

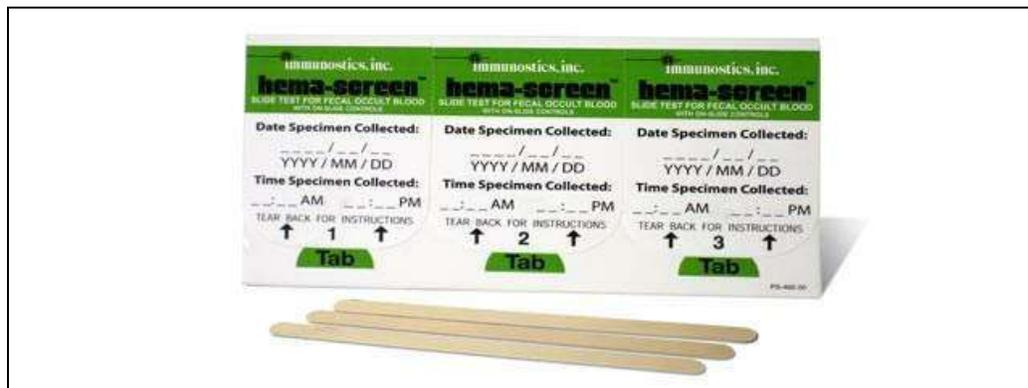
SCREENING TESTS

(i) Guaiac Fecal Occult Blood Test (gFOBT)

One of the presentations of colon cancer is chronic blood loss in the stool. Sometimes, such blood loss is so minimal, it cannot be seen when the stool is inspected in the toilet. Hence, a stool sample may be collected which is returned to the doctor or lab to test for occult (hidden) blood. The guaiac fecal occult blood test 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 Fecal Immunochemical Test, is explained below.

The idea behind the gFOBT is that blood vessels at the surface of larger colorectal polyps or cancers are often fragile and easily damaged by the passage of feces. The damaged vessels usually release a small amount of blood into the feces, but only rarely is there enough bleeding to be noticeable in the stool. This test, however, cannot determine whether the blood is from the colon or from other portions of the digestive tract (such as the stomach). Therefore, if the test is positive, a colonoscopy is required to determine if there is a cancer, polyp, or other cause of bleeding such as ulcers, hemorrhoids, diverticulosis (tiny pouches that form at weak spots in the colon wall) or inflammatory bowel disease (colitis).

The Guaiac Fecal Occult Blood Test Kit



Source: http://health.gov.on.ca/en/ms/coloncancercheck/images/fobt_kit.jpg

gFOBT is done with a take-home kit that can be used in the privacy of the patient's home. See image above. People having this test will receive a kit with instructions explaining how to take a stool or feces sample at home (usually specimens from 3 consecutive bowel movements that are smeared onto small squares of paper). The kit should then be returned to the doctor's office or mailed to a medical lab (usually within 2 weeks) for testing. Supplies will include a test kit, test cards, either a brush or wooden applicator, and a mailing envelope. The instructions below can be used as a guide, but the instructions on the kit might be a little different depending upon province and manufacturer. Provincial screening



programs have specified laboratories to carry out the work on the sample and it is important to follow the specific instructions of the program when returning the sample, including the accompanying paper work.

FOBT Instructions:

- You will need to collect a sample from your bowel movement. You can place a sheet of plastic wrap loosely across the toilet bowl to catch the stool or you can use a dry container to collect the stool. Do not let the stool specimen mix with urine. After you obtain a sample, you can flush the remaining stool down the toilet.
- Use a wooden applicator or a brush to smear a thin film of the stool sample onto one of the slots in the test card or slide.
- Next, collect a specimen from a different area of the same stool and smear a thin film of the sample onto the other slot in the test card or slide.
- Close the slots and put your name and the date on the test kit. Store the kit overnight in a paper envelope to allow it time to dry.
- Repeat the test on your next 2 bowel movements as instructed. Most tests require collecting more than one sample from different bowel movements. This improves the accuracy of the test because many cancers don't bleed all of the time, and blood may not be present in all stool samples.
- Place the test kit in the mailing pouch provided and return it to your doctor or lab as soon as possible (but within 14 days of taking the first sample).

Some foods or drugs can affect the test, so the doctor may suggest that the following be avoided before the test:

- vitamin C in excess of 250 mg daily from either supplements or citrus fruits and juices for 3 days before testing. (This can affect the chemicals in the test and make it show negative.)

If this test finds blood, a colonoscopy will be required to look for the source. It is not sufficient to simply repeat the FOBT or follow up with other types of tests.

Additional instructions on how to use the FOBT may be found at Ontario's Colon Cancer Check [website](#).

In summary, the pros and cons of accessing an FOBT are:

Pros

- Simple
- Cost-effective
- Done at home

Cons

- Must be every two years
- Least effective means of detecting cancer
- Viewed as unsanitary by some
- Patient must retrieve samples of stool from the toilet bowl
- All positive results MUST BE EVALUATED WITH A COLONOSCOPY

(ii) Fecal Immunochemical Test (FIT or iFOBT)

The other type of FOBT called immunochemical FOBT or FIT, uses antibodies to detect human hemoglobin protein in stool. Much like the gFOBT, the test detects the presence of blood in the stools but the main difference is that the fecal immunochemical test uses a more high-tech laboratory method to detect the presence of blood. For this reason, it may be a more accurate way to screen for blood in the stools than the fecal occult blood test. If blood is detected, the patient will require follow-up testing such as colonoscopy, to determine the reason for the presence of blood in the stools.

FIT is performed in much the same way as the gFOBT, but sample collection may take less effort. This test reacts to part of the human hemoglobin protein, which is found on red blood cells. Hemoglobin from bleeding in the upper digestive tract is broken down before it reaches the lower digestive tract and is not detected by FIT. Hence, this test is also less likely to react to bleeding from parts of the upper digestive tract, such as the stomach. Thus, the FIT is a more specific test than gFOBT. As with the FOBT, however, the FIT may not detect a tumor that is not bleeding. And if the results are positive for hidden blood, a colonoscopy is required to investigate further.

Supplies will include a test kit, test cards, long brushes, waste bags, and a mailing envelope. The kit will provide detailed instructions on how to collect the specimen. The instructions below can be used as a guide, but the kit instructions might be a little different. Provincial screening programs have specified laboratories to carry out the work on the sample and it is important to follow the specific instructions of the program when returning the sample including the accompanying paper work.

- Flush the toilet before your bowel movement. After you go, place used toilet paper in the waste bag from the kit, not in the toilet.
- Brush the surface of the stool with one of the brushes, then dip the brush in the toilet water.

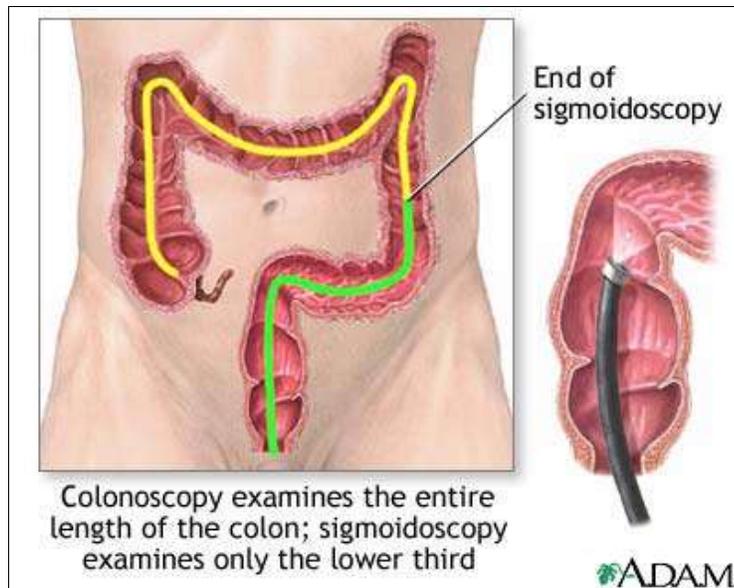
Dab the end of the brush onto one of the slots in the test card or slide.

- Close the slot and put your name and the date on the test kit.
- Repeat the test on your next bowel movement if instructed to do so. Not all FIT kits require multiple samples, though most tests require collecting more than one sample from different bowel movements. This improves the accuracy of the test because many cancers don't bleed all of the time, and blood may not be present in all stool samples.
- Place the test kit in the mailing envelope provided and return it to your doctor or lab as soon as possible (but within 14 days of taking the first sample).

(iii) Flexible Sigmoidoscopy

In this test, the doctor performs an examination to view the inside of the lower colon and rectum (usually about the lower 2 feet) for polyps and cancers using a flexible sigmoidoscope (a thin, flexible, lighted instrument having the thickness of a finger with a small video camera located at its end). It is inserted through the anus, into the rectum and sigmoid colon and images from the scope are viewed on a display monitor. If an adenoma (precancerous growth) is found, subsequent colonoscopy may be performed because sigmoidoscopy does not examine the entire colon and so is less reliable than colonoscopy for detecting polyps throughout the entire colon. Sedation is usually not used for sigmoidoscopy.

A sigmoidoscopy usually takes approximately 10-15 minutes wherein the patient is placed on a table on their left side with their knees positioned near their chest. The sigmoidoscope is lubricated to make it easier to insert into the rectum and may, therefore, feel cold upon entry. Upon insertion, the scope may stretch the wall of the colon, which may cause bowel spasms or lower abdominal pain. Air will be placed into the sigmoid colon through the scope so the doctor can view the colon better. It is quite common and normal to feel pressure and slight cramping in the lower abdomen during the procedure. After the procedure, once the air leaves the colon, the discomfort is alleviated.



Source: <http://www.nlm.nih.gov/medlineplus/ency/images/ency/fullsize/1083.jpg>

If a small polyp is found during the test, the doctor may wish to remove it with a small instrument passed through the scope, which will then be sent to a lab to be looked at by a pathologist (biopsy). If precancerous growths (polyps) or cancerous growths are discovered during a sigmoidoscopy, they may be removed and then biopsied with an instruction to perform a follow-up colonoscopy at a later date to look for polyps or cancer in the rest of the colon.

It is quite normal to see a small amount of blood in the first bowel movement after the test. Hence, do not be alarmed. On the other hand, should the colon have become punctured (a very rare but possible complication), immediate reporting of the complication to the treating physician should be done.

In summary, the pros and cons of accessing sigmoidoscopy are:

Pros

- Quick - usually a five-minute exam
- Does not require a vigorous bowel prep as in colonoscopy
- Does not require sedation
- Discomfort is minimal and complications are rare
- Less extensive cleansing of the colon is necessary for this test than for a colonoscopy

Cons

- Can only examine the lower third of the colon. The other two-thirds of the colon are not examined
- If polyps are found, the patient MAY HAVE TO RETURN FOR A FULL COLONOSCOPY
- Medication and diet restrictions may be required before the test

(iv) Colonoscopy

In this test, the rectum and entire length of the colon are examined using a lighted instrument called a colonoscope, essentially a longer version of a sigmoidoscope. The colonoscope is inserted through the anus and into rectum and the colon. It has a video camera on the end that is connected to a display monitor so the doctor can see and closely examine the inside of the colon. Special instruments can be passed through the colonoscope to remove (biopsy) any suspicious looking areas such as polyps, if need be. During colonoscopy, precancerous and cancerous growths throughout the colon can be found and removed or biopsied, including growths in the upper part of the colon, where they would be missed by sigmoidoscopy. A thorough cleansing of the colon is necessary before this test, and most patients receive some form of sedation to help keep them comfortable. Colonoscopy may be performed in a hospital outpatient department, or in a clinic. The colon and rectum must be empty and clean so the doctor can view the inner lining of the colon during the test. Laxatives (liquids, pills, or both) will be prescribed for the day before the test and possibly an enema on the morning of the test. Many patients consider the bowel preparation to be the most unpleasant part of the test, as it usually requires the patient to be in the bathroom quite a bit.

Other instructions may be given as well. For example, the doctor may instruct that only clear liquids may be ingested (water, apple juice, and any jello except red or purple) for a day or 2 before the exam. Plain tea or coffee with sugar is usually okay, but no milk or creamer is allowed. Clear broth, ginger ale, and most soft drinks or sports drinks are usually allowed unless they have red or purple food colorings, which could be mistaken for blood in the colon. Patients will also receive instructions for the morning of the test to abstain from eating or drinking anything after midnight the night before the test. Patients may need to arrange for someone to drive them home from the test because the sedative used during the test can affect their ability to drive.

The test itself usually takes approximately 30 minutes, although it may take longer if a polyp is found and removed. Before the colonoscopy begins, a sedating medicine is administered (usually through the vein) to promote comfort and drowsiness during the procedure. Patients may likely be awake, but may not be aware of what is going on and may not remember the procedure afterward. Most people will be fully awake by the time they get home from the test.

During the procedure, the patient is placed on their side with their knees flexed and a drape will cover them. The patient's blood pressure, heart rate, and breathing rate will be monitored during and after the test. The colonoscope is lubricated so it can be easily inserted through the anus and into the rectum. Once in the rectum, the colonoscope is passed all the way to the beginning of the colon, called the cecum. If not sedated, patients may feel an urge to have a bowel movement when the colonoscope is inserted or pushed further up the colon. To ease any discomfort, it may help to breathe deeply and slowly through the mouth. The colonoscope will deliver air into the colon so that it is easier for the doctor to view the lining of the colon and use the instruments to perform the test. Suction will be used to remove any blood or liquid stools. The doctor will look at the inner walls of the colon as they slowly withdraw the colonoscope on the way out of the colon. If a small polyp is found, the doctor may remove it. Some small polyps may eventually become cancerous and it is for this reason that they are removed.

This is usually done by passing a wire loop through the colonoscope to cut the polyp from the wall of the colon with an electrical current. The polyp can then be sent to a lab to be checked under a microscope to see if it has any areas that have changed into cancer.

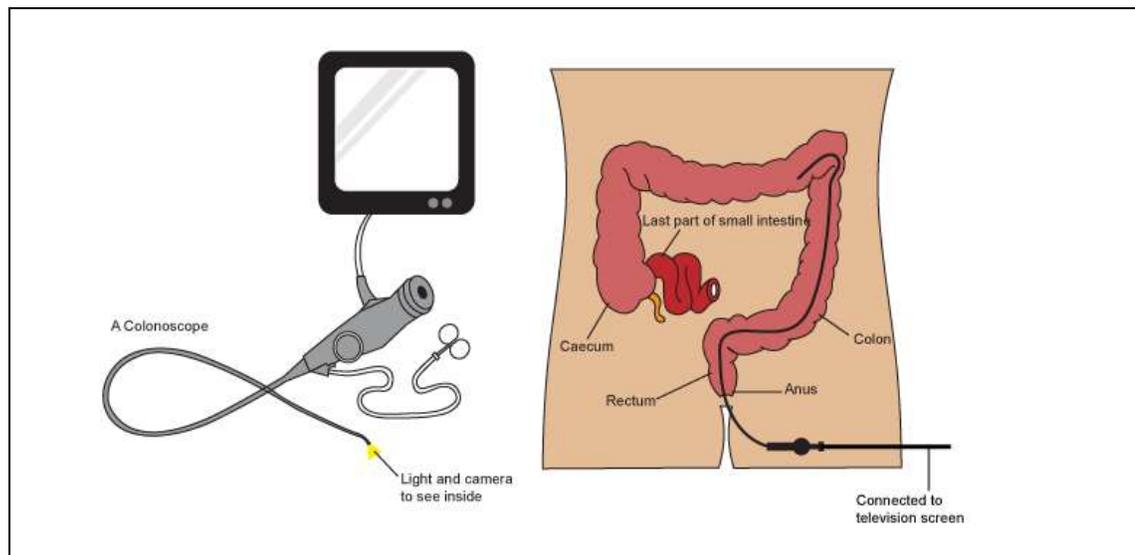


Image Source: <http://healthtopics.hcf.com.au/images/hcf/gifs/colonoscopy.gif>

The bowel preparation before the test can be unpleasant. The test itself may be uncomfortable, but the sedative usually prevents this, and most people feel normal once the effects of the sedative wear off. Some people may have gas pains or cramping for a while after the test. In some cases, people may experience low blood pressure or changes in heart rhythms due to the sedation during the test, although these are rarely serious. If a polyp is removed or a biopsy is performed during the colonoscopy, patients may notice some blood in their stool for a day or two after the test. Significant bleeding is slightly more likely with colonoscopy than with sigmoidoscopy, but it is still uncommon. In rare cases, continued bleeding might require treatment. Although colonoscopy is a safe procedure, on rare occasions the colonoscope can puncture the wall of the colon or rectum. This is called a perforation. It can be a serious complication and at times requires surgical repair. Possible complications should be discussed ahead of time with the treating physician.

In summary, the risks and benefits associated with accessing colonoscopy are:

Risks

- Bowel perforation (a hole or tear in the wall of the colon), requiring a repair operation (Occurs approximately 1 out of 1,000 tests)
- Nausea, vomiting, bloating, or rectal irritation caused by medicines, taken by mouth, that cleanse the bowel

- Requires a complete bowel prep the day before to cleanse the colon
- Lesions may still be missed, such as flat or depressed lesions
- Diet restrictions the day before the test

Benefits

- If all is well, most people can wait ten years before getting another one
- One of the main advantages of colonoscopy over other types of tests is its ability to sample (biopsy) abnormal areas of the colon for further evaluation
- Examines the entire colon, making it the most thorough method for evaluating the colon and rectum
- High detection rate for polyps, including small polyps, and ability to remove them immediately during the procedure
- Done with intravenous sedation to assure comfort during the exam

(v) CT Colonography (Virtual Colonoscopy)

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 required, 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 the test. The test allows the physician to look for colorectal polyps and cancers without having to insert a long colonoscope into the colon; and the test is performed by a radiologist as opposed to a gastroenterologist.

This test is an advanced type of computed tomography (CT or CAT) scan of the colon and rectum. A CT scan is an x-ray test that produces detailed cross-sectional images of the body. Instead of taking one picture, like a regular x-ray, a CT scanner takes many pictures as it rotates around the body while the patient is lying on a table. For CT colonography, special computer programs create both two-dimensional x-ray pictures and a three dimensional “fly-through” view of the inside of the colon and rectum, which allows the doctor to look for polyps and cancer.



Image Source: http://www.radiologyinfo.org/en/photocat/gallery3.cfm?pid=1&Image=colo-ct-072.jpg&pg=ct_colo

This test may be especially useful for some people who cannot have or do not wish to have more invasive testing such as colonoscopy. It can be done fairly quickly and does not require sedation. But even though this test is not invasive like colonoscopy, it still requires the same type of bowel preparation and uses a tube placed in the rectum to fill the colon with air. Another possible drawback is that if polyps or other suspicious areas are seen on this test, a colonoscopy will still likely be required to remove them or to explore them fully. And finally, radiation exposure as a result of radiological procedures has come to the forefront of discussion recently. Medical x-rays have a potential risk for cancer induction but at the rates of exposure in routine procedures for diagnostic imaging, these concerns and risks are minimal. CT colonography uses a low dose technique and, therefore, even when used cumulatively for repeated screening, the risk of radiation-related complications is low.

It is important that the colon and rectum are emptied before this test to provide the best images. Patients will likely be told to follow a clear liquid diet for a day or 2 before the test. They will also be given instructions for taking strong laxatives and/or enemas the night before or morning of the exam. This will probably require patients to be in the bathroom quite a bit.

This test is done in a special room with a CT scanner, and takes approximately 10 minutes. Patients may be asked to drink a contrast solution before the test to help "tag" any remaining stool in the colon or rectum, which helps the doctor when looking at the test images. Patients are asked to lie on a thin table that is part of the CT scanner, and will have a small, flexible tube inserted into their rectum. Air is pumped through the tube into the colon to expand it to provide better images. The table then slides into the CT scanner and the patient will be asked to hold their breath while the scan takes place. Patients will likely have 2 scans: one while they are lying on their back and one while they are on their stomach. Each scan typically takes approximately 10 to 15 seconds.

There are usually very few side effects after CT colonography. Patients may feel bloated or have cramps because of the air in the colon, but this should go away once the air passes from the body. There is a very small risk that inflating the colon with air could injure or puncture the colon, but this

risk has been proven to be significantly less than with colonoscopy.

In summary, the risks and benefits of accessing virtual colonoscopy are:

Benefits

- This minimally invasive test provides three-dimensional images that can depict many polyps and other lesions as clearly as when they are directly seen by optical colonoscopy.
- It can provide useful information with regards to incidental findings in the abdomen and outside the colon, which cannot be seen on conventional colonoscopy
- CT colonography has a markedly lower risk of perforating the colon than conventional colonoscopy. Most of those examined do not have polyps, and can be spared having to undergo a full colonoscopy.
- CT colonography is an excellent alternative for patients who 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 there is a cancer present, CT colonography can help in planning management and assess the full extent of disease.
- If conventional colonoscopy cannot reach the full length of the colon—which occurs up to 10% of the time—CT colonography can be performed on the same day because the colon has already been cleansed.
- CT colonography is tolerated well. Sedation and pain-relievers are not needed, so there is no recovery period.

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 2,000 patients.
- There is always a slight chance of cancer from excessive exposure to radiation. However, the benefit of an accurate diagnosis far outweighs the risk.
- Patient is exposed to small amounts of ionizing radiation. The effective radiation dose from this procedure is about 10 mSv, which is about the same as the average person receives from background radiation in three years. Recent studies have questioned the over-use of CT for diagnostic purposes and follow up. It is important to discuss the risks and benefits for the use of CT scanners so that this effective tool can be used in the most appropriate cases.
- A thorough cleansing of the colon is required before the test

- It can miss small polyps
- Additional procedures such as colonoscopy may be required if the test finds an abnormality
- Can unintentionally discover medical results outside the colon that may trigger unnecessary procedures or follow-up

(vi) Stool DNA Test or Fecal DNA Testing

Colorectal cancers contain abnormal DNA (genetic material found in cells) which is shed into the stool. A sample of stool may, therefore, be checked for abnormal DNA and colonoscopy is performed if any is found. Much like the FOBt and FIT, the stool DNA test screens a stool sample that has been collected and sent into a lab for analysis. However, instead of looking for blood, the stool DNA test looks for abnormal genetic material, called DNA, that may signal the presence of cancer or polyp in the colon. Colorectal cancer cells often contain DNA mutations (changes) in certain genes. Cells from colorectal cancers or polyps with these mutations are often shed into the stool, where tests may be able to detect them.

This is a newer type of test, and the best length of time to go between tests is not yet clear. This test is also much more expensive than other forms of stool testing. This test is not invasive and doesn't require any special preparation. But as with other stool tests, if the results are positive, a colonoscopy is required to investigate further. People having this test will receive a kit with detailed instructions on how to collect the specimen. Always follow the instructions on the kit. This test requires an entire stool sample. It is obtained using a special container, which is placed in a bracket that stretches across the seat of the toilet. A bowel movement takes place while sitting on the toilet, making sure it goes into the container. The container and an ice pack is then placed in a closed shipping box which is clearly labeled. The specimen must be shipped to the lab within 24 hours of having the bowel movement.

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 required to determine whether this type of test can accurately detect colorectal cancer or precancerous polyps in people who do not have symptoms.

Please note: this test is not yet available in Canada through any population-based screening program.

In summary, the pros and cons of accessing a stool DNA test are:

Cons:

- May miss many polyps and some cancers
- May produce false-positive test results
- More expensive than other stool tests
- Still a fairly new test
- Not clear how often it should be performed
- Colonoscopy must be accessed if abnormal

Pros

- No direct risk to the colon
- No bowel preparation
- No pre-test dietary restrictions
- Sampling done at home

DID YOU KNOW...

1. **African Canadian/American women and men** are diagnosed with and die from colorectal cancer at higher rates than any other racial or ethnic group. The reason for this is not yet fully understood.
2. Colorectal cancer is **highly treatable!** If the cancer is found and treated early (while it's small and before it has spread), the 5-year survival rate is approximately 90%. But because many people are not getting screened for colorectal cancer, only approximately 4 out of 10 are diagnosed at this early stage when treatment is most likely to be extremely successful.
3. Colorectal cancer can often be **prevented** altogether! It almost always starts with a small growth called a polyp. If the polyp is found early through **screening**, doctors can remove it and stop colorectal cancer before it starts. Additionally, you can help lower your risk of colorectal cancer by getting regular exercise, eating at least 2.5 cups of fruits and vegetables daily, limiting intake of red and processed meats and alcohol, and not smoking.

Sources:

<http://www.cmaj.ca/content/188/5/340>

<https://canadiantaskforce.ca/guidelines/published-guidelines/colorectal-cancer/>

<https://www.cancer.gov/types/colorectal/screening-fact-sheet>

<http://cancerview.ca/PreventionAndScreening/ColorectalCancerScreeningPage/>