

# Colorectal Cancer Screening

## Introduction

The National Cancer Institute of Canada (NCIC) acknowledges colorectal cancer as the third most common cancer and the second most common cause of death from a cancer among men and women in Canada, second only to lung cancer. If, however, the cancer is detected early through screening, it may be highly treatable and need not be deadly. In a majority of cases, colorectal cancer is preventable and yet each year in Canada, thousands of people are diagnosed with advanced colorectal cancer. The majority of colorectal cancers begin as benign growths in the lining of the large bowel wall called adenomatous polyps. Over the years (at least ten years), these polyps grow in size and number, thereby increasing the risk that the cells in the polyps will become cancerous and invade the wall and move on to other organs. Approximately two thirds of these cancers are found in the large intestine and one third in the rectum. Early removal of these growths will prevent colorectal cancer from developing in the first place. Hence, identification and removal of polyps are key to preventing the development of colorectal cancer.

Clearly, being screened as part of a regular physical exam has the potential to save lives and patients who are experiencing symptoms related to colorectal cancer should not delay accessing a screening test nor should patients who are at higher risk of developing the cancer. Briefly, the risk factors for colorectal cancer are:

**Age:** the older you are, the more likely you are to develop colorectal cancer.

**Heredity:** you are more likely to develop colorectal cancer if someone in your family, especially a first degree relative (child, sibling, parent) has been diagnosed with it.

**Diet:** a diet high in red meat and low in fruits and vegetables may increase your risk.

**Weight:** obesity and a lack of physical activity increase the risk.

**Alcohol Consumption:** alcohol, especially beer, may increase the risk. Lower rates of colorectal cancer have been found in those who drink no alcohol.

**Smoking:** smoking also increases the risk of developing colorectal cancer.

Enough cannot be said about the importance of screening in preventing, detecting and curing colorectal cancer. It is simply the best line of defense when it comes to protecting oneself from this deadly disease. Screening is clearly the best way to stop colorectal cancer in its tracks or prevent it from developing in the first place which is why the Colorectal Cancer Association of Canada (CCAC) has developed the following content providing information on the various colorectal cancer screening tests as well as a summary of the recommended guidelines overseeing the administration of the screening tests. Simply click on one of the following headings to access its information.

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## PART A: TYPES OF SCREENING TESTS

According to the American Cancer Society, screening or testing, is performed while the patient is feeling well – so as to find any abnormalities early, before signs and symptoms of disease occur. Screening for colorectal cancer allows for the early detection of cancer when it is highly curable, as well as the detection of growths (polyps) that might eventually become cancer. These polyps may be removed preventing the cancer from developing altogether. There are several tests used to screen for colorectal cancer and polyps. Appearing below is a summary of the various types.

### (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).



Source: [http://health.gov.on.ca/en/ms/coloncancercheck/images/fobt\\_kit.jpg](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. 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 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 foods be avoided before the test as well as cessation of these drugs:**

- non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen (Advil), naproxen (Aleve), or aspirin (more than 1 adult aspirin per day), for 7 days before testing. (They can cause bleeding, which can lead to a false-positive result.) Acetaminophen (Tylenol) can be taken as needed.
- 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.)
- red meats (beef, lamb, or liver) for 3 days before testing. (Components of blood in the meat may cause the test to show positive.)

**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 which can be accessed by clicking on the following link:*

*[[http://www.health.gov.on.ca/fr/ms/coloncancercheck/docs/fobt/fobt\\_instructions\\_\\_20080301\\_English.pdf](http://www.health.gov.on.ca/fr/ms/coloncancercheck/docs/fobt/fobt_instructions__20080301_English.pdf)->[http://www.health.gov.on.ca/fr/ms/coloncancercheck/docs/fobt/fobt\\_instructions\\_\\_20080301\\_English.pdf](http://www.health.gov.on.ca/fr/ms/coloncancercheck/docs/fobt/fobt_instructions__20080301_English.pdf)]*

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

Pros

- Simple
- Cost-effective
- Done at home

Cons

- Must be done yearly
- 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 some patients may find it easier to use because there are no drug or dietary restrictions (vitamins or foods do not affect the FIT) and sample collection may take less effort. This test reacts to part of the human hemoglobin protein, which is found on red blood cells. This test is also less likely to react to bleeding from parts of the upper digestive tract, such as the stomach. As with the FOBT, 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.

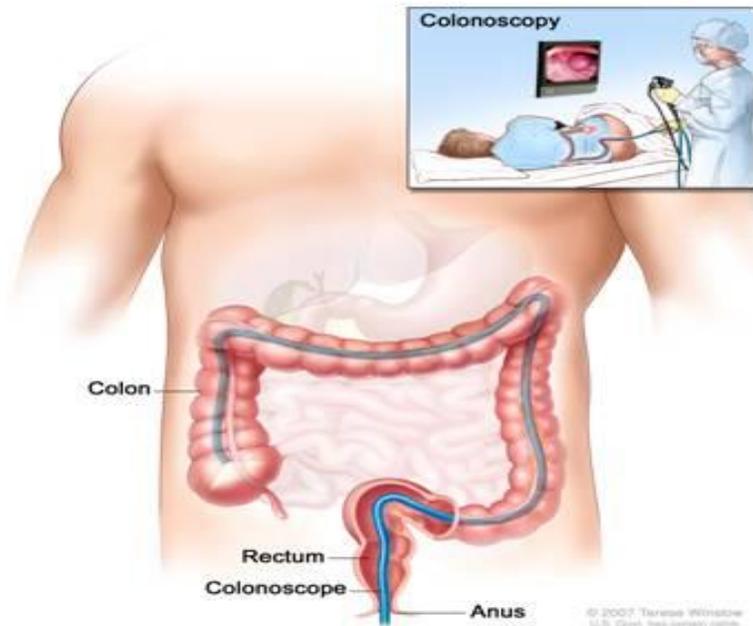
- Flush the toilet before your bowel movement. After you go, place used toilet paper in the waste bag from the kit, not in the toilet.
- Brush the surface of the stool with one of the brushes, then dip the brush in the toilet water. Dab the end of the brush onto one of the slots in the test card or slide.
- 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 rectum and into the lower part of the colon and images from the scope are viewed on a display monitor. If an adenoma 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. Sedation is usually not used for sigmoidoscopy. A thorough cleansing of the lower colon is necessary for this test. The colon and rectum must be empty and clean so the doctor can view the lining of the sigmoid colon and rectum. A special diet may need to be adhered to for a day before the exam, such as drinking only clear liquids as well as the use of strong laxatives which promotes the evacuation of the bowel

contents.

A sigmoidoscopy usually takes approximately 10-20 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 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 one to five minute exam
- Does not require a vigorous bowel prep as in colonoscopy
- Does not require sedation

**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 **MUST RETURN FOR A FULL COLONOSCOPY**

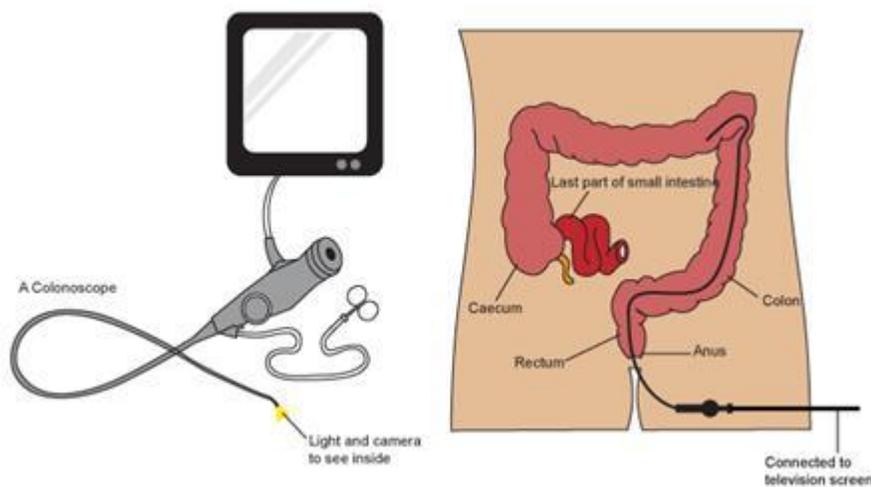
(iv) Colonoscopy

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 rectum into 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 their inner linings 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 or cranberry juice, and any gelatin 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 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. 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. If the doctor sees a larger polyp or tumor or anything else abnormal, a biopsy may be done. For this procedure, a small piece of tissue is taken out through the colonoscope. The tissue is looked at under a microscope to determine if it is a cancer, a benign (non-cancerous) growth, or a result of inflammation.



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 colonoscopy 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 (between 1 and 3 times out of 1,000 tests)
- Heavy or persistent bleeding from biopsy or polyp-removal sites (about 7 times out of 1,000 tests in which polyp-removal is done -- the larger the polyp, the higher the risk)
- Adverse reaction to sedative medication, causing breathing problems or low blood pressure (6 to 7 out of 10,000 tests)
- Infection requiring antibiotic therapy (very rare)
- Nausea, vomiting, bloating, or rectal irritation caused by medicines, taken by mouth, that cleanse the bowel
- Requires a complete bowel prep the night before to cleanse the colon
- Missing a lesion

However, these complications rarely occur and are even less common with colonoscopies that don't involve polyp removal.

### **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
- The test provides a direct view of the bowels.
- 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
- Given the "Gold Standard" rating above all other screening options by: American Society for Gastrointestinal Endoscopy (ASGE), American Gastroenterological Association (AGA), American College of Gastroenterology (ACG) and the American Cancer Society (ACS)

(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.



Source: [http://www.radiologyinfo.org/en/photocat/gallery3.cfm?pid=1&Image=colo-ct-072.jpg&pg=ct\\_colo](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 new 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 also provide useful information with regards to incidental findings in the abdomen and outside the colon, which cannot be seen on conventional endoscopy.
- 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 provides more detailed images and has a better performance at polyp detection than does a conventional barium enema x-ray examination.
- CT colonography is tolerated well. Sedation and pain-relievers are not needed, so there is no recovery period.
- CT colonography is less costly than colonoscopy.
- X-rays used in CT scans usually have no side effects.

### **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.
- 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.
- Women should always inform their physician and x-ray or CT technologist if there is any possibility that they are pregnant.
- CT scanning is, in general, not recommended for pregnant women unless medically necessary because of potential risk to the baby.

## **(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.

**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

## (vii) Blood Tests

Another screening test, by the name of "Cologic" has become available and is marketed by Phenomenome Discovery. This is a new serum test for colorectal cancer risk screening. The blood test detects a metabolite called "GTA 446", which studies have shown is deficient in the blood of up to 90% of people with colorectal cancer. GTA deficiency identifies high risk patients, and studies involving ethnically diverse populations show that 86-99% of CRC positive subjects are deficient in GTA-446.

COLOGIC is a very simple test. COLOGIC is a blood-based test that requires a small patient blood sample at a lab, similar to most other common blood-based lab tests. COLOGIC does not require advanced preparation or extended collection periods. It provides an alternative for patients who prefer a simple blood test instead of performing a Fecal Occult Blood Test (FOBT) or the Fecal Immunochemical Test (FIT).

COLOGIC is currently available at all CML HealthCare Customer Care Centre locations across Ontario and Phenomenone Laboratory Services Inc. in Saskatchewan. Phenomenone Laboratory Services Inc. is making every effort to have COLOGIC available to any Canadian who wishes to have the test. Please continue to check the COLOGIC website for updates on where to get COLOGIC. More information is available at: [www.phenomenome.com](http://www.phenomenome.com)

## PART B: CANCER PREVENTION VS. CANCER DETECTION TESTS

The most recent colorectal cancer screening Guidelines jointly produced by the American Cancer Society and the U.S. Multi-Society Task force on Colorectal Cancer, released a delineation of tests into two major types – cancer detection tests and cancer prevention tests:

- 1) Cancer Detection Tests: Tests that primarily detect cancer, include both guaiac-based fecal occult blood testing (gFOBT) and immunochemical-based FOBT (FIT) and testing stool for exfoliated DNA (sDNA), and
- 2) Cancer Prevention Tests: Tests that can detect cancer and advanced lesions, which include endoscopic examinations and radiologic examination (i.e. Flexible sigmoidoscopy, colonoscopy, and virtual colonoscopy)

Cancer prevention tests have the potential to image both cancer and polyps, whereas cancer detection tests have low sensitivity for polyps and typically lower sensitivity for cancer compared with that in cancer prevention tests (imaging tests). This distinction is intended to help primary care physicians support informed decision making and to help the public understand the features, advantages and disadvantages that distinguish these two groups of screening tests. Furthermore, the guidelines state that although all recommended tests are acceptable options, the prevention of colorectal cancer is the greater priority in screening. The Guidelines recommend a preferred cancer prevention test – colonoscopy every ten years and a preferred cancer detection test – annual fecal immunochemical test (FIT) to detect occult bleeding. The Guidelines are discussed in greater detail in PART D of this document.

Preventing colorectal cancer (and not just finding it early) should be a major reason for getting tested. Finding and removing polyps keeps some people from getting colorectal cancer. Tests that have the best chance of finding both polyps and cancer are preferred if these tests are available in the respective provincial jurisdiction and a patient is willing to have them.

## PART C: A COMPARISON CHART OF COLORECTAL CANCER SCREENING TESTS

Organizations such as the National Cancer Institute and the American Cancer Society have developed charts outlining some of the advantages and disadvantages of the various colorectal cancer screening tests currently available. Their information has been collectively combined to produce the chart appearing below which also contains some additional information patients may find helpful when reviewing the various colorectal cancer screening tests.

The recommendations appearing below are in respect of average risk patients – that is to say patients who do not have a first degree relative diagnosed with the disease nor are they symptomatic (i.e. experiencing any symptoms related to colorectal cancer).

### Advantages and Disadvantages of Colorectal Cancer Screening Tests

	Advantages	Disadvantages	Accuracy	Screening Interval
<b>Fecal Occult Blood Test (FOBT)</b>	<ul style="list-style-type: none"> <li>No cleansing of the colon is necessary.</li> <li>○ Samples can be collected at home.</li> <li>○ The cost is low compared with other</li> </ul>	<p>This test fails to detect most polyps and some cancers</p> <p>(the test suggests an abnormality when none is present) are possible</p> <p>Dietary restrictions and changes, such as avoiding meat, certain</p>	<p>Multiple kinds of tests are available.</p> <p>Detection rate varies from 9-64%</p>	Recommended it be performed annually

	<p>colorectal cancer screening tests.</p> <p>FOBT does not cause bleeding or tearing/perforation of the lining of the colon.</p>	<p>vegetables, <a href="#">vitamin C</a>, iron <a href="#">supplements</a>, and <a href="#">aspirin</a>, and increasing <a href="#">fiber</a> consumption, are often recommended for several days before a guaiac FOBT. These restrictions and changes are not required for immunochemical FOBT.</p> <ul style="list-style-type: none"> <li>○ Additional procedures, such as colonoscopy, may be necessary if the test indicates an abnormality.</li> </ul>		
<p><b>Fecal Immunochemical Test (FIT)</b></p>	<ul style="list-style-type: none"> <li>○ No direct risk to the colon</li> <li>○ No bowel preparation</li> <li>○ No pre-test dietary restrictions</li> <li>○ Sampling performed at home</li> <li>○ Fairly inexpensive</li> </ul>	<p>May miss many polyps and some cancers</p> <p>May produce false-positive test results</p> <ul style="list-style-type: none"> <li>○ Should be performed annually according to guidelines</li> <li>○ Colonoscopy will be required if abnormal</li> </ul>	<p>Detection rate is up to 65%</p>	<p>Recommended annually</p>
<p><b>Flexible Sigmoidoscopy</b></p>	<p>The test is usually quick, with few complications.</p> <ul style="list-style-type: none"> <li>○ For most patients, discomfort is minimal.</li> </ul> <p>In some cases, the doctor may be able to perform a biopsy (the removal of tissue for examination under a microscope by <a href="#">a pathologist</a>) and remove polyps during the test, if necessary.</p> <ul style="list-style-type: none"> <li>○ Less extensive cleansing of the colon is necessary with this test than for a colonoscopy.</li> </ul>	<p>Views approximately a third of the colon</p> <p>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.</p> <p>There is a very small risk of bleeding or tearing/ perforation of the lining of the colon</p> <ul style="list-style-type: none"> <li>○ Additional procedures, such as colonoscopy, may be necessary if the test indicates an abnormality.</li> </ul>	<ul style="list-style-type: none"> <li>○ Highly accurate in diagnosing colon cancer in the lower colon.</li> </ul> <p>Accuracy depends on the experience of the person performing the exam</p>	<p>Recommended every five years</p>

<p><b>Colonoscopy</b></p>	<p>This test allows the doctor to view the rectum and the entire colon.</p> <p>The doctor can perform a biopsy and remove polyps or other abnormal tissue during the test, if necessary.</p>	<p>This test may not detect all small polyps, non-polypoid lesions, and cancers, but it is one of the most sensitive tests currently available.</p> <p>Thorough cleansing of the colon is necessary before this test.</p> <p>Some form of sedation is used in most cases.</p> <p>Although uncommon, complications such as bleeding and/or tearing/perforation of the lining of the colon can occur</p>	<p>Greater than 95% accurate in diagnosing colorectal cancer</p> <p>Accuracy depends on the experience of the person doing the exam</p> <p>○ This is considered by many experts to be the gold standard test</p> <p>Colonoscopy is used as the follow up for all positive screening tests</p>	<p>Recommended every ten years</p>
<p><b>Virtual Colonoscopy</b></p>	<p>This test allows the doctor to view the rectum and the entire colon.</p> <p>This is not an <a href="#">invasive procedure</a>, so there is no risk of bleeding or tearing/perforation of the lining of the colon.</p>	<p>This test may not detect all small polyps, non-polypoid lesions, and cancers</p> <p>Thorough cleansing of the colon is necessary before the test.</p> <p>If a polyp or non-polypoid lesion 6 to <a href="#">9 millimeters</a> 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</p>	<p>Up to 94% detection rate for large polyps, followed up by colonoscopy</p>	<p>Recommended every 5 years</p>
<p><b>Stool DNA Test</b></p>	<p>No direct risk to the colon</p> <p>No bowel preparation</p> <p>No pre-test dietary restrictions</p>	<p>May miss many polyps and some cancers</p> <p>May produce false-positive test results</p> <p>More expensive than other stool tests</p>	<p>Detection rate is 72-77%</p>	<p>Undetermined</p>

	Sampling done at home	<ul style="list-style-type: none"> <li>○ Still a fairly new test</li> <li>○ Not clear how often it should be performed</li> <li>○ Colonoscopy will be required if abnormal</li> </ul>		
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## PART D: SCREENING GUIDELINES / SCREENING FREQUENCY

### (i) American Guidelines

The most current and updated **American-based screening guidelines** were released jointly by the American Cancer Society, the American College of Radiology, and the U.S. Multi-Society Task Force on Colorectal Cancer (a group that comprises representatives from the American College of Gastroenterology, American Gastroenterological Association, and American Society for Gastrointestinal Endoscopy) – some of whose recommendations have been adopted by various provincial jurisdictions. As previously stated, recommended screening tests are grouped into two categories: tests that primarily detect cancer, which include both guaiac-based fecal occult blood testing (gFOBT) and immunochemical-based FOBT (FIT) and testing stool for exfoliated DNA (sDNA); and, tests that can detect cancer and advanced lesions, which include endoscopic examinations and radiologic examinations (i.e. flexible sigmoidoscopy [FSIG], colonoscopy, double contrast barium enema and computed tomography colonography [CT colonography]). This distinction is intended to help primary care physicians support informed decision making and to help the public understand the features, advantages, and disadvantages that distinguish these two groups of screening tests. Furthermore, the guidelines state that although all recommended tests are acceptable options, the prevention of colorectal cancer is the greater priority in screening.

The guidelines are recommended according to whether a patient is considered to be **average risk or at higher risk** of developing colorectal cancer.

**Average Risk Adults:** Average risk adults are those who are between 50 and 74 years of age with no symptoms (such as those symptoms associated with colorectal cancer – bloating, abdominal cramping, change in bowel habits, narrowing of stools, bloody stools, etc.), also known as asymptomatic, and no family history of colorectal cancer (i.e. no first degree relatives affected such as a sibling, parent, or child). Average risk adults should begin colorectal cancer screening with one of the following options:

- Annual gFOBT or FIT – if results are positive, a colonoscopy is required
- sDNA, for which, currently, there is uncertainty with regard to the screening interval
- FSIG every 5 years
- Colonoscopy every 10 years
- Double Contrast Barium Enema every 5 years, or
- CT colonography every 5 years

**Increased Risk Adults:** Increased risk adults are those people with certain risk factors for colon cancer and they include:

- Individuals with a history of adenomatous polyps
- Individuals with a personal history of curative-intent resection of colorectal cancer

- Individuals with a family history of either colorectal cancer or colorectal adenomas diagnosed in a first-degree relative (i.e. parent, sibling, child) before age 60 years
- Individuals at significantly higher risk due to a history of inflammatory bowel disease of significant duration (i.e. ulcerative colitis or Crohns)
- Individuals at significantly higher risk due to the known or suspected presence of 1 of 2 hereditary syndromes, specifically, hereditary nonpolyposis colon cancer (HNPCC) or familial adenomatous polyposis (FAP)

The preferred and more frequently administered screening test for increased risk adults is colonoscopy to begin at age **40 years** or ten years earlier than the youngest diagnosis of colorectal cancer or polyps in the family.

For the African-American segment of the population, screening is recommended starting at the age 45 years. The first line screening test for this group is a colonoscopy, which should be repeated every ten years, unless additional risk factors, such as family history, warrant more frequent testing. The recommendation reflects findings that Americans of African descent tend not only to be diagnosed with this cancer at a younger age than others but also to survive for a shorter period of time. Also, some evidence shows that those of African descent have more right sided cancers and polyps (making the colonoscopy of greatest benefit).

The following table was extracted from the American Cancer Society which suggests screening guidelines for those with increased or high risk of colorectal cancer based on specific risk factors. Please bear in mind that the recommendations are adopted from the American Guidelines and may not necessarily reflect those currently in place in the respective provincial jurisdiction in Canada. The content appearing after the table deals more specifically with the recommended Canadian Guidelines.

Risk Category	Age to Begin	Recommended Test(s)	Comment
<b>INCREASED RISK -- Patients With a History of Polyps on Prior Colonoscopy</b>			
People with small rectal hyperplastic polyps	Same as those with average risk	Colonoscopy, or other screening options at regular intervals as for those at average risk	Those with hyperplastic polyposis syndrome are at increased risk for adenomatous polyps and cancer and should have more intensive follow-up.
People with 1 or 2 small (less than 1 cm) tubular adenomas with low-grade dysplasia	5 to 10 years after the polyps are removed	Colonoscopy	Time between tests should be based on other factors such as prior colonoscopy findings, family history, and patient and doctor preferences.
People with 3 to 10 adenomas, or a large (1 cm +) adenoma, or any adenomas with high-grade dysplasia or villous features	3 years after the polyps are removed	Colonoscopy	Adenomas must have been completely removed. If colonoscopy is normal or shows only 1 or 2 small tubular adenomas with low-grade dysplasia, future colonoscopies can be done every 5 years.
People with more than 10 adenomas on a single exam	Within 3 years after the polyps are removed	Colonoscopy	Doctor should consider possibility of genetic syndrome (such as FAP or HNPCC).
People with sessile adenomas that are removed in pieces	2 to 6 months after adenoma removal	Colonoscopy	If entire adenoma has been removed, further testing should be based on doctor's judgment
<b>INCREASED RISK – Patients With Colorectal Cancer</b>			
People diagnosed with colon or rectal cancer	At time of colorectal surgery, or can be 3 to 6 months later if person doesn't have cancer spread that can't be removed	Colonoscopy to view entire colon and remove all polyps	If the tumor presses on the colon/rectum and prevents colonoscopy, CT colonoscopy (with IV contrast) or DCBE may be done to look at the rest of the colon.

People who have had colon or rectal cancer removed by surgery	Within 1 year after cancer resection (or 1 year after colonoscopy to make sure the rest of the colon/rectum was clear)	Colonoscopy	If normal, repeat exam in 3 years. If normal then, repeat exam every 5 years. Time between tests may be shorter if polyps are found or there is reason to suspect HNPCC. After low anterior resection for rectal cancer, exams of the rectum may be done every 3 to 6 months for the first 2 to 3 years to look for signs of recurrence.
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#### INCREASED RISK – Patients With a Family History

Colorectal cancer or adenomatous polyps in any first-degree relative before age 60, or in 2 or more first-degree relatives at any age (if not a hereditary syndrome).	Age 40, or 10 years before the youngest case in the immediate family, whichever is earlier	Colonoscopy	Every 5 years.
Colorectal cancer or adenomatous polyps in any first-degree relative aged 60 or higher, or in at least 2 second-degree relatives at any age	Age 40	Same options as for those at average risk.	Same intervals as for those at average risk.

#### HIGH RISK

Familial adenomatous polyposis (FAP) diagnosed by genetic testing, or suspected FAP without genetic testing	Age 10 to 12	Yearly flexible sigmoidoscopy to look for signs of FAP; counseling to consider genetic testing if it hasn't been done	If genetic test is positive, removal of colon (colectomy) should be considered.
Hereditary non-polyposis colon cancer (HNPCC), or at increased risk of HNPCC based on family history without genetic testing	Age 20 to 25 years, or 10 years before the youngest case in the immediate family	Colonoscopy every 1 to 2 years; counseling to consider genetic testing if it hasn't been done	Genetic testing should be offered to first-degree relatives of people found to have HNPCC mutations by genetic tests. It should also be offered if 1 of the first 3 of the modified Bethesda criteria is met.1
Inflammatory bowel disease -Chronic ulcerative colitis -Crohn's disease	Cancer risk begins to be significant 8 years after the onset of pancolitis (involvement of entire large intestine), or 12-15 years after the onset of left-sided colitis	Colonoscopy every 1 to 2 years with biopsies for dysplasia	These people are best referred to a center with experience in the surveillance and management of inflammatory bowel disease

**Source:** [http://www.cancer.org/docroot/CRI/content/CRI\\_2\\_8\\_Should\\_I\\_Be\\_Testing\\_for\\_Colon\\_and\\_Rectum\\_Cancer.asp](http://www.cancer.org/docroot/CRI/content/CRI_2_8_Should_I_Be_Testing_for_Colon_and_Rectum_Cancer.asp)

To access the extensive version of the American Guidelines, please click on the following link:  
[\[http://caonline.amcancersoc.org/cgi/content/full/CA.2007.0018v1-](http://caonline.amcancersoc.org/cgi/content/full/CA.2007.0018v1-)  
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(ii) Canadian Guidelines

The Canadian Task Force on Preventive Health Care (2001) and the Canadian Association of Gastroenterology/Canadian Digestive Health Foundation (2004) have released guidelines in Canada in respect of colorectal cancer screening. The Canadian Task force on Preventive Health Care is an independent panel funded through a partnership of the federal and provincial/territorial governments of Canada and their statements are based on the technical report "Preventive health care, 2001 update: screening strategies for colorectal cancer. The Canadian Association of Gastroenterology issued Guidelines on Colon Cancer Screening in 2004 whose summary appears below for both average and high risk patients:

**Screening of individuals at average risk:** Individuals over the age of 50 years with a negative family history should undergo screening with one of the following strategies:

- FOBT every two years
- Flexible Sigmoidoscopy every five years
- Flexible Sigmoidoscopy Combined with FOBT every five years
- Double contrast barium enema every five years
- Colonoscopy every ten years

**Screening of Individuals at higher risk:** Some groups are at increased risk of colon cancer. Colonoscopy is the recommended screening test for these patients who have:

- A first degree relative with the disease diagnosed before age 60 (colonoscopy every 5 years to begin at age 40 or ten years earlier than the youngest diagnosis of polyp or cancer in the family; if diagnosed after the age of 60, then employ average risk screening to begin at age 40),
- a family history that suggests a genetic abnormality capable of causing the disease such as HNPCC (Colonoscopy every 1-2 years beginning at age 20 years or ten years younger than the earliest case in the family),
- FAP (sigmoidoscopy annually to begin at age 10-12 years) or
- long standing colonic inflammatory bowel disease - such as Crohn's or Ulcerative Colitis (for pancolitis – colitis that involves the entire colon -, begin screening at 8 years after onset of disease, continue with colonoscopy every three years in the second decade, colonoscopy every two years in the third decade and colonoscopy every year in the fourth decade; for left sided colitis, begin screening at 15 years after onset)

Cancer screening participation rates are still considered too low for colorectal cancer, despite the fact that colorectal cancer is a cancer that can be prevented through proper screening. Fortunately, the majority of provinces and territories have now made commitments to establishing organized colorectal cancer screening programs which hopes to increase compliance rates throughout the nation. In an effort to and with the goal of encouraging all Canadians age 50-74 to actively gain information and seek screening within their provincial program options, the Colorectal Cancer Association of Canada has developed a Screening & Treatment Map organized according to each provincial jurisdiction such that information on every provincial screening program and treatment may be easily accessed and acted on. Regardless of where Canadians live, ensuring that Canadians understand the importance of screening and early detection is one of the Association's many objectives. The Screening & Treatment Map may be accessed by clicking on the following link [<http://www.colorectal-cancer.ca/en/just-the-facts/canada-map2/>-><http://www.colorectal-cancer.ca/en/just-the-facts/canada-map2/> ].

Also, since the primary screening practices across Canadian jurisdictions may vary somewhat depending upon whether or not a population-based screening program has already been implemented, the following chart has been created delineating the various population-based screening programs across Canada so that patients may identify the current screening practice in place in their respective province.

### **PRIMARY SCREENING PRACTICES ACROSS CANADIAN JURISDICTIONS**

PROVINCE	POPLN-BASED SCREENING PROGRAM?	AVERAGE RISK SCREENING TEST (Age 50-74 years)	INCREASED RISK SCREENING TEST (FAMILY HISTORY OR SYMPTOMATIC – ANY AGE) THROUGH GI SPECIALIST	LINK
BRITISH COLUMBIA	PILOT PROGRAM COLON CHECK	FOBT* THROUGH HEALTH CARE PROVIDER	COLONOSCOPY	<a href="#">Link</a>
ALBERTA	ALBERTA CRC SCREENING (PROGRAM BEING REVIEWED)	FOBT/FIT THROUGH HEALTH CARE PROVIDER	COLONOSCOPY	<a href="#">Link</a>
SASKATCHEWAN	FIT** THROUGH HEALTH CARE PROVIDER	COLONOSCOPY	PILOT SCREENING PROGRAM FOR COLORECTAL CANCER	<a href="#">Link</a>
MANITOBA	COLON CHECK MANITOBA	FOBT THROUGH HEALTH CARE PROVIDER OR THROUGH COLON CHECK MANITOBA	COLONOSCOPY	<a href="#">Link</a>
ONTARIO	COLON CANCER CHECK	FOBT THROUGH HEALTH CARE PROVIDER OR CALL INFO line at 1-866-410-5853 EVERY TWO YEARS	COLONOSCOPY	<a href="#">Link</a>
NEW BRUNSWICK	PILOT PROJECT TO START IN 2010-2011 OVER THREE YEARS	TBD	COLONOSCOPY	<a href="#">Link</a>
NOVA SCOTIA	PILOT PROJECT (COLON CANCER PREVENTION /SCREENING PROGRAM) NOW IN EFFECT WITH STAGGERED PHASE IN	FIT TO BE MAILED OR THROUGH HEALTHCARE PROVIDER OR CALL 1 866 599 2267	COLONOSCOPY	<a href="#">Link</a>
PEI	PILOT PROJECT IN PLACE	FOBT THROUGH HEALTH CARE PROVIDER	COLONOSCOPY	<a href="#">Link</a>
NFLD/LABRADOR	PILOT PROJECT BEING IMPLEMENTED IN PHASES	FOBT TO BE MAILED OUT OR THROUGH HEALTHCARE PROVIDER	COLONOSCOPY	<a href="#">Link</a>
QUEBEC	PILOT TO BE IMPLEMENTED SOON	FOBT (FIT?) THROUGH HEALTHCARE PROVIDER	COLONOSCOPY	<a href="#">Link</a>

## PART E: UP AND COMING SCREENING TESTS

The following are new screening tests in development which may prove to be effective, patient-friendly options for detecting early signs of colorectal cancer and polyps in the future.

### Blood Test

Several types of blood tests are being evaluated for detecting signs of colorectal cancer and, in some cases, polyps. These tests differ in the markers they look for in the blood that are associated with colorectal cancer and polyps, i.e. genetic or chemical markers. Those who test positive for the markers must undergo a colonoscopy to determine if disease is present. The ColonSentry test is the world's first commercially available blood test for colon cancer screening. It is currently available in Ontario, Canada. The ColonSentry test measures the expression of seven genes, which serve as biomarkers to detect colorectal cancer. Interpretation of the status of these seven biomarkers allows doctors to identify patients who have an increased current risk of colorectal cancer. More information is available at: <http://www.colonsentry.com>

### Saliva Test

This test involves a simple saliva sample taken from the patient's mouth and sent to a laboratory where cellular DNA is analyzed for a genetic alteration associated with a predisposition to developing colorectal cancer. Unlike the other screening tests that help determine current risk of colorectal cancer, this test helps determine the chances of developing the disease during an individual's whole lifetime. The results of the saliva test, along with environmental risk factors such as smoking and age, are entered into a software calculation to establish the patient's lifetime risk. The final test results categorize the patient as either low, medium or high risk for lifetime development of colorectal cancer. He/she can then be monitored with appropriate screening tests and interval times.

## Capsule Endoscopy

A capsule colonoscopy requires the patient to ingest a disposable capsule, about the size of a large vitamin pill, containing a miniature video camera at each end that travels through the digestive tract. Special sensors are affixed to the patient's abdomen and connected to a recording device worn on a belt around the waist. As the capsule travels through the digestive tract (which takes about 10 hours), it captures thousands of images and transmits them through the sensors to the recording device. After the 10 hours, the patient returns the recording device to the doctor who downloads the images onto a computer for review in a moving video format. The pill passes naturally from the patient's body in a bowel movement and does not need to be retrieved. A conventional colonoscopy is required if abnormalities are seen on the video.

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