, Chapman MA. A meta-analysis of the association of physical activity with reduced risk of colorectal cancer. *Colorectal Disease* 2005; 7(3):204–213.
10. Paskett ED, Reeves KW, Rohan TE, et al. Association between cigarette smoking and colorectal cancer in the Women's Health Initiative. *Journal of the National Cancer Institute* 2007; 99(22):1729–1735.

11. Chao A, Thun MJ, et al. Cigarette smoking and colorectal cancer mortality in the Cancer Prevention Study II. *Journal of the National Cancer Institute* 2000; 92(23):1888–1896.
12. Soetikno RM, Kaltenbach T, Rouse RV, et al. Prevalence of nonpolypoid (flat and depressed) colorectal neoplasms in asymptomatic and symptomatic adults. *Journal of the American Medical Association* 2008; 299(9):1027–1035.
13. Burch JA, Soares-Weiser K, St John DJ, et al. Diagnostic accuracy of faecal occult blood tests used in screening for colorectal cancer: A systematic review. *Journal of Medical Screening* 2007; 14(3):132–137.
14. PDQ® Cancer Information Summary. National Cancer Institute; Bethesda, Maryland. *Colorectal Cancer Screening—Health Professional*. Date last modified: 08/26/2008. Available at <http://www.cancer.gov/cancertopics/pdq/screening/colorectal/healthprofessional>. Accessed 10/3/2008.
15. Ouyang DL, Chen JJ, Getzenberg RH, Schoen RE. Noninvasive testing for colorectal cancer: A review. *American Journal of Gastroenterology* 2005; 100(6):1393–1403.
16. Gatto NM, Frucht H, Sundararajan V, et al. Risk of perforation after colonoscopy and sigmoidoscopy: A population-based study. *Journal of the National Cancer Institute* 2003; 95(3):230–236.
17. Pickhardt PJ, Choi JR, Hwang I, et al. Computed tomographic virtual colonoscopy to screen for colorectal neoplasia in asymptomatic adults. *New England Journal of Medicine* 2003; 349(23):2191–2200.
18. Johnson CD, Chen MH, Toledano AY, et al. Accuracy of CT colonography for detection of large adenomas and cancers. *New England Journal of Medicine* 2008; 359(12):1207–1217.
19. Rex DK, ACG Board of Trustees. American College of Gastroenterology action plan for colorectal cancer prevention. *American Journal of Gastroenterology* 2004; 99(4):574–577.
20. Summerton S, Little E, Cappell MS. CT colonography: Current status and future promise. *Gastroenterology Clinics of North America* 2008; 37(1):161–189.
21. Imperiale TF, Ransohoff DF, Itzkowitz SH, Turnbull BA, Ross ME. Fecal DNA versus fecal occult blood for colorectal-cancer screening in an average-risk population. *New England Journal of Medicine* 2004; 351(26):2704–2714.
22. Itzkowitz SH, Jandorf L, Brand R, et al. Improved fecal DNA test for colorectal cancer screening. *Clinical Gastroenterology and Hepatology* 2007; 5(1):111–117.

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Related NCI materials and Web pages:

- National Cancer Institute Fact Sheet 4.21, *Physical Activity and Cancer: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/physical-activity-qa>)
- Colon and Rectal Cancer Home Page (<http://www.cancer.gov/cancertopics/types/colon-and-rectal>)
- *What You Need To Know About™ Cancer of the Colon and Rectum* (<http://www.cancer.gov/cancertopics/wyntk/colon-and-rectal>)

How can we help?

We offer comprehensive research-based information for patients and their families, health professionals, cancer researchers, advocates, and the public.

- **Call** NCI's Cancer Information Service at 1-800-4-CANCER (1-800-422-6237)
- **Visit** us at <http://www.cancer.gov> or <http://www.cancer.gov/espanol>
- **Chat** using LiveHelp, NCI's instant messaging service, at <http://www.cancer.gov/livehelp>
- **E-mail** us at cancergovstaff@mail.nih.gov
- **Order** publications at <http://www.cancer.gov/publications> or by calling 1-800-4-CANCER
- **Get help** with quitting smoking at 1-877-44U-QUIT (1-877-448-7848)

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