

Colorectal Cancer Screening

What is colorectal cancer screening?

Screening examinations are tests performed to identify disease in individuals who lack any signs or symptoms. The primary goal of cancer screening is to detect cancer at its earliest stage, when treatment is still an option. However, the primary goal of colorectal cancer screening is to identify abnormal growths, known as polyps, well before the polyps become cancerous. In order to be endorsed by the medical community, a screening program must meet a number of criteria (http://www.radiologyinfo.org/en/info/safety-hiw_05), including reducing the number of deaths from the given disease.



Many options exist for individuals who are interested in undergoing screening for colorectal cancer, including:

- Computed tomography colonography (CTC), also called virtual colonoscopy, a test in which low-dose CT scanning is used to produce pictures of the colon and rectum.
- Colonoscopy, a test that examines the rectum and entire colon using a long, lighted instrument called a colonoscope.
- Double-contrast barium enema, also called lower GI tract radiography (<http://www.radiologyinfo.org/en/info/lowergi>), a test in which a barium solution and air are introduced into the colon and a series of x-rays are taken of the entire colon and rectum. A single-contrast barium enema that produces images using x-ray and a barium solution without air is also available for select situations.
- Sigmoidoscopy, a test that examines the rectum and lower colon using a lighted instrument called a sigmoidoscope.

Screening examinations for detection only of colorectal cancer include:

- Fecal occult blood test (FOBT) or fecal immunochemical test that checks for hidden blood in fecal material (stool).
- Stool DNA test that checks for abnormal DNA or genetic material in mutated cells that are shed into the stool.

Who should consider colorectal cancer screening – and why?

About Colorectal Cancer

Colorectal cancer (<http://www.radiologyinfo.org/en/info/colocarcinoma>) is cancer that forms in the colon or rectum, which comprise the lower part of the body's digestive tract, a series of hollow organs joined in a long, twisting tube from the mouth to the anus. This tract is part of the digestive system, a complex system that enables the body to break down and absorb food and eliminate waste.

Polyps, abnormal growths that stick out from the inner wall of the colon or rectum, are common in people over age 50. Most polyps are benign (non-cancerous). However, the majority of colorectal cancers develop in specific types of polyps known as adenomas. Detecting and removing adenomas may help prevent colon cancer.

Colorectal cancer is the third most common cancer and the third leading cause of cancer death in the United States. The number of

deaths from the disease has decreased as a result of improved tests that allow for both cancer prevention and for early detection of cancer, when it can be more easily treated.

Screening Recommendations

The American Cancer Society (<https://onlinelibrary.wiley.com/doi/full/10.3322/caac.21457>) recommends that adults begin screening at age 45, preferably with a test that allows for both cancer prevention and detection.

Tests that offer both cancer prevention and detection (preferred) include:

- CT colonography (CTC), also called virtual colonoscopy, repeated every five years
- colonoscopy, repeated every 10 years
- double-contrast barium enema, repeated every five years
- flexible sigmoidoscopy, repeated every five years

Tests that allow for cancer detection only include:

- fecal occult blood test (gFOBT) or fecal immunochemical test (FIT) every year
- stool DNA test every three years

If blood, significant polyps or other suspicious areas are found during the screening tests above (other than colonoscopy), your physician will most likely recommend a follow-up colonoscopy.

High Risk Individuals

Individuals at high risk for developing colorectal cancer should be screened more often and begin screening before age 45. Your doctor can advise you about when to begin screening for colorectal cancer, which tests to have, the benefits and risks of testing, and how often to be screened.

Factors that put an individual at a higher risk for developing colorectal cancer include:

- age 60 or older
- African American or eastern European ancestry
- a personal history of:
 - colorectal cancer
 - cancer of the ovary, endometrium, or breast
 - inflammatory bowel disease (ulcerative colitis or Crohn's disease)
- a family history of:
 - colorectal cancer or polyps
 - a hereditary colorectal cancer syndrome such as familial adenomatous polyposis (FAP) or hereditary non-polyposis colon cancer (HNPCC)

Other risk factors for colorectal cancer include smoking cigarettes, drinking alcohol and consuming a high-fat, low-fiber diet.

How is colorectal cancer screening performed?

CT colonography (CTC)

CT colonography, also known as virtual colonoscopy, uses low-dose radiation CT scanning to obtain images of the inside of the colon that otherwise can only be seen with the more invasive colonoscopy.

During CT colonography, a small tube is inserted a short distance into the rectum to allow for inflation with carbon dioxide or air. Automated carbon dioxide is preferred as it provides improved distention and less discomfort. CT images are then taken of the patient's abdomen and examined for polyps and other abnormalities using advanced computer software. No sedation is required for this exam.

CT scanning works very much like other x-ray examinations. X-rays are a form of radiation—like light or radio waves—that can be directed after their passage through the part of the body being examined. Different body parts absorb the x-rays in varying degrees. Radiologists, physicians who specialize in medical imaging performance and interpretation, recognize the importance of keeping the radiation dose to their patients as low as possible while still using the necessary amount to ensure they obtain a diagnostic quality image. *See the Safety page (<http://www.radiologyinfo.org/en/info/safety-xray>) for more information about x-rays.*

Colonoscopy

Colonoscopy is an examination in which a flexible tube with a tiny camera at the end called a colonoscope is inserted into the colon to capture images of the interior of the colon. The colonoscope may also have a tool to remove polyps or tissue samples.

During colonoscopy, a colonoscope is inserted through the rectum and into the colon. The colon is inflated with air and the camera at the end of the scope transmits video images onto a video screen, allowing the physician to examine the inner walls of the intestines. If necessary, the physician may remove polyps and tissue samples using tools inserted through the colonoscope. A thorough cleansing of the colon is necessary before this test, and most patients also receive some form of sedation (anesthesia).

Because this screening examination is more invasive and utilizes fairly heavy sedation, recovery time is required and a separate individual must drive the patient home.

Double-Contrast Barium Enema

A double-contrast barium enema, also called lower gastrointestinal (GI) tract radiography, is an x-ray examination of the entire colon and rectum after the colon is filled with a barium liquid and air.

For a double-contrast barium enema, the radiologist or technologist inserts a mixture of barium and water into the colon through a small tube placed into the rectum. Air is also injected through the tube to help distend (inflate) the colon and to help the barium thoroughly coat the lining of the colon. A single-contrast version of the barium enema without air may also be employed. A series of x-ray images of the abdomen are taken. Prior to this test, a thorough cleansing of the colon is necessary to allow the doctor to see the inner lining of the colon and rectum. You will receive instructions on how to empty the colon, which may require you to take a laxative (in either liquid or pill form) and possibly an enema.

Sigmoidoscopy

Sigmoidoscopy is an examination in which a flexible tube with a tiny camera at the end called a sigmoidoscope is inserted into the colon to capture images of the interior of the lower colon and rectum. Unlike colonoscopy, which examines the entire colon, sigmoidoscopy typically captures images of only the lower third of the colon known as the sigmoid colon. Attached to the sigmoidoscope are tools that allow the physician to remove polyps or tissue samples if needed.

During a sigmoidoscopy, the physician inserts the scope through the rectum and into the lower colon. Air is used to help inflate the colon. The camera transmits video images onto a computer screen allowing the physician to examine the tissue lining of the sigmoid colon and rectum and, if necessary, to remove polyps and tissue samples. Prior to a sigmoidoscopy, a thorough cleansing of the lower colon is necessary.

If sigmoidoscopy is positive, your doctor may recommend a full colonoscopy be performed at a later date.

Fecal Occult Blood Test

The guaiac fecal occult blood test (gFOBT) and the immunochemical FOBT (iFOBT) also called the fecal immunochemical test (FIT) are tests to check the stool (solid waste) for tiny traces of blood that may be a sign of polyps or cancer. The immunochemical FOBT (iFOBT) is a newer fecal occult blood test.

For this test, small samples of stool are placed on special cards and returned to a laboratory where they are analyzed under a microscope.

Stool DNA Test

The stool DNA test checks for specific abnormal DNA or genetic material from cancer or polyp cells. Colorectal cancer cells often contain DNA abnormalities and these cells may shed into the stool, where tests may be able to identify them. The DNA test may be combined with a test that detects blood in the stool as well.

For this test, you will receive a kit with various containers. An entire stool sample is collected and shipped within a day of collection to a laboratory for analysis. It must arrive within 72 hours to the laboratory.

These tests are primarily intended to detect cancer (not polyps). They lack the preventive benefit of the other screening options, which are preferred by the American Cancer Society for use in patients who have no symptoms.

What are the benefits and risks of colorectal cancer screening?

CT Colonography

Benefits

- This minimally invasive test provides both 2-D and 3-D images that can depict many polyps and other lesions as clearly as when they are directly seen by conventional colonoscopy.
- CT colonography has a much lower risk of perforating the colon than conventional colonoscopy. Most people who undergo CT colonography do not have polyps, and can be spared having to undergo a full colonoscopy.
- CT colonography is an excellent alternative for patients who wish to avoid sedation or have clinical factors that increase the risk of complications from colonoscopy, such as treatment with a blood thinner or a severe breathing problem.
- Elderly patients, especially those who are frail or ill, will tolerate CT colonography better than conventional colonoscopy.
- CT colonography can be helpful when colonoscopy cannot be completed because the bowel is narrowed or obstructed for any reason, such as by a large tumor.
- If conventional colonoscopy cannot reach the full length of the colon—which occurs up to 10 percent of the time—CT colonography can generally be performed on the same day because the colon has already been cleansed.
- CT colonography provides clearer and more detailed images than a conventional barium enema x-ray examination.
- CT colonography can detect abnormalities outside of the colon, including early-stage malignancies and potentially dangerous conditions, such as abdominal aortic aneurysms.
- CT colonography is well tolerated. Sedation and pain relievers are not needed, so there is no recovery period. Patients can drive themselves home.
- CT colonography is less costly than colonoscopy.
- No radiation remains in a patient's body after a CT examination.
- X-rays used in standard CT scans have no immediate side effects. CT colonography is a specific type of low dose CT scan.

Risks

- There is a very small risk that inflating the colon with air could injure or perforate the bowel. This has been estimated to happen in fewer than one in 10,000 patients.
- Although unproven, there is a slight theoretical risk of developing a cancer secondary to radiation exposure much later in

life. However, the benefit of an accurate diagnosis greatly outweighs any theoretical risk. These risks are more pronounced in children and individuals under the age of 50.

- The effective radiation dose for this procedure varies. *See the Safety page (<http://www.radiologyinfo.org/en/info/safety-xray>) for more information about radiation dose.*
- Women should always inform their physician and x-ray or CT technologist if there is any possibility that they are pregnant. *See the Safety page (<http://www.radiologyinfo.org/en/info/safety-radiation>) for more information about pregnancy and x-rays.*
- CT scanning is generally not recommended for pregnant women unless medically necessary because of potential risk to the baby.

Colonoscopy

Benefits

- This procedure allows the entire colon and rectum to be examined.
- The doctor may be able to remove polyps and perform a biopsy (in which a sample of abnormal tissue is removed) during this procedure.

Risks

- Colonoscopy may not detect all polyps and cancers; however, it is one of the most sensitive tests currently available (along with CT colonography).
- A thorough cleansing of the colon is necessary before this test.
- In most cases, some form of sedation (anesthesia) is necessary for this procedure.
- Although relatively uncommon, complications such as bleeding, tearing or perforation of the colon and cardiovascular complications may occur. Due to the invasiveness of this screening test, immediate risk is more common than with the minimally invasive screening options.
- Colonoscopy misses up to 20 percent of polyps and up to five percent of colon cancers.

Double-Contrast Barium Enema

Benefits

- This procedure allows the entire colon and rectum to be examined.
- Complications are rare.
- No sedation is required.

Risks

- The barium enema may not detect some small polyps and cancers.
- A thorough cleansing of the colon is necessary for this test.
- A physician cannot remove polyps or perform a biopsy (in which a sample of abnormal tissue is removed) during this procedure.
- False-positive results can occur. False-positive results occur when a test appears to be abnormal but no cancer is found.
- Abnormal findings require additional testing to determine whether or not cancer is present. These tests have risks and may cause a patient anxiety.

Sigmoidoscopy

Benefits

- The procedure is quick to perform.
- Complications are rare.
- For most patients, discomfort is minimal.
- The doctor may be able to remove polyps and perform a biopsy (in which a sample of abnormal tissue is removed) during this procedure.
- Less extensive cleansing of the colon is necessary for this test than for a colonoscopy.

Risks

- During a sigmoidoscopy, only the last third of the colon is examined and as a result, some cancers and polyps may be missed.
- No sedation is necessary for this test.
- False-negative results may occur. Test results that appear to be normal even when colorectal cancer is present are called false-negative results. A person who receives a false-negative test result may delay seeking medical care.
- Additional procedures, such as a colonoscopy, may be needed if the test indicates an abnormality.

Fecal Occult Blood Test (FOBT)

Benefits

- No cleansing of the colon is necessary.
- Stool samples can be collected at home.
- The cost of this test is low compared with other colorectal cancer screening tests.

Risks

- The fecal occult blood test fails to detect most polyps and some cancers.
- Additional procedures, such as colonoscopy, may be needed if the test indicates an abnormality.
- Certain foods and medications need to be avoided prior to taking the test.
- False-positive results can occur. False-positive results occur when a test appears to be abnormal but no cancer is found. Abnormal findings require additional testing to determine whether cancer is present. These tests have risks and may cause a patient anxiety.
- False-negative results can occur. Test results that appear to be normal even when colorectal cancer is present are called false-negative results. A person who receives a false-negative test result may delay seeking medical care.

Stool DNA Test

Benefits

- No cleansing of the colon is necessary.
- No dietary restriction.
- Stool sample can be collected at home.

Risks

- The stool DNA test fails to detect most polyps and a small percentage of cancers.
- Additional procedures, such as colonoscopy, may be needed if the test indicates an abnormality.

- False-positive results can occur. False-positive results occur when a test appears to be abnormal but no cancer is found. Abnormal findings require additional testing to determine whether cancer is present. These tests have risks and may cause a patient anxiety.
- False-negative results can occur. Test results that appear to be normal even when colorectal cancer is present are called false-negative results. A person who receives a false-negative test result may delay seeking medical care.

What happens if something is detected on my screening exam?

If blood, significant polyps, or other suspicious areas are found during the screening tests above (other than colonoscopy), your physician will most likely recommend a follow-up colonoscopy. If an abnormality is found during a colonoscopy, a biopsy or polypectomy may be performed to determine whether cancer is present.

Your physician may also perform a complete physical, including an evaluation of your personal and family medical history, and a blood test called a CEA assay that measures a protein called carcinoembryonic antigen (if cancer is found). Patients with colorectal cancer sometimes have high levels of CEA in their blood, and this marker can also be used to assess for tumor recurrence post therapy.

Colorectal cancer treatment

Treatment options for colorectal cancer depend on the stage of the disease—that is, how far it has spread or how deeply it is affecting the intestinal wall and other tissues as well as whether it is located in the colon or rectum. In general, patients with colon cancer receive post-operative chemotherapy (<http://www.radiologyinfo.org/en/gallery/image/290>) if the lymph nodes are positive (disease is detected) or if the tumor has spread to other tissues. For rectal cancer, patients with positive nodes, widespread disease, or tumors that extend beyond the rectum receive chemotherapy plus radiation, most often before surgery. Treatment is also determined by the patient's age, medical history, overall health and tolerance for specific medications and therapies.

For more information, see the *Colorectal Cancer Treatment* (<http://www.radiologyinfo.org/en/info/colorect>) page.

Which test, procedure or treatment is best for me?

- Colorectal Cancer Screening (<http://www.radiologyinfo.org/en/info/article-appropriateness-criteria#65ee0a9b1f7a41e7938d00b9a061e3d8>)

Where can I find more information about colorectal cancer screening?

You can find more information on colorectal cancer screening at:

- The American Cancer Society (<http://www.cancer.org/cancer/colonandrectumcancer/moreinformation/colonandrectumcancerearlydetection/colorectal-cancer-early-detection-acs-recommendations>)
- The National Cancer Institute (<http://www.cancer.gov/cancertopics/factsheet/detection/colorectal-screening>)

Screening Trials

Before a screening program is widely accepted and recommended by medical practitioners, it must do more than detect disease at an early stage. The accepted measure of screening effectiveness is a reduction in the number of deaths from the given disease.

Clinical *screening trials* (<http://www.radiologyinfo.org/en/info/screening-clinical-trials>) are research studies that help determine to what extent screening methods actually reduce mortality (death rate) and at what cost.

Information on clinical trials studying both cancer screening and treatment methods is also available at the *National Cancer*

Institute (<http://cancer.gov/clinicaltrials/search>) .

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