Fifth edition

Colorectal Cancer & You

A guide for people living with colorectal cancer

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CANCER
CANADA

The information you need is at hand.
Visit Colorectal Cancer Canada at
www.colorectalcancercanada.com or call 1.877.50.COLON (26566)

Financial support for the development and publication of *Colorectal Cancer & You* was provided by Amgen Canada Inc.

Colorectal Cancer Canada would like to acknowledge and thank Dr. Michael Rafael for his review of this booklet.

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Printed in Canada.

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A Letter from the President

Few of us cancer survivors can forget how we felt when we were first diagnosed with cancer. I remember how I felt as if it was yesterday.

I was flattened by the news. I experienced a rush of emotions and suddenly began to panic. I broke out into a sweat. I felt bombarded by information, dished out faster than I could absorb it. I felt anger, and I felt sorry for myself. I wondered why this was happening to me, and if I would ever see my young family grow up.

I tried to digest the fact that my life was suddenly threatened by a disease that came upon me silently, without any symptoms. The doctors must have it wrong, I thought. I feel absolutely normal. Surely they've made a mistake.

I knew very little, if anything, about cancer, but I had some preconceptions — I associated the word cancer with death. Still, when my doctor told me that the cancer had spread from my colon to my liver and that I had a thirty percent chance of surviving five years, I could not accept it. I knew I had to fight.

I wanted to do everything possible to improve my situation, but I had no experience and I understood very little of the information given to me. I was determined to do as much research as I could so that I would be able to make informed decisions about my treatment. And this determination proved to be a very important first step in my cancer journey.

Whatever emotion you may feel after a diagnosis of cancer, I hope this guide will help you, together with your healthcare professional, to find the most appropriate treatments for you.

Colorectal Cancer & You contains clear, basic information on colorectal cancer, its diagnosis and treatment. I hope this book will help you to make better and more informed decisions about the management of your disease or, if you are a caregiver, family member or friend of someone who has colorectal cancer, assist you in helping that person to do so.

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Colorectal Cancer & You, and additional information on colorectal cancer, is available on our website at **www.colorectalcancercanada.com**. If you find the book and the website helpful, please share them with a friend. If you have any comments, suggestions or additional information or resources that you think will assist other colorectal cancer patients, please write to us at info@colorectalcancercanada.com so that we can share your insights with others.

Barry D. Stein
President, Colorectal Cancer Canada

P.S. As this fifth edition of CRC & You is completed, I look back to 1995 when I was diagnosed with the disease, filled with emotions of all kinds and reflecting on the fact that there were few treatments available to patients. It is now 2022, my family is all grown up and I am now a grandfather of eight, something I could never have imagined in 1995. I marvel at the many new treatments available to patients that have changed the landscape of treatment, providing more hope for a cure than ever before.

Contents

Important Features of

Colorectal Cancer & You

You can participate in your care and make informed decisions if you understand more about your diagnosis and your treatment options. This publication has been developed to help meet your information needs. We've also added the following features to make this guide even more useful:

- **Glossary:** look for definitions of bold and blue words in the Glossary section on page 62.
- **Table of commonly used drug names:** check the generic and brand names of commonly used drugs on page 68.
- **Suggested references:** find more information on valuable resources such as books, websites, videos, and support groups in the *Finding Information* section starting on page 57.

We hope that *Colorectal Cancer & You* will serve as a helpful resource and guide throughout your cancer journey.

1. Participating in Your Treatment

Receiving a diagnosis of cancer can be overwhelming. You may alternate between feeling intense emotions such as panic, outrage, anger, guilt, or in some cases, despair. You can manage your emotions by gathering accurate information, resources, and support. But remember, you are the same person as you were the day before you were diagnosed.

When you first hear the diagnosis of colorectal cancer, your natural reaction is to want immediate treatment, but colorectal cancer usually grows slowly, and, in many cases, immediate treatment is not needed. It is more important to take the time to calm down, learn about your options, think things over and gain some perspective before deciding on a course of treatment.

This guide has been prepared to help you understand colorectal cancer, diagnostic tests, and available treatments and to help you to maintain a healthy lifestyle once treatment is over.

This guide is also for families and friends of people with colorectal cancer. Learning more about the journey will help you better care for your loved one. Many patients find it helpful to write down questions or to bring a family member to the consultation during which they learn about treatment choices and **prognosis**.

Attitude is important. Patients who believe they can fight their cancer cope better than those who believe they cannot. The first step to participating in your treatment is to believe it will be successful. To participate fully in managing your disease: ask questions, determine your options, and work closely with your health professionals to make choices.

Your need for information and the degree to which you may wish to participate in or control decisions about your treatment are entirely up to you. As a partner in your treatment, you will feel better if you participate actively in managing your disease, and your participation will help the people around you cope better. Remember, cancer does not just affect you, but also the people around you.

> ***How is it possible?***
>
> *I woke up one morning and found out I had cancer. I thought my life was over all of a sudden, but later I came to realize that I was the same person I was the day before I was diagnosed.*

2. What is Colorectal Cancer?

Learning about how colorectal cancer develops can help you better understand your options.

2.1 The Gastrointestinal System

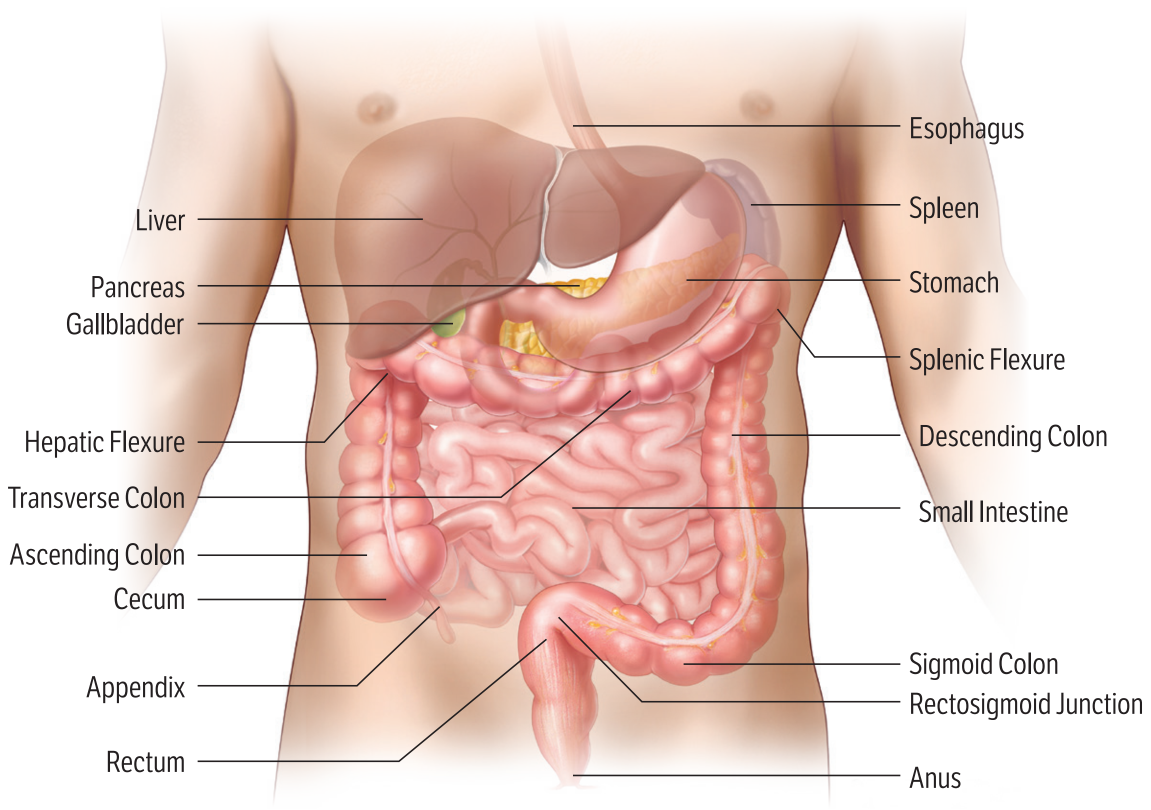
The term *colorectal* refers to both the **colon** and the **rectum**. The colon and the rectum form part of the digestive tract, also called the gastrointestinal (gass-tro-in-tess-tin-nul) or GI tract.

The gastrointestinal tract is essentially a long tube running through the body, starting at the mouth, and ending at the anus. After food is swallowed, it moves along the tube which breaks down the food, absorbs nutrients into the blood to be used by the body and removes the unusable portion as waste.

The stomach begins the digestive process by secreting gastric juices and mixing them with food to break it down. The mixture of food and gastric juices then empties into the small intestine, a long, coiled, hose-like organ. Here the food is churned and digested. Nearly all nutrients from food are absorbed into the bloodstream along the length of the small intestine.

Undigested food substances that cannot be absorbed, such as vegetable fibre, move from the small intestine into the large intestine at the lower right side of the abdomen. The large intestine, also called the large bowel, is divided into seven areas: the cecum; the ascending, transverse, descending and sigmoid colon; the rectum and the anus (see illustration on page 4). The colon removes water as well as some nutrients and minerals from the remainder of the food contents. Any remaining food matter that has passed through the colon is solid waste, called feces. The feces eventually move through to the end of the colon and reach the rectum, leaving the body through the anus.

The Gastrointestinal System



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2.2 How Cancer Develops

Even after you stop growing, many cells in your body continue to divide and multiply to keep your body healthy. Cells multiply to take the place of those damaged by injury or disease, or those that are programmed to die naturally when no longer needed (a process called **apoptosis**).

Usually, cells grow and multiply in an orderly and controlled way. Genetic information is passed from one generation to the next by **DNA**, or deoxyribonucleic acid, the hereditary material in humans and almost all other cells. In addition to being a blueprint, DNA also directs and coordinates the activities of all cells in the body.

Sometimes when cells divide and multiply, mistakes happen in the DNA. These mistakes are called **mutations**, and they may cause some cells to behave abnormally. A mutation may cause a cell to continue to multiply for no reason, or to ignore its instructions to die. Eventually, enough of these cells may multiply to form a solid mass called a **tumour**.

A TUMOUR CAN BE BENIGN OR MALIGNANT

Benign: Cells of **benign** tumours are non-cancerous. They stay in one location and do not invade other tissue or spread to other parts of the body.

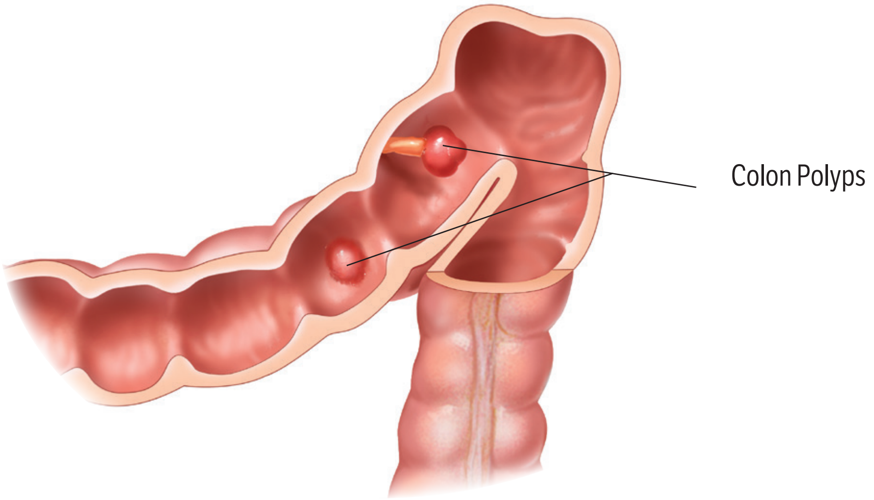
Malignant: Malignant tumours contain cells that have gone through a significant genetic change. These cells divide uncontrollably and usually have an irregular shape and structure. Cells may break away from the tumour, invade other tissues and spread to other parts of the body. They continue multiplying to form a metastasis.

2.3 How Colorectal Cancer Develops

Colorectal cancer includes two types of cancers: cancer of the colon (large intestine or large bowel) or colon cancer, and cancer of the rectum (the final portion of the large intestine) or rectal cancer. Both types of cancer have many features in common, so they are collectively called colorectal cancer.

In general, colorectal cancer spreads fairly slowly, especially in comparison to many other types of cancers. It can stay in the colon or rectum for months or years, but, if it is not treated, it can spread to areas in the body outside the large intestine. The most common places for colorectal cancer to spread to are the **lymph nodes, the liver and the lung**. The best chance to completely cure the cancer is to remove it entirely with surgery, which is most likely to be possible if it's caught in its early stages.

Most colorectal cancers evolve from small mushroom-like growths on the innermost layer (the layer closest to the food) of the colon or rectum. These growths, known as **polyps**, are usually benign, but as they evolve, they may become cancerous.



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Over time, the benign polyp can grow through some or all of the tissue layers that make up the colon and rectum and become malignant. Eventually, malignant cells from the tumour can reach the blood and lymphatic system and travel to other parts of the body such as the liver, abdomen, or lung, causing cancer to develop in these organs. When the cancer spreads to a distant organ it is said to have metastasized. The spread of the cancer to another organ is called a **metastasis** (meh-tas-tuh-sis). Evaluating how far the cancer has spread is done by staging the disease. (See Stages of Colorectal Cancer on page 9).

2.4 Risk Factors

YOUR **RISK FACTORS** ARE HIGHER IF YOU HAVE

- a family history of colorectal cancer
- inherited syndromes or benign polyps
- a personal history of colorectal cancer
- inflammatory bowel disease, such as **ulcerative colitis**

Family history: About a quarter of all cases of colon cancer are thought to be related to heredity. You are more likely to get colorectal cancer if someone in your family, especially in your immediate family (parent, sibling, or child), has been diagnosed with it. The risk increases further if you have two or more close relatives who have been diagnosed with colorectal cancer, if a relative is diagnosed with it before the age of 50 or if your family members have had polyps.

Inherited syndromes: Certain individuals may have an inherited predisposition to developing colorectal cancer or polyps. Five to ten percent of patients with colorectal cancer have an inherited genetic error which puts them at a much greater risk of colorectal cancer.

One condition is called **hereditary nonpolyposis colorectal cancer** (HNPCC), which is also known as Lynch syndrome. HNPCC is responsible for only a small number of colorectal cancers (2% to 5% of patients). Though people affected by HNPCC have few polyps, the polyps are likely to turn into cancer and at a faster rate.

Familial adenomatous polyposis (FAP) also accounts for only a small number of colorectal cancers (1% of patients). People affected by FAP can develop thousands of polyps (also called adenomas) along the inside wall of the colon. These polyps are likely to turn cancerous by the time a person reaches their early 40s, so FAP is best treated by preventative surgery to remove the colon.

Another condition called Peutz-Jeghers Syndrome is characterized by the development of benign polyps in the gastrointestinal tract. These can lead to a greater risk in the development of cancerous polyps over time. Patients with Peutz-Jeghers Syndrome commonly have pigmented lesions on the lips, inside the mouth, nostrils or in the perianal area.

Medical history: If you have had colorectal cancer or polyps in the past, you are more likely to develop new cancers in other parts of the colon or rectum.

Inflammatory bowel disease: If you have had inflammatory bowel disease (which is different from irritable bowel syndrome, commonly known as IBS) for a long period, you are at a higher risk of developing colorectal cancer.

Age: The older you are, the more likely you are to develop colorectal cancer. Most people diagnosed with colorectal cancer are 50 years or older; however, it is becoming more common in people under the age of 50, where screening is less common and symptoms often aren't noticed. In adults 30-49 years old, approximately 8% of new cancer cases are colorectal cancer. Unfortunately, colorectal cancer in young people is also increasingly common. Regardless of age, symptoms suggestive of colon cancer such as abdominal pain, blood in the stool, and pain with passing a bowel movement (see page 51) need to be taken seriously and investigated. For more information on hereditary colorectal cancer syndromes, see our information pamphlet: **https://www.colorectalcancercanada.com/app/uploads/2021/10/hereditary-pamphlet.pdf**

> *Knowing what to expect was key and helped make the treatment less stressful. I knew what to watch for and how to prepare for the side effects.*

3. Stages of Colorectal Cancer

If cancer is found, the next step is to determine the extent of the disease and how far it has advanced. This process is known as staging. Staging involves a physical examination, blood tests, colonoscopy, as well as an ultrasound or computed tomography (CT) scan of the chest, abdomen and pelvis.

Staging is based on a number of factors, including the size and location of the tumour, and how deeply the tumour has penetrated the layers of the bowel wall. The **stage** also depends on whether the cancer has spread to the lymph nodes or distant organs, such as the lungs, liver, or **peritoneum** (abdominal lining). The **TNM staging system** is used to stage colorectal cancer.

TNM SYSTEM

- **T** describes the **tumour** and uses different numbers to explain its size.
- **N** stands for **nodes** and indicates whether the cancer has spread to the lymph nodes.
- **M** means **metastatic** and indicates whether the cancer has spread to a distant organ.

In general, the stage of your disease is not known until after surgery, once a pathologist has examined a sample of the tissue removed during surgery. The TNM system is used to describe the extent of the cancer, and whether it has spread. Once T, N and M categories have been determined, the information is grouped together.

The five stages are defined below:

Stage 0: The tumour is small in size and harmless. It has not grown beyond the inner lining (mucosa) of the colon or rectum. This growth can often be removed during a colonoscopy, which means that no surgery is necessary.

Stage I: The tumour has invaded the layers of the colon or rectum, but has not grown outside the wall of the colon or into surrounding tissue. Surgery of the affected part of the colon or rectum is recommended for this stage.

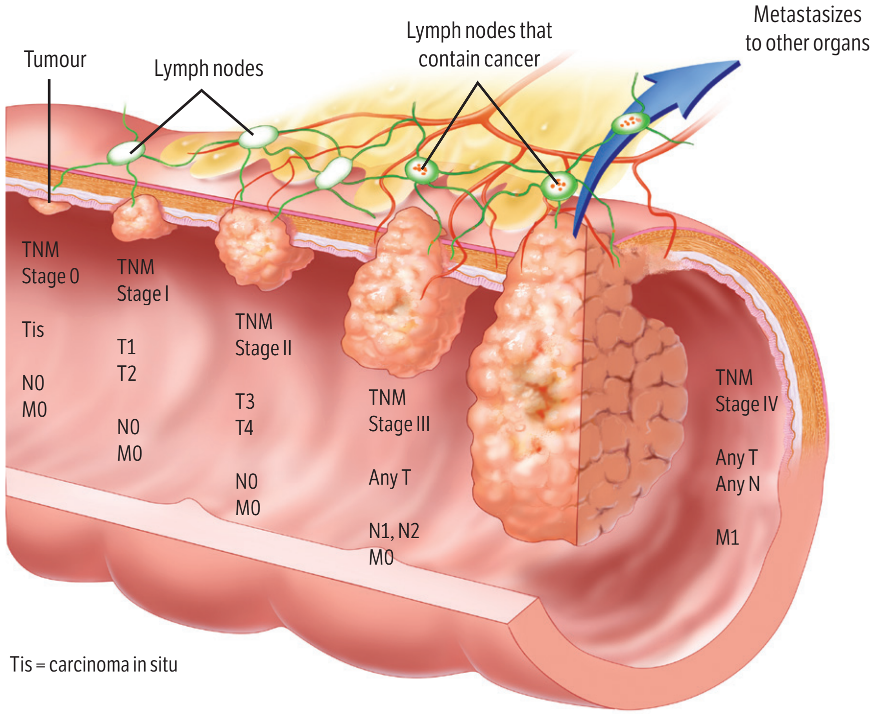
Stage II: The tumour has grown through the wall of the colon or rectum into nearby tissues or organs, without affecting lymph nodes. Possible treatments include surgery and, in higher-risk cases, **chemotherapy** after surgery.

Stage III: The tumour has spread to one or more lymph nodes, but not to distant organs. Possible treatments include surgery and chemotherapy after surgery.

Stage IV: The tumour has spread to distant sites, most commonly the liver, lungs and **peritoneum**. Possible treatments include surgery, **radiation therapy, chemotherapy, targeted therapy, and immunotherapy**. At this stage, the cancer may not be curable but may be kept under control.

The higher the staging number, the more advanced the disease. The stage of your cancer is important in determining what your treatment options will be.

With all of the information gathered from the biopsy, and the results of your physical examination and diagnostic tests, you can work with your healthcare team to choose the best treatment option available for you.



Tis = carcinoma in situ

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QUESTIONS TO ASK YOUR DOCTOR

1. What stage is my cancer?
2. What are my treatment options?

For additional questions, go to **www.colorectalcancercanada.com**

> *Treatments have evolved so much in the last several years. When I was first diagnosed there was only one treatment option besides surgery. Now there is a growing list of options available.*

4. Treatment

For years, surgery and chemotherapy for colorectal cancer, as well as radiation therapy for rectal cancer, have been the basis of treatment. Recent approaches to treatment include new targeted therapies and immunotherapy for treating advanced colorectal cancer.

The stage of your cancer, the location of the original tumour (within the colon or rectum), and your general health will determine which treatment is best for you, or whether a combination of two or more treatments are needed.

YOU WILL NEED TO FIND OUT

- what treatment choices are available to you at diagnosis
- how cancer and the specific treatment you will receive may impact your daily life and that of your family
- what the side effects of the treatment are and how to eliminate or reduce their impact on you
- what are the possibilities of recurrence of the cancer and how to minimize the possibility of recurrence
- what the chances are that the treatment will help you

Your doctor will inform you of your treatment choices and the impact they may have on your quality of life.

For guidance on managing nutrition-related side effects, refer to:
www.foodsthatfightcancer.ca/wp-content/uploads/2020/03/EBmed-NourishExtra-Colon2-06.pdf

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4.1 Surgery

For Stages 0 to III of colon cancer, surgical removal (**resection**) of the tumour is usually the first treatment option. For Stages 0 to III of rectal cancer, radiation in combination with low dose chemotherapy is usually the first treatment option.

Stages 0 to I

When polyps are detected at Stage 0 and some Stage I colon or rectal cancers, local removal of the polyp through a colonoscope avoids abdominal surgery. This is called a **polypectomy**.

Stages II and III

Colon Cancer

When the cancer has invaded the wall of the colon or surrounding tissues, surgery usually involves removal of the cancerous tissue and some surrounding tissue as well as lymph nodes. This surgery is called a partial **colectomy** and may result in the removal of a portion of the colon, with the two resulting ends being joined together to allow normal bowel function, a process called **anastomosis**.

Rectal Cancer

Due to the close proximity of organs and the small amount of space in the pelvic area, rectal cancer has a higher rate of **local recurrence** (recurrence of the tumour at the original site). For this reason, the surgeon needs to make certain that the tumour and surrounding tissues are completely removed. A newer surgical technique known as **total mesorectal excision** (TME) has become the main surgical procedure used for Stage II or III rectal cancers. This procedure involves removal of a sheet of fatty tissue (mesentery) around the rectum. Surgery for Stage II and III rectal cancer is usually preceded by radiation with or without low dose chemotherapy. Surgery may be offered for Stage IV rectal cancer depending on if the tumour is causing you symptoms.

Colostomy

It is not always possible to reconnect the colon or rectum after removing the tumour. In this case a **colostomy** or ***ileostomy*** is required. A colostomy involves attaching the colon to an opening (**stoma**) on the surface of the abdomen to allow the passage of feces. In an ileostomy, the bottom of the small intestine (ileum) is attached to the stoma. In both cases, feces and gas exit the bowel through the opening into a bag or pouch attached to the skin. In most circumstances an ostomy is only needed for a short time until the colon has healed enough for a second surgery to close the ostomy. In other cases, the colostomy is permanent. People with a colostomy or ileostomy can enjoy normal lives. Of course, having a stoma, even temporarily, requires an adjustment in a person's life. A stomal therapy nurse will discuss all aspects of living with a stoma and give you the information you need. Several organizations offer support services to patients with a colostomy or ileostomy. For guidance on what to eat and drink after ostomy surgery, refer to: **www.foodsthatfightcancer.ca/wp-content/uploads/2020/03/EBmed-NourishExtra-Colon1-06.pdf**

Stage IV

If your cancer has spread to another organ or part of your body, for example the liver, lungs or peritoneum, surgery may still be a treatment option. In this case, a variety of techniques can be used to treat your cancer. To help control the cancer you will likely be offered chemotherapy, possibly in combination with a targeted therapy which you will read about shortly. These treatments may be used before surgery (**neoadjuvant** therapy) or after surgery (**adjuvant** therapy) to improve the effects of surgery.

There is now a much better prognosis for Stage IV cancer. For instance, liver-only metastases have been shown to be successfully managed through surgical resection. The liver is the dominant metastatic site for patients with colorectal cancer, and although many patients' cancer may spread beyond the liver, some patients have disease that is isolated to the liver. For these patients, regional treatment approaches such as surgical resection may be considered in addition to chemotherapy. Studies have also demonstrated a clinical benefit of cytoreductive surgery (CRS) in patients with resectable peritoneal metastases. CRS is a surgical procedure in which tumours are completely removed from the abdominal cavity. Your doctor will discuss the best option available to you, based on your individual condition.

Side Effects of Surgery

A side effect is any effect other than the primary intended effect of a medicine or treatment. Side effects may be uncomfortable but are usually short-lived. Following surgery, you will determine which foods irritate your digestive system, and which ones don't, and adjust what you eat accordingly. Medication for diarrhea and constipation may also help and should be taken according to your doctor's instructions.

SIDE EFFECTS OF SURGERY

- You may experience temporary pain and tenderness after colon or rectal cancer surgery, but you will be offered excellent options for controlling pain.
- You may also experience short-term constipation or diarrhea, and there are medications to control these side effects as well.
- If you have a colostomy or ileostomy, the skin around the opening (stoma) may become irritated. A qualified ostomy nurse can teach you how to look after your colostomy/ileostomy at home.

4.2 Radiation Therapy

Radiation therapy (radiotherapy) uses high-energy x-rays to help kill tumour cells. The rays enter the body and disrupt the cells in their path. Though both normal and tumour cells are affected, tumour cells are selectively killed because they divide more rapidly than do normal cells. Radiation, given in small doses over several weeks, results in a steady decline of tumour cells.

Radiation therapy is used primarily to treat Stage II, III, and IV rectal cancer before or sometimes after surgery, and to alleviate or prevent symptoms, such as bone pain, that are associated with Stage IV disease. Often radiation on its own or in combination with chemotherapy is used to shrink large tumours before surgery, making it easier to completely remove the tumour. Radiation in combination with chemotherapy helps to reduce the chance of recurrence of rectal cancer.

Radiation therapy for rectal cancer involves sequential treatments over a period of five weeks. Radiation is usually given with low dose chemotherapy pills, which help the radiation work better. Radiation is most commonly given before surgery for rectal cancer.

Each radiation treatment takes only a few minutes and is usually carried out at a local cancer centre or hospital.

Radiation therapy is not generally used for colon cancer because of the risk of radiation damage to nearby organs.

Side Effects of Radiation

While chemotherapy affects your whole body, radiation therapy only affects the specific area of the body where it is given. Therefore, there are fewer side effects from radiation than chemotherapy. Newer technology has allowed radiation to be more precisely focused so that only the target tissues and small margins are radiated.

Some side effects may occur during or following radiation therapy. Speak to your physician before the treatment begins to learn what measures may be taken to reduce any discomfort.

SIDE EFFECTS OF RADIATION THERAPY MAY INCLUDE

Nausea, vomiting, diarrhea
Can be alleviated with medication. Changes in your diet may prevent or lessen these symptoms.

Tiredness
Adjust your lifestyle and take regular breaks.

Mild skin irritations of the radiated area
Use skin lotions to soothe the affected area.

Sexual dysfunction
Can affect both men and women. Ask your physician about measures that may be taken to continue an active and satisfying lifestyle.

Change in bowel function and burning sensation
Radiation may affect bowel function and cause a burning sensation which in most cases will return to normal with the passage of time.

Interventional Radiology

Many conditions that once required surgery can be treated less invasively by interventional radiologists. Interventional radiology is a non-surgical treatment that can be used to treat colorectal tumours that have spread to the liver and lungs. Specialists use x-rays, CT, MRI, and other imaging to place a catheter, usually in an artery, to treat at the source of the disease.

One of these methods is called **chemoembolization**, which involves showering the blood supply to a tumour with small beads that are attached to chemotherapy.

Another type of embolization is called portal vein embolization. It is used in colorectal cancer patients who previously were not candidates for surgery due to the small amount of liver that would remain after the surgery. Portal vein embolization helps the liver re-grow before surgery. The radiologist identifies the blood vessel (portal vein) at the side of the liver with the most disease. The portal vein is embolized, and the other side of the liver subsequently grows in response. After several weeks, there should be enough liver to perform a normal surgery.

Radiofrequency ablation (RFA): An interventional radiologist uses computed tomography (CT) to guide a small needle through the skin into the tumour. Radiofrequency (electrical) energy is transmitted to the tip of the needle, producing heat in the tissue. When the temperature is greater than 50°C for more than 5 minutes, the tumour cells are treated.

4.3 Watch-and-Wait Approach for Rectal Cancer

Watch-and-Wait is an approach used in some patients with rectal cancer after successful radiation and chemotherapy. The watch-and-wait approach involves closely monitoring and regularly examining patients who achieve a complete response (tumour no longer visible on CT, MRI or during colonoscopy) after chemoradiation therapy. This approach has been gaining interest as an alternative to radical surgery, since patients may be spared from complications associated with surgery. Research on the benefits of this approach is gaining interest and more and more evidence is showing that this approach may be as effective as radical surgery, although further research is being done to confirm these findings.

4.4 Chemotherapy

In many cases, all of the cancer can be surgically removed. However, not everyone who has surgery for colorectal cancer will be cured. Depending on the stage of your cancer at diagnosis, you may be offered further treatment after your surgery.

Although the surgeon may remove all visible cancer, there may be a few cells that have escaped into surrounding tissue or lymph nodes that cannot be identified. In this case, you may be offered chemotherapy after surgery to try to kill cancer cells that may have travelled to other parts of the body. Eliminating escaped tumour cells may prevent the cancer from growing back. Chemotherapy given after surgery is called adjuvant chemotherapy (adjuvant means "alongside").

People with Stage III and IV and some people with high-risk Stage II colon cancer are given adjuvant chemotherapy. If you have Stage II or III rectal cancer, you may be given adjuvant chemotherapy in addition to radiation therapy.

When cancer spreads to distant organs, chemotherapy can control the resulting tumours that cannot be removed by surgery or radiation therapy. Chemotherapy can reduce the cancer burden to control the symptoms, improve quality of life, as well as extend life. This is referred to as **palliative chemotherapy**.

Chemotherapy alone or in combination with **targeted therapy** (described in the next section) may also shrink tumours that were initially too large to be removed by surgery. Once the tumour shrinks you may qualify for surgery and additional adjuvant therapy. In some cases, this may lead to a cure.

How Chemotherapy Works

Chemotherapy uses drugs to kill cancerous cells. Once in the blood the drugs circulate throughout the body, reaching cancer cells wherever they are, and preventing them from growing. This may cause the tumour to shrink.

Chemotherapy for colorectal cancer consists of one drug or a combination of drugs. Chemotherapy may be taken by mouth as a pill. It can also be given as an intravenous injection (IV) into a vein over a few minutes, as an infusion that can last 30 minutes or longer, or through a portable infusion pump which delivers drugs over a period of days. The course of therapy is given in cycles, alternating periods of taking the drug with periods of rest. The rest periods give your body a chance to build healthy new cells and regain strength. A cycle is commonly every 2 weeks, every 3 weeks, or monthly. A course of therapy may consist of several cycles of treatment.

Depending on the treatment prescribed, you may receive chemotherapy at a doctor's office, a clinic, a hospital outpatient department, as an inpatient in hospital, or at home. Chemotherapy most often begins five to six weeks after surgery and may continue for six months or longer.

The type and duration of chemotherapy you receive will depend on the stage of your cancer, how healthy you are and the availability of particular drugs at your cancer centre or hospital.

Side Effects of Chemotherapy

Some of the most effective chemotherapy **regimens**, which use high doses of chemotherapy drugs, may cause side effects. Since chemotherapy does not distinguish between cancerous and normal cells, it affects other parts of the body. Damage to normal cells, referred to as **toxicity**, is responsible for the common side effects of chemotherapy. Normal tissue is able to recover once chemotherapy is stopped, and most damage is usually short-lived.

Drugs affect people in different ways. Not all patients have the same side effects with the same drug. You may experience only some of the likely side effects with a particular chemotherapy drug. Effective medications are available to reduce most of the side effects, or at least lower them significantly. Acute or serious chemotherapy side effects happen most often during the first cycles of treatment and lessen following therapy. Techniques to lower anxiety, such as meditation or relaxation, may help you cope with your cancer journey.

SERIOUS SIDE EFFECTS OF CHEMOTHERAPY THAT MAY REQUIRE MEDICAL ATTENTION

Side Effect	Symptoms
• **febrile neutropenia** • **anemia** • serious vomiting or diarrhea resulting in dehydration • unexplained bleeding	• fever and chills • tiredness due to a low **red blood cell** count

It is important that you know how to contact a member of your healthcare team, day or night, and know when to go to the emergency ward if any of these potentially serious side effects occur. **If there is ever any doubt, always report to the emergency department of your hospital without delay**.

Diarrhea

Damage to cells lining the gastrointestinal tract may cause diarrhea or frequent, loose feces. Although diarrhea is a common side effect of certain chemotherapy drugs, it is often not serious or long-lasting. It can usually be managed with non-prescription anti-diarrheal agents. Refer to your nurse or oncologist for the dosage. If you experience diarrhea, drink plenty of fluids to avoid dehydration.

If you experience diarrhea that persists for days, notify your physician since it may result in severe loss of body fluid (dehydration) and require admission to hospital.

If you experience diarrhea at the same time as receiving your chemotherapy infusion, immediately advise your nurse. Your oncologist may prescribe another medication for you to take at the same time as the infusion.

Upset stomach and vomiting

Stomach upset or vomiting may occur on the day of, and possibly for a few days after, chemotherapy.

Your doctor may suggest trying anti-nausea drugs, such as ondansetron (ZOFRAN®) or drugs in the same family), or dexamethasone (DECADRON®). If you get an upset stomach more than two days after treatment, your doctor may recommend taking prochlorperazine (STEMETIL®), domperidone (MOTILIUM®), dimenhydrinate (GRAVOL®) or metoclopramide (MAXERAN®).

If you experience vomiting, remember to drink plenty of fluids to avoid dehydration and advise your oncologist and/or nurse immediately.

Feeling tired

Feeling tired is a common side effect of chemotherapy.

SEVERAL FACTORS CONTRIBUTE TO FEELING TIRED

- the stress of adjusting to being diagnosed with cancer
- recent surgery and anesthesia
- lowered red blood cell counts
- the effects of the chemotherapy drugs themselves

To manage your tiredness, try to get enough sleep, eat well, and minimize stress at home and on the job. Relaxation therapies can be useful. Tiredness resulting from chemotherapy can be treated. See Anemia on page 21 for details on managing this condition.

Mouth sores (mucositis)

Damage to fast-growing cells lining the mouth may cause mouth sores (mucositis). Mucositis is common and may occur several days after chemotherapy starts. Mouth sores and tenderness often appear when your white blood cell count is low.

Before beginning chemotherapy, it is recommended that you have a dental checkup and cleaning. When chemotherapy begins, rinse with a mild mouthwash that contains no alcohol. Mouthwashes may contain some pain relievers (anesthetics) as well as an anti-fungal agent that will help control infections such as candidiasis, or thrush. Consult with your doctor to determine what is right for you. Keep your mouth clean using a soft toothbrush and avoid foods that may irritate the inside of the mouth or throat. Avoid dental cleaning and procedures when receiving chemotherapy.

Hand-foot syndrome

You may also find that skin becomes dry and thick or begins to crack around the palms and soles of the feet. Some patients develop blisters or a rash. This is called hand-foot syndrome. Your healthcare team can give you treatments such as lotions or pain medicine.

Hair loss

This side effect is seen in only some of the chemotherapy drugs used for colorectal cancer.

In some cases, damage to fast-growing cells in hair follicles can cause hair loss (alopecia). Lost hair almost always grows back once chemotherapy is completed. If you experience some hair loss, you may choose to cut your hair short or even shave your head. These steps may help you feel more in control of your appearance, the disease, and its treatment.

Numbness or tingling in the hands and feet (neuropathy)

Numbness or tingling in the fingers and toes is a common side effect with some drugs which irritate nerve endings. You may have trouble doing-up buttons, for example, or picking up small objects. This is called **peripheral neuropathy**, and it can occur a few days or a few weeks after treatment.

While these side effects are frustrating and sometimes painful, they may go away after stopping treatment. Always report side effects to your doctor who may decide to reduce the drug dose or suggest a break from therapy.

Neutropenia

Neutrophils are white blood cells that help the body fight infection. A reduction in the number of **neutrophils** in your blood is called **neutropenia**. Prolonged neutropenia may necessitate a decrease in your next chemotherapy dose or a delay in receiving your next dose.

Virtually all patients receiving chemotherapy develop some degree of neutropenia, resulting in a greater-than-normal vulnerability to infection. If you experience a fever higher than 38˚C or other symptoms of infection, contact a member of your healthcare team immediately (day or night). In most cases, you will be admitted to hospital and treated with intravenous antibiotics. The likelihood of experiencing serious neutropenia that would result in hospitalization depends in part on the type of chemotherapy regimen being used.

> Neutropenia due to cancer chemotherapy may result in a serious or even life-threatening infection.

If your fever is higher than 38˚C or if you have other signs of infection, contact your doctor or cancer centre immediately. An infection left untreated while you have a low white blood cell count can be life-threatening.

Since neutropenia is a potentially serious complication of chemotherapy, white blood cell counts are closely monitored during chemotherapy. On the day you are scheduled to receive your next cycle of chemotherapy, your white blood cell count will be measured to make certain you are able to receive the next dose. If your white blood cell count has not recovered to a level that allows chemotherapy to be given safely, the next cycle of chemotherapy will be delayed until the white blood cell level has recovered. If you have had serious or long-lasting neutropenia, your dose during future cycles of chemotherapy may be lowered.

Treatment of neutropenia

Neutropenia can be treated, and the incidence lowered, by administering growth factors that cause new white blood cells to grow.

Two injectable growth factors used to decrease the incidence of neutropenia include filgrastim and pegfilgrastim, also known as **granulocyte colony-stimulating factors (G-CSF)**. By reducing the risk of neutropenia, the use of G-CSFs may help avoid dose reductions and/or delays. Brand names of growth factor products include NEUPOGEN®, GRASTOFIL®, NIVESTYM™, NEULASTA®, FULPHILA™, LAPELGA®, NYVEPRIA™ and ZIEXTENZO®.

Severe neutropenia requiring treatment is more common with intensified chemotherapy regimens and in older patients. You may have medical conditions in addition to cancer (called comorbid conditions) that may affect your ability to receive a full chemotherapy dose. You may wish to discuss with your physician ways of ensuring that you are able to receive a full and effective dose of chemotherapy.

Anemia

Feeling tired more than usual may be a result of **anemia**, a common side effect of many chemotherapy regimens. Anemia happens when there is a significant decrease in your red blood cell level. **Hemoglobin** in your red blood cells carries oxygen throughout your body, and a decrease in the number of these oxygen-rich blood cells can contribute to your energy level being lower. Although anemia is not usually life-threatening, many patients report that the resulting tiredness has a negative impact on their day-to-day activities.

Your doctor will check your blood count often during treatment. Mild or moderate anemia is common with some chemotherapies and treatment is usually not needed. The severity of anemia may increase with certain types of chemotherapy regimens; it can also become more serious when chemotherapy continues for several months.

Treatment of anemia

Anemia is commonly observed in cancer patients undergoing chemotherapy. Optimal management of anemia may require the use of red blood cell growth factors (erythropoietic-stimulating agents) and iron supplementation if necessary, or blood transfusion. You may require a transfusion of red blood cells if you experience rapidly developing symptomatic anemia.

COMMONLY USED CHEMOTHERAPY TREATMENTS

5-fluorouracil and folinic acid (leucovorin)	The most common chemotherapy drug for colorectal cancer is the fluoropyrimidine, called 5-fluorouracil, or 5-FU for short. You may be given 5-FU with a vitamin derivative called folinic acid, or FA for short (it is also called leucovorin). Folinic acid makes the 5-FU more active against cancer cells. 5-FU and FA are administered intravenously by either direct injection or infusion, and/or through a **port** (a surgically implanted catheter).
Capecitabine (XELODA®)	Capecitabine is a pill form of 5-FU and has been demonstrated to work as well as daily injections of 5-FU. It has a slightly different side effect profile than 5-FU and may be taken at home.
Irinotecan (CAMPTOSAR®) (CPT-11)	You may be administered irinotecan as a first treatment (first-line chemotherapy) for advanced colorectal cancer. Or you may be given irinotecan in later lines of treatment if earlier chemotherapy hasn't controlled your colorectal cancer. Depending on the treatment you've had before, you may be given irinotecan by infusion, either on its own or with 5-FU and folinic acid. Administration of irinotecan in combination with 5-FU and folinic acid is known as FOLFIRI.
Oxaliplatin (ELOXATIN®)	Oxaliplatin is administered in a similar way to irinotecan. Oxaliplatin is a platinum-based chemotherapy drug typically administered in combination with fluorouracil and leucovorin in a combination known as FOLFOX for the treatment of colorectal cancer.
Trifluridine and tipiracil (TAS-102) (LONSURF®)	TAS-102 is an oral combination chemotherapy approved for the treatment of metastatic colorectal cancer. Your doctor may prescribe this if you have been previously treated with, or if you are not a candidate for, other therapies such as fluoropyrimidine-, oxaliplatin- and irinotecan-based chemotherapies, anti-vascular endothelial growth factor (anti-VEGF) and anti-epidermal growth factor receptor (anti-EGFR) agents. Other than Quebec, TAS-102 is generally not reimbursed in Canada. For information on financial support options and how to access TAS-102, refer to the Drug Access and Reimbursement Resources section for contact information.

COMBINATION CHEMOTHERAPIES

FOLFOX	FOLFOX is a combination of chemotherapies you may be given as a first treatment for colorectal cancer. FOLFOX is a combination of 5-FU, folinic acid and a third drug called oxaliplatin.
FOLFIRI	FOLFIRI is the name of a combination chemotherapy treatment consisting of 5-FU, folinic acid and a third drug called irinotecan. It is another treatment option for colorectal cancer.
FOLFOXIRI	FOLFOXIRI is an intensive combination chemotherapy treatment that includes 5-FU, folinic acid, oxaliplatin and irinotecan. FOLFOXIRI may be given as the first treatment option in patients who have more advanced colorectal cancer
XELOX or CAPOX	XELOX is a combination of capecitabine and oxaliplatin. It is also commonly referred to as CAPOX.

4.5 Targeted Therapy

In addition to chemotherapy, patients with stage IV (metastatic) colorectal cancer may be offered other types of cancer treatment, such as targeted therapy. **Targeted therapies** work differently than chemotherapy because targeted therapies interfere with specific characteristics of cancer cells. These therapies can destroy primarily cancer cells while minimizing harm to normal cells.

Each targeted therapy "targets" a feature, process, or molecule specific to cancer cells. Targeted therapies may be combined with chemotherapy to enhance the effect on tumours and increase the amount of time before they begin to grow again. In clinical trials, patients have been shown to live longer by taking a targeted therapy as well as chemotherapy, compared to chemotherapy alone. In some cases, targeted therapies may further enhance the effect of chemotherapy and the shrinking of tumours, thus making surgery an option.

Most targeted therapies are either **biologic therapies** or **small molecule drugs**. Biologic therapies are drugs that are made from living organisms or substances derived from living organisms. Biologic therapies target molecules (eg, receptors) on the outside of cancer cells. Small molecule drugs are generally synthetic chemicals that are small enough to enter a cell and target molecules on the inside of cancer cells.

4.5.1 Tumour Markers and Biomarkers

Over the past decade, great advances have been made to identify signals in the blood, body fluids, and tumour samples, to better understand an individual's cancer. Biomarkers may be circulating proteins like CEA (carcinoembryonic antigen) that can be measured with a blood test, or they may be tumour markers, specific to tumour genetic or cellular features.

Tumour tissue from a biopsy or from surgery will be examined by the laboratory to identify which biomarkers are present. You may hear the terms molecular testing or genetic testing used to describe this process. Within colorectal cancer, there are different subtypes which are defined by certain features of the cancer cells. These tumour cell features provide important information about how the cancer will likely behave and which treatments will work better than others.

Scientists have uncovered many types of tumour markers in advanced colorectal cancers including mutations in the **KRAS** or **NRAS** genes (sometimes together called **RAS** genes), as well as mutations in the BRAF gene. These specific mutations guide the choice of targeted therapies.

Cancer cells may also be deficient in a DNA repair mechanism called mismatch repair (MMR), a condition also found in Lynch syndrome. As a result, the cancer cells accumulate many changes in their DNA, a characteristic referred to as high microsatellite instability (MSI-H). Clinical trials have demonstrated that in patients with colorectal cancer, MSI-H or deficient MMR (dMMR) status predicts response to immunotherapy, which is discussed below.

For more information on biomarkers, refer to the links below:
Colorectal Cancer and Biomarker Testing
Colorectal Cancer and Biomarker Testing: What Patients Need to Know

4.5.2 Companion Diagnostics for Targeted Therapy

Companion diagnostics are biomarker tools or tests that help your healthcare team determine if you are likely to benefit from certain therapies. These tools may examine your genetic make-up or measure specific biomarkers in your blood or from the tumour tissue. The companion diagnostic for a targeted therapy is based on the biological pathway that the therapy targets. For example, many studies show that the presence of KRAS or NRAS mutations in tumour cells predicts lack of response to EGFR inhibitor therapy in colorectal cancer. Companion diagnostics for EGFR-targeted therapies test for the presence of KRAS or NRAS genetic mutations. Only patients with cancer cells containing non-mutated (or wild-type) KRAS or NRAS genes would then be offered EGFR targeted therapies, such as panitumumab (VECTIBIX®) or cetuximab (ERBITUX®). Ongoing research also suggests high levels of the HER2 protein is associated with reduced response to EGFR inhibitors, making HER2 another biomarker and potential treatment target in colorectal cancer.

4.5.3 Tumour Location and Treatment Options

The location of a tumour in the body may affect how long someone with metastatic colorectal cancer survives and guide the type of treatment used. Patients with tumours that started growing on the left side of the colon may respond better to EGFR inhibitors (panitumumab or cetuximab), whereas patients whose tumours started from the right may respond to therapies such as bevacizumab. This is because the biology and genetics of right and left-sided tumours seem to be different. Ongoing research is being conducted to better understand the reasons that explain these differences.

4.5.4 Targeted (Biologic) Therapies

Most biologic therapies used to treat colorectal cancer are **monoclonal antibodies**. Monoclonal antibodies are antibodies that have been engineered to recognize specific proteins or receptors on the surface of a cell and interfere with signals that help cancer cells survive. At this time, targeted (biologic) therapies are used in patients with metastatic colorectal cancer.

Blocking tumour growth signals

Tumour cells have receptors which attach to substances produced by the body called EGF (epidermal growth factor). When EGF attaches to a tumour cell receptor, the tumour cell is stimulated to grow and divide, resulting in uncontrolled, unregulated growth of the tumour.

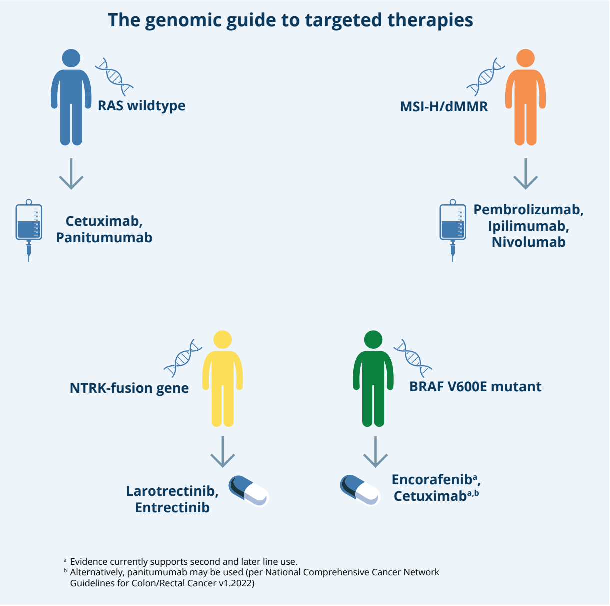
The drugs that block growth factors from attaching to the tumour cell EGF receptors are known as **EGFR (epidermal growth factor receptor)** inhibitors. Two of these drugs, panitumumab (VECTIBIX®) and cetuximab (ERBITUX®), have been shown in **clinical trials** to block EGFR in advanced colorectal cancer. As mentioned previously, these therapies only work in colorectal cancers that have non-mutated KRAS or NRAS genes. These treatments are given by injection into a vein and may be given as single-drug therapy or in combination with chemotherapy.

Blocking nourishment to tumours

Tumours need a blood supply to obtain oxygen and nourishment for new and dividing cells. Cancer cells manufacture chemicals which cause blood vessels in the area of the tumour to sprout additional tiny blood vessels - a process known as angiogenesis (an-jee-o-jen-eh-sis). These blood vessels are then attracted to the tumour, feeding it and enabling it to grow.

Anti-angiogenic agents block this process of inducing the formation and attraction of blood vessels and cause the blood vessels to shrink away from the tumour, effectively starving it of oxygen and nutrients.

One of the cellular signals required for new blood vessel formation is a protein called **vascular endothelial growth factor (VEGF)**. The anti-angiogenic therapy bevacizumab (AVASTIN®) blocks the VEGF signal from attaching to the receptor, and therefore blocks the growth of the tumour's blood supply. Ramucirumab (CYRAMZA®) is another targeted (biologic) therapy that binds to the VEGF receptor and blocks VEGF signals that lead to angiogenesis. Ramucirumab was approved in the USA for treating advanced colorectal cancer after treatment with bevacizumab plus chemotherapy has failed (second-line treatment). However, ramucirumab is not yet available for treating colorectal cancer in Canada.



[a] Evidence currently supports second and later line use.
[b] Alternatively, panitumumab may be used (per National Comprehensive Cancer Network Guidelines for Colon/Rectal Cancer v1.2022)

TARGETED (BIOLOGIC) THERAPIES IN CANADA

Bevacizumab (AVASTIN® + biosimilars)	Bevacizumab is a monoclonal antibody given in combination with chemotherapy. While chemotherapy attacks the tumour directly, bevacizumab is an anti-VEGF drug which blocks the growth of the tumour's blood supply.
Panitumumab (VECTIBIX®)	Panitumumab is a fully human monoclonal antibody used together with chemotherapy as initial therapy or as a single-drug therapy (without chemotherapy) after failing previous therapy. It works by blocking EGFR signals required for tumour growth on cancer cells which may prevent them from growing and dividing.
Cetuximab (ERBITUX®)	Cetuximab is a human/mouse (chimeric) monoclonal antibody used alone or in combination with chemotherapy. It works by blocking EGFR signals required for tumour growth on cancer cells which may prevent them from growing and dividing.

4.5.4.1 Biosimilars

A biosimilar is a type of biologic therapy that is highly similar to an already-approved biologic treatment but is not identical due to the large and complex nature of biologic drugs. Biosimilars are made to meet the manufacturing standards of regulatory authorities and offer cost-savings to the healthcare system. The approval pathway of biosimilars is shorter than the original or "innovator" biologic therapy, which lowers the cost of making these drugs. As patents for innovator biologic therapies expire, many companies are developing biosimilar medicines. In Canada, two bevacizumab (AVASTIN®) biosimilars, MVASI® and ZIRABEV®, are available as a first-line treatment in combination with fluoropyrimidine-based chemotherapy for metastatic colorectal cancer. Additional biosimilars for colorectal cancer are currently under development in Canada, the US, and Europe.

4.5.4.2 Side Effects of Targeted (Biologic) Therapies

Like chemotherapy and radiation therapy, targeted (biologic) therapies can also have side effects. Inform your doctor of any symptoms you experience during treatment. Most side effects dissipate or disappear entirely following treatment.

COMMON SIDE EFFECTS OF BIOLOGIC THERAPIES

Patients who receive anti-angiogenic agents (such as Avastin®) may experience	Patients who receive EGFR inhibitors (such as Vectibix® or Erbitux®) may experience
• high blood pressure	• skin rash
• diarrhea	• tiredness
• lowered white blood cell counts	• nausea
• mouth sores	• vomiting
• headaches	• diarrhea
• slow wound healing	• dry skin
• loss of appetite	• constipation

The most common side effect of EGFR inhibitors is skin rash. This is a direct effect of the drug on normal skin cells and can be effectively managed with the appropriate treatment.

GENERAL MEASURES YOU CAN TAKE TO RELIEVE SKIN RASH

- Use SPF30 or higher sunscreen with UVA and UVB protection
- Wear a hat and long clothes to limit sun exposure
- Stay hydrated
- Keep your skin clean by washing with warm water and gentle soap
- Moisturize with alcohol-free, fragrance-free, gentle, non-irritating products specialized for sensitive skin
- Apply a steroid cream (eg, hydrocortisone) as recommended by your doctor
- Apply moisturizer and steroid cream every morning and night to face, neck, upper chest and back
- Reapply moisturizer after exposure to water
- Wear soft, comfortable, loose-fitting clothes
- Take medicine according to the label
- Avoid direct sun
- Avoid hot showers and baths
- Avoid using harsh skin products
- Avoid scented skin care products
- Avoid acne products
- Avoid irritating clothing material

Questions? Ask your doctor

For additional skin care tips for patients being treated with EGFR inhibitors, refer to **https://vimeo.com/582623702/e4de3cc739**

Depending on the severity and type of rash developed, your doctor may prescribe additional medicines to help with the rash. The doctor may also reduce or delay the next dose of EGFR inhibitor. Once the rash has subsided, normal therapy can begin again. In cases of severe rash, your doctor may refer you to a dermatologist.

4.5.5 Targeted (Small Molecule) Therapies

Kinase Inhibitors

Kinase inhibitors are small molecules commonly used to treat metastatic colorectal cancer. They target proteins called kinases inside of cancer cells. In cancerous cells, kinases help send signals that encourage the cancer cell to grow and survive. Kinase inhibitors contribute to slowing tumour growth by interfering with these growth and survival processes. Tyrosine kinase inhibitors (TKIs) are a subtype of kinase inhibitors.

Regorafenib (STIVARGA®)

Regorafenib is a specific type of tyrosine kinase inhibitor that interferes with several kinase proteins at once. For this reason, it is sometimes called a multi-kinase inhibitor. The kinase proteins that regorafenib blocks are involved in tumor growth and progression (oncogenesis), blood vessel development (angiogenesis), and the tumor microenvironment. Regorafenib has been shown to be effective in patients with both KRAS mutant and KRAS wild-type tumours. Regorafenib is currently available in Canada for previously treated metastatic colorectal cancer, but it is generally not reimbursed.

Larotrectinib (VITRAKVI®)

Larotrectinib is a tyrosine kinase inhibitor that blocks the activity of a family of kinase proteins involved in cell division and survival. Larotrectinib is conditionally approved in Canada to treat patients with solid tumours that contain genetic alterations in the NTRK gene, are metastatic or not candidates for surgery and lack satisfactory treatment options. Until reimbursement is confirmed in Canada, information on financial support options and how to access VITRAKVI® is available through the patient support program for VITRAKVI®. Refer to the Drug Access and Reimbursement Resources section for contact information.

Entrectinib (ROZLYTREK™)

Entrectinib is a tyrosine kinase inhibitor that targets a number of kinases including the ROS1 protein and proteins encoded by NRTK genes. Entrectinib is conditionally approved in Canada to treat adult patients with locally advanced or metastatic solid tumours that contain an NTRK gene fusion and who are not candidates for surgery or lack satisfactory treatment options. Entrectinib is not yet funded for colorectal cancer in Canada. For information on how to access ROZLYTREK™, refer to the contact information in the Drug Access and Reimbursement Resources section.

Encorafenib (BRAFTOVI®)

Encorafenib is a kinase inhibitor that targets the kinase, BRAF. Encorafenib is approved, in combination with cetuximab, to treat patients with metastatic colorectal cancer with a BRAF V600E mutation. This drug combination blocks cell growth pathways and showed clinical benefit in patients with a BRAF V600E mutation. For more information on how to access BRAFTOVI®, refer to the Drug Access and Reimbursement Resources section for contact information.

4.5.5.1 Side Effects of Targeted (Small Molecule) Therapies

Some of the side effects of targeted (small molecule) therapies include pain (e.g., in muscles, joints, abdomen, back, or extremities), tiredness/fatigue, decreased appetite, diarrhea, nausea/vomiting, and skin rash. You may experience side effects not listed here. It is important that you discuss any side effects with your healthcare team.

4.6 Immunotherapy

Immunotherapy is a type of biological therapy that uses a person's own immune system to fight cancer or other diseases. These therapies are designed to stimulate the immune system to work harder or to better identify cancer cells to target them for destruction.

Immunotherapies, such as the checkpoint inhibitors pembrolizumab (KEYTRUDA®) and nivolumab (OPDIVO®), have become important new treatment options for patients with advanced colorectal cancer. **Checkpoint inhibitors** are a type of immunotherapy that interferes with the immune system pathway, specifically with the communication between immune-fighting cells, called T cells, and tumour cells. **PD-1 is a cell marker on T cells that communicates with PD-L1, a cell marker on tumour cells**. The PD-1/PD-L1 pathway acts as a "checkpoint" for destroying immune cells to prevent the immune response from being too strong. By disrupting or "inhibiting" this communication, checkpoint inhibitors prevent the body's immune cells from being destroyed so that the immune cells are available to fight cancer cells for longer, resulting in a stronger response.

Based on positive results from immunotherapy trials in colorectal cancer, pembrolizumab is approved as a monotherapy for the treatment of advanced colorectal cancer with high levels of microsatellite instability (MSI-H) or deficiency of mismatch repair (dMMR). Limited provincial reimbursement policies may restrict use to certain patient types. For more information on how to access KEYTRUDA®, refer to the Drug Access and Reimbursement Resources section for contact information.

Nivolumab (OPDIVO®) in combination with ipilimumab (YERVOY®) is also approved for MSI-H or dMMR advanced colorectal cancer. Ipilimumab is another immunotherapy drug that targets a different protein found on T cells called CTLA-4. Reimbursement limitations may also apply. For more information on how to access YERVOY® and OPDIVO®, refer to the Drug Access and Reimbursement Resources section for contact information.

4.6.1 Side Effects of Immunotherapy

Common side effects from immunotherapy treatment are listed below. Some side effects from immunotherapy such as diarrhea, rash, and shortness of breath are managed differently than when these side effects are caused by chemotherapy. You may also experience side effects not listed in the table below. It is important that you speak with your healthcare team about side effects early, to help manage them and reduce their severity. Your care team may provide you with a wallet card describing your immunotherapy regimen. It is important to share this with any doctor or healthcare professional with whom you interact.

COMMON SIDE EFFECTS OF IMMUNOTHERAPIES Patients who receive immunotherapy may experience	
• Feeling tired	• Lymphocytopeia (low levels of white blood cells)
• Itching, rash	• Shortness of breath
• Low sodium	• Cough
• Stomach pain	• Fever
• Constipation	• Decreased appetite
• Diarrhea	• Changes in weight
• Nausea/vomiting	• Loss of colour in patches of skin (vitiligo)
• Headache	
• Musculoskeletal pain	

Treatment regimens consisting of more than one immunotherapy agent tend to cause more side effects than those consisting of only one immunotherapy agent.

In addition to surgery, the treatments summarized in the following diagram are some of the available treatments you may receive. However, depending on which province you live in, some of these treatments either may not be available or not be reimbursed by your provincial health care plan. Some pharmaceutical companies have patient assistance programs to assist patients financially to obtain their medications. Additionally, if you have private insurance, you should verify coverage with your insurance company.

A SUMMARY OF TREATMENT OPTIONS FOR COLON CANCER

DIAGNOSIS	STAGE 0&I	STAGE II	STAGE III	STAGE IV and recurrent cancer
TREATMENT CHOICE	Polypectomy or local excision For Stage 0 and some Stage I cases	Surgery[a]	Surgery + adjuvant chemotherapy	Chemotherapy + targeted therapy, with or without surgery
CHEMOTHERAPY REGIMEN CHOICE		If high risk features: 5-FU/FA Capecitabine FOLFOX/ CAPOX	5-FU/FA FOLFOX Capecitabine CAPOX[b]	5-FU/FA, FOLFOX, FOLFIRI, XELOX, Capecitabine, Irinotecan, TAS-102
TARGETED TREATMENTS				Panitumumab, Cetuximab, Bevacizumab, Encorafenib, Entrectinib, Regorafenib, Larotrectinib
IMMUNOTHERAPY				Pembrolizumab, Nivolumab + Ipilimumab (MSI-H/dMMR)
FOLLOW-UP TESTS	• CEA laboratory tests every 3-6 months for the first 3 years and every 6 months for the next 2 years • CT chest, abdomen and pelvis every 6-12 months for the first 3 years, then annually for 2 years • Colonoscopy within 1 year post-surgery (or within 6 months if complete colonoscopy could not be performed pre-operatively) and every 2-3 years thereafter, depending on results.			

[a] Chemotherapy may be offered to patients with Stage II colon cancer who are deemed to be at high risk for a recurrence.

[b] CAPOX is the preferred treatment in most cases.

A SUMMARY OF TREATMENT OPTIONS FOR RECTAL CANCER

DIAGNOSIS	STAGE 0&I	STAGE II	STAGE III	STAGE IV and recurrent cancer
TREATMENT CHOICE	Polypectomy or local excision For Stage 0 and some Stage 1 cases	Surgery[a]	Surgery[b] + radiation[c] ± adjuvant chemotherapy	Surgery[b,d] ± chemotherapy ± Radiation[e] ± targeted therapy
CHEMOTHERAPY REGIMEN CHOICE			5-FU/FA, FOLFOX, Capecitabine CAPOX	5-FU/FA, FOLFOX, FOLFIRI, XELOX, Capecitabine, Irinotecan, TAS-102
TARGETED TREATMENTS				Panitumumab, Cetuximab, Bevacizumab, Encorafenib, Entrectinib, Regorafenib, Larotrectinib
IMMUNOTHERAPY				Pembrolizumab, Nivolumab + Ipilimumab (MSI-H/dMMR)
FOLLOW-UP TESTS	• CEA laboratory tests every 3-6 months for the first 3 years and every 6 months for the next 2 years • CT chest, abdomen and pelvis every 6-12 months for the first 3 years, then annually for 2 years • Colonoscopy within 1 year post-surgery (or within 6 months if complete colonoscopy could not be performed pre-operatively) and every 2-3 years thereafter, depending on results			

[a] Chemotherapy may be offered to patients with Stage I rectal cancer who are deemed to be at high risk for a recurrence.

[b] For specific patients who have experienced a complete response following chemoradiation, a watch-and-wait treatment strategy may be used instead of surgery.

[c] Stage II and III tumours may be treated with short or long course radiation, depending on the circumstance.

[d] Used for symptomatic tumours resulting in pain or bleeding.

[e] Brachytherapy may be used in rare circumstances.

4.7 Other Treatment Strategies

OTHER STRATEGIES IN THE MANAGEMENT OF METASTATIC COLORECTAL CANCER

- Hyperthermic intraperitoneal chemotherapy (HIPEC) for peritoneal metastases
- Hepatic artery infusion (HAI) pump chemotherapy for liver unresectable metastases
- Stereotactic body radiation therapy (SBRT) for liver, brain, and lung metastases
- Chemoembolization with drug eluting beads for liver metastases
- Selective internal radiation spheres (SIRspheres) for liver metastases
- Cryotherapy/Cryoablation for lung metastases
- Microwave coagulation for lung metastases
- Radiofrequency ablation

Hyperthermic intraperitoneal chemotherapy (HIPEC) for peritoneal metastases: HIPEC involves direct administration of heated chemotherapy after abdominal surgery (i.e., CRS) into the peritoneal cavity which surrounds the abdominal organs. For patients who have abdominal tumours/metastases, this maximizes the amount of drug delivered to these tumours, while minimizing that delivered to the blood. Application of HIPEC can occur during or after the surgical procedure. However, the value of adding HIPEC to CRS has been questioned recently due to new research that suggests a higher risk of post-operative challenges. Therefore, the use of HIPEC may be restricted to specific patients that would most likely experience clinical benefit.

Hepatic artery infusion (HAI) pump chemotherapy for unresectable liver metastases: HAI uses an abdominal implanted pump to deliver a high dose of chemotherapy to the tumour cells in the liver, while maintaining low toxicity in healthy sites away from the tumour. This procedure targets the liver via the hepatic artery of the liver, thereby exploiting the blood supply to the tumour. Use of a specialized infusion system allows a catheter to directly deliver chemotherapy to the hepatic artery of the liver over several weeks and is often used in combination with systemic treatment. In Canada, this procedure is only available at the Sunnybrook Odette Cancer Centre.

Stereotactic body radiation therapy (SBRT) for liver, brain, and lung metastases: SBRT involves the delivery of high-dose radiation treatments to target liver, brain and lung metastases. SBRT uses imaging and multiple external radiation beam angles to determine the exact location of and precisely treat the tumours, which reduces damage to surrounding healthy tissue. Typically, the treatment session may take up to 60 minutes and the entire course of therapy is concluded within a few days (usually 3 to 5 treatments every other day).

Chemoembolization with drug eluting beads for liver metastases: This procedure involves the administration of beads which contain a chemotherapeutic agent and are delivered via a catheter directly to cancer cells in the liver. This method of delivery allows a controlled release of the anti-tumour agent, targeting the tumour over a greater period of time and minimizing exposure to healthy tissue.

Selective internal radiation-spheres (SIRspheres) for liver metastases: SIRspheres are small polymer beads or microspheres that contain a radioactive element called yttrium-90. They act on cancer cells by emitting a high dose of radiation, thus sparing the surrounding healthy tissue. The microspheres are released into the body via a pre-determined site in the hepatic artery to maximize the effect on tumour cells while minimize the impact on healthy tissues.

Cryotherapy/cryoablation for lung metastases: Cryotherapy or cryoablation refers to the application of extreme cold to destroy cancer cells in the lungs. This technique uses gas to create a hypothermic environment, which freezes cancer cells. Ice formation disrupts cell function, further damaging the cancer cell. Cryoablation can be performed by way of a needle puncture through the skin or using a bronchoscope into the airway.

Microwave coagulation for lung metastases: Microwave coagulation is one of many techniques used to treat lung metastases. This method uses microwave radiation, which refers to the region of the electromagnetic spectrum with frequencies between 900 and 2450 MHz. With imaging guidance, a thin antenna is placed directly into the tumour. A microwave generator then emits radiation through the antenna, which agitates water molecules in the surrounding tissue of the tumour producing heat and friction, thus damaging the cancer cells.

Radiofrequency ablation: Radiofrequency ablation (RFA) uses high-energy radio waves for treatment. A thin, needle-like probe with tiny electrodes is placed through the skin and into the tumour. Placement of the probe is guided by ultrasound or CT scans. The tip of the probe releases high-frequency radio waves that heat the tumour and destroy the cancer cells.

4.8. New Developments in the Treatment of Metastatic Colorectal Cancer

The many areas of active research include preventing the disease, screening, early treatment and late disease stage options. For the last 50 years, chemotherapy has been the main approach in treating patients with colorectal cancer. Modern therapeutic research is examining the combination of targeted treatments and immunotherapies with chemotherapy. Scientists also continue to uncover why colorectal cancers grow, and this helps to identify new targets for therapies. Clinical trials are continually underway with the goal of identifying more effective and safer treatments.

4.8.1 Clinical Trials in Canada

Clinical trials involving investigational drugs or different combinations of therapies are important in order to achieve advancements in colorectal cancer treatment. Trials may be conducted during different points of the treatment journey with the aim of identifying strategies to improve cancer outcomes as well as increase tolerability or convenience. Patients with colorectal cancer may seek access to investigational drugs or drug combinations by participating in a clinical trial. Your doctor can explain the different types of clinical trials involving new cancer treatments, helping determine if you are eligible and if the trial is appropriate for you.

4.8.2 Informed Consent

Before enrolling in a clinical trial, it is important to understand the importance of **informed consent and your rights as a patient**. Your team of doctors and nurses will discuss the purpose of the clinical trial and the details about trial involvement (treatment, tests, and risks and benefits). The privacy of your medical records will also be discussed. After your discussion, your research team will provide you with an informed consent form to read. If you agree to enroll in the study, you will need to sign the consent form. Remember to ask for new information about your trial as soon as it becomes available. As a patient, you have the right to make the decision about participation and you also have the right to leave the study at any time.

Information on clinical trials in Canada can be found on Colorectal Cancer Canada's website. Visit **www.colorectalcancercanada.com/colorectal-cancer/treatment/#clinical** or refer to the Cancer Clinical Trials Patient and Caregiver Guide at:
www.colorectalcancercanada.com/app/uploads/2021/05/Cancer-Clinical-Trials_-A-Patient-Caregiver-Guide-1.pdf

QUESTIONS TO ASK YOUR DOCTOR

1. What can I expect from my therapy?
2. What are the names of the drugs that will be used in my treatment?
3. What will I feel like after my treatments?
4. How will I know if the treatment is working?

4.9 Making Sense of the Patient Journey

A patient who is diagnosed with colorectal cancer embarks on a journey that they are inevitably not prepared for. If you have been diagnosed with CRC, there are so many variables that make your experience unique; from the initial symptoms and testing, to the diagnosis, treatment and outcome.

Learning that you have CRC has a significant emotional impact; not only on you, but your loved ones as well. You may feel shock and disbelief, anger, depression and/or fear. At the time of diagnosis, you will have so many questions. It is important to work with your healthcare providers to get the answers to all of your questions so that you understand what lies ahead. Open and clear communication with everyone involved in your treatment is essential. It is helpful to prepare a list of questions in advance of an appointment, to avoid forgetting something. If you do not understand what your healthcare provider is telling you, make sure you let them know so they have an opportunity to explain things more clearly to you.

Often patients who are diagnosed with CRC feel that their life is out of control. One of the most important initial steps in regaining the feeling of control is to develop an action plan for treatment. CRC treatment depends on a number of things (i.e., cancer stage, surgical candidacy, tolerance of side effects, response to therapy). Adherence to the treatment plan may improve outcomes, so you should be in agreement with the recommended treatment plan and be prepared for any side effects.

Even after initial treatment, further testing is required to determine the effectiveness of the therapy and/or disease progression. Waiting for test results may cause a great deal of anxiety and stress, and an effort should be made to cope with these feelings. Several organizations and support groups offer help to individuals and families who are dealing with CRC. This support is valuable as it often encourages emotional strength, a more positive outlook, and acceptance of the disease and surrounding circumstances.

CRC is a life changing diagnosis. It affects you physically and emotionally, and it may impact your work and family life as well. The most important thing to remember is that you are not alone. CCC has a listing of support groups offered across the country which can be accessed at **http://www.colorectalcancercanada.com/**. Also, please see the "Finding Information" section for a list of support groups and resources that will help you cope on your journey with CRC.

4.10. Follow-up

Regular checkups after treatment will allow you to discuss questions and deal with any side effects of treatment. Your healthcare team can also help you find emotional or social support if you need it.

Most importantly, keep all scheduled follow-up appointments, since cancer can recur in the colon or rectum following treatment or a new cancer can start in another part of the body. Regular physical and radiological examinations aim to try to find any recurring cancer as soon as possible. Your checkups will continue for several years.

If your cancer was assessed to be Stage I, II or III, your healthcare team may evaluate your health with different tests, including physical examination or various imaging tests. If your surgeon wasn't able to inspect your whole bowel at the time of the operation, a follow-up colonoscopy may also be ordered. The table below summarizes the different tests and test frequencies that you may have as part of your follow up plan.

FOLLOW UP EXAMINATION MAY INCLUDE THE FOLLOWING

Evaluation	Recommendation	Recommended Frequency
CEA	CEA measurements are recommended for all non-metastatic patients who would potentially be candidates for additional treatment	• Every 3-6 months for the first 3 years • Every 6 months for the next 2 years
CT chest/ abdomen/pelvis	Chest, abdominal and pelvic CT scanning is recommended for all non-metastatic patients who would potentially be candidates for additional treatment	• Every 6-12 months for the first 3 years, then annually for 2 years
Colonoscopy	Surveillance colonoscopy is recommended for all non-metastatic patients who would potentially be candidates for additional treatment	• Within 1 year post-surgery (or within 6 months if complete colonoscopy could not be performed pre-operatively) • Every 2-3 years thereafter, depending on results
Physical examination and history	A medical history and physical examination should be considered periodically	• Consider periodically • If elevated CEA persists

REGARDLESS OF THE DATE OF YOUR NEXT APPOINTMENT, CONTACT YOUR DOCTOR IF YOU EXPERIENCE ANY NEW, PERSISTENT OR WORSENING OF THE FOLLOWING SYMPTOMS:

- stomach pain, particularly on the right side
- dry cough
- fatigue
- nausea
- diarrhea
- unexplained weight loss
- pelvic pain
- sciatica
- difficulty urinating
- difficulty with bowel movements

Adapted from Members of the Colorectal Cancer Survivorship Group. Follow-up care, surveillance protocol, and secondary prevention measures for survivors of colorectal cancer. Toronto (ON): Cancer Care Ontario; 2012 Feb 3. Program in Evidence-based Care Evidence-Based Series No.: 26-2 Version 2. March 15, 2016.

Tell your doctor or other members of your healthcare team about any symptoms or side effects that concern you.

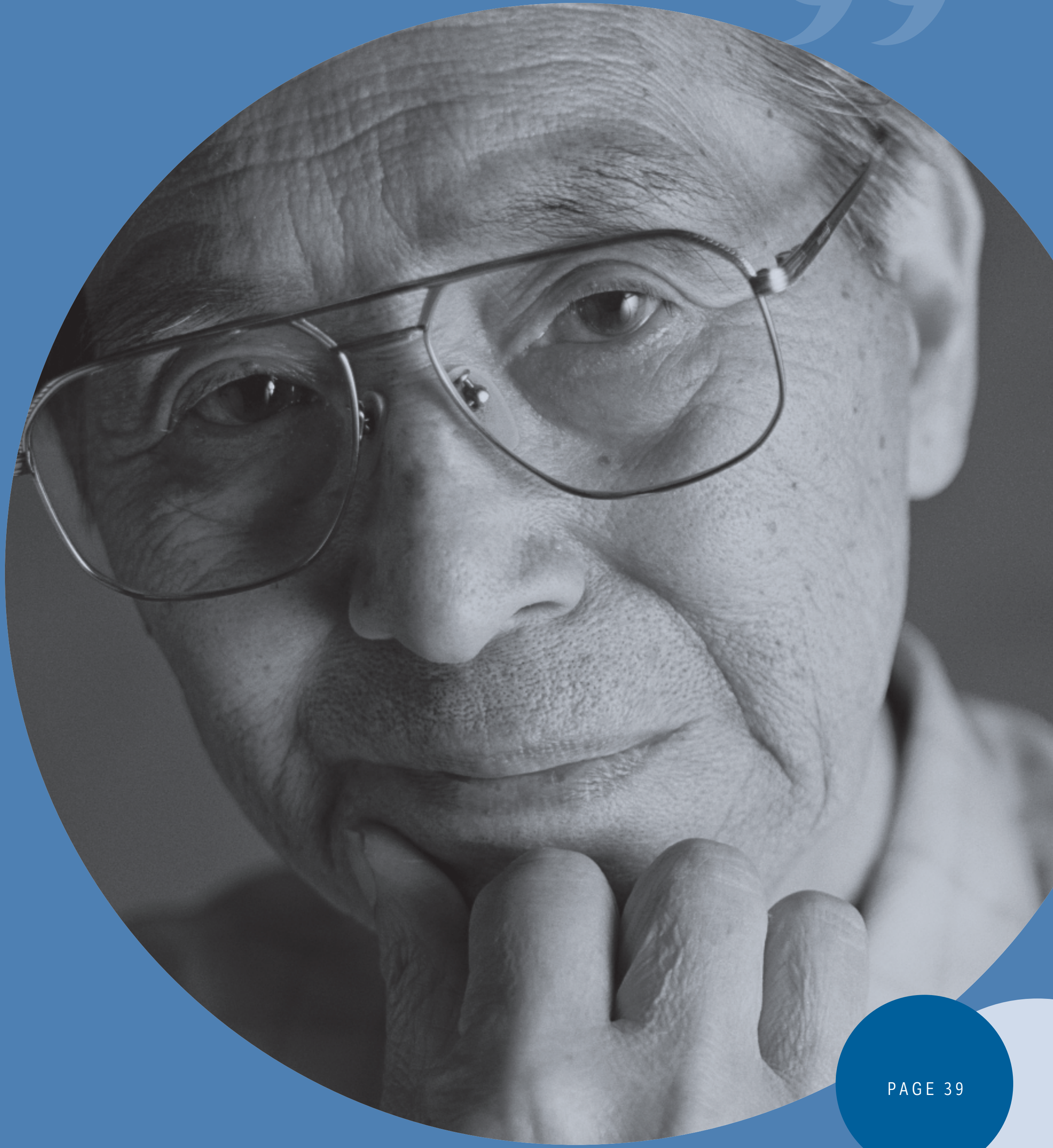
4.11 Palliative or Supportive Care

Palliative or supportive care refers to care given to improve the quality of life during any stage of illness. It can include managing pain and other symptoms, providing psychological, emotional and spiritual support, supporting caregivers and family, and providing support for bereavement.

Palliative care can have a few meanings and it is important for you to understand which your healthcare professional may be discussing with you. Palliative cancer therapy can refer to treatments aimed to delay the progression of cancer and reduce cancer-related symptoms in patients with metastatic disease whose cancer cannot be cured. In late-stage colorectal cancer, palliative cancer therapies may be given over a few years to slow the growth of tumours.

There are many palliative/supportive care resources available for colorectal cancer patients and their families, including for those who are at the end-of-life stage of the disease. Please see the “Finding Information” section for a listing of organizations that may offer palliative support.

> *At first I thought I would never get through this, but then I realized that by taking each day at a time and by doing something special to enjoy the days, the whole treatment was that much easier for me. I began living life, not the disease.*



5. Living with Cancer

Living with cancer is a challenge. Only you can decide how to best cope with your cancer and treatments, and how to manage your daily life. You will feel better if you participate actively in managing your disease.

In addition to the medical aspects of cancer, you will have to cope with many different emotional, psychological and practical issues. You may need to make decisions about priorities that you would not otherwise have had to make.

This section includes coping techniques that many patients have found useful, as well as resources to find the help and information you need.

5.1 Putting Statistics in Perspective

Many published statistics are outdated because they are based on older methods of treating cancer. In addition, statistics indicate only how groups of patients respond to a particular disease or treatment; they cannot predict an individual's response. You want to know what your chances are, but it is best not to let a positive attitude be negatively affected by statistics which really have nothing to do with you. To better cope with your cancer, focus your mental and emotional resources in a positive way.

5.2 Coping with Treatment

It may seem difficult, but it's best to acknowledge, experience and talk about how you feel. You may prefer to talk to family, friends, a member of your healthcare team or other patients in a support group. A support or self-help group can be a good place to talk with others who have dealt with similar problems, to learn how they are coping and to share your feelings and experiences. You may also wish to talk with a professional counsellor, such as a psychologist, to help you deal with your emotions.

Most people find that they cope with their illness better if they have good emotional support. Seek the emotional support to suit your needs.

Techniques to lower anxiety, such as meditation or relaxation, may help you cope with your cancer journey. Several programs are available to help teach you how to better cope with stress such as Colorectal Cancer Canada's Scotiabank Cancer Coach Support Program or our colorectal cancer support groups.

5.3 Relationships

Cancer doesn't only touch your life, but also the lives of those around you. Sharing your cancer experience with others may make some relationships grow stronger and cause some others to become strained or even dissolve.

Most people are supportive and caring when they learn that someone close to them has cancer, although others may have difficulty dealing with their own emotions. They may respond by withdrawing, by blaming you for having cancer, by making insensitive remarks such as "be grateful it can be treated," or by giving you unwanted advice. Their reactions may hurt you or leave you angry at a time when you need support.

People who respond this way do so because of their own fears, not because they don't care. Choose who you wish to tell about your diagnosis. Having someone else you can talk to can be helpful and even energizing.

5.4 Age

Cancer can affect people at any stage in their lives. Each stage has its special concerns, and you might find it useful to talk to people your own age.

Young people are often concerned about the effect of cancer on completing their education, establishing a career, dating, social relationships and starting a family. Middle-aged individuals often find that cancer interrupts their career and makes it more difficult to look after others who depend on them, such as children or aging parents. Older patients may worry about the effect of cancer on other health problems, about not having enough support or about losing the opportunity to enjoy their retirement.

It is important to deal with your concerns and come to terms with them. You can find a support group specifically for patients with colorectal cancer and share similar experiences, concerns and feelings on the Colorectal Cancer Canada website.

5.5 Self-image

Although hair loss does not occur as a result of all treatments for colorectal cancer, you may experience short-term changes such as loss of hair, dry skin, brittle nails, a blotchy complexion, and hand and foot syndrome. Depending on your treatment, you may also receive a temporary or permanent ostomy pouch. The "Look Good... Feel Better" program teaches women and men with cancer how to deal with changes to their physical appearance. See resources on page 57 for contact details and additional information.

5.6 Fatigue

Tiredness is a common side effect that may limit what you can accomplish on any given day. Consider whether you can continue working or going to school full-time. Set priorities. Pace yourself and listen to your body. Stop and rest when you are tired. See “Feeling tired” in the chemotherapy side effects section on page 19 for more information.

5.7 Complementary/Alternative Therapies (CATs)

Meditation, relaxation and visualization often help patients with cancer to lower stress and anxiety levels and maintain a positive attitude. There are many different types of therapy that promote relaxation. Your healthcare team or support group can help you find workshops that teach these techniques. Exercise is also important to reduce stress and frustration. Experiment with different techniques or activities to find what’s best for you and what helps improve your feelings of well-being.

You may also be interested in experimenting with “natural” medicines, vitamins, herbal remedies or other unproven therapies advertised as cures for cancer. Using them may make your cancer therapy work less effectively — unproven treatments have not been scientifically tested and may contain unknown products or additives that may conflict with treatment prescribed by your healthcare team. To make certain of the most effective treatment, discuss with the members of your healthcare team your interest in CATs prior to taking them, especially during treatment.

> “***Knowing there would be a follow-up schedule*** *in advance was so important. I knew that once my treatment was over I would be checked for a recurrence and that if something was found it would be early and taken care of, as quickly as possible.*”

6. After Treatment

You may feel that successful treatment has given you another chance at life. It is not uncommon for cancer to change people's priorities or career directions.

6.1 Living in Remission

Remission is when the signs and symptoms of cancer have decreased or disappeared, although cancer may still be in the body. Living in **remission** can be a source of both relief and anxiety — relief that the tumour is gone and anxiety that it may recur. It is important for you to deal with changes in your attitude to your life, your relationships and yourself. While hoping that the disease stays in remission, it is also important to remember that it can recur. Take the time to maintain your health and follow your physician's recommendations for follow-up visits.

6.2 If Cancer Returns

If you experience a **relapse**, you may feel even worse psychologically than when you were first diagnosed because you had hoped and believed that the cancer was cured. However, it may actually be easier for you to cope the second time around; you already know what to expect, how to find support and how to manage your disease. Remember, if your cancer was successfully treated once, it may be successfully treated again. Use whatever support you need to get through a relapse.

6.3 Facing Sterility

If you are intending to have children, it would be beneficial to discuss options with your healthcare professionals prior to starting treatment. If you want to have children and you are not able to as a result of your cancer treatment, you may face several practical and emotional issues. You may be able to deal with your disappointment on your own, or you may need help. Your partner, friends, family, or support groups can help.

6.4 Five Ways to Stay Healthy

For most people, age and lifestyle are the major factors that contribute to the development of colorectal cancer. Although factors such as age, genes, and family history are beyond your control, you can adopt a healthier lifestyle to reduce your risk. Studies have indicated that certain lifestyle decisions increase risk of developing colorectal cancer, such as smoking, diet and excessive alcohol intake.

1. Alcohol consumption: Alcohol consumption may increase your risk. Lower rates of colorectal cancer have been found in those who drink no alcohol. Although small amounts of alcohol are thought to lower the risk of some types of heart disease, it appears that alcohol, particularly in larger quantities, may contribute to the incidence of colorectal cancer.

2. Weight: Being overweight (particularly having excess weight around your midsection, rather than hips or thighs) increases your risk of developing colorectal cancer. This is particularly important for men.

3. Physical activity: Lack of physical activity has been associated with higher rates of colorectal cancer and can lead weight gain. People who are physically active before a diagnosis of colorectal cancer appear to do better. People who take up regular physical activity after a diagnosis of colorectal cancer often have improved outcomes. It is important to participate in some form of exercise for at least 30 minutes every day.

4. Smoking: Long-term, heavy smoking may also increase your risk. Studies indicate that smokers are two to three times more likely to develop colorectal polyps.

5. Diet: Your eating habits may have an effect on your risk of developing colorectal cancer. A lot of research has been conducted on this topic. Key factors that increase your risk are not eating enough fruits, vegetables, and fibre, eating too much red meat and processed meats, and regularly eating food that does not have proper nutritional content, is high in fat and sugar.

Fats: Some studies have shown that foods high in fat (fried foods, red meat and "junk food" such as potato chips and other packaged snacks) may put you at risk. When cooking, try using olive oil instead of butter, but remember that it's always best to use any type of fat with moderation.

Fibres: Many studies have looked at the benefits of fibre for reducing colorectal cancer risk. You can increase your fibre intake by eating lots of vegetables, fruit, whole grains, and legumes (beans, lentils, and nuts). Try to have at least half of the cereals you eat be whole grains and eat different cereals like barley, brown rice, oat, quinoa, and wild rice. Bank on diversity!

Fruits and vegetables: Many studies say it: a diet high in different fruits and vegetables reduces the risk of colorectal cancer in men and women alike. Why? Fruits and vegetables usually contain few calories and have a high content in fibres, nutrients, and antioxidants. Fruits and vegetables also help maintain a healthy weight and eliminate body waste faster. Try putting a lot of colours on your plate!

Meat consumption: Several studies have shown that eating large quantities (greater than 500 grams, cooked weight) of red meat or processed meat plays a part in developing colorectal cancer. Cooking meats at high temperatures (frying or barbecuing) may turn harmless substances in the meat into cancer-causing agents or **carcinogens**. Try replacing red meat with fish or trying vegetarian recipes with legumes.

Milk products: Milk products contain many nutrients that are important for a balanced diet and provide health benefits. For example, they help form and maintain a good bone mass; studies also tend to agree that milk seems to have a favourable effect in reducing your risk of colorectal cancer. This protection seems to be associated with two key nutrients: calcium and vitamin D. But other elements of milk could also play a role. It is presumed that calcium content in milk helps to prevent and reduce growth of benign polyps in the colon, one of the early signs of colorectal cancer.

Lower your risk of colorectal cancer by changing what you eat and adopting a healthy lifestyle. Every little change counts!

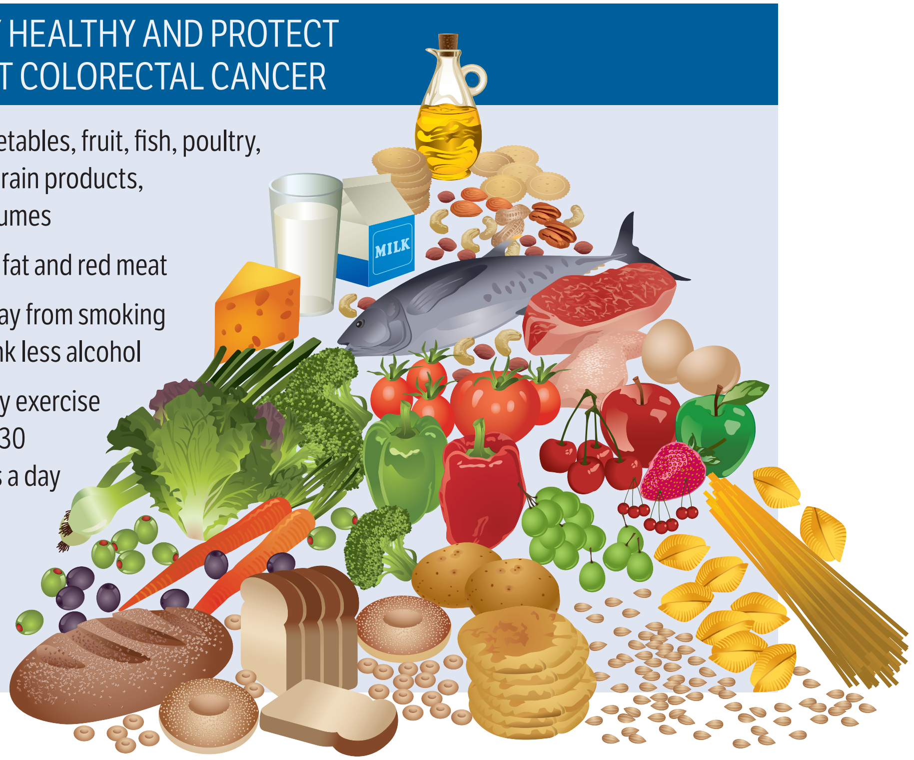
Below are examples of certain foods which are rich in nutrients and phytochemicals and that may, as part of a healthy diet, positively influence your health. Don't forget that's it's important to include a great variety of healthy food in your diet and keep in mind to cook as much as possible with fresh foods that have not been processed.

- Cabbage & cruciferous vegetables
- Algae (seaweed)
- Tofu
- Miso
- Salmon
- Red chili peppers/chili powder
- Saffron
- Turmeric
- Ginger
- Parsley
- Oregano
- Thyme
- Onions, chives, and shallots
- Garlic
- Olive oil
- Flaxseed
- Walnuts
- Pecans
- Pistachios
- Almonds
- Soybeans (edamame)
- Beans
- Oats
- Pears
- Citrus fruit
- Berries
- Apricots
- Tomatoes
- Swiss chard
- Sweet potato
- Spinach
- Mushrooms
- Kale
- Carrots
- Brussel sprouts
- Broccoli
- Bell peppers
- Beets
- Avocado
- Artichoke
- Asparagus

For more information on foods that help to fight cancer, go to: **www.foodsthatfightcancer.ca/** and refer to the NOURISH pamphlet "Eating well after treatment", found at **www.foodsthatfightcancer.ca/wp-content/uploads/2020/03/EBmed-NourishExtra-Colon3-06.pdf**. You will find many delicious recipes!

TO STAY HEALTHY AND PROTECT AGAINST COLORECTAL CANCER

- eat vegetables, fruit, fish, poultry, whole grain products, and legumes
- eat less fat and red meat
- stay away from smoking and drink less alcohol
- regularly exercise at least 30 minutes a day



Prevention through a healthy lifestyle and active screening is an important part of preventing colorectal cancer development and recurrence. Colorectal Cancer Canada offers a number of resources and additional information online. Visit **www.colorectalcancercanada.com**

Understanding the different treatment options was so important to me. Not only did I feel better because I knew what to expect from the treatment I was on, but I knew that if the treatment did not work out there were other options available for me.

7. Screening Information for Family and Caregivers

Colorectal cancer is highly preventable if it is caught early before polyps develop into cancer. When the cancer is found early, particularly before it has spread outside the colon, early treatment can lead to an excellent outcome.

The process of diagnosis usually begins with a visit to your family doctor with a specific complaint or symptom, or perhaps because your doctor discovers something not seen before during a routine checkup. Your doctor will take a medical history, do a physical examination, and prescribe some additional tests. A diagnosis can only be confirmed by a pathologist's examination of the cells under a microscope.

7.1 Understanding the Risks

Understanding your risk can help you make decisions about screening and prevention.

If a person is at higher risk, their doctor may develop an individualized **screening** program, based on medical and family history. This program may include one or more of the screening methods described below. A patient may most likely need to be screened more often, and usually before they reach 50 years of age.

Genetic testing is recommended for individuals with a strong family history of cancer. In this case, your doctor may recommend that you meet with a genetic counsellor. Genetic mutations can be inherited from either the maternal or paternal side of the family; therefore, genetic counsellors examine the complete family history, or pedigree, usually going back three generations. See Section 8. Finding Information for more information.

QUESTIONS TO ASK YOUR DOCTOR

1. Based on my family and medical history, do I have any of the risk factors that would make me likely to develop colorectal cancer?
2. If I have any of the risk factors, are there any changes I can make to place me at less risk?
3. What are the signs and symptoms that I should be aware of?

For additional questions, go to **www.colorectalcancercanada.com**

7.2 Symptoms

Symptoms, or warning signs, of colorectal cancer are often not obvious. Whether or not you display symptoms depends on the location of the cancer, whether or not there is bleeding and whether the polyp has penetrated the walls of the colon. Many of the symptoms are nonspecific and could be related to other conditions such as infections, hemorrhoids and inflammatory bowel disease. In any case, it is important to talk to your doctor if you experience symptoms such as those listed below.

THE MOST COMMON SIGNS INCLUDE

- blood (bright red or black flecks) or mucus in the stool (feces)
- changes in bowel habits (diarrhea, constipation, or both) that last more than six weeks
- the feeling of not having completely emptied your bowels
- pain or discomfort in the stomach area (colicky pain, cramps, or tenderness)
- unexplained weight loss
- extreme tiredness or anemia
- a lump in the abdomen or abdominal pain

7.3 Tests to Detect Colorectal Cancer

Since it generally takes as long as eight to ten years for benign polyps to turn into malignant tumours, screening tests can help find benign polyps which can be safely and easily removed before they turn cancerous. In this way, cancer can be prevented from developing.

Recommendations for Colorectal Screening

Most provinces have implemented screening programs for colorectal cancer. The test used in each province may vary, but generally the **fecal immunochemical test (FIT) is used**.

Note: screening is only used for asymptomatic patients at average risk. If you have symptoms (e.g., blood in stool, low hemoglobin), stool-based tests are not appropriate, and you require a full colonoscopy. If you have a family history of colorectal cancer, your risk is higher than average and stool-based tests are not appropriate; you require a full colonoscopy.

IF A SCREENING TEST HAS IDENTIFIED A POTENTIAL PROBLEM, FURTHER DIAGNOSTIC TESTS CAN BE DONE TO

- confirm the presence of cancer
- determine the type of cancer
- locate where the cancer started (primary tumour)
- determine how far the cancer has spread (**stage**)
- make decisions about your treatment
- determine if cancer has returned (**recurrence** or **relapse**)

The diagnosis of colorectal cancer requires some of the tests listed below. In Canada, the types of tests that doctors use for screening or diagnosis may vary from centre to centre, or province to province; however, the only way to confirm a diagnosis is by a pathologist's examination of the cells under a microscope. Most provincial population-based screening programs will begin with iFOBT/FIT testing for average-risk participants in the program and a colonoscopy for high-risk individuals.

There are seven main ways to detect colorectal cancer or polyps:

Digital rectal exam (DRE): This examination is done by a doctor or nurse, who places a lubricated, gloved finger into the anus to feel for rectal tumours. This technique is safe and painless. The digital rectal examination may detect large polyps only in your lower rectum, but it may not detect smaller ones or tumours higher up in the colon. Thus, it is not recommended as a stand-alone test for colorectal cancer.

Small amounts of blood may appear on the surface of, or be mixed in with, your stool. Bowel bleeding is caused by the bursting of a blood vessel in the bowel wall. Colorectal cancer and polyps are the most serious of these causes, but there are many other common causes for bowel bleeding that are not connected to cancer.

Fecal immunochemical test (FIT) or immunochemical fecal occult blood test (iFOBT): This stool blood test detects occult (hidden) blood in the stool. It detects a specific portion of a human blood protein called hemoglobin. This test is more specific and reduces the number of false positive results compared to some older stool-based tests.

Colorectal Cancer Canada recommends that men and women of average risk between the ages of 50–74 should have FIT at least every two years.

Recently, the United States Preventative Services Task Force (USPSTF) updated their recommendations to also include screening for men and women of average risk between the ages of 46-49.

If your FIT test is positive, there may be blood in the stool resulting from a number of problems, only one of which is colorectal cancer. In order to better determine the origin of the blood, you will be asked to have a colonoscopy; alternatively, you may be asked to have a sigmoidoscopy or a double-contrast barium enema to investigate the result. In some cases, you may be asked to undergo a **CT scan** or **ultrasound** as well.

Flexible sigmoidoscopy: This procedure involves the placement of a sigmoidoscope - a thin, soft, bendable tube with a tiny video camera at its tip - through the anus into the rectum and colon. This procedure can only detect polyps in the lower half of the colon since the tube does not reach the full length of the colon. You will be asked to avoid consuming fluids or food the night before the procedure to clean out the colon. Before the test, you will also be given two enemas, where fluid is inserted into the rectum to cause movement of the bowel. During the examination sedation is not utilized, and consequently you may experience slight pressure as the sigmoidoscope is inserted through the colon.

Colonoscopy: The colonoscope is similar to the sigmoidoscope except it is thinner and longer, allowing the doctor to see the entire length of the colon. The colonoscope can also remove polyps or take a small amount of tissue for a **biopsy** or testing in the lab. If your FIT/iFOBT test shows blood in the stool, or if polyps were seen during flexible **sigmoidoscopy**, you will likely be asked to undergo a full **colonoscopy**. It is also recommended for individuals who are at high risk of developing colorectal cancer for genetic or other reasons.

Preparation for a colonoscopy may vary from physician to physician. In some cases, you will be asked to take laxatives or enemas prescribed by your doctor for up to four days before a colonoscopy and eat a restricted diet within 24 hours to help clear the bowel. If your bowel is empty, the doctor will have a clear view of the lining of the colon and rectum through the colonoscope. It is important that you drink lots of water during this cleanse to prevent dehydration. During the examination, you will be mildly sedated to avoid any sensation of pressure or discomfort.

Virtual colonoscopy: This technique utilizes a series of computed tomography (CT) scans to examine the colon for polyps or masses. The images obtained are then combined to create a 3-dimensional (3-D) model of the colon using computer software. If an abnormality is found, you may still need a regular colonoscopy.

COLORECTAL CANCER SCREENING RECOMMENDATIONS FOR EARLY DETECTION

Guideline	Canadian Task Force on Preventive Health, 2016[1]		US Preventive Services Task Force Draft, 2021[2]	
Age group and recommendation	50-59 yr	Screen	46-49 yr	Screen
	60-74 yr	Screen	50-75 yr	Screen
	>75 yr	Do not screen	76-85 yr	Conditional screen
Modality and interval	gFOBT[a] or FIT	Every 2 yr	gFOBT[a] or FIT	Every year
	Flexible sigmoidoscopy	Every 10 yr	Flexible Sigmoidoscopy	Every 10 yr plus FIT every year
	Colonoscopy	Do not recommend	Colonoscopy	Every 10 yr

[a] gFOBT is generally not used anymore.

1. Adapted from Canadian Task Force on Preventive Health Care. Recommendations on Screening for Colorectal Cancer in Primary Care. CMAJ. 2016;188(5):340-348.

2. Adapted from US Preventative Services Task Force Recommendation Statement. Screening for Colorectal Cancer.

7.4 Primary Screening Practices Across Canadian Provinces

PROVINCE	SCREENING PROGRAMS	FOR MORE INFORMATION
British Columbia	ScreeningBC	http://www.bccancer.bc.ca/screening/colon
Alberta	Alberta Colorectal Cancer Screening Program (ACRCSP)	https://screeningforlife.ca/
Saskatchewan	Saskatchewan Screening Program for Colorectal Cancer (SPCRC)Cancer (SPCRC)	www.saskcancer.ca 1-855-292-2202
Manitoba	ColonCheck	ColonCheckmb.ca 1-855-95-CHECK or 1-866-744-8961
Ontario	ColonCancerCheck	www.ontario.ca/coloncancercheck 1-866-410-5853
Quebec	Colorectal Cancer Screening	http://sante.gouv.qc.ca/en/programmes-et-mesures-daide/depistage-du-cancer-colorectal/
New Brunswick	Colon Cancer Screening Program (CCSP)	www.gnb.ca
Northwest Territories	Let's Talk About Cancer: Colorectal Cancer Screening	https://www.cancernwt.ca/services/screening-and-early-detection/colorectal-cancer-screening 1-866-313-7989 cancer_navigator@gov.nt.ca
Nova Scotia	Colon Cancer Prevention Program (CCPP)	www.cancercare.ns.ca/coloncancerprevention 1-866-599-2267
Nunavut	Does not have a colorectal cancer screening program	
PEI	Colorectal Cancer Screening Program	http://www.healthpei.ca/colorectal 1-888-561-2233
Newfoundland/ Labrador	Newfoundland and Labrador Colon Cancer Screening Program	www.easternhealth.ca 1-855-614-0144
Yukon	ColonCheck	http://www.hss.gov.yk.ca/coloncheck.php Phone: (867) 667-5497 Toll Free (Yukon, Nunavut, and NWT) 1-844-347-9856

For more information go to **www.colorectalcancercanada.com**

QUESTIONS TO ASK YOUR DOCTOR

1. What screening test(s) for colorectal cancer do you recommend for me?
2. How do I prepare for these tests? Do I need to change my diet or my usual medication schedule?
3. What is involved in the test? Will it be uncomfortable or painful? Is there any risk involved?
4. When and from whom will I obtain my results?
5. If I am to have a colonoscopy or sigmoidoscopy, who will do the exam?
6. How often will I be requiring a colonoscopy?

Prevention through a healthy lifestyle and active screening is an important part of preventing colorectal cancer development and recurrence. Colorectal Cancer Canada offers a number of resources and additional information online. Visit **www.colorectalcancercanada.com/prevention/prevention-overview/**

> ***I went to a support group***
> *thinking that I was the only one and found out that almost everyone there had similar experiences and felt similar emotions.*
> *It gave me strength to carry on, knowing that I was not alone.*

8. Finding Information

Patients who have more information usually do better because they feel more in control and are more able to participate in their treatment.

HERE ARE WAYS TO GET MORE INFORMATION

- learn more about your disease and discuss treatment options with your healthcare team (doctor, nurses, pharmacists)
- write out your questions before appointments
- take a family member with you and make notes
- consult books and Internet websites (see below)
- Download the *Physician Directed Questions* at **www.colorectalcancercanada.com**

Finding a Support Group

People who have had similar experiences can often offer support. Ask your oncologist, your cancer nurse or the oncology social worker for information about groups in your area. In addition, the Canadian Cancer Society's Cancer Information Service (CIS) maintains a national database of support groups listed by postal code, although it does not rate them. You will have to use your own judgment to find a group that works for you. Colorectal Cancer Canada also maintains a list of support groups at **www.colorectalcancercanada.com**. To learn more about support groups, please contact **support@colorectalcancercanada.com**

Information Booklets

Booklets containing additional information related to colorectal cancer, such as genetic testing, clinical trials and nutrition, can be found at **www.colorectalcancercanada.com/resources/patient-caregiver-resources/**

Internet Resources

The Internet has thousands of sites devoted to cancer. Websites can give huge amounts of information about treatment, alternative medicine, personal experiences, specific types of cancer and general cancer issues. It is important to remember that information on the Internet is not screened for accuracy; therefore, we have included recommended sites below. Many sites link to related sites; if you access the websites listed below, you will be able to link to others. See the Colorectal Cancer Canada website for an updated current list of sites specific to colorectal cancer.

Colorectal Cancer Resources

Colorectal Cancer Canada
http://www.colorectalcancercanada.com

Colorectal Cancer Canada - Never Too Young Program
https://www.colorectalcancercanada.com/what-we-do/our-programs/#section2

Canadian Association of Provincial Cancer Agencies
http://www.capca.ca

Canadian Cancer Society – What is colorectal cancer?
https://cancer.ca/en/cancer-information/cancer-types/colorectal/what-is-colorectal-cancer

OncoLink – Colon Cancer
https://www.oncolink.org/cancers/gastrointestinal/colon-cancer

OncoLink – Rectal Cancer
https://www.oncolink.org/cancers/gastrointestinal/rectal-cancer

Quebec Cancer Foundation
https://fqc.qc.ca/en

Ostomy Canada
http://www.ostomycanada.ca

"Look Good...Feel Better"
For women: https://lgfb.ca/en/
For men: http://www.lookgoodfeelbetterformen.org

National Cancer Institute (U.S. National Institutes of Health)
https://www.cancer.gov/

Managing Side Effects

Chemocare – drug and side effects information for chemotherapy, targeted therapy and immunotherapy
https://chemocare.com

Tips for Managing Treatment-Related Side Effects
https://www.cancercare.org/publications/182-treatment_update_colorectal_cancer#chapter-2

Nutrition Resources

Foods That Fight Cancer
https://www.foodsthatfightcancer.ca/

Canada's Food Guide
https://www.canada.ca/en/health-canada/services/canada-food-guides.html

Support Resources

Gilda's Club
https://www.gildasclubtoronto.org

Hope and Cope
https://hopeandcope.ca

Canadian Association of Psychosocial Oncology
https://www.capo.ca

Virage Foundation
https://www.viragecancer.org

Wellspring Cancer Support
https://wellspring.ca

Wellwood
https://www.wellwood.ca

Canadian Hospice Palliative Care Association
https://www.chpca.ca

Clinical Trials Resources

Canadian Cancer Trials
https://www.canadiancancertrials.ca

Clinical Trials (U.S. National Institutes of Health)
https://clinicaltrials.gov

Canadian Clinical Trials Group (CCTG)
https://www.ctg.queensu.ca

Canadian Cancer Clinical Trials Network (3CTN)
https://3ctn.ca

Q-CROC
https://qcroc.ca/en

Oncoquebec
https://www.oncoquebec.com/home

Colorectal Cancer Registries

Familial Gastrointestinal Cancer Registry
https://www.zanecohencentre.com/fgicr

Count Me In – Colorectal Cancer Registry
https://joincountmein.org/colorectal

If you have a recommended book, article or website which is not listed here or on the Colorectal Cancer Canada website and would like to contribute that information, please submit it to **info@colorectalcancercanada.com**

9. Drug Access and Reimbursement Resources

MANUFACTURER PATIENT ASSISTANCE PROGRAMS*

Drug	Manufacturer	Patient Support Program	Phone	Email
Bevacizumab (MVASI®)	Amgen	Amgen Victory Program	1.888.706.4717	victory@adjuvantz.com
Bevacizumab (ZIRABEV®)	Pfizer	Pfizer Liaison Patient Support Program	1.844.533.0150	pfizerliaison@rxinfinity.ca
Bevacizumab (AVASTIN®)	Roche	OnCare Patient Assistance Program	1.888.748.8926	
Cetuximab (ERBITUX®)	Eli-Lilly	Erbitux Patient Support Program	1.844.367.4889	
Darbepoetin (ARANESP®)	Amgen	Amgen Victory Program	1.888.706.4717	victory@adjuvantz.com
Encorafenib (BRAFTOVI®)	Pfizer	Pfizer Liaison Patient Support Program	1.844.616.6888	pfizerliaison@bayshore.ca
Entrectinib (ROZLYTREK®)	Roche	MI-OnCare Patient Assistance Program	1.877.354.0492	mi-oncare@supportprogram.com
Epoetin Alfa (EPREX®)	Janssen	Janssen BioAdvance Patient Assistance Program	1.833.562.8433	eprex@bioadvancemail.ca
Filgrastim (GRASTOFIL®)	Apotex	Apotex Answers Patient Support Program	1.866.276.1664	Answers@innomar.strategies.com
Filgrastim (NIVESTYM™)	Pfizer	Pfizer Liaison Patient Support Program	1.844.616.6888	pfizerliaison@rxinfinity.ca
Ipilimumab (YERVOY®)	BMS	BMS Access to Hope Program	1.877.967.6626	
Larotrectinib (VITRAKVI®)	Bayer	TRAKtion Patient Assistance Program	1.888.561.8725	info@traktionsupport.ca
Netupitant-Palonosetron (AKYNZEO®)	Purdue	www.innovicares.ca	1.877.790.1991	info@innovicares.ca

MANUFACTURER PATIENT ASSISTANCE PROGRAMS* (cont'd)

Drug	Manufacturer	Patient Support Program	Phone	Email
Nivolumab (OPDIVO®)	BMS	BMS Access to Hope Program	1.877.967.6626	
Panitumumab (VECTIBIX®)	Amgen	Amgen Victory Program	1.888.706.4717	victory@adjuvantz.com
Pegfilgrastim (LAPELGA®)	Apotex	Apotex Answers Patient Support Program	1.866.276.1664	Answers@innomar.strategies.com
Pegfilgrastim (NEULASTA®)	Amgen	Amgen Victory Program	1.888.706.4717	victory@adjuvantz.com
Pegfilgrastim (FULPHILA™)	Mylan	Viatris Advocate www.BiosimilarsCanadaPSP.com	1.833.847.4323	BiosimilarsCanada@innomar-strategies.com
Pegfilgrastim (NYVEPRIA™)	Pfizer	Pfizer Liaison Patient Support Program	1.844.533.0150	pfizerliaison@rxinfinity.ca
Pembrolizumab (KEYTRUDA®)	Merck	Merck Care Oncology Patient Assistance Program	1.855.549.9416	
Regorafenib (STIVARGA®)	Bayer	BTher4U Patient Support Program	1.844.384.3748	bther4u@patientassistance.ca
Trifluridine-Tipiracil (TAS-102 or LONSURF®)	Taiho	Conexus Patient Support Program	1.833.266.3987	lonsurf@bayshore.ca

*Please note, patient assistance programs may provide services only for patients meeting certain criteria, or for a specific window of time. The program representatives will help you to understand and navigate their offerings.

10. Glossary

adjuvant: chemotherapy or radiation offered after surgery to decrease risk of cancer returning

anastomosis: a surgical procedure to connect two tubular structures; in colon cancer, anastomosis is the procedure to connect two parts of the intestine after the cancerous section has been surgically removed, which allows for normal function to be retained

anemia: a reduction in hemoglobin (a measure of the red blood cell count) to below normal levels; chemotherapy may cause anemia; symptoms may include tiredness, paleness, weakness and sometimes heart problems

anti-angiogenic: blocking the process of new blood vessel formation, a type of cancer therapy that helps to starve the tumour

apoptosis: programmed cell death or built-in instructions for cells to die after a specific lifespan; tumours may grow because cancer cells have evaded this mechanism

benign: not cancerous; a benign growth is a non-cancerous lump or growth

biologic therapy: medical products isolated from natural sources — human, animal, or microorganism — or produced by biotechnology

biomarker: a biological molecule that can be found in bodily fluids or tissues and measured to provide information about an individual's health, condition, or disease.

biopsy: removal of a small piece of tissue for examination in the laboratory; biopsies are usually taken during surgery for colorectal cancer

biosimilar: a biologic medicine that is similar, but not identical to, a biologic therapy that has already been approved as a treatment

BRAF: a gene that provides the genetic code for the BRAF protein that is involved in sending signals in cells and in cell growth. Mutations in the BRAF gene may cause changes in the BRAF protein, resulting in increased growth and spread of cancer cells

carcinogens: cancer-causing substances

carcinoembryonic antigen (CEA): protein found in the blood; when a higher than normal amount of CEA is found, this might mean that a person has cancer — the cancer might be colorectal cancer, but could also be a different kind of cancer; in addition, a high level of CEA can be caused by other things, such as smoking; CEA levels often become lower during treatment; this may be a sign that treatment is working, which your doctor will discuss with you

checkpoint inhibitors: a type of immunotherapy that strengthens the immune response to help immune cells destroy cancer cells.

chemotherapy: systemic drugs usually given by intravenous (IV) injection that are used to kill cancer cells

chemoembolization: a procedure that involves blocking the blood supply to a tumour, while delivering a high dosage of anticancer drugs to the tumour

clinical trial: a study comparing the benefits and safety of different treatments in specific groups of patients

colectomy: an operation to remove the colon or part of the colon

colon: the longest part of the large intestine, which is a tube-like organ connected to the small intestine at one end and the anus at the other; the colon removes water and some nutrients and electrolytes from partially digested food; the remaining material, solid waste called stool, moves through the colon to the rectum and leaves the body through the anus

colonoscopy: a test to examine the bowel; a doctor inserts a long, slim, flexible tube, with a light attached, through the anus and examines the bowel

colostomy: an operation which brings part of the colon through an opening in the surface of the abdomen; this allows feces to come through the stoma and be collected in a bag instead of through the rectum; the colostomy may be for a short time or last indefinitely

computed tomography or computerized axial tomography (CT or CAT) scan: an imaging study that produces a three-dimensional x-ray

DNA (deoxyribonucleic acid): the hereditary material in humans and almost all other living beings; responsible for directing and coordinating the activities of all cells in the body, including life cycles

epidermal growth factor receptor (EGFR): a protein found on the surface of some cells and to which epidermal growth factor binds, causing the cells to divide; it is found at abnormally high levels on the surface of many types of cancer cells, so these cells may divide excessively in the presence of epidermal growth factor

erythropoietin: a hematopoietic growth factor involved in the production of blood; erythropoietin stimulates the development of red blood cells from immature cells

familial adenomatous polyposis (FAP): an inherited condition that causes hundreds of small polyps (adenomas or benign growths) to grow throughout the bowel; these benign growths can turn malignant if not removed

febrile neutropenia: fever associated with neutropenia

fecal occult blood test (FOBT): chemical test for the presence of hidden blood in feces

fecal immunochemical occult blood test (iFOBT) or fecal immunochemical test (FIT): this test detects the "globin" part of the hemoglobin molecule as occult (hidden) blood in the stool; this test is done in a similar way to FOBT

granulocyte: a white blood cell

granulocyte colony-stimulating factor (G-CSF): a growth factor made in the body that stimulates the development of granulocytes; G-CSF is used to promote the recovery of granulocytes following chemotherapy

hemoglobin: oxygen-carrying protein in red blood cells; hemoglobin levels are measured to determine the occurrence of anemia

hepatic artery infusion (HAI): this procedure uses an abdominal implanted pump to deliver a high dose of chemotherapy to the tumour cells in the liver (for liver metastases), while maintaining low toxicity in healthy sites away from the tumour

HER2: a tyrosine kinase protein that promotes the growth of cancer cells. HER2 is used as a biomarker to predict treatment response in different types of cancers. Patients with colorectal cancer whose tumours have increased levels of HER2 due to gene amplification (referred to as HER2-positive) have shown poorer response to EGFR inhibitors. Patients with HER2 amplifications may be treated with additional treatments, including HER2-targeted therapies.

hereditary nonpolyposis colorectal cancer (HNPCC): a type of colon or rectal cancer known or strongly suspected to be due to an inherited gene mutation which runs through a group of relatives who have an extensive family history of bowel and possibly other cancers; HNPCC does not produce numerous polyps like FAP

hyperthermic intraperitoneal chemotherapy (HIPEC): this procedure is for peritoneal metastases and involves direct administration of heated chemotherapy into the peritoneal cavity (which surrounds the abdominal organs) to maximize the amount of drug delivered to these tumours; this can occur during or after a surgical procedure

ileostomy: a stoma that has been constructed by bringing the end of the small intestine (the ileum) through the abdomen to the surface of the skin; intestinal waste passes out of the ileostomy and is collected in an external pouch attached to the skin; ileostomies are usually placed above the groin on the right-hand side of the abdomen

immunotherapy: a specific type of biologic treatment that boosts the body's immune system and improves the ability to fight cancer

KRAS: a gene that provides the genetic code for the KRAS protein. The KRAS protein is involved in signaling that helps cancer cells reproduce and spread. Some colorectal tumours have a mutation in this gene, which helps the tumour grow/spread and increases the likelihood of resistance to anti-EGFR biologic therapies. The KRAS gene belongs to a family of similar genes, collectively referred to as RAS genes

local recurrence: cancer that has recurred after treatment, but which is confined to nearby tissue

lymph nodes: small, most often pea-sized organs found throughout the body but most easily felt in the neck, armpits and groin; part of the body's system of defense against infection; they also harbour cancer cells that have spread from other parts of the body

magnetic resonance imaging (MRI): imaging study that uses radiofrequency waves to produce a three-dimensional image

malignant: cancerous tumour that can spread to another part of the body

metastatic/metastasis: spread of a cancer from the original tissue through the blood or lymph system to another part of the body

microsatellite instability: a term that describes the inability to repair genetic mutations in microsatellite DNA. Microsatellite DNA are short repeated sequences within genes

mismatch-repair deficiency (MMRd): in colorectal cancer, this is characterized by genetic mutations in genes that govern DNA mismatch repair. Early studies have shown that this deficiency may help in response to immunotherapy, specifically checkpoint inhibitors

monoclonal antibody: a specific type of biologic therapy that mimics natural antibodies produced by the immune system, but is engineered to help the immune system to recognize features or processes specific to cancer cells

mutation: a genetic change in a cell which is transmitted to succeeding generations; a mutation can occur spontaneously or be induced by toxins, carcinogens, or radiation

neoadjuvant: chemotherapy or radiation offered before surgery

neutropenia: a reduction in the neutrophil count to below normal levels caused by chemotherapy; neutropenia places patients at risk of serious infection and chemotherapy dose reductions and delays

neutrophil: a white blood cell

NRAS: a gene that provides the genetic code for the NRAS protein. The NRAS protein is involved in signaling that helps cancer cells reproduce and spread. Some colorectal tumours have mutations in this gene, which helps the tumour grow/spread and increases the likelihood of resistance to anti-EGFR biologic therapies. The NRAS gene belongs to a family of similar genes, collectively referred to as RAS genes

palliative therapy: treatment given to ease pain or other symptoms without curing the underlying disease

PD-1/PD-L1: an important signaling pathway in the immune system that plays a role in regulating the lifecycle of immune cells

peripheral neuropathy: refers to conditions resulting from damage to peripheral nerves that carry information to and from the brain and spinal cord; symptoms may include (but are not limited to) numbness, tingling of hands/feet, cramps, muscle weakness or twitching

peritoneum: the membrane lining the abdomen

polyp: a small tumour in the bowel; polyps are usually benign, but can turn malignant

polypectomy: local removal of the polyp through a colonoscope

port: a small medical device implanted below the skin, allowing more convenient access to a vein

positron emission tomography (PET): a nuclear medicine medical imaging technique which produces a three-dimensional image or map of functional processes in the body

prognosis: a forecast or prediction of the likely course of a disease, outcome of treatment and risk of relapse

radiation therapy or radiotherapy: the use of radiation, for example x-rays, to kill cancer cells

radiofrequency ablation: this procedure involves a thin needle-like probe with tiny electrodes and is placed through the skin and into the tumour while guided by ultrasound or CT scans; the tip of the probe releases high-frequency radio waves that heat the tumour and destroy the cancer cells

RAS: a term used to describe a family of genes with similar function. KRAS and NRAS are genes that both belong to the RAS family

rectum: the last 12–15 centimetres of the large bowel, which opens to the outside at the anus; the feces are collected in the rectum before they are passed as a bowel movement

recurrence: the return (relapse) of detectable cancer after first treatment resulted in no detectable signs of cancer (remission)

red blood cell: blood cell responsible for carrying oxygen to the tissues

regimen: drug recipe that specifies the drugs, doses, timing, frequency and total amounts

relapse: see recurrence

remission: the absence of any detectable signs of a tumour after treatment has been completed

resection: removal of part of the body in an operation

risk factor: anything that increases your chance of developing colorectal polyps or colorectal cancer

screening: the process for finding polyps

sigmoidoscopy: a procedure for examining the rectum and lower part of the colon by inserting into the anus a sigmoidoscope — a thin, soft, bendable tube with a tiny video camera at its tip

small molecule drug: a type of drug that is made from chemically manufactured molecules

stage/staging: a system for describing the extent, risk of spread or recurrence and appropriate treatment of a tumour

stoma: artificial opening into the bowel created by surgery to act as an exit for feces or body waste; this opening onto the abdomen allows the feces to be diverted and collected in a bag

stool DNA test: new method of colorectal cancer screening that tests stool for the presence of known DNA alterations in the adenoma-cancer sequence of colorectal cancer development

targeted therapy: a targeted cancer treatment that uses drugs to find and attack specific cancer cells while minimizing harm to normal cells

TNM staging system: a system for describing the extent of cancer in a patient's body; T describes the size of the tumour and whether it has invaded nearby tissue; N describes any lymph nodes that are involved; and M describes metastasis (spread of cancer from one body part to another)

thrombocytopenia: a below-normal number of platelets in the blood; platelets help prevent bleeding

total mesorectal excision (TME): specialized operation to remove the rectum and surrounding tissue

toxicity: unwanted damage to normal cells caused by chemotherapy, radiation, hormonal therapy or other treatment

tumour: any swelling; in the context of cancer, the word usually refers to malignant (cancerous) lumps

tyrosine kinase inhibitor (TKI): a type of targeted therapy that stops the function of tyrosine kinase proteins. Tyrosine kinase proteins are involved in sending signals that help cancer cells grow and survive

ulcerative colitis: inflammatory disease of the large bowel, which causes a higher risk of cancer

ultrasound: medical imaging technique using high-frequency sound waves

vascular endothelial growth factor (VEGF): a substance made by cells that stimulates new blood vessel formation

virtual colonoscopy: a method under study to examine the colon by taking a series of x-rays (called a CT colonography) and using a high-powered computer to reconstruct 2-D and 3-D pictures of the interior surfaces of the colon from these x-rays. The pictures can be saved, manipulated to better viewing angles and reviewed after the procedure, even years later

11. Common Drug Names

Generic Name	Brand Name
Individual Drug Products	
bevacizumab	AVASTIN®, MVASI®, ZIRABEV®, BAMBEVI®, ABVMY®, AYBINTIO®, VEGZELMA®
capecitabine	XELODA®
cetuximab	ERBITUX®
encorafenib	BRAFTOVI®
entrectinib	ROZLYTREK®
fluorouracil (5-FU)	Fluorouracil Injection USP
folinic acid (FA) or leucovorin (LV)	Leucovorin Calcium/ Lederle LEUCOVORIN® Calcium
irinotecan	CAMPTOSAR®
ipilimumab	YERVOY®
nivolumab	OPDIVO®
oxaliplatin	ELOXATIN®
panitumumab	VECTIBIX®
pembrolizumab	KEYTRUDA®
ramucirumab	CYRAMZA® (not currently available in Canada)
regorafenib	STIVARGA® (not currently reimbursed in Canda)
trifluridine/tipiracil	TAS-102 or LONSURF® (not currently reimbursed in Canada)

Generic Name	Brand Name
Combination Chemotherapeutic Regimens	
FOLFIRI	fluorouracil, leucovorin and irinotecan
FOLFOX	fluorouracil, leucovorin and oxaliplatin
FOLFOXIRI	fluorouracil, leucovorin calcium and oxaliplatin and irinotecan
XELOX/CAPOX	capecitabine and oxaliplatin
XELIRI	capecitabine and irinotecan
Supportive Care	
darbepoetin alfa	ARANESP®
dexamethasone	DECADRON®
dimenhydrinate	GRAVOL®
dolasetron mesylate	ANZEMET®
domperidone	MOTILIUM®
epoetin alfa	EPREX®
filgrastim	NEUPOGEN®, GRASTOFIL®, NIVESTYM™
granisetron	KYTRIL®
metoclopramide	MAXERAN® or REGLAN®
ondansetron	ZOFRAN®
palifermin	KEPIVANCE®
palonosetron	ALOXI®
pegfilgrastim	NEULASTA®, FULPHILA™, LAPELGA®, NYVEPRIA™, ZIEXTENZO®
prochlorperazine	STEMETIL®

To find out more about Colorectal Cancer Canada and how you can become involved with our efforts, please see our website and social media channels:

Website
www.colorectalcancercanada.com

facebook.com/coloncanada

Instagram @coloncanada

twitter.com/coloncanada

Colorectal Cancer Canada

You may also contact us at:
info@colorectalcancercanada.com
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